



**Monitoring and Evaluation Reference Group (MERG)**

**Mortality Task Force Meeting  
30-31 January 2006  
New York City, USA**

**DISCUSSION SUMMARY**

**OBJECTIVE**

The overall objective of the mortality task force meeting was to make recommendations on how best to assess the mortality impact of malaria control efforts, and to develop consensus on the process for harmonizing/coordinating efforts to monitor trends in malaria-related mortality.

To achieve this objective, the discussion covered the following topics:

- Review the need for assessing the impact of malaria control efforts on mortality
- Evaluate options for assessing the mortality impact
- Make recommendations on how best to assess the impact of malaria control efforts on mortality
- Develop consensus on the process for harmonizing/coordinating efforts to monitor trends in malaria-related mortality

**DISCUSSION SUMMARY**

**1. Review the need for assessing the impact of malaria control efforts on mortality**

Bernard Nahlen presented a brief overview on the need for assessing the mortality impact of malaria control programs. He noted that there are significant new streams of funding for malaria that require an assessment of mortality impact of control efforts – such as the President’s Malaria Initiative, The Gates Foundation, The Global Fund, The World Bank Malaria Booster Program, and Canadian CIDA for an expansion of the Accelerated Child Survival and Development program. In addition, some international goals and targets (including RBM and MDG targets) also call for monitoring malaria-specific mortality.

But there are significant challenges to monitoring the malaria-specific mortality, notably in high transmission countries of Africa, given weak health information and vital registration systems. It was agreed that while there are significant challenges to assessing mortality, there is clearly a high demand for such an assessment. The RBM MERG mortality task force, therefore, has an important role to play in providing guidance on the

best approach for assessing the mortality impact, and for developing a process to harmonize these efforts across partners.

## **2. Evaluate options for assessing the mortality impact**

Alex Rowe and Gareth Jones presented different approaches to assessing the mortality impact, and these presentations were followed by discussion among the participants.

### **Alex Rowe's presentation (and discussion)**

Alex Rowe presented the draft MERG paper entitled, "Options for Evaluating the Impact of Malaria Control Efforts on Mortality in Africa". This paper had been presented and discussed at the MERG general meeting in New Delhi in December 2005 and had previously been circulated to all MERG members for comment. His presentation outlined the series of eight options for assessing the mortality impact discussed in the paper, including their advantages and disadvantages:

1. In representative populations, measure trends in all-cause child mortality, coverage of malaria control interventions, and other factors that might influence child mortality.
2. In demographic surveillance systems (DSSs), measure trends in malaria-specific mortality, coverage of malaria control interventions, and other factors that might influence malaria mortality.
3. Use results on malaria-specific mortality and all-cause mortality (ACM) from DSSs to interpret trends in ACM from population-based surveys, controlling for coverage of malaria control interventions, and other factors that might influence malaria mortality.
4. In representative populations, measure trends in malaria-specific mortality (by adding verbal autopsies to population-based surveys), coverage of malaria control interventions, and other factors that might influence malaria mortality.
5. Use results on malaria-specific mortality and ACM from DSSs to interpret trends in ACM from population-based surveys, controlling for coverage of malaria control interventions, and other factors that might influence malaria mortality; also, measure trends in malaria mortality with verbal autopsies added to population-based surveys.
6. In community-based sentinel sites, measure trends in malaria-specific mortality, ACM, coverage of malaria control interventions, and other factors that might influence malaria mortality.
7. Estimate malaria mortality trends from a mathematical model based on coverage of malaria control interventions and other factors that might influence malaria mortality.
8. Measure trends in malaria-specific mortality by analyzing data from a country's health information system or data abstracted from hospital records, coverage of malaria control interventions, and other factors that might influence malaria mortality.

It was noted that most options use same basic approach including (1) indicator of malaria mortality measured over time (2) data collected on factors influencing malaria mortality: program factors (coverage), non-program factors (rainfall) (3) trends analyzed to show coverage increased to high level (4) trends in malaria mortality indicator interpreted to account for changes in non-program factors (confounders). The President's Malaria Initiative has planned to use Option 5 in countries where it is deemed feasible to do so, and the paper presents an algorithm to help countries discern which option would be best suited to their needs.

It was noted during the discussion that some of the disadvantages highlighted during the presentation would make certain options unfeasible in most settings. Specifically:

**DSS sites:** DSS sites do not exist in many areas, and it would take a large effort to set up new sites to collect information relevant to monitoring malaria-specific mortality. Where DSS sites do exist, they frequently are involved in intervention studies (such as ITNs) and thus may not be representative of the actual malaria control situation: in other settings the DSS site may collect information on unrelated issues, such as monitoring the reproductive health situation of an area, and may not collect actual malaria-specific data. When relevant information is collected by DSS sites, the information is often not nationally-representative, and the timely sharing of information among numerous DSS sites has been problematic. While it is important to engage communities working at DSS sites as well as other local research centers, it was broadly agreed that the systematic use of DSS information in this effort would be a challenge. On the other hand, collaboration with DSS sites can be important for capacity building for malaria M&E, and, in addition, data from DSS sites can be useful for triangulation with other locally available data in order to better interpret trends in all-cause and malaria-specific morbidity and mortality among children as well as older age groups, where relevant.

**Verbal autopsies:** It was noted that verbal autopsies were included in the DHS at one point, but it was particularly difficult to ascertain cause of death for malaria as the symptoms are non-specific. The possibility was discussed of using verbal autopsies to exclude deaths that are clearly not malaria in order to try to derive a better estimate of malaria-related deaths. But there is a need for a better understanding of how to collect and analyze information on malaria-related deaths derived from verbal autopsies before moving forward with this method.

**Health information and vital registration systems:** Most countries in Africa where the burden of malaria is highest have weak health and vital information systems, making an estimate of malaria-specific mortality based solely on these sources problematic. It was noted that there may be a few exceptions to this, such as the focal malarious regions of South Africa where most clinical malaria cases are treated in the public health facilities and where the HIS system is much stronger. The issue was also raised that information from health systems is useful to allow for an analysis of the malaria burden on the health system itself. It also provides a better understanding of the extent of data gaps in the system. The problem has been that the HIS data are reported with no comment on how

complete these data are likely to be, which further limits their usefulness for triangulation with other locally available data. It would, however, be useful to look at this information while at the same time deriving a more reliable estimate of the mortality impact using alternate approaches. At the same time, more emphasis should be placed on assessing the quality and completeness of data reported from the HIS in order to increase the usefulness of these data.

There was also discussion on the feasibility of the pooled multi-country approach, excluding non-malarious areas within countries, inclusion of transmission indicators and confounding variables, as well as whether it would be pertinent to focus only on under-fives. Below is a brief summary of these discussions:

**Pooled country vs. individual country approach:** There was a discussion on whether it would be best to pool information from multiple countries in order to increase sample size, or to derive a mortality impact estimate for individual countries only. There was broad agreement that mortality impact should be assessed at the country level, and that a multi-country analysis could be done as an additional investigation if needed.

**Exclusion of non-malarious areas within countries:** It would be useful to this assessment if DHS and MICS surveys could exclude non-malarious areas within countries. It was noted, however, that this would be difficult to implement. DHS and MICS should be contacted to find out whether geocoding could be used to separate out non-malarious areas.

**Focus on under-fives:** There was a discussion of whether the focus should be on assessing the mortality impact on under-fives in Africa south of the Sahara, the population which bears the greatest burden of malaria-related mortality. There was broad agreement that the focus should start with sorting through the measurement issues of under-fives in Africa before moving to the equally difficult measurement issues of assessing the malaria-specific mortality among older children and adults, as well as estimating the mortality impact in other regions.

**Transmission indicators:** There was a discussion of including transmission indicators and accounting for confounding variables (i.e. rainfall). On transmission indicators, it was noted that it is difficult to standardize entomologic inoculation rate (EIR) collections and sampling methods, although parasite prevalence could be considered for inclusion. With decreasing transmission pressure (as measured by EIR, where possible to do so, parasite prevalence would also be expected to gradually decrease over time, although more slowly than other indications such as severe anemia in young children. More recent data on parasite prevalence is also urgently needed in most countries in order to be able to update the endemicity maps, which are key for estimating populations at risk as well as overall disease burden. Parasite prevalence can also be more easily measured and standardized than EIR measurement. However, EIR should also be measured where there is adequate technical capacity to do so. It is also important to collect this information to update endemicity maps. On confounding variables, such as rainfall, there is currently no clear way of accounting for their effect.

## Gareth Jones presentation (and discussion)

Gareth Jones presented the model developed to assess the impact of child survival interventions (including those for malaria) on under-five mortality, first published in article 2 of the Child Survival Lancet Series (referred to as the ‘Lancet’ model). The ‘Lancet’ model was used by UNICEF’s Accelerated Child Survival and Development (ACSD) program to assess the impact of scaling-up coverage of basic health interventions (including malaria control interventions) on under-five mortality ([http://www.unicef.org/health/index\\_childsurvival.html](http://www.unicef.org/health/index_childsurvival.html)). Note that the ACSD was initially implemented in 11 West African countries in 2002, and will likely to be expanded in the near future.

Specifically, the model links coverage of key child survival interventions (including those for malaria) with an estimate of each intervention’s efficacy. The proportionate reduction of under-five deaths due to the increasing coverage of an intervention from its current value to a target is then calculated. Note that interventions are included in the model based on their feasibility to be delivered at high levels of population coverage in low income countries. Each potential intervention is assigned to one of three levels based on the strength of evidence of its effect (i.e. sufficient evidence of effect, limited evidence and inadequate evidence). For malaria, below is a sample table that includes malaria-specific interventions, coverage levels and efficacy:

### Malaria

Evid. level	Intervention	Current coverage	Target coverage	Efficacy	Affected fraction
			shift of N z-score towards		
1 P1	Complementary feeding	by country	mean by country		malaria
1 P2	ITM	by country	0.99	0.75	countries only
					by country
					(and only for 6 months plus)
2 P3	Vitamin A	by country	0.99	0.44	by country
2 P4	Zinc	0	0.99	0.36	by country
					malaria
1 T5	Anti-malarials	by country	0.99	0.67	countries only

Based on these inputs, the model can calculate an estimate of how much under-five mortality has been reduced, and can also derive an estimate of malaria deaths averted. Some key advantages of this approach are that it is practical, cost-effective and provides immediate outputs. It was noted that it is quite a challenge to assess mortality impact, but at least this model brings together all we know in terms of intervention coverage and its impact on mortality (malaria specific and all cause). It was also noted that the model is an important advocacy tool as well. It could be used by program managers or donors to decide which interventions may have the greatest impact and where to put their money (although the model does not address the cost-effectiveness issues). There was broad

agreement that it would be beneficial to include the malaria assessment in the broader context of child survival and if possible, to keep the two models linked together. This would be politically salient as well as would ensure that the estimates of malaria-specific and all cause mortality are in line.

It was discussed that a key challenge with the model based approach is ensuring that users understand what the model can and cannot do. It was also noted that this model still needs to be validated. As an exercise to test validity, it was suggested to increase ITN coverage from 1%-70% in the model while leaving other interventions unchanged to see if the mortality estimate goes to about 17% (what was seen in the ITN impact studies). Questions were also raised on the efficacy estimates for malaria interventions and on whether the model considers coverage of all antimalarial drugs, or only those that are most effective in the local context. The issue of whether the model considers coverage of different interventions to be independent was also discussed, as it is likely that the same people with ITNs will also receive antimalarials at lower coverage levels and this would cause the model to overestimate impact. The issue of the time lag between intervention coverage and assessment of the mortality levels was also discussed.

### **3. Make recommendations on how best to assess the impact of malaria control efforts on mortality**

The group agreed that it is important for MERG to make recommendations on how best to assess the mortality impact, rather than to provide a set of options or an algorithm for countries to follow. There was also broad agreement that the MERG should set out the minimum needed to assess the mortality impact in all countries, and what additional analyses could then potentially be implemented. There was broad consensus around the following recommendations:

1 – All high burden countries should monitor the coverage of key malaria control interventions (i.e. ITN use and antimalarials) collected through DHS, MICS and other national-level household surveys, which may be used to derive an estimate of mortality using a model-based approach (see recommendation 2)

2 – Based on these coverage indicators and their known efficacy, all high burden countries may derive an estimate of the mortality impact of malaria control interventions using a model-based approach (specifically the ‘Lancet’ model which is now being updated). This would provide an estimate of the impact on all cause under five mortality, as well as for malaria-related under-five mortality.

3 – Additional analyses could be undertaken if complementary and robust information were available that could assist in monitoring trends in malaria-specific mortality. For example, such information may come from local research projects or from DSS sites. It would also be beneficial to review malaria data from health information and vital registration systems to determine the burden of malaria on the health system itself, as well as to understand gaps in this information sources. Finally, if available, information from morbidity measures could be reviewed.

4 - Countries under pressure to provide more in depth information on malaria-specific mortality may want to explore as an operational research question how information from verbal autopsy sources could be used.

In terms of moving forward with the model based approach, the modeling work done by the HIV/AIDS sector was discussed as a template for the malaria-related work. Note that that model focuses on estimating HIV prevalence and infections averted rather than AIDS-related mortality. John Stover of the Futures Group developed a user-friendly software package where countries could input information on intervention coverage to measure its impact on prevalence rates. It has been used mainly as a planning and advocacy tool. It was broadly agreed that this type of model (but for mortality impact) could be a good output of this task force.

#### **4. Develop consensus on the process for harmonizing/coordinating efforts to monitor trends in malaria-related mortality**

Partners working in support of malaria prevention and control efforts should aim for coordination and consistency in approaches in assessing and reporting on changes in the mortality impact of malaria control efforts. There was a consensus that there should be a minimum recommendation that all countries can implement in order to ensure consistency across countries. There is also a need to harmonize the coverage estimates used in these assessments, and UNICEF has agreed to pull together a group (including WHO and the World Bank) to review relevant data later this year. Finally, the capacity building task force is currently putting together a plan for strengthening M&E for malaria at the national and sub-national level, and these mortality recommendations could be incorporated into that document.

### **OUTPUTS AND NEXT STEPS**

There was consensus that the mortality task force should develop the following two products:

#### **1. Papers (short and long versions)**

**Short paper:** The purpose of the short paper is to summarize the MERG mortality task force recommendations in a brief, user-friendly document. The paper would outline the need for a mortality impact assessment; describe the MERG recommendation on how countries may best assess the mortality impact; benefits/drawbacks of the approach; issues for consideration (i.e. confounders, time lag); any additional analyses that could be undertaken (i.e. reviewing data from health information systems)

Next steps: Rick Steketee will draft the short paper and circulate it to mortality task force members for their review (completed), with input on the time lag issue from Gareth Jones by end-February.

**Long paper:** The purpose of the long paper is to provide more detailed technical information for interested users and would be organized to closely complement the short paper. This longer document, for example, would describe in detail the benefits/drawbacks of using various methodologies and data sources and the rationale for the MERG recommendation. This paper could then be turned into a manuscript at a later stage.

Next steps: Alex Rowe will revise the current version of the PMI draft document based on the short paper so that the two documents closely complement one another. The updated paper will be reviewed by the mortality task force members, and then subsequently shared with the rest of the MERG for their comments. It was also noted that a one-page cover note should be provided to MERG reviewers to highlight the revisions made, given the length of the paper and the reviewers' time constraints. A manuscript based on this paper may then be developed.

## 2. **Model (with accompanying package for users)**

The purpose of the model is to allow users (such as program managers) to derive an estimate of the mortality impact of malaria control efforts. The model would be based on the version used in the ACSD program (as described in the 'discussion summary'), and could be linked with the effort to update the 'Lancet' child survival model. This model would then be developed into a user-friendly software package for wide distribution to assess the impact of child survival (particularly malaria) interventions on mortality. Note that the task force members envisioned a model like the one used for HIV/AIDS, which is both user-friendly and tamper-proof (developed by John Stover of Futures Group).

Next steps: Tessa and Emily will prepare a plan for developing the model, which would include a timeline and budget. They will discuss with Gareth the extent to which the 'Lancet' model needs to be refined prior to dissemination, and identify a consultant to work with Gareth to do this. They will also look into the timeline for updating the 'Lancet' model. Finally, they will speak with John Stover of the Futures Group to explore the possibility of working with them on this effort.

## **LIST OF PARTICIPANTS**

### **(In Attendance)**

Erin Eckert	MEASURE Evaluation/ORC Macro, USA
Gareth Jones	Consultant
Bernard Nahlen	The Global Fund for AIDS, TB and Malaria, Switzerland
Alex Rowe	Centers for Disease Control and Prevention, USA
Rick Steketee	PATH/MACEPA, France
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Emily White Johansson	UNICEF, USA
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### **(Invited but unable to attend)**

Fred Arnold	MEASURE DHS/ORC Macro, USA
Nathan Bakyaite	WHO/AFRO, Uganda
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