Malaria Elimination Toolkit

Malaria Program Efficiency Analysis Tool (MPEAT)

Malaria Elimination Initiative

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The Malaria Elimination Initiative is a project of the Global Health Group at UCSF Global Health Sciences.

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Background

Malaria elimination requires countries to invest significant financial and human resources in their health systems in the short-term. To successfully interrupt malaria transmission, disease surveillance systems must be robust. Health workers need to promptly diagnose and effectively treat malaria cases that are often concentrated in remote and rural areas. Though having sufficient resources can enable a country to successfully eliminate malaria, resource constraints can reverse progress in driving down the disease. Historical evidence suggests that ill-timed downsizing of malaria control programs, due to withdrawal of financial and political support, can lead to malaria resurgences and, consequently, increased morbidity and mortality.

In the Asia Pacific region, overall funding for malaria grew 5.5-fold between 2000 and 2010, with a peak of almost USD 500 million. In 2013, funding for malaria decreased to USD 390 million, 47% of which was from national governments and 53% was from donors. The decline in funding was due to reductions in domestic financing and donor support, which is being prioritized for countries with high disease burdens and low incomes. Given the shortage of financing and the risk of resurgence, national malaria control programs (NMCPs) face increasing pressure to maximize the impact of existing funding. More and more donors and governments are requiring that NMCPs demonstrate value for money and efficiency as a prerequisite for future allocations.

Understanding Efficiency

Efficiency is achieved when the least amount of inputs (e.g., funding, human resources, infrastructure, drugs, medical equipment, information) is used to produce the greatest amount of desirable outputs or outcomes; in other words, an efficient system or health program achieves the best value for money.

Two of the most commonly assessed types of efficiency in healthcare are allocative efficiency and technical efficiency. Allocative efficiency is achieved when "health service resources are put to their best possible use so that no further improvements in the health status of the community are possible." Technical efficiency refers to the state where "healthcare interventions are each performed with the least amount of inputs."[2]

1 Palmer S, Torgerson DJ. Economics notes: Definitions of efficiency. *BMJ* 1999; **318**: 1136.
2 Yip W, Hafez R. Reforms for improving the efficiency of health systems: lessons from 10 country cases. 2015. http://apps.who.int/iris/bit-stream/10665/185989/1/WHO_HIS_HGF_SR_15.1_eng.pdf.

Recognizing the gap in supporting NMCP managers to assess the efficiency of malaria interventions, the Malaria Elimination Initiative (MEI) at the University of California, San Francisco Global Health Group developed the Malaria Program Efficiency Analysis Tool (MPEAT) to guide NMCPs in monitoring the impact of various inputs and identifying opportunities to maximize efficiency.

What Is The Malaria Program Efficiency Analysis Tool (MPEAT)?

MPEAT is a Microsoft Excel®-based tool (referred to henceforth as "MPEAT workbook") that helps NMCP managers collect, organize, and track data points related to the technical efficiency of a malaria program. MPEAT allows users to compare specific epidemiological, financial, and operational indicators between two years and against performance targets set by the NMCP. MPEAT is a flexible tool that can be used for national- and subnational-level programs.

MPEAT assumes that efficiency of health service delivery is directly related to the optimal use of resource inputs (i.e., funding, people, and time). MPEAT enables NMCP managers to identify malaria program outputs (e.g., long-lasting insecticidal nets [LLINs] distributed) and outcomes (e.g., proportion of malaria cases that are severe) that require attention and improvement. Unlike statistical methods for efficiency analysis (such as data envelopment analysis or stochastic frontier analysis), MPEAT does not provide an aggregate technical efficiency or scale efficiency analysis score. Instead, MPEAT calculates a score based on how close an NMCP's performance indicators are to predetermined targets. In addition, MPEAT provides a snapshot of how efficiency and performance indicators are changing over time. It is important to note that MPEAT identifies potential areas of inefficiency but not the root cause of those inefficiencies.
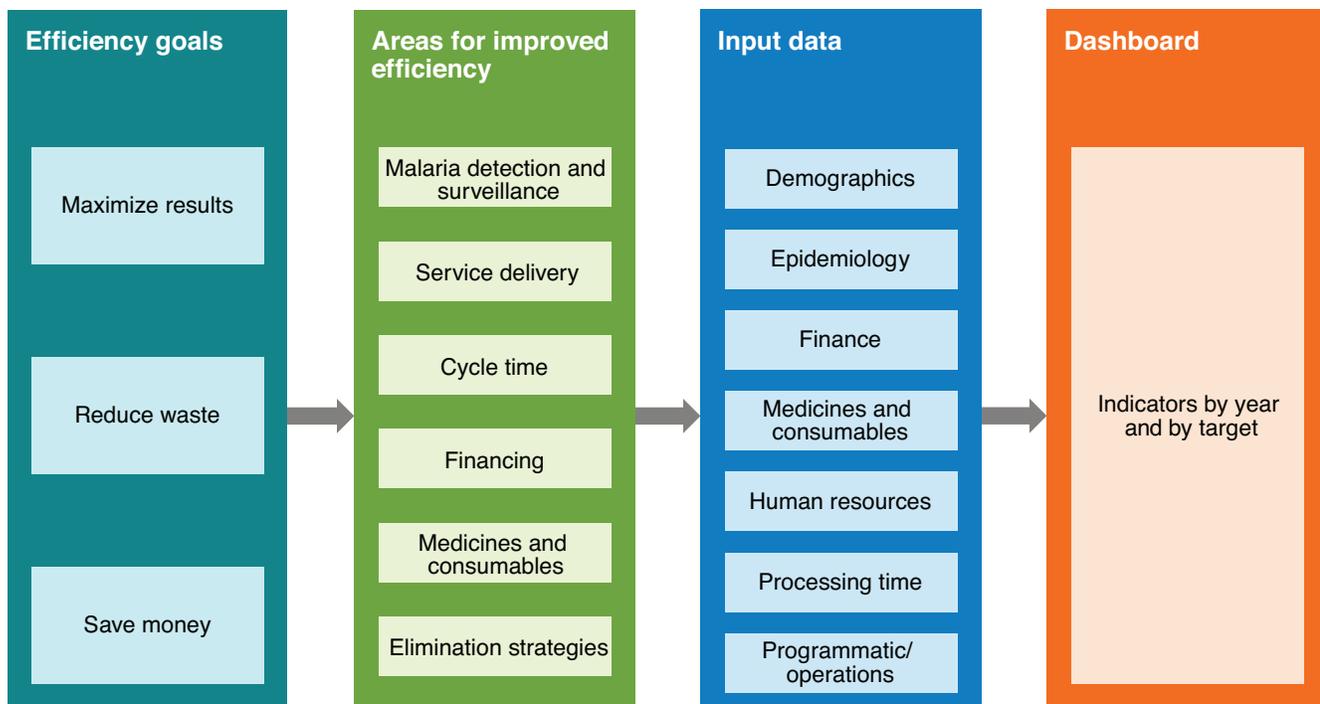
The outputs of MPEAT can be used to:

- Identify potentially inefficient areas that require improvement or further examination
- Improve malaria-specific and other health system operations that impact efficiency
- Defend annual budget requests by demonstrating improvements in value
- Advocate for more funds for the program by demonstrating better use of resources over time

MPEAT uses current and existing program data that NMCPs already collect as part of their routine management. Most of the data required are aggregated from subnational or health facility reports. This manual (referred to henceforth as "MPEAT manual") provides guidance in collecting, organizing, and interpreting the data.

MPEAT framework

MPEAT was designed to help NMCPs achieve three primary efficiency goals: maximizing value, reducing waste, and saving money **(Figure 1)**. For each of these goals, there are six areas of efficiency where NMCPs can improve performance through deliberate actions. MPEAT helps advance efficiency and achieve value for money by highlighting potential areas of inefficiency and progress over time.

Figure 1. Framework used to design MPEAT

Efficiency goals	Areas for improved efficiency	Input data	Dashboard
Maximize results	Malaria detection and surveillance	Demographics	
	Service delivery	Epidemiology	
	Cycle time	Finance	
Reduce waste	Financing	Medicines and consumables	Indicators by year and by target
	Medicines and consumables	Human resources	
Save money	Elimination strategies	Processing time	
		Programmatic/operations	

Who Is This Tool For?

MPEAT is intended for NMCP managers to understand current resource use, assess resource efficiency, and identify opportunities for cost savings. Results from MPEAT can inform NMCP budget proposals, strategic planning, and resource allocation.

Where Has This Tool Been Used?

The MPEAT was developed in 2016 and piloted in Bangladesh, Indonesia, and Papua New Guinea between October 2016 and April 2017. MPEAT was further improved based on the experience of the pilot implementation. MPEAT is expected to be disseminated through the Asia Pacific Malaria Elimination Network and other relevant forums in 2017.

How Is MPEAT Used?

To use MPEAT, data on malaria epidemiology, financing, and operations for two years (i.e., the baseline and comparator years) are entered into the MPEAT workbook. The MPEAT workbook automatically calculates values for 44 efficiency and performance indicators and generates graphs where trends can be assessed.

Implementation of MPEAT is usually led by the NMCP manager. One analyst is required to enter the data by using the instructions in the MPEAT manual. If necessary, other team members can help in the data gathering if needed.

It is recommended that the outputs of the tool are reviewed by several members of the NMCP to assess the implications of the results and to define actions that can mitigate any identified inefficiencies. MPEAT is most useful if used on an annual basis so that trends of efficiency can be monitored over time. Once inefficiencies are identified by MPEAT, causes of the inefficiencies should be identified by NMCP operations staff or through further qualitative research.

The MEI requests that NMCPs contact us prior to using MPEAT or any of the tools in the Malaria Elimination Toolkit. Support in implementing the tool may be available. Please contact Rima Shretta (rima.shretta@ucsf.edu) for questions about MPEAT.

Malaria Program Efficiency Analysis Tool (MPEAT) Manual

Introduction

MPEAT is a Microsoft Excel®-based tool that helps NMCP managers monitor key efficiency and performance indicators over time and identify inefficient areas that require further investigation. This MPEAT manual explains how the MPEAT workbook is used.

Data entry sheets

The MPEAT workbook is comprised of several sheets. **Table 1** below summarizes the function or purpose of each sheet.

Table 1. Sheets in MPEAT workbook

Sheet	Function or purpose
ABOUT	The ABOUT sheet provides information about the MEI that developed the tool, the MPEAT workbook version number, and contact information for questions regarding MPEAT.
ADMIN	The ADMIN sheet is where information about the administration of the MPEAT workbook can be entered, such as years being compared, analyst name and affiliation, completion date, etc. This sheet also provides a conceptual framework from which the tool was designed.
THEORY	This sheet shows a theory of change diagram on how using MPEAT can impact malaria programming and financing.
POLICY-NATIONAL	The POLICY-NATIONAL sheet is where the number of World Health Organization (WHO)-recommended malaria policies implemented nationally can be tallied and tracked.
INPUTS-NATIONAL	The INPUTS-NATIONAL sheet is the primary data entry sheet in the MPEAT workbook. Data entered in this sheet are national-level aggregated data (a separate sheet called INPUTS-SUBNAT is dedicated to subnational data).
RESULTS BY YEAR-NATIONAL	RESULTS BY YEAR-NATIONAL uses data in the INPUTS-NATIONAL sheet to calculate values for 44 efficiency and performance indicators. The color of circles and arrows next to each indicator denote whether the change in value observed between the baseline and comparator years is positive (green) or negative (red). A yellow circle appears when there is no change between years. No modifications are allowed in this sheet except for the targets column.
RESULTS BY TARGET-NATIONAL	The dashboard in RESULTS BY TARGET-NATIONAL provides an overview of the 44 efficiency and performance indicators grouped by area. A red circle appears next to indicators whose current values are significantly off from the target entered.The red circles help program managers quickly identify problematic areas and investigate inefficiencies in the system.
INVESTMENTS REQUIRED*	In INVESTMENTS REQUIRED, scores from 0 to 5 are calculated based on how close or far indicator values are from specified targets. The scores are presented in six bar graphs that allow NMCP managers to rapidly assess the state of efficiency and identify areas that may need attention or further investment. The scores for the 44 indicators are averaged for each of the six efficiency areas and presented in the radar chart. *The sheets following INVESTMENTS NEEDED are dedicated to conducting efficiency analysis at the subnational level. Currently the MPEAT workbook allows data collection for up to 20 uniform sites such as districts, provinces, or health facilities. It is important to note that the national and subnational sheets are not linked.
POLICY-SUBNAT	The POLICY-SUBNAT sheet is where the number of WHO-recommended malaria policies implemented at the subnational level can be tallied and tracked.

Sheet	Function or purpose
RESULTS BY YEAR-SUBNAT	The RESULTS BY YEAR-SUBNAT sheet uses data in the INPUTS-SUBNAT sheet to calculate values for 44 efficiency and performance indicators. No modifications are allowed in this sheet except for the targets column.
RESULTS BY TARGET-SUBNAT	The RESULTS BY TARGET-SUBNAT sheet provides an overview of the 44 efficiency and performance indicators grouped by area.
SUBNAT CHARTS	In the SUBNAT CHARTS sheet, scores from 0 to 5 are calculated based on how close or far subnational indicator values are from specified targets. The scores are presented in six bar graphs that allow NMCP managers to rapidly assess the state of efficiency and identify areas that may need attention or further investment.

TIP: To make the data entry easier, review the INPUTS-NATIONAL and INPUTS-SUBNAT sheets to determine which data points are readily available, which need to be aggregated before being entered into the workbook, and which data points are not available or not routinely collected by the NMCP. It might be easier to print out the INPUTS sheet and highlight actions that will be required to collect or generate the data.

Getting Started

To start, open the workbook and click on the ADMIN sheet. This sheet allows you to enter administrative data regarding the use of MPEAT.

1. Click on the "Country" drop-down menu and pick the country you are conducting the analysis for.

Malaria Program Efficiency Analysis

GENERAL INFORMATION

Country	Country
Administrative Level	Country
Baseline year	Afghanistan
Year of assessment	Albania
Type of epidemic	Algeria
Phase of epidemic	American Samoa
	Andorra
	Angola
	Antigua and Barbuda
	Argentina
	Armenia
	Aruba
	Australia

ADMINISTRATION

Prepared by	Name
Completion date	Date
Version	1.1
Presentation date	Date

2. Click on the "Baseline year" drop-down menu and pick the year that will serve as the baseline year.

Malaria Program Efficiency Analysis

GENERAL INFORMATION

Country	Country
Administrative Level	Admin level
Baseline year	Year
Year of assessment	Year
Type of epidemic	type
Phase of epidemic	phase

Year
2012
2013
2014
2015
2016
2017
2018
2019
2020

ADMINISTRATION

Prepared by	Name
Completion date	Date
Version	1.1
Presentation date	Date

3. Click on the "Year of assessment" drop-down menu and pick a comparator year against which progress will be measured.

4. Click on the "Type of epidemic" drop-down menu to choose the malaria epidemic experienced by your country. Only choose "Targeted" if malaria is limited to a small number of geographic areas or high-risk populations.

Malaria Program Efficiency Analysis

GENERAL INFORMATION

Country	Country
Administrative Level	Admin level
Baseline year	Year
Year of assessment	Year
Type of epidemic	Epidemic type
Phase of epidemic	

Epidemic Type
Targeted
Endemic

ADMINISTRATION

Prepared by	Name
Completion date	Date
Version	1.1
Presentation date	Date

5. Click on the "Phase of the epidemic" to choose the phase the NMCP is in (just as you did in choosing the type of epidemic).

6. A name of a specific person or a unit can be entered in the "Prepared by" cell. This helps keep track on who worked on the workbook last.

7. The "Completion date" is to help you keep track of the various iterations of the workbook.The date can be changed until the final data of completion is entered.

8. The drop-down menu called "Version" also helps keep track of the latest version of the workbook in case several iterations are required to complete it.

9. The "Presented date" is the when the results of the MPEAT workbook are shared in a meeting or outside the NMCP.

TIP: Remember to save your work.

Step 1: Entering Malaria Policy Data

1. After filling in the ADMIN sheet, you are now ready to enter technical data required for the workbook. Click on the POLICY-NATIONAL sheet. The baseline and comparator years you entered in the ADMIN sheet should appear at the top of the table that appears.

2. Review each WHO-recommended policy and put in a "Yes" if your country has fully implemented the policy and "No" if your country has not fully implemented the policy. If the policy is not relevant to your program, leave it blank or choose N/A.

No.	Policy	2015	2016	Source
1	ITNs/LLINs are distributed for free			WHO
2	ITNs/LLINs are distributed to all age groups			WHO
3	IRS is recommended by malaria control program			WHO
4	ACT policy adopted and implemented			WHO
5	Patients of all ages tested for malaria using diagnostic test before treatment			WHO
6	Malaria diagnosis is free of charge in the public sector			WHO
7	RDTs used at community level			WHO
8	Pre-referral treatment with quinine or artemether IM or artesunate suppositories			WHO
9	IV artesunate used for severe malaria			WHO
10	Single dose of primaquine is used as gametocidal medicine for *P. falciparum*			WHO
11	Primaquine is used for radical treatment of *P. vivax* cases			WHO
12	G6PD test is recommended before treatment with primaquine			WHO
13	Directly observed treatment with primaquine is undertaken			WHO
14	Oral monotherapies banned			WHO
15	Malaria is a notifiable disease			WHO
16	Active surveillance recommended as policy intervention			WHO

	2015	2016
Total number of policies	16	16
Total number of policies implemented	0	0
Total number of policies not implemented	0	0
Total of policies not applicable	0	0
Percent policies implemented	0.0%	0.0%

3. After filling in all the blank cells under the baseline and comparator years, summary statistics will appear at the bottom of the table.

TIP: WHO has a malaria country fact sheet that also has most of this data in case you are unsure whether the country has fully implemented the policy. It can be found at this link: Country Statistics.

Step 2: Entering Input Data

INPUT-NATIONAL is the most important sheet in the workbook that allows other sheets to generate indicator scores and graphics. The data is organized around seven input categories.

The input categories are:
1. Demographics
2. Epidemiology
3. Financial
4. Medicines and consumables
5. Human resources
6. Processing time
7. Programmatic/operations

TIP: It is not critical to enter the data in the order it is listed. To speed up the process, enter the data that is readily available to you.

Most of the data is widely available or routinely reported and should be easy to locate.

Note that once a number is entered, the red cell will turn green in color. This is to help you quickly identify cells that have not been completed.

No.	Input Category	Input Name	Unit of Measure	Baseline 2015	Current 2016	Accounting/Time Period	Recommended Source
D1	Demographics	Total population	People	7,000,000	7,200,000	Calendar year	World Bank
D2		Assumed number of family members per household	People	5	5	Calendar year	Census Bureau
D3		Total population at risk for malaria	People	7,000,000	7,200,000	Calendar year	WHO
D4		Total number of households	Households	1,320,755	1,384,615	Calendar year	NA (calculated automatically)
D5		Total number of households at risk for malaria	Households	1,320,755	1,384,615	Calendar year	NA (calculated automatically)
D6		Total number of districts	Districts	20	20	Calendar year	Census Bureau
D7		Total number of health facilities	Health facilities	112	118	Calendar year	Census Bureau
D8		Total number of health facilities with QAS	Health facilities	60	85	Calendar year	Census Bureau

The following inputs may require additional work to calculate before the final number can be entered in the workbook:

- Total number of fever cases may not be readily available and may require estimating the number based on studies conducted in your country.

- The number of active foci may only be applicable to countries at malaria pre-elimination or elimination phases.

- Most costed malaria strategic plans are for five years. The number that should be entered should be for one year out of the five-year total cost.

- Recurrent expenditure for medicines and consumables can be best obtained through the procurement department of the ministry of health or the central warehouse where such items are normally stored. If there is more than one donor for medicines and consumables, it might be easier to collect the data on a separate spreadsheet and then aggregate it later.

    To get aggregated data for several indicators, you may have to organize the raw data in a separate spreadsheet before transferring to the workbook (**Table 2**).

Table 2: Example of a data collection sheet for consumables

Donor	Item	Total USD	Quantity	Cost, insurance, and freight	Comments
UK Department for International Development	Artemisinin-based combination therapy	700,000	569,106	175,000	
US Agency for International Development	Artemisinin-based combination therapy	1,200,000	975,610	420,000	
US Agency for International Development	LLINs	890,000	395,556	133,500	
The Global Fund to Fight AIDS, Tuberculosis and Malaria	Rapid diagnostic test	95,000	50,350	28,500	Emergency procurement

- Data on the length needed to collect reports will also require data to be inputted first in a separate sheet before the aggregate number can be entered in the workbook. **Table 3** shows an example of how this data can be collected.

Table 3. Example of data collection sheet for surveillance system performance

District	Dates reports received	Dates when the reports should arrive	Total number	Dates reports received	Dates when the reports should arrive	Total number
	January			February		
1	2/25/17	2/10/17	15	3/3/17	3/10/17	-7
2	2/5/17	2/10/17	-5	4/5/17	3/10/17	26
3	3/1/17	2/10/17	19	3/25/17	3/10/17	15
4	2/15/17	2/10/17	5	3/10/17	3/10/17	0
			8.5			8.5

Step 3: Understanding Results By Year

The RESULTS BY YEAR-NATIONAL sheet calculates values for 44 efficiency and performance indicators that provide insight into the state of efficiency in the NMCP. Note that the units for the indicators vary (e.g., percent, days, USD). Indicators are first grouped by efficiency goals and then by efficiency area (**Figure 1**).

Malaria Program Efficiency Performance

Efficiency Goals	Areas for Improved Efficiency	Indicators	Unit	Baseline 2015	Current 2016	Year-to-year Comparison	Trend	Target
Maximize program	Malaria detection and surveillance	Increased ratio of reported malaria cases to estimated malaria cases	Percent	78.7%	77.6%	🔴	↓	95%

In this sheet, the only cells that can be changed are the targets. Provisional values for all the targets have been entered (based on expert opinion and global standards), but they can be revised based on the actual plans of the country.

TIP: When deciding what values to set as targets, NMCPs are advised to seek expert opinion or technical support from the MEI.

Once all the targets are reviewed, it is important to review the outputs to determine whether the results are in line with what is experienced in country operations and whether it is in line with the studies conducted in this area.

TIP: The results in the workbook should be reviewed by members of the NMCP who are involved in different aspects of malaria programming.

Based on the review, the team should identify the following:
1. Results that are clear outliers
2. Reasons for an increase or decrease in a particular indicator

A table can be used to highlight the main findings from the RESULTS BY YEAR-NATIONAL sheet (**Table 4**).
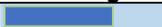
Table 4: Example of a sheet to identify key issues

Indicator	Area of concern	Next steps
Number of malaria cases fully investigated	The outputs showed that very few (less than 1%) of the malaria cases were investigated.	Almost 94% of the population is at risk for malaria, this strategy is not implemented – IGNORE in the analysis
Long-lasting insecticidal net distributed in comparison to WHO recommendation	The program distributes almost four nets per household compared to the two nets recommended. The number of people sleeping under a net is low.	Potential misuse of nets? Needs further investigation.
Reporting cycle time	Takes over four months to receive all the reports.	Need to further investigate cause of delay.

TIP: Efficiency here can be best understood through trends. Pay special attention to indicators that fluctuated dramatically from one year to another. This may signal an area that warrants further action.

Step 4: Results By Target Dashboard

The RESULTS BY TARGET-NATIONAL sheet auto-populates with the indicators and the targets from the RESULTS BY YEAR-NATIONAL sheet. The current indicator values and targets are compared, providing a snapshot of how well parts of the NMCP are doing. A red circle will appear when an indicator is significantly off from the target (i.e., 25% more or less than the target, depending on whether the indicator is expected to increase or decrease). The circles should help the NMCP team to focus on areas that require attention.

Financing

Indicator		Actual	Target	% of target
Increased proportion of malaria strategic plan costs that are funded		55.8%	80.0%	
Increased proportion of malaria budget spent		95.0%	100.0%	
Decreased malaria case per health worker		145	150	
Decreased cost per uncomplicated malaria case	●	10.0	3.50	
Decreased cost per severe malaria case	●	500.0	30.00	
Decreased variable resources per uncomplicated malaria case	●	8.0	1.50	
Decreased variable resources per severe malaria case	●	380.0	20.00	
Increase use of local funds	●	13.0%	50.0%	
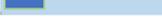
The RESULTS BY YEAR-NATIONAL and RESULTS BY TARGET-NATIONAL use the same indicators but provide a slightly different perspective. The RESULTS BY YEAR-NATIONAL sheet allows you to assess the performance of the NMCP between two years. In the RESULTS BY TARGET-NATIONAL sheet, indicators are clustered by area, and indicator values from the comparator year (referred to as "Actual" in the workbook) are compared to targets set by the NMCP.

Step 5: Summarizing Results in Investments Needed

The INVESTMENTS NEEDED sheet generates a series of figures summarizing the results from previous sheets. There are six bar graphs (representing the six areas of efficiency improvements) and one radar chart (also called "spider" chart).

In order to combine several indicators with different units of measure on a single graph, their values must be converted to comparable values based on a similar scale. In MPEAT, this is done using two scales (one each for indicators whose values are expected to increase and decrease) that assigns a score (from zero to five) depending on the magnitude of the difference between an indicator's value and its corresponding target.

For example, consider the following indicator, "Increased ratio of reported malaria cases to estimated malaria cases". The target is 95%, and the values for 2015 (baseline year) and 2016 (comparator year) are 78.7% and 77.6%, respectively. Using the scale in Table 5, indicators for 2015 and 2016 are both given an efficiency score of four (4) because they are within 6-20% of the target. The process of translating indicator values to efficiency scores is repeated for all 44 indicators and is shown in the six bar graphs.

Table 5. Scale used to translate indicator values to efficiency scores

Efficiency score	Difference between target and indicator values
0	≥86%
1	61-85%
2	41-60%
3	21-40%
4	6-20%
5	≤5%

Efficiency scores per area are averaged and summarized in a radar chart which provides a snapshot of efficiency via the six efficiency areas.. Areas whose efficiency scores are close to "5" are performing well, while those closer to "0" need attention.

Efficiency and performance of the NMCP
Average efficiency score per area
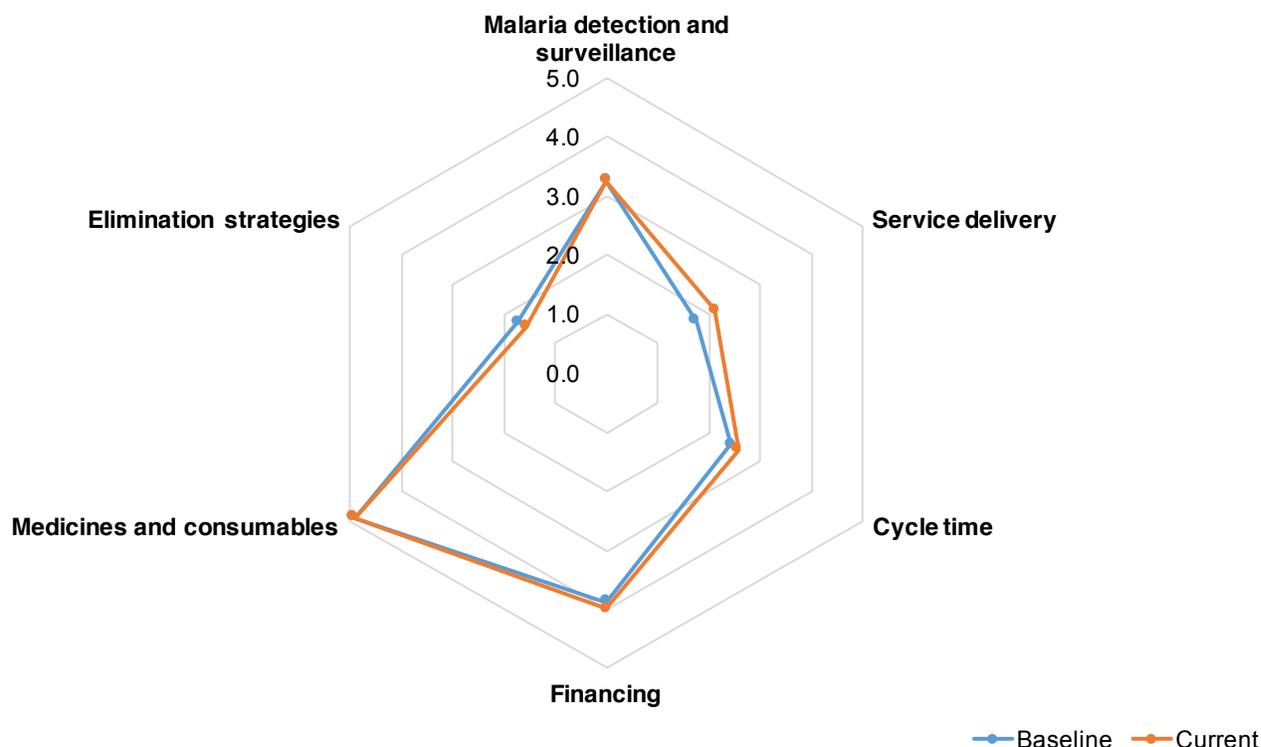
Conducting Subnational Analysis

The same MPEAT workbook can be used to conduct subnational analysis. The sheets following INVESTMENTS NEEDED have been set up for analyzing the efficiency of up to 20 subnational entities such as districts, provinces, or health facilities. The use of subnational sheets is not required and has no impact on the national-level analysis.

POLICY-SUBNAT

Similar to the POLICY-NATIONAL sheet, the POLICY-SUBNAT sheet is where you can track and tally the number of WHO-recommended malaria policies implemented at the subnational level. Pick a response from the drop-down menu (i.e., "Yes", "No", or "N/A").

INPUTS-SUBNAT

The data required in the INPUTS-SUBNAT sheet is similar to the INPUTS-NATIONAL sheet. Conducting a subnational analysis assumes that subnational entities operate independently but conduct the same type of activities as the national level. The cell will turn green once a value is entered in the cell; this helps to quickly identify missing data.

RESULTS BY YEAR-SUBNAT

The RESULTS BY SUBNATIONAL sheet automatically calculates values for 44 performance and efficiency indicators. Except for target values, this sheet cannot be modified. This sheet compares the performance across subnational entities.

RESULTS BY TARGET-SUBNAT

The RESULTS BY TARGET-SUBNAT sheet provides an overview of the 44 efficiency and performance indicators grouped by area.

SUBNAT CHARTS

In the SUBNAT CHARTS sheet, scores from 0 to 5 are calculated based on how close or far subnational indicator values are from specified targets. The scores are presented in six bar graphs that allow NMCP managers to rapidly assess the state of efficiency and identify areas that may need attention or further investment.