REVIEW OF MONITORING OF MALARIA IN PREGNANCY THROUGH NATIONAL HEALTH MANAGEMENT INFORMATION SYSTEMS: KENYA

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The findings of this review are based on Kenyan health management information system forms that were collected and reviewed during the period of October 2012–March 2013. Every attempt was made to get the latest tools available. Qualitative information included in this report was collected during key informant interviews conducted May–September 2013. This report was compiled by the Maternal and Child Health Integrated Program (MCHIP) for review by the President's Malaria Initiative and Roll Back Malaria Initiative.

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Abbreviations

ACT	Artemisinin-Based Combination Therapy
AL	Artemether-Lumefantrine
ANC	Antenatal Care
CDC	Centers for Disease Control and Prevention
CHEW	Community Health Extension Worker
CHW	Community Health Worker
DDSR	Division of Disease Surveillance and Response
DHS	Demographic and Health Survey
DMCC	District Malaria Control Coordinator
DOMC	Division of Malaria Control
DQA	Data Quality Assessment
DQI	Data Quality Improvement
DRH	Division of Reproductive Health
DSS	Demographic Surveillance System
Global Fund	The Global Fund to Fight AIDS, Tuberculosis and Malaria
HIS	Health Information System
HMIS	Health Management Information System
IDSR	Integrated Disease Surveillance and Response
IPTp	Intermittent Preventive Treatment of Malaria in Pregnancy
ITN	Insecticide-Treated Net
KEMRI	Kenya Medical Research Institute
LLIN	Long-Lasting Insecticide-Treated Net
LMIS	Logistics Management Information System
M&E	Monitoring and Evaluation
M&E Plan	*Kenya Malaria Monitoring and Evaluation Plan 2009–2017*
MCH	Maternal and Child Health
MCHIP	Maternal and Child Health Integrated Program
MIP	Malaria in Pregnancy
MIS	Malaria Indicator Survey
MOH	Ministry of Health
MOP	*Malaria Operational Plan*
MOPHS	Ministry of Public Health and Sanitation
N/A	Not Applicable
NMS	*National Malaria Strategy*

OPD	Outpatient Department
PMI	President's Malaria Initiative
RBM	Roll Back Malaria
RDT	Rapid Diagnostic Test
RH	Reproductive Health
SP	Sulfadoxine-Pyrimethamine
TB	Tuberculosis
TWG	Technical Working Group
USAID	United States Agency for International Development
WHO	World Health Organization

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Introduction

MCHIP works closely with the President's Malaria Initiative (PMI) and the Roll Back Malaria (RBM) Partnership community—including key stakeholders in maternal health and child health—to support reduction in the global burden of malaria morbidity and mortality. MCHIP supports this reduction by helping to improve the quality of malaria programs, strengthening health systems, and helping countries achieve sustained results. A critical aspect of health systems strengthening is ensuring that appropriate high-quality data on malaria service delivery are available to policymakers and program managers so they can monitor program implementation and make informed policy and program decisions to facilitate better health outcomes.

Obtaining reliable, valid, and timely malaria service data, especially data related to the control of malaria in pregnancy (MIP), is challenging. While MIP indicators in population-based surveys are useful, the timing of these surveys, generally every two to five years, is too infrequent for effective program monitoring. National health management information system (HMIS) data are more frequently collected, complement the population-based survey data, and have the potential to be more useful for ongoing service improvement and decision-making. Yet the quality of HMIS data in low-income settings is poor; often data are missing, report formats are outdated, and reporting is late. Furthermore, it is not widely known what data are being recorded at the facility level, what data are reported up through the health system, and whether those data are being used at the facility.

MCHIP, with support from PMI, decided to conduct a review of national HMISs in a sample of six PMI focus countries to improve its understanding of how ministries of health (MOHs)—both national malaria control programs and reproductive health (RH) units—are monitoring and reporting on their MIP-related program results and how the data are being used. The review will provide specific recommendations for improving routine data collection and use for MIP-related activities.

This review fits within a larger review of routine maternal and newborn data collection systems being conducted by MCHIP in the same six countries and additional non-PMI/non-malaria-endemic countries. PMI countries selected for this review are Kenya, Mozambique, Malawi, Mali, Tanzania, and Uganda. Each of these countries is one of the 19 focus countries benefiting from PMI. The review focuses on the public sector and examines how HMISs and supplemental routine data collection and reporting strategies are used at different levels of the health system to capture MIP indicators. The review describes MIP information and data quality gaps and best practices.

This report presents findings from the review and recommendations on

- priority indicators that should be monitored at the facility level,
- data collection formats, and
- ways to interpret and use data to improve services and to report data up through the Kenyan health system.

Information from this report, along with the other five country reviews, will be used to propose revisions to the World Health Organization (WHO)/RBM manual, *Malaria in Pregnancy: Guidelines for Measuring Key Monitoring and Evaluation Indicators*.[1]

[1] World Health Organization. 2007. *Malaria in Pregnancy: Guidelines for Measuring Key Monitoring and Evaluation Indicators*. Geneva, Switzerland: World Health Organization. http://whqlibdoc.who.int/publications/2007/9789241595636_eng.pdf.

The findings and recommendations from this review will be shared with the countries to help improve their routine monitoring systems. Findings and recommendations will also be shared with PMI, as well as the RBM MIP working group and the RBM Monitoring and Evaluation Group, for further review, discussion, and development of final recommendations for global and country levels.

A note on language: When referring to key informants, the authors will be using "they" and so forth in place of the third-person singular.

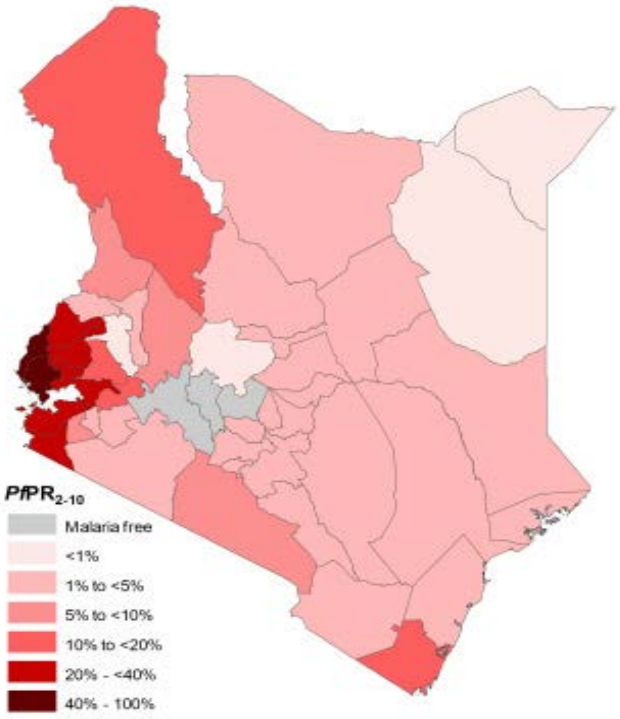
Background

MALARIA SITUATION IN KENYA

About 76% of Kenya's population of 43 million[2] is currently at risk of malaria.[3] Transmission of malaria in Kenya varies greatly by geographic area, with high levels of transmission on the coast and around Lake Victoria but little or no transmission in highland areas above 1,500–2,000 meters. Malaria prevalence is higher in rural areas (12%) than urban areas (5%). A decline in malaria transmission has been documented in recent years. Moderate to high levels of transmission remain in some endemic zones, while prevalence in nonendemic zones is less than 5%.[4] See Figure 1 for a map of the malaria burden in Kenya.

Recent Demographic and Health Survey (DHS) and Malaria Indicator Survey (MIS) household surveys show improvements in coverage of malaria prevention and control interventions (see Table 1), which may help explain reductions in the malaria burden in the country.

Figure 1. Malaria burden in Kenya, 2010



Source: Noor, Abdisalan M., Damaris K. Kinyoki, Jacob O. Ochieng, Caroline W. Kabaria, Victor A. Alegana, Viola A. Otieno, Rebecca Kiptui, et al. 2013. *The Malaria Epidemiology and Control Profile in Kenya: Reviewing the Evidence to Guide Future Vector Control*. Nairobi, Kenya: Division of Malaria Control, Ministry of Public Health and Sanitation & Malaria Public Health Department, KEMRI-Wellcome Trust-University of Oxford-Research Programme. http://www.testing.inform-malaria.org/wp-content/uploads/2014/04/Kenya-Epi-Report-280713.pdf.
Abbreviation: $PfPR_{2-10}$, Plasmodium falciparum prevalence rate among children aged 2-10 years.

[2] United States Census Bureau. 2012. "International Data Base." http://www.census.gov/population/international/data/idb/informationGateway.php.
[3] World Health Organization. 2011. *World Malaria Report 2011*. Geneva, Switzerland: World Health Organization. http://apps.who.int/iris/bitstream/10665/44792/2/9789241564403_eng_full.pdf?ua=1.
[4] Division of Malaria Control, Ministry of Public Health and Sanitation; Kenya National Bureau of Statistics; and ICF Macro. 2011. *2010 Kenya Malaria Indicator Survey*. Nairobi, Kenya: Division of Malaria Control, Ministry of Public Health and Sanitation. http://dhsprogram.com/pubs/pdf/MIS7/MIS7.pdf.

Table 1. Population-based malaria indicators for Kenya

MALARIA INDICATORS	DHS 2008–09[a]	MIS 2010[b]
All-cause under-five mortality rate	74/1,000	—
Proportion of households with at least one ITN [insecticide-treated net]	56%	48%
Proportion of children under five years old who slept under an ITN the previous night	47%	42%
Proportion of pregnant women who slept under an ITN the previous night	49%	41%
Proportion of women who received two or more doses of IPTp [intermittent preventive treatment of malaria in pregnancy] during their last pregnancy in the last two years	14%	25%

a. Kenya National Bureau of Statistics (KNBS) and ICF Macro. 2010. *Kenya Demographic and Health Survey 2008–09*. Calverton, MD: KNBS and ICF Macro. http://dhsprogram.com/pubs/pdf/fr229/fr229.pdf

b. Division of Malaria Control, Ministry of Public Health and Sanitation; Kenya National Bureau of Statistics; and ICF Macro. 2011. *2010 Kenya Malaria Indicator Survey*. Nairobi, Kenya: Division of Malaria Control, Ministry of Public Health and Sanitation. http://dhsprogram.com/pubs/pdf/MIS7/MIS7.pdf.

Data on availability of antimalarial medications at health facilities were collected as part of the 2010 Kenya Service Provision Assessment, as were observational data on antenatal care (ANC) service delivery, including provision of IPTp and ITNs for new ANC clients.

Kenya is currently undergoing a "devolution" process, whereby the geopolitical/administrative units of the country are changing. The country is dropping provinces in favor of a smaller administrative unit—the county—each of which consists of several subcounties or districts. As part of this process, some MOH staff, including those in the Division of Malaria Control (DOMC) and the Division of Reproductive Health (DRH), began being transferred from Nairobi to the field in April/May 2013—to counties, subcounties, and health facilities. Recently these transfers have been halted because it was found that by transferring one national MOH person to each district, all health areas could not be supported, according to one key informant. Therefore, national MOH staff will be maintained at the central level but will be available on request for technical assistance to counties.

The Ministry of Public Health and Sanitation (MOPHS) supported a malaria program performance review in 2009, which found that the DOMC functioned well at the national level, but had a weak coordinating capacity at provincial and district levels, leading to inadequate support for malaria control interventions and monitoring and evaluation (M&E). The PMI 2012 *Malaria Operational Plan* (*MOP*) suggests that moving to a county structure will likely not resolve all challenges the DOMC faces in supervising the national malaria control program.[5] The MOH has recently appointed district malaria control coordinators (DMCCs), who have been supporting malaria control activities. The DMCCs have challenges in guiding the districts on choice of effective malaria control interventions for the various epidemiological areas because they have not undergone a basic malaria course.

[5] President's Malaria Initiative. 2011. *Malaria Operational Plan: Kenya; FY 2012*. http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy12/kenya_mop_fy12.pdf?sfvrsn=6.

WORLD HEALTH ORGANIZATION AND KENYA MALARIA MONITORING AND EVALUATION RECOMMENDATIONS

Updated WHO Policy Recommendation (October 2012)

- In areas of moderate-to-high malaria transmission, IPTp with SP is recommended for all pregnant women at each scheduled ANC visit. WHO recommends a schedule of four ANC visits.
- The first IPTp-SP dose should be administered as early as possible during the second trimester of gestation.
- Each SP dose should be given at least one month apart.
- The last dose of IPTp with SP can be administered up to the time of delivery, without safety concerns.

The WHO Evidence Review Group meeting, held in July 2012, resulted in new recommendations for frequency and timing of IPTp-SP (that is, IPTp using sulfadoxine-pyrimethamine) dosing, based on review of the latest evidence of the efficacy of IPTp-SP. The recommendations were presented to the WHO Malaria Policy Advisory Committee in September 2012 and adopted as the *Updated WHO Policy Recommendation* on IPTp-SP in October 2012.[6] To help facilitate MIP program implementation, it is important to have harmonization of country policies, guidelines, training, and supervision materials between RH and malaria control. In light of the *Updated WHO Policy Recommendation* and recognizing that many countries will need to revise their national-level documents to disseminate the new guidance, MCHIP conducted a systematic review of national-level MIP policies and guidance documents in Kenya, Mali, Mozambique, Tanzania, and Uganda.[7] The purpose of the policy review was to increase our understanding of each country's MIP guidance for health workers and to find any inconsistencies that may exist between WHO and country guidance as well as between RH programs and malaria programs at the country level. The report of the national-level MIP policies and guidance review recommends specific actions at the country level for removing inconsistencies and complements the HMIS review presented in this report.

Given variations in malaria transmission across the country, the Government of Kenya's DOMC 2009–2017 *National Malaria Strategy* (*NMS*) directs malaria prevention and control interventions according to malaria risk.[8] In line with Kenya's *NMS*, PMI supports four malaria prevention and treatment measures:

- ITNs
- Indoor residual spraying
- IPTp-SP
- Diagnosis with rapid diagnostic tests (RDTs) or microscopy and treatment with artemisinin-based combination therapy (ACT)

In malaria-endemic areas (14 counties), the main strategies for controlling MIP are ITNs and IPTp. Malaria-epidemic areas (9 counties) are not providing IPTp but are providing ITNs to pregnant women through ANC services. These areas are also supposed to be promoting "accurate parasitological diagnosis of malaria using microscopy or rapid diagnostic tests for all persons with fever and/or other symptoms of malaria," according to the National Malaria Policy 2010. With the increased availability of malaria RDTs and the observed reductions in malaria transmission in many parts of Kenya, screening for infection is becoming a key feature of MIP control in both

[6] World Health Organization and Global Malaria Programme. 2012. *Updated WHO Policy Recommendation (October 2012): Intermittent Preventive Treatment of Malaria in Pregnancy Using Sulfadoxine-Pyrimethamine (IPTp-SP).* http://www.who.int/malaria/iptp_sp_updated_policy_recommendation_en_102012.pdf.

[7] Gomez, Patricia, Aimee Dickerson, and Elaine Roman. 2012. *Review of National-Level Malaria in Pregnancy Documents in Five PMI Focus Countries*. Baltimore, MD: Jhpiego Corporation. http://www.mchip.net/sites/default/files/mchipfiles/MIP%20in%20Five%20African%20Countries.pdf.

[8] Division of Malaria Control, Ministry of Public Health and Sanitation. 2009. *National Malaria Strategy 2009–2017*. Nairobi, Kenya: Division of Malaria Control, Ministry of Public Health and Sanitation. http://www.c-hubonline.org/ sites/default/ files/resources/main/Kenya_National_Malaria_Strategy_2009-2017.pdf.

epidemic and endemic areas. However, a fire in December 2012 destroyed a central supply depot in Nairobi that contained thousands of RDTs that were on the verge of being shipped out to lower-level facilities, creating a nationwide shortage. PMI has ordered more.

Methods

DESK REVIEW

For each country review, MCHIP field offices first collected HMIS forms. A content analysis was done on these forms to determine what was being monitored and reported relating to MIP. Second, in each country, a review was conducted of national policies, strategies, and guidelines with information related to MIP M&E, as well as technical reports, publications, and Web materials related to MIP. The following documents were reviewed as part of the desk review:

Data Collection and Reporting Formats

- ANC register
- Maternal and Child Health (MCH) booklet[9]
- Maternal Death Notification form
- Outpatient department (OPD) register
- Community health worker (CHW) registers (MOH forms 513–516)
- Health Facility Monthly Summary Report for Malaria Medicines
- Artemether-Lumefantrine (AL) Dispenser's Book
- MOH 711A—National Integrated Form for Reproductive Health, HIV/AIDS, Malaria, TB [Tuberculosis] and Child Nutrition

MIP-Related Documents

- *NMS* 2009–2017
- Kenya Malaria Monitoring and Evaluation Plan 2009–2017 (M&E Plan)[10]
- National Malaria Policy 2010
- 2012 PMI *MOP*
- Malaria supportive supervision manual and tools
- National Monitoring and Evaluation Guidelines and Standard Operating Procedures (Pillar One)[11]

In addition, the authors reviewed the online DHIS 2 database, an open-source database for warehousing, aggregating, and reporting on routine health information.[12]

[9] The MCH booklet is an individual client card that stays with the pregnant woman/mother and records information during pregnancy through age five of the child.
[10] Division of Malaria Control, Ministry of Public Health and Sanitation. 2009. *Kenya Malaria Monitoring and Evaluation Plan 2009–2017*. Nairobi, Kenya: Division of Malaria Control, Ministry of Public Health and Sanitation. http://www.c-hubonline.org/sites/default/files/resources/monitoring-evaluation/Kenya_Malaria_M%26E_PLan_2009-2017.pdf.
[11] Ministry of Public Health and Sanitation and Ministry of Medical Services. 2011. *National Monitoring and Evaluation Guidelines and Standard Operating Procedures (Pillar One)*. Nairobi, Kenya. http://nascop.or.ke/library/3d/National%20M&E%20Guidelines%20and%20SOPs.pdf.
[12] DHIS 2 is being used as the primary HMIS in 30 countries across four continents. DHIS 2 helps governments in developing countries and health organizations to manage their operations, monitor processes, and improve communication. In September 2011, Kenya became the first country in sub-Saharan Africa to deploy a completely online national health information system (HIS). All districts and selected health facilities are connecting to the DHIS 2 national server using mobile Internet (dongles / USB modems) on their computers. Kenya allows self-registration of personal user accounts. Over 2,000 users are entering data and using the data analytics features in DHIS 2 to improve management of health districts and other administrative areas. See http://www.dhis2.org/ and https://hiskenya.org/dhis-web-commons/security/login.action.

KEY INFORMANT INTERVIEWS

Annex 1 contains questions used to guide the desk review as well as key informant interviews. The findings of the desk review were used to tailor interviews that were conducted in each country. In-country interviews were conducted with key stakeholders at national, district, and facility level. At each level, efforts were made to glean the perspective from three key areas: malaria, RH, and HMIS. At the national level, interviews were held with staff from malaria control programs, RH units, and HMISs, as well as with malaria partners including PMI; WHO; the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund); and nongovernmental organizations funded to support the MOH in strengthening malaria programs. A list of interviewees is in Annex 2.

Findings

HEALTH MANAGEMENT INFORMATION SYSTEM STRUCTURE AND FUNCTION

A technical assistance project funded by the United States Agency for International Development (USAID), AfyaInfo, is supporting the Government of Kenya's single, integrated Internet-based national HIS. This project was started in June 2011 with a five-year implementation period ending in May 2016. The system will make a difference to the health sector mainly by bridging the gap between public and private sector health reporting, integrating information systems from all the health system building blocks,[13] and providing health information to all stakeholders, which should facilitate policy and program decisions for better health outcomes.

Routine community service delivery data flow in paper form from the community to the facility, and the facility to the district (subcounty). At the district level, the data are entered by the district community health focal person into the Community Health Unit HIS Chalkboard (MOH 516), a paper-based form. Community data are not entered into DHIS 2 but remain in the Chalkboard for use by the district health teams to identify health issues and areas in need of attention.

Routine facility service delivery data flow in paper form from the facility to the district (subcounty), where the data are entered by the health records and information officer into the DHIS 2. Information is accessed at other levels of the health system (e.g., province/county and national) through the DHIS 2 online information system. Provincial and other referral hospitals can enter data directly into the DHIS 2 so they do not need to send reports to the district level. However, there are some routine data sources with MIP information that are not included in the national HMIS / DHIS 2 (e.g., training and supervision information). Paper forms that capture training data are sent from the provincial level to the national DOMC office and entered into the DOMC database. According to the DOMC staff, training on MIP is embedded in case management training.

All indicators are not captured in the ANC register. Information on case management of pregnant women is located in the OPD register but is incomplete and not aggregated as pregnancy status is not always noted. Information on training of health workers in MIP is captured through MOH and partner training reports/logs and is not entered into the DHIS 2. Instead, it is sent to DOMC directly and is supposed to be entered into their database. This

[13] "The World Health Organization defines a health system as all organizations, people and actions whose primary intent is to promote, restore and maintain health.(1) It has six interrelated building blocks, namely: service delivery; health workforce; information; medical products, vaccines and technologies including infrastructure; financing; and leadership or governance." (Somanje, Habib, Saidou Pathé Barry, Babacar Dramé, and Chris Mwikisa-Ngenda. 2012. "Health Systems Strengthening: Improving District Health Service Delivery and Community Ownership and Participation." *African Health Monitor* (15): 48–54.)

training information is not shared with the DRH. Additional MIP information is captured in malaria supervision reports; these data are also not entered into the DHIS 2.

The SMS for Life project has piloted the use of eHealth to improve capture and use of case management data. Data on all cases tested and treated and commodity data were collected in five districts. The information was not disaggregated by age or pregnancy status. There is also an RDT pilot/module, called "SMART READER," being implemented in Nyando in Nyanza Province to read RDT results and link them with other patient data.

MALARIA IN PREGNANCY INDICATORS IN NATIONAL PLANS, HEALTH MANAGEMENT INFORMATION SYSTEM REGISTERS, AND REPORTS

Kenya has a wide array of stakeholders from the government, academic and research institutions, donor agencies, nongovernmental organizations, and the private sector that support M&E, surveillance, and operations research activities. These stakeholders have formed a working group to help guide such activities.

The DOMC is part of the MOPHS and has six technical units that cover case management, MIP, surveillance, M&E, operational research, vector control, epidemic preparedness and response, advocacy communication, and social mobilization. Each unit has a focal person and associated program officers. The DOMC's units for surveillance and M&E are responsible for tracking malaria program performance; they use both routine information sources and survey data to measure program impact, outcomes, and population-based coverage. DRH is involved in supportive supervision; development of information, education, and communication materials; chairing the MIP Technical Working Group (TWG); and joint planning and implementation of activities. M&E for MIP at the national level is the responsibility of the DOMC's M&E focal person. At the district level, the health records officer is responsible for entering MIP and other RH and malaria information into the DHIS 2.

The 2009–2017 NMS, developed by the DOMC, has six strategic objectives; the fourth objective focuses on improving M&E: "Objective 4: To strengthen surveillance, monitoring and evaluation systems so that key malaria indicators are routinely monitored and evaluated in all malarious districts by 2011." The 2009–2017 NMS presents an M&E performance framework with specific program objectives and targets. DOMC staff interviewed for this review emphasized that the NMS has been important in guiding the DOMC and its partners by streamlining the set of indicators to be measured, defining them, and setting targets.

Complementary to the NMS is the M&E Plan. The M&E Plan presents the program objectives; lists associated indicators (see Box 1), data sources, and frequency of collection; shows who is responsible; and includes an M&E action plan.

Box 1. MIP-related indicators in the *M&E Plan*

Process
- Number of IPT drugs distributed to health facilities and consumed for IPTp
- Number of health care workers trained in IPT
- Number of health workers trained (clinical and laboratory)

Output
- Number of ITNs / long-lasting ITNs (LLINs) distributed through facilities
- Number of ITNs/LLINs distributed through mass campaign
- Number of pregnant women who had four ANC visits
- Number of pregnant women who received IPTp1 (endemic districts only)
- Number of pregnant women who received IPTp2 (endemic districts only)
- Number of health facilities with no reported stock-outs of IPTp drugs in the last three months lasting more than seven days

Outcome

- Proportion of pregnant women who received at least one dose of IPTp for malaria during their last pregnancy (in the last two years)
- Proportion of pregnant women who received two or more doses of IPTp for malaria during their last pregnancy (in the last two years)
- Proportion of households with at least one ITN/LLIN
- Proportion of pregnant women sleeping under an ITN/LLIN
- Proportion of pregnant women who slept under an ITN/LLIN on the night before the survey

The M&E Plan has several shortcomings because many key indicators recommended by the WHO MIP M&E Guidelines are not included, such as indicators for severe anemia and birth weight. Indicators for malaria diagnosis and treatment for pregnant women are also not included. Additionally, the 2012 MOP notes strengths and weaknesses of the Kenya malaria M&E system (presented in Box 2).

Box 2. Strengths and weaknesses of the Kenya malaria M&E system

- Notable strengths of the Kenya malaria M&E system include the organizational structure of the M&E unit, M&E partnerships, the presence of a comprehensive M&E system and costed M&E plan, and the presence of an M&E database to store routine and activity data as well as data from surveys and evaluations.
- The main weakness, as reported by two separate data quality assessments (DQAs) conducted in 2010 by the Global Fund and Kenya's MOPHS, is the delay in data made available through the HMIS. In addition, with the varied epidemiology of malaria in Kenya, sample sizes for household and health facility surveys need to be very large to get subnational estimates.

Source: President's Malaria Initiative. 2011. *Malaria Operational Plan: Kenya; FY 2012*. http://www.pmi.gov/docs/default-source/default-document-library/malaria-operational-plans/fy12/kenya_mop_fy12.pdf?sfvrsn=6.

Key Malaria Indicators

Indicators of primary interest include those having to do with the three prongs of MIP control promoted by WHO:

1. IPTp
2. ITN use among pregnant women
3. MIP case management with
   a. RDTs
   b. ACTs

The authors reviewed the client card, ANC and OPD registers, maternal death notification form, and monthly facility reporting form to determine which indicators related to the three prongs of MIP prevention and control were being tracked and reported. Results are presented in Tables 2–4 below. A description of MIP indicators and their level of use is in Table 5 below.

Other Routine Malaria in Pregnancy Data

The DOMC has a malaria supervision manual with three checklists—one for facilities, one for districts/subcounties, and one for counties/provinces. The facility checklist includes a review of any stock-outs of key commodities in the last three months, including SP, quinine (tablets and injection), AL, RDTs, and ITNs distributed through ANC / child welfare clinics. A review of data management and reporting is also included. There are complementary Excel spreadsheets to enter the data collected. ICF International has prepared a report on use of supportive supervision data. At least one of the checklists has been programmed for use on a PDA using Visual Basic and Windows Mobile 5. The PIMA project (MEASURE Evaluation Associate Award) is working with the DOMC to try to digitize the supportive supervision checklists and link them to the DOMC's proprietary database, the Malaria Information Acquisition System, currently housed at the national headquarters. The data are not entered into the DHIS 2.

The facility supervision checklist asks the visiting supervisor to observe client-provider interactions during an ANC visit and record if SP was provided, whether the provider directly observed the client swallow the SP, and if the provider gave adequate counseling about IPTp, including dosage, timing, side effects, and follow-up. In addition, the facility supervision checklist records whether the facility provides pregnant women with ITNs/LLINs and indicates that the supervisor should check the ANC register to confirm, and if ITNs/LLINs are not being provided, explore the reasons why.
Health worker training in malaria, including MIP, is captured at the national level in the Malaria Information Acquisition System, according to DOMC staff. A health facility key informant reported that training information is collected routinely using the service delivery indicators form—MOH 105—yet a DMCC interviewed said this information was "available but not updated."

As specified in the *NMS*, semiannual facility surveys are conducted to monitor the availability of malaria case management commodities and assess the quality of practices. There is a questionnaire for service providers; an inventory of drugs and supplies, including SP; and an exit interview guide for case management clients. An integrated supportive supervision tool is also used as part of this process. Five of these semiannual surveys have been completed to date. Management Sciences for Health is helping to support these surveys; results are presented at the M&E TWG.

Data from sentinel surveillance sites are useful for understanding changes in malaria prevalence, malaria drug efficacy, and death rates from malaria and other causes. Since Kenya's malaria control interventions are tailored to the epidemiological context in different counties, the surveillance is vital for ensuring that the program is designed to meet the needs of its clients, including pregnant women. For details, please see Annex 3.

With respect to case management, findings from a recent study by Afrane et al.[14] revealed substantial overprescription of antimalarials and misdiagnosis of clinical malaria among hospitals in Kenya. More than half of cases with fever treated for malaria were not actually clinical malaria. The authors concluded that routine health facility data are unreliable for monitoring trends in malaria morbidity and for evaluating impacts of malaria interventions. This is an example of why sentinel surveillance remains important.

Table 2. Indicators related to MIP prevention

DOES THE FORM HAVE A PLACE TO RECORD THE FOLLOWING INFORMATION?	ANC REGISTER	MCH BOOKLET	MATERNAL DEATH NOTIFICATION FORM	NATIONAL INTEGRATED FORM FOR REPRODUCTIVE HEALTH, HIV/AIDS, MALARIA, TB AND CHILD NUTRITION	DISTRICT/PROVINCE/COUNTY	NATIONAL
Are instructions for completing the form included?	Yes	No (instructions about a few specific data elements)	Yes	No	Data from monthly facility reports entered into online DHIS 2 by districts and subnational referral hospitals	N/A (not applicable; can access data from DHIS 2)

[14]Afrane, Yaw A., Guofa Zhou, Andrew K. Githeko, and Guiyun Yan. 2013. "Utility of Health Facility-Based Malaria Data for Malaria Surveillance." *PLOS One* 8 (2): e54305. doi: 10.1371/journal.pone.0054305.

DOES THE FORM HAVE A PLACE TO RECORD THE FOLLOWING INFORMATION?	ANC REGISTER	MCH BOOKLET	MATERNAL DEATH NOTIFICATION FORM	NATIONAL INTEGRATED FORM FOR REPRODUCTIVE HEALTH, HIV/AIDS, MALARIA, TB AND CHILD NUTRITION	DISTRICT/PROVINCE/COUNTY	NATIONAL
IPTp dose given	Yes, doses 1 and 2 only	Yes, IPTp1–IPTp7 (with date recorded)	Yes	Yes, doses 1 and 2 only	Yes	Yes
ITN distribution	Yes, by visit	Yes (with date)	No	Yes	Yes	Yes
Asked if slept under net the previous night	No	No	No	No	No	No

The MCH booklet (revised edition January 2013) has preprinted spaces to fill out IPTp doses 1–7, but the ANC register only has columns for IPTp1 and IPTp2. One ANC register is used across the country but only the 14 malaria-endemic counties provide IPTp and therefore record and report it in the ANC register and MCH booklets.

Table 3. Indicators related to MIP case management

DOES THE FORM HAVE A PLACE TO RECORD THE FOLLOWING INFORMATION?	ANC REGISTER	MCH BOOKLET	MATERNAL DEATH NOTIFICATION FORM	NATIONAL INTEGRATED FORM FOR REPRODUCTIVE HEALTH, HIV/AIDS, MALARIA, TB AND CHILD NUTRITION	OUTPATIENT (MORBIDITY) >5 YEARS REGISTER (705A)
Are instructions for completing the form included?	Yes	No (instructions about a few specific data elements)	Yes	No	Yes
Asked if client currently has fever/malaria	Blank field for remarks	No	No	No	No
Temperature recorded	No	No	No	No	No
Malaria testing	No	No	No	No	No
Malaria test result listed	No	No	No	No	Yes (diagnosis column)
Malaria treatment given	Blank field for remarks	No	No	No	Yes (treatment/prescription column)
Referral for malaria treatment	Blank field for remarks	No	No	No	Yes (just blank referral column)
Pregnancy status	N/A	N/A	N/A	N/A	No

Table 4. Other ANC indicators relevant to control of MIP

DOES THE FORM HAVE A PLACE TO RECORD THE FOLLOWING INFORMATION?	ANC REGISTER	MCH BOOKLET	MATERNAL DEATH NOTIFICATION FORM	NATIONAL INTEGRATED FORM FOR REPRODUCTIVE HEALTH, HIV/AIDS, MALARIA, TB AND CHILD NUTRITION
Are instructions for completing the form included?	Yes	No (instructions about a few specific data elements)	Yes	No
ANC visit	Yes, each visit	Yes	Total ANC visits only	Records 4 visits only
Gestation of pregnancy at visit (in weeks)	Yes	No	Yes	No
Iron/folate given	Records iron and folate separately	Yes	Iron only (Y/N)	No
Hb, PCV recorded	Yes, Hb level recorded	Yes	No	Yes
HIV testing done—pregnant woman	Yes	Yes	Yes	Yes
Prevention of mother-to-child transmission—on CTX (prevention of opportunistic infections)	Yes	No (ARV or Option B + HAART, but not whether on CPT/CTX)	Blank field for remarks	Yes

Abbreviations: ARV, antiretroviral; CPT, co-trimoxazole preventive therapy; CTX, co-trimoxazole; HAART, highly active antiretroviral therapy; Hb, hemoglobin; PCV, packed cell volume.

Table 5. Indicators and level of use

INDICATOR	LEVEL OF USE
% of ANC clients receiving IPTp1	Facility, subcounty/district, county, national
% of ANC clients receiving IPTp2	Facility, subcounty/district, county, national
% of ANC clients receiving ITN	Facility, subcounty/district, county, national
% of malaria cases among pregnant women	Facility

DATA FLOW AND REPORTING PROCESS

Data Collection

Pregnant women with fever in large health centers and district hospitals are generally sent to the OPD clinic for a diagnostic test and treatment, if they test positive for malaria. Pregnant women attending smaller health centers and dispensaries, where all services are likely to be provided in the same room, are sent to the laboratory, if present, or clinically diagnosed and treated.

In the OPD register, there are two different forms to indicate if the client tested was more than or less than five years of age. Providers are instructed to write in the comments column whether or not a client is pregnant, but the information is not always reported and is not aggregated. In the ANC register, the health worker is supposed to record if malaria was diagnosed during the visit or if the pregnant woman complains about it in the "Other conditions" field but there is no place in the ANC register to specifically record whether a malaria test was conducted.

Also in the ANC register, the health worker is supposed to record if the pregnant woman was treated for malaria in the "Additional treatments given?" field, but the health worker does not have to write down the specific treatment regimen provided. One health center–based Kenya enrolled community health nurse pointed out that if pregnant women with symptoms of malaria come to the health facility for treatment on the weekend when the ANC clinic is closed, they will not be captured in the ANC register.

Kenya is currently pilot testing a longitudinal ANC register where each client would be recorded just once during her pregnancy and information from subsequent visits would be recorded on the same row in the register. Results of the pre-test are pending.

The MCH booklet does not have any specific designated area to record information on malaria treatment and referral, but there is a "clinical notes" section that is open-ended where this information could be recorded.

CHWs, whose role is related to health education/counseling and promoting early and repeated attendance at ANC, do not collect any MIP-related information in the 514 household register they complete (MOH 514 register) but rather record whether pregnant women are referred to ANC and counseled about birth planning. CHWs also fill out the community HIS household register (MOH 513), which captures information on whether members of the household registered are using an ITN, including pregnant women.

Each community health extension worker (CHEW) aggregates information from the 513 and 514 forms submitted by the CHWs working in the CHEW's area of oversight on the CHEW Summary form (MOH 515). The Summary form includes information on the number of individuals ages five years and older that tested positive for malaria using an RDT and were treated with ACTs, but does not indicate pregnancy status or provide any information on ITN use. Information from CHEW Summary forms is not entered into the DHIS 2 but is summarized on the Community Health Unit HIS Chalkboard, where gaps in service usage will prompt CHW action (e.g., number of pregnant women **not** attending at least four ANC visits).

Data Reporting

Data sent from the facility level to the district level are entered into the DHIS 2. These data are publicly available and database users can create their own charts and graphs. Figures 3.1–3.3 in Annex 3 are illustrative graphs showing the type of MIP-related and ANC data captured in the DHIS 2 using Homa Bay District and Siaya County as examples. The data can also be aggregated and displayed at the individual health facility and national levels.

The following routine national reports are produced with HMIS and other routine data:

- Annual reports—these are provided to RBM
- RBM quarterly report—RBM has their own quarterly report template
- *Malaria Surveillance Bulletin*—produced by the DOMC on a quarterly basis for Global Fund
- DRH annual operational/work plan—produced by DRH using program performance data

The audiences for these reports include RBM, Global Fund, district officials, program implementing partners, and health facilities. The DOMC prepares graphs and charts through the DHIS 2 to populate these reports.

The *Malaria Surveillance Bulletin* includes information aggregated at the national level on the proportion of ANC clients that received IPTp1, IPTp2, and an ITN/LLIN. The *Bulletin* also includes information on malaria testing and treatment by epidemiological zone, but the information is not disaggregated by age or pregnancy status. Sources used to produce the *Bulletin* include various routine data reporting systems such as the DHIS 2, Integrated Disease Surveillance and Response (IDSR), the Logistics Management Information System (LMIS), and Laboratory Information Management System.

MALARIA IN PREGNANCY DATA QUALITY

DOMC staff said that completeness of the data is still a challenge because of late reporting. HMIS data are entered into the DHIS 2 primarily at the district level. Information on case management of pregnant women appears to be incomplete as DOMC staff have said that not all providers note in the "remarks" section of the OPD register whether the client was a pregnant woman. In addition, there are no written instructions to show that providers should be doing this. One enrolled community health nurse said that the MOH 514 has incomplete data as it does not collect all the information needed to fill out the 515 form. As noted, the MOH 514 register does not collect any MIP-related information, just whether pregnant women are referred to ANC and counseled about birth planning. The most recent national *Malaria Surveillance Bulletin* from June 2013 indicated that "reporting rates remained steady over the last quarter at 90% for DHIS, at around 65–70% for LMIS and 65% for e-IDSR. A low rate for e-IDSR is due to the migration to the electronic systems and is expected to improve as the system stabilizes."

The majority of facility-based stakeholders interviewed did not report problems with data quality and felt they had adequate data for making decisions. County-level stakeholders, in contrast, voiced concerns about gaps in data quality (including IPTp2 and LLINs) and completeness of reporting. One DMCC mentioned that private facilities were the biggest challenge with respect to complete monthly reporting by all facilities. Another subcounty informant noted, "Confirmed and unconfirmed cases [of malaria] are complete but not accurate."

National stakeholders noted there are still problems with delayed reporting, especially for facilities that are more remote and may have a more difficult time sending the hard copy reports to the district level and the health records officer. The DHIS 2 has made it easier and faster for stakeholders at multiple levels of the health system to access information. Facility-based key informants generally stated that reports are sent on time.

Efforts to Improve Data Quality

The national interagency malaria M&E TWG meets quarterly to review data and discuss implementation of the national M&E plan. Participants include the HMIS Division, implementing partners, Division of Disease Surveillance and Response (DDSR), DOMC, MEASURE Evaluation, Kenya Medical Research Institute (KEMRI), and US Centers for Disease Control and Prevention (CDC)/KEMRI.

At the facility and district levels, the DOMC is conducting annual DQAs, as mandated by the Global Fund, in high-burden malaria districts. The DQA team compares source documents (e.g., registers) with summary reporting tools and looks for any discrepancies. IPTp is one of the indicators included in the DQAs. According to the DOMC, common problems found are

transcription and arithmetic errors. Staff, such as the district health records officers, are periodically given HMIS training (by the HMIS Division).

USAID's AfyaInfo project and the PIMA project are working with the DOMC and MOH to improve data quality and reporting. There is also a broader indicator harmonization working group supported by PIMA that makes recommendations regarding the DHIS 2. PIMA has worked with the DOMC to include IPTp in the *Malaria Surveillance Bulletins* so that people will review, and help improve the quality of, the IPTp data. One DMCC mentioned that facilities hold internal meetings to review their data before submitting it (to the district/subcounty) and that the facilities had received feedback on how to improve reporting on LLIN provision and ANC visits. A subcounty key informant mentioned that health facilities in their area are holding monthly data review meetings.

USE OF MALARIA IN PREGNANCY DATA

The DOMC staff said they review DHIS 2 data to plan resource allocations and to see which counties are doing well and which are not. The staff also said that they try to address any gaps noted with those counties. In addition, they are using commodity data for planning and management (e.g., LLIN stock-outs). Malaria control and prevention oversight, including resources, is under the malaria strategy, which is led by DOMC. DRH participates at the planning and implementation level.

One DOMC staff person said, "We expect that the facility is the first place to look at this [data in the DHIS 2]. If IPTp2 is low or malaria has increased, they should take action."

Another DOMC staff person gave an account of seeing something strange about several districts' IPTp2 data: the proportion of clients receiving IPTp2 was higher than those receiving IPTp1. They made arrangements to go out to districts to review their data and correct the problem. The problem was with the numerator, as doses of IPTp3 and above were being counted together with IPTp2.

In another example, the DOMC observed that one county had a falling trend for IPTp. A DOMC staff person travelled to that county and reviewed the data with the district managers, who had not been using DHIS 2 to look at trends in the data. There are some endemic counties with nonendemic districts that are not providing IPTp due to reinforcement of the national policy (that IPTp be provided in malaria-endemic areas only). Some counties have included those districts in the denominator for IPTp coverage in the past, which caused the coverage to appear artificially low.

Data from different sources are also put into a dashboard for the Global Fund. IPTp is not supported by Global Fund so is not reported apart from information on SP availability as an MOH-sourced commodity. The dashboard information is only available from DOMC with authorization from the DOMC director.

Health facility–based key informants mentioned using the Chalkboard to target community outreach services. A dispensary nurse said they use HMIS data to see if they have reached their targets or not and also indicated data on LLIN distribution is used to inform them as to how many nets to order. One of the DMCCs interviewed pointed out that malaria case management information for pregnant women is not adequate for making decisions. Overall, informing decisions about commodities procurement was the most commonly mentioned use of MIP-related data among district and facility stakeholders.

Other Issues

When calculating the percentage of ANC clients receiving IPTp1 and IPTp2, Kenya uses "new ANC visits" as the denominator. This is slightly different from what is recommended by WHO/RBM, which is "first ANC visits." One key informant noted there are challenges in the definition of the terminologies "first ANC visit" and "new ANC visits" because some pregnant women start ANC visits in one area and continue in another, which may not even be in the same county or may be in an area not designated to provide IPTp (e.g., low-transmission areas). Data on first ANC visits from areas not providing IPTp is not captured at the national level, hence the use of "new ANC visit."

There is also a problem with the calculation of the IPTp2 indicator, according to DRH staff, as the ANC register only has two columns for recording IPTp doses—a column for IPTp1 and a column for IPTp2. IPTp doses 3 and higher (IPTp2+) are often recorded under the IPTp2 column. The bottom of the ANC register has a space to aggregate IPTp2 and greater. This was being used as the numerator for the percentage of clients who received IPTp2 in reports to the district, causing IPTp2 to be higher than IPTp1 in some cases. In addition, to calculate coverage, the MOPHS recently used the estimate of all pregnant women in the country rather than those in the 12 malaria-endemic counties where IPTp is offered. The MOPHS has worked with partners to correct this calculation in the DHIS 2.

STOCK MANAGEMENT

PMI is supporting the Kenya Medical Supplies Agency to strengthen supply chain management, warehousing, and financial management and information systems at the national level. Information on malaria medicines is tracked at the health facility level and reported monthly to the district level using the Health Facility Monthly Summary Report for Malaria Medicines, which provides information on the quantities of malaria drugs received (AL, quinine, and SP), the quantities dispensed, the number of doses that expired, and the number of days out of stock, if any. However, the Summary Report does not provide any client information. The Artemether-Lumefantrine Dispenser's Book tracks number of doses dispensed by client weight category but not age, sex, or pregnancy status. Information on the numbers of SP and AL doses dispensed is also included in DHIS 2 and can be disaggregated by geographic area and facility, but not by client type.

Reporting on MIP service delivery and logistics management data is integrated at the district level. There is an integrated RH monthly facility report that is sent to the district headquarters in addition to the Health Facility Monthly Summary Report for Malaria Medicines. At the district level, MIP data on IPTp1, IPTp2, and ITNs are entered into the online DHIS 2 database where both the DOMC and the DRH can access them, as can others who register with the system. The DHIS 2 was only implemented in the past two years. However, data from some routine data collection mechanisms, such as supervision reports and training reports, are not part of the HMIS and are not entered into the DHIS 2. This information is captured at the national level in the DOMC's proprietary database, the Malaria Information Acquisition System.

Discussion

STRENGTHS AND OPPORTUNITIES

DOMC staff interviewed asserted that they are very happy with the new DHIS 2, which they feel is dynamic. One helpful feature is that the date is recorded whenever anyone makes a change to the data in the system. In general, the DOMC staff feel the data collection system is working well and the quality of their data is improving and is being regularly uploaded to the DHIS 2. Specific opportunities worth highlighting include the following:

- Kenya has made great strides in improving quality and accessibility of HMIS data by recently transitioning to use of the DHIS 2.
- A midterm review of the *NMS* is scheduled in 2014 and will also consider the role of intermittent screening and testing and coverage areas.
- Simplified guidelines on providing IPTp are being rolled out following a CDC-led operations research study. The study also revealed that folic acid can be given concurrently with SP if a lower dose of folic acid is used than what Kenya was using at the time.

WEAKNESSES

- Tracking of case management of malaria in pregnant women: The DOMC said that MIP cases are underreported and suggested that adding RDT data to the ANC register would help rectify the situation.
- Calculation of the IPTp2 indicator from HMIS data is problematic: Entry of IPTp2+ into the DHIS 2 as IPTp2 doses makes the IPTp2 indicator from HMIS data higher than IPTp1 in some places.
- DOMC staffing for service delivery (e.g., dispensaries only have one staff person) and M&E and training of staff in M&E (including data clerks): When tools change, retraining is needed.

RECOMMENDATIONS

- DOMC to make RDTs available at ANC clinics to enable case detection and collection of data on MIP. Key steps to moving this forward include
  - discussion at national level among all stakeholders including DOMC, DRH, and procurement partners;
  - quantifying procurement needs at ANC clinics;
  - ensuring distribution of RDTs to ANC clinics; and
  - properly developing capacity of managers and frontline providers to correctly use RDTs.
- Update HMIS paper forms and DHIS 2 electronic platform for ANC and OPD to include collection and reporting of IPTp3 and IPTp4, malaria test conducted, malaria test result and treatment and/or referral. For OPD, also add field for documenting pregnancy status. Add IPTp4 to MCH booklet. Key steps to moving this forward include
  - discussion at national level, ideally through national working group, to review existing forms and update as necessary; and
  - introduction of new forms to managers and frontline providers through training, supervision visits, and M&E-specific visits to health centers.
- Improve quality of MIP data collected and reported, including existing data on IPTp1 and 2. Key steps to moving this forward include
  - investing in data quality improvement (DQI) for MIP indicators include IPTp doses 1 and 2 (and 3 and 4, when integrated);
  - LLIN distribution in ANC and case management (when/if they are integrated into the HMIS), including assigning responsibility and funds to lead DQI efforts which may include developing and implementing a module to assess MIP data quality; and
  - supporting the MOH to develop, implement, and monitor action plans for DQI.
- Data use often drives identification of data quality issues, so this should be part of the DQI process. Organize review meetings of data at all levels of monitoring: monthly at facility level, quarterly at district level and above.

- DOMC and local implementing partners to update service providers on IPTp indicators to clarify the issue of IPTp2 and IPTp2+ doses and entries in order to standardize reporting and ensure accurate aggregation of data. Key steps to moving this forward include ensuring training and supervision materials have the correct information to transfer to frontline providers and ensuring trainers have the most up-to-date knowledge to train frontline providers effectively.
- Local implementing partners in counties to support collection of retrospective data from ANC registers on IPTp1 and IPTp2 doses given from 2011 to the present for reentry into DHIS 2 in districts/counties where reporting of IPTp2+ as IPTp2 was a documented problem. Key steps to moving this forward include ensuring local partners have the capacity to support this effort.
- For calculating IPTp coverage, ensure that the estimate of pregnant women in DHIS 2 in subsequent years reflects the corrected calculation, including only malaria-endemic districts versus all districts. This will require that the steps for the correct calculation are clearly documented and published in the 2011 *National Monitoring and Evaluation Guidelines*.

To review these findings, vet these recommendations, and mobilize resources to act upon them, it is recommended that country-level stakeholders, under the leadership of the MOPHS, DOMC, and DRH, as well as WHO, PMI, the United Nations Children's Fund, and implementing/supporting partners, meet to discuss the findings of this report and the stated recommendations and identify and prioritize steps for moving forward.

Annex 1. Questions to Guide Desk Review and Key Informant Interviews

Specific questions developed to guide the HMIS desk review and key informant interviews include the following:

- What forms, tools, registers, etc., are used?
- What is actually collected and reported (indicators)?
- Are all MIP indicators captured through ANC?
- Is MIP HIS integrated or parallel?
- Is ANC HIS integrated or parallel?
- How complete and timely is reporting?
- Who is responsible for MIP M&E?
- How are indicators summarized, analyzed?
- How is MIP data used, if at all?

Annex 2. List of Key Informant Interview Respondents at the National and Subnational Levels

NATIONAL LEVEL

NAME	JOB TITLE	DEPARTMENT/AGENCY
David Soti	Director	DOMC
Jacinta Opondo	M&E Program Officer	DOMC
Julius Kimti	Program Officer for Case Management / MIP	DOMC
Amin Abdinasir	Team Leader	ICF/PIMA (MEASURE)
Geoffrey Lariumbi	Program Officer	PIMA (MEASURE)
Peter Nasokho	Program Officer	PIMA (MEASURE Associate Award)
Rose Mulindi	M&E Advisor	Jhpiego/MCHIP Kenya
Judith Mawa	MNH Program Officer	DRH
Shiphrah Kuria	Focal person for maternal, neonatal, and child health	DRH
Sanyu Kigondu	Program Officer	Jhpiego/MCHIP Kenya
Augustine Ngindu	Malaria Technical Advisor	Jhpiego/MCHIP Kenya

SUBNATIONAL LEVEL

RESPONDENT ROLE(S)	HEALTH FACILITY / RESPONSIBILITY	COUNTY
Health care provider	Kabucha health center	Bungoma
Health care provider	Luucho dispensary	Bungoma
Health care provider	Ekitale dispensary	Bungoma
Health care provider	Chwele subdistrict hospital	Bungoma
Health care provider	Kachonge dispensary	Bungoma
Health care provider	Ngalasia dispensary	Bungoma
Health care provider	Mayanga dispensary	Bungoma
DMCC	County community health services focal person	Bungoma
Doctor, HRIO, DMCC, RHC, DCSsFP/PHO	DHMTs at subcounty level	Bungoma
DMOH	In charge of the DHMTs	Bungoma East
HRIO	DHMT in charge of records	Bungoma West
DMOH	In charge of the DHMTs	—
DMCC	DHMT in charge of malaria	Bungoma North

Abbreviations: DCSsFP/PHO, district community strategy focal person / district public health officer; DHMT, district health management team; DMOH, district medical officer of health; HRIO, health records information officer; RHC, reproductive health coordinator.

Annex 3. Malaria in Pregnancy Data from the National Health Management Information System

Figure 3.1. MIP-related service statistic data for Homa Bay District, January 2012–February 2013

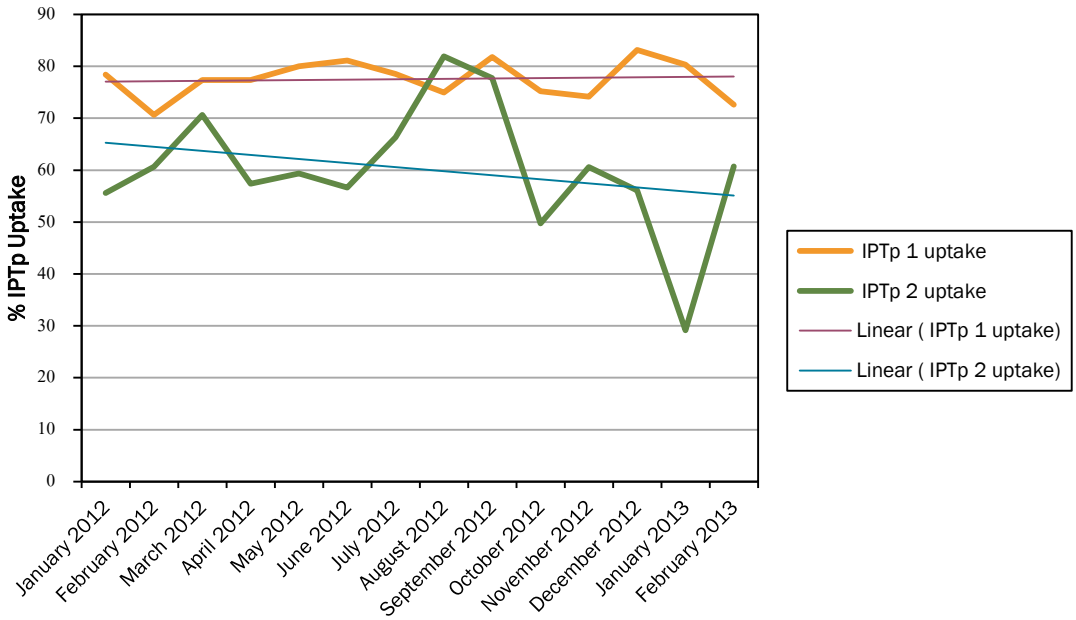


Figure 3.2. ANC attendance service statistic data for Homa Bay District, January 2012–February 2013

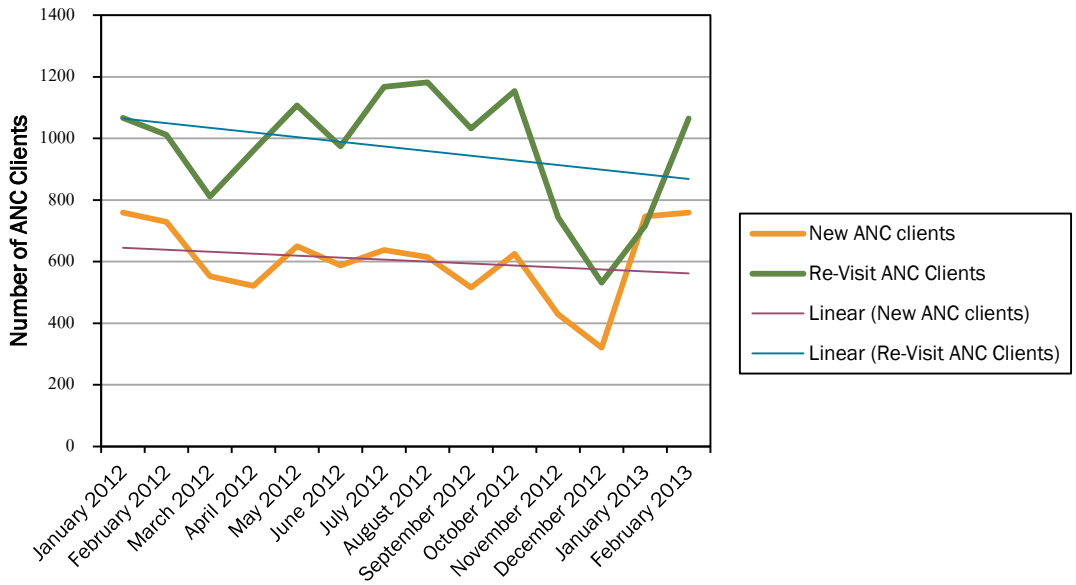
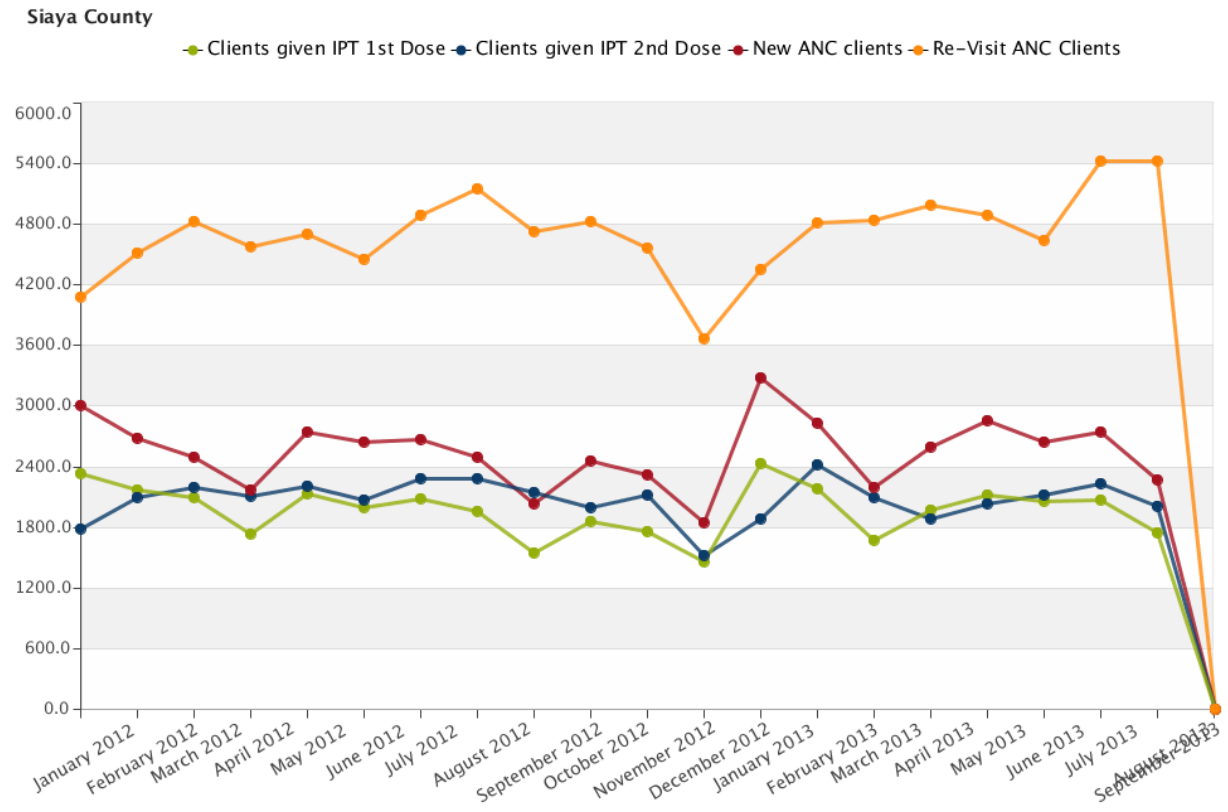


Figure 3.3. ANC attendance and IPTp provision for Siaya County, January 2012–September 2013



TYPES AND SOURCES OF ROUTINE DATA FOR DIVISION OF MALARIA CONTROL MONITORING AND EVALUATION INDICATORS (FROM THE 2012 PRESIDENT'S MALARIA INITIATIVE KENYA *MALARIA OPERATIONAL PLAN*)

- Routine disease and service reporting and national surveillance from the HMIS, LMIS, the IDSR system, and district, county (new), provincial, and national administrative systems.
- Routine sentinel surveillance information from selected sites prospectively monitoring different parameters.
- Routine demographic sentinel information from Kenya's Demographic Surveillance System (DSS) sites in Kisumu (population of 135,000, managed by KEMRI/CDC) and Kilifi (population of 220,000, managed by KEMRI / Welcome Trust). In the absence of functional national vital registration systems, these sites monitor birth and death rates, mortality and morbidity rates, and socioeconomic indicators and conduct verbal autopsies to ascribe probable causes to all deaths. Data from the DSS sites is provided to the DOMC quarterly per agreements.

TYPES AND SOURCES OF ROUTINE DATA FROM SENTINEL SITE SURVEILLANCE (FROM THE 2012 PRESIDENT'S MALARIA INITIATIVE KENYA *MALARIA OPERATIONAL PLAN*)

- Routine sentinel surveillance information from selected sites prospectively monitoring different parameters. These include five sites monitoring antimalarial drug quality and two sites monitoring antimalarial drug efficacy. With decreasing malaria risk in the country, health facilities in sentinel districts established in 2000 to represent the four different epidemiologic zones are no longer routinely used by the DOMC / KEMRI / Welcome Trust to collect retrospective data on implementation and health impact of malaria control interventions.
- The malaria surveillance and response system for the 39 epidemic-prone districts, managed by the DDSR, is an important part of the *M&E Plan*. Epidemic thresholds for malaria have been set for four to six sentinel facilities in each of these districts. Health centers submit data to districts on a weekly basis, and districts then transmit the data to provincial and national level by text message. Data is reviewed at the district level and case counts above preset thresholds are investigated by the district health officer.
- Routine demographic sentinel information from Kenya's DSS sites in Kisumu (population of 135,000 managed by KEMRI/CDC) and Kilifi (population of 220,000, managed by KEMRI / Welcome Trust). In the absence of functional national vital registration systems, these sites monitor birth and death rates, mortality and morbidity rates, and socioeconomic indicators and conduct verbal autopsies to ascribe probable causes to all deaths. Data from the DSS sites is provided to the DOMC quarterly per agreements.