NATIONAL MALARIA CONTROL PROGRAMME REVIEW

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First published in November 2013.

Layout and designed by PT. Desprindo Natamedia
It is my pleasure to welcome you all for an external review of malaria control programme in Indonesia. Malaria Elimination initiatives in Indonesian, officially have proclaim/ declare by the Ministry of Health, Republic of Indonesia, on 25th April 2009 coincide with the second World Malaria Day celebration. Malaria Elimination Performance guidance in Indonesian embodied in the decree of Ministry of Health Indonesia Republic dated on 28th April 2009, about Malaria Elimination in Indonesia.

Malaria control and elimination should be achieved according to the agreed country plans since delay can lead to an increase in malaria cases and elimination will become more challenge. The assessment of resource requirements and costs has become crucial in the light of the goal of control/eliminate malaria as planned. Scaling up should be pursued through the application of the best practices which are based on evidence. Quality assurance and quality improvements have to be an integral part of scaling up efforts. The demand side, i.e. the perspective of the people needs to be kept in mind. The process comprised of discussion during the meeting of malaria review experts during 25 July to 05 August 2011. Review of the documents, discussions with national provincial and district level health staff to prepare programme costing is important. Various programmatic constraints in need to be identified and a framework should be developed based on the needs assessment.

Malaria elimination is performed step by step appropriate with the level of infection and available resource on each Districts/Cities and Provinces. Malaria elimination also have integrated with various elements, which is Government, Local government, business world, donor institute, professional organization, social organization and society. Despite, to become Malaria free region needs to exceed four steps, which is Control Phase, Pre Elimination Phase, Elimination and Consolidation Phase where each phase is established based on the evaluation of infection level and ability of available resources.

The Monitoring and Evaluation Guidelines and malaria Elimination checklist is in process of development with the technical support of WHO and other partners. To ensure that the malaria elimination efforts reach with its specified objectives, the Health Officer at every
administration level should monitor that, does the available resources are sufficient, does all activities are performed according to guidelines/protocol, and does it cover the set target. It could also assess that the efforts have impact on decreasing parasite infection level and finally reach to the specified malaria elimination phases. Severe, fatal and multidrug-resistant vivax malaria challenges our perception of P. vivax as a benign disease. Strategies to understand and address these phenomena are needed urgently if the global elimination of malaria is to succeed.

The Challenges ahead to us are the occurrence of drug-resistant malaria, the quality of data and estimations of the malaria burden and its containment. Improvement of the quality of research proposals in the area of malaria and vector borne diseases, strengthening national capacity, and overcoming financial constraints, Epidemic malaria control management in hyper endemic areas are the another challenges.

WHO is concerned about access to what we have. We are equally concern about innovation for new products and ensuring access to those future technologies. Innovation is important, but innovation must be affordable. Let us accelerate the innovation to deliver existing interventions and innovation for new tools to do more.

We expect this review will come up with updated malaria epidemiology and verified levels and estimation of malaria prevalence, morbidity, and mortality. This should further help to re-defined malaria risk districts, risk population, and risk factors, updated Malaria social and economic burden and costs. Changes proposed to strengthen malaria control organizational structure, capacity, identified for revision in country for existing strategic, annual operational plans and systems at national, provincial and district levels. I am confidence that his external review findings will very much useful for scaling up control interventions and eliminate the disease from the country as planned.
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<tr>
<td>ACD</td>
<td>Active case detection</td>
</tr>
<tr>
<td>ACT</td>
<td>Artemisinin based combination therapy</td>
</tr>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>ANC</td>
<td>Antenatal clinic</td>
</tr>
<tr>
<td>APBN</td>
<td>Anggaran Pendapatan dan Belanja Nasional (The National Budget)</td>
</tr>
<tr>
<td>API</td>
<td>Annual parasite incidence</td>
</tr>
<tr>
<td>ASAQ</td>
<td>Artemisinin and amodiaquine</td>
</tr>
<tr>
<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
</tr>
<tr>
<td>BAPPENAS</td>
<td>Badan Perencanaan dan Pembangunan Nasional (Indonesian National Development Agency)</td>
</tr>
<tr>
<td>BOK</td>
<td>Biaya Operational Kesehatan (Health Center Operational Budget)</td>
</tr>
<tr>
<td>BTKL</td>
<td>Balai Teknik Kesehatan Lingkungan (Environmental Health Laboratory)</td>
</tr>
<tr>
<td>CDC</td>
<td>Communicable disease control</td>
</tr>
<tr>
<td>DAK</td>
<td>Dana Alokasi Khusus (Special Allocation Fund)</td>
</tr>
<tr>
<td>DAU</td>
<td>Dana Alokasi Umum (General Allocation Fund to the District)</td>
</tr>
<tr>
<td>Decon</td>
<td>Deconcentration Funds</td>
</tr>
<tr>
<td>DDT</td>
<td>Dichlorodiphenyltrichloroethane</td>
</tr>
<tr>
<td>DHP</td>
<td>Dihydroxy artemisinin/piperaquine</td>
</tr>
<tr>
<td>DIU</td>
<td>District Implementation Unit</td>
</tr>
<tr>
<td>DKI</td>
<td>Daerah Khusus Ibukota (Special Capital City District)</td>
</tr>
<tr>
<td>ELISA</td>
<td>Enzyme-linked immunosorbent assay</td>
</tr>
<tr>
<td>EPI</td>
<td>Expanded Programme on Immunization</td>
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<tr>
<td>GF</td>
<td>Global Fund to Fight AIDS, TB and Malaria</td>
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<tr>
<td>IBI</td>
<td>Ikatan Bidan Indonesia (Indonesian Mid-Wives Association)</td>
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<tr>
<td>IDIA</td>
<td>Ikatan Doctor Anak Indonesia (Indonesia Paediatric Association)</td>
</tr>
<tr>
<td>IEC</td>
<td>Information, education and communication</td>
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<tr>
<td>IMA</td>
<td>Indonesian Medical Association</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>IPT</td>
<td>Intermittent preventive treatment</td>
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<tr>
<td>IRS</td>
<td>Indoor residual spraying</td>
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<td>ITN</td>
<td>Insecticide treated nets</td>
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<tr>
<td>JMD</td>
<td>Juru Malaria Desa (Village Malaria Cadre)</td>
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<tr>
<td>JML</td>
<td>Juru Malaria Lingkungan (Environmental Malaria Cadre)</td>
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<tr>
<td>KOPEM</td>
<td>Komando Pembasmian Malaria</td>
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<tr>
<td>LCI</td>
<td>Low case incidence</td>
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<tr>
<td>LFA</td>
<td>Local funding agent</td>
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<tr>
<td>LLIN</td>
<td>Long lasting insecticide treated nets</td>
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<tr>
<td>M&amp;E</td>
<td>Monitoring and evaluation</td>
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<tr>
<td>MBS</td>
<td>Mass blood survey</td>
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<tr>
<td>MCI</td>
<td>Moderate case incidence</td>
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<tr>
<td>MDG</td>
<td>Millennium development goal</td>
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<tr>
<td>MFS</td>
<td>Mass fever survey</td>
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<tr>
<td>MIP</td>
<td>Malaria in pregnancy</td>
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<tr>
<td>NAD</td>
<td>Nanggroe Aceh Darussalam (Aceh Province)</td>
</tr>
<tr>
<td>NIH</td>
<td>National Institutes of Health</td>
</tr>
<tr>
<td>NIHRD</td>
<td>National Institute of Health Research and Development</td>
</tr>
<tr>
<td>NTT</td>
<td>Nusa Tenggara Timur</td>
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<tr>
<td>NMCP</td>
<td>National Malaria Control Program</td>
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<tr>
<td>NTB</td>
<td>Nusa Tenggara Barat</td>
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<tr>
<td>NU</td>
<td>Nahdatul Ulama (Islamic social Organization)</td>
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<tr>
<td>PCD</td>
<td>Passive case detection</td>
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<tr>
<td>PELKESI</td>
<td>Protestant Association of Health (Christian)</td>
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<tr>
<td>PERKHAKI</td>
<td>Catholic Association for Health (Christian)</td>
</tr>
<tr>
<td>PKD</td>
<td>Pusat Kesehatan Desa (village health post)</td>
</tr>
<tr>
<td>PNPM</td>
<td>Programme National Pemberdaan Masyarakat</td>
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<tr>
<td>PR</td>
<td>Principal Recipient</td>
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<tr>
<td>PSM</td>
<td>Procurement supply management</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>RDT</td>
<td>Rapid diagnostic test</td>
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<tr>
<td>RPJM</td>
<td>Rencana Pembangunan Jangka Menengah Nasional (National Mid-Term Development Plan)</td>
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<tr>
<td>RRT</td>
<td>Rapid response team</td>
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<td>RSUD</td>
<td>Rumah Sakit Umum Daerah (District General Hospital)</td>
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<tr>
<td>SCM</td>
<td>Supply chain management</td>
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<tr>
<td>SOP</td>
<td>Standard operating procedure</td>
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<tr>
<td>SR</td>
<td>Sub-recipient</td>
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<tr>
<td>TES</td>
<td>Therapeutic efficacy study</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>VBC</td>
<td>Vector biology and control</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>VBDC</td>
<td>Vector Borne Disease Control</td>
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<tr>
<td>VMP</td>
<td>Village malaria post</td>
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<td>VPP</td>
<td>Voluntary pooled procurement</td>
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<td>WHOPES</td>
<td>WHO Pesticide Evaluation Scheme</td>
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<tr>
<td>Yanfar</td>
<td>Pelayanan Farmasi (Pharmaceutical Services)</td>
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Indonesia has made progress in controlling malaria but there are several areas where improvements are needed. From 24 July to 6 August 2011 an external independent review on National Malaria Control Program (NMCP) performance and achievement was conducted after the last external review in 1991. The general objective is to conduct comprehensive in-depth review of the NMCP and recommend measures to further strengthen the programme with a view to achieving national and global targets on Millennium Development Goals (MDG) 6 related to malaria.

The review team composed of experts from WHO-HQ, WHO-SEARO, WHO Country Office, UNICEF, USAID, GF, independent experts and NMCP experts. Team included both external and national experts with expertise in different areas such as programme management, epidemiology, malariology, parasitology, entomology, vector control, policy, strategic planning, financial and human resources development, advocacy, communication and social mobilization, procurement and supply management, quality control laboratory, training and research. Four teams with cross cutting expertise were formed and two sets of field visits were made from 26 July to 29 July 2011 and from 1 August to 4


August 2011. Locations visited were: Papua, Nusa Tenggara, Sulawesi, Central Kalimantan, Central Java, East Java, and West Java. During each visit members spent 3-4 days meeting with provincial and district health officials, with medical personnel in provincial and district hospitals, personnel responsible for logistics and supply chain management, and staff at puskesmas, posyandu and pustu. Team members also interacted with community leaders and members of households. The findings from the review are highlighted below.

Malaria transmission is concentrated on the outer islands of Papua, Maluku, Nusa Tenggara, Sulawesi, Kalimantan and Sumatra. It occurs with low frequency in Java and Bali where approximately 70% of the population lives. Malaria transmission is limited to rural areas; there is no evidence of transmission in urban areas. Based on annual parasite incidence (API), there are huge variations in the level of malaria burden between districts and within provinces. Moreover, within each district the geographic distribution is focal and the level of endemicity varies between puskesmas service areas.

The total population of Indonesia is approximately 238 million. With district as the unit of stratification and API as the basis for stratification, each district is stratified as high risk, moderate risk, low risk or malaria free. In 2010, the NMCP reported that the proportion of population residing in high, moderate, low risk and malaria free Districts was 58%, 19%, 8%, and 15% respectively. The population at risk is probably over estimated. If proper stratification of risk areas would be...
carried out, most of the populations would be categorized under malaria free areas.

All four species of human malaria parasites are found in Indonesia. P. vivax is the predominant species except in Papua where P. falciparum slightly predominates. P. malariae and P. ovale were mostly found in the eastern part of Indonesia, Nusa Tenggara Timur and Papua. In the past few years, P. knowlesi was documented in humans in Kalimantan.

Current MoH policy is that DHP is the first line treatment for acute malaria. Artesunate amodiaquine is still in use, and has in the past been procured with GF resources directly by Malaria Sub Directorate through the VPP, but DHP is the preferred treatment. Under existing MoH policy, district (and provincial) medical stores should provide DHP on request to both primary health facilities (e.g., the puskesmas system) and hospitals. The Papua/Central Java team found evidence that this policy is not clearly understood everywhere and at all levels.

The MoH has issued guidelines for malaria diagnosis and case management that have been regularly up-dated since 2006 in collaboration with the Malaria Expert Committee. The guidelines require that malaria diagnosis be based on laboratory confirmation either through microscopy or with RDT. The principle of the malaria treatment policy is to stop monotherapy and use the ACT for uncomplicated and complicated malaria cases (all species).

Sebenarnya, jika stratifikasi daerah berisiko yang tepat dilakukan, sebagian besar populasi akan dikategorikan tinggal di daerah bebas malaria.


Berdasarkan kebijakan Kementerian Kesehatan saat ini, DHP adalah pengobatan lini pertama untuk malaria akut. Artesunat amodiaquine, yang sebelumnya diperoleh dengan menggunakan dana GF secara langsung oleh Subdit Malaria melalui VPP, masih digunakan, walaupun DHP lebih dipilih. Berdasarkan kebijakan Depkes yang ada, apotek di kabupaten (dan propinsi) harus memberikan DHP atas permintaan untuk kedua fasilitas pelayanan kesehatan primer (misalnya, sistem puskesmas) dan rumah sakit. Tim Papua / Jawa Tengah menemukan bukti bahwa kebijakan ini tidak dimengerti dengan jelas diberbagai tempat dan di semua tingkatan.

Berdasarkan kebijakan Kementerian Kesehatan, Depkes telah mengeluarkan pedoman untuk diagnosis dan manajemen kasus malaria yang telah diperbarui secara teratur di tahun 2006, bekerja sama dengan Komite Ahli Malaria. Pedoman mengharuskan diagnosis malaria didasarkan pada konfirmasi laboratorium baik melalui mikroskop atau RDT. Prinsip kebijakan pengobatan malaria adalah untuk menghentikan monoterapi dan menggunakan ACT untuk kasus malaria.
The Team found that at Rumah Sakit (RS) Bethesda, RS Tomohon and RS Prof. Dr Kandou in Manado there is clear policy on malaria diagnosis and case management (including procedures for identifying severe cases) and all malaria cases are confirmed by microscopy and treated with ACT and when required, with intravenous artesunate. At RS Bethesda, microscopy examinations includes parasite quantification and a semi quantitative method is used at RS Prof. Dr Kandou. This example of appropriate malaria case management could easily be reproduced in other area in Indonesia.

The Team noted the establishment of malaria QA system in Aceh. This QA system includes development of a competence-based training curriculum for microscopists at different levels, standard training slide banks for competence testing, a slide cross checking system and on-site microscopic competence testing. There are plans to establish the same QA system in North Molucca and Papua Provinces.

As Indonesia straddles Wallace’s line, its malaria vectors are unusually diverse, with representatives from both the Asiatic and Australian-Papuan fauna. In Papua, Maluku, and North Maluku, members of both broad faunal groups may be found, while in the remainder of Indonesia only Asiatic vectors are present.

At present, policies for vector control of malaria emphasize LLIN distribution and IRS. IRS is generally reserved for control of outbreaks, tanpa ataupun dengan komplikasi (semua jenis spesies). Tim menemukan bahwa di Rumah Sakit (RS) Bethesda, RS Tomohon dan RS Prof Dr Kandou di Manado memiliki kebijakan yang jelas tentang diagnosis dan manajemen kasus malaria (termasuk prosedur untuk mengidentifikasi kasus yang parah) yaitu semua kasus malaria yang dikonfirmasi oleh mikroskop dan diobati dengan ACT, dan bila diperlukan, dengan menggunakan artesunat intravena. Pada RS Bethesda, pemeriksaan mikroskop meliputi metode kuantifikasi parasite. Sementara itu, di RS Prof Dr Kandou semi kuantitatif digunakan. Percontohan manajemen kasus malaria ini dengan mudah dapat dilakukan di daerah lainnya di Indonesia.

Tim Penilaian Malaria mencatat sistem QA malaria di Aceh telah berjalan. Sistem QA ini meliputi pengembangan kurikulum pelatihan berbasis kompetensi untuk petugas mikroskop pada tingkat yang berbeda, standar pelatihan penyimpanan slide untuk kompetensi pengujian, sistem pemeriksaan silang dari slide darah dan uji kompetensi mikroskopis di tempat. Terdapat perencanaan untuk membangun sistem QA yang sama di Maluku Utara dan Provinsi Papua.

Di Indonesia terbentang garis Wallace, dengan vektor malaria yang sangat bervariasi, terbagi menjadi dua kelompok: Asia dan Australia-Papua. Di Papua, Maluku, dan Maluku Utara, anggota kedua kelompok hewan dapat ditemukan, sementara di sisa Indonesia hanya dapat ditemukan vektor Asiatic.

Saat ini, kebijakan untuk pengendalian vektor malaria ditekankan pada distribusi LLIN dan IRS. IRS umumnya dilakukan untuk
though some districts may routinely spray in highly endemic villages. As these may occur in any province, in theory every province should have IRS teams on standby equipped for rapid deployment. LLIN distribution is stratified according to level of endemicity of malaria. In high transmission areas, LLINs are to be distributed in mass campaigns to all community members followed by routine distribution to pregnant women and infants via antenatal care and routine immunizations to maintain coverage. In middle transmission areas, no mass campaigns are carried out, but routine distribution to high priority groups—pregnancy women and young children—is done via integration with antenatal care and routine immunizations. In low transmission areas, LLINs are not distributed. These programs are carried out with various levels of efficiency, resulting in varying levels of coverage.

As is the case for IRS, maximal impact of LLINs requires high coverage. In the context of eastern Indonesia, where routine access to villages is extremely difficult, LLINs have proven easier to implement than IRS. However, high community coverage of LLINs has been attained only in certain areas of Indonesia, including Aceh (with tsunami funding), much of malaria endemic Sumatra (with funding from the American Red Cross via UNICEF), some highly endemic parts of Kalimantan and Sulawesi (with funding from GF R8), and four districts in Papua (jointly funded by the GF and UNICEF). Programmatic implementation has been variable, whereby in some districts WHO targets of 80% coverage have been met, but in others coverage has fallen short of this.

Seperti halnya IRS, LLINs memerlukan cakupan tinggi untuk meningkatkan efektivitasnya. Di Indonesia timur, di mana akses rutin ke desa-desa sangat sulit, LLINs telah terbukti lebih mudah diterapkan daripada IRS. Namun, pencapaian cakupan LLINs yang tinggi hanya di daerah tertentu di Indonesia, termasuk Aceh (dengan dana tsunami), Sumatera (dengan dana dari Palang Merah Amerika melalui UNICEF), Kalimantan dan Sulawesi (dengan dana dari GF R8), dan empat kabupaten di Papua (didanai bersama oleh GF dan UNICEF). Implementasi program sangat bervariasi dimana WHO menargetkan cakupan 80% yang dapat dipenuhi dibeberapa kabupaten sementara di kabupaten yang lainnya jauh dari target ini.
Notably, much of highly endemic Eastern Indonesia (most of Papua, the Maluku, and East and West Nusa Tenggara) has not yet benefited from high coverage of LLINs. The primary challenge in attaining this coverage is financial constraints. When nets are purchased with GF support, the cost is about $5 per net (or less) if free of tax. If purchased with MoH funds, the cost more than doubles, with part of the cost due to taxes. Locally manufactured WHOPES-recommended LLINs are not available. It is recommended to remove taxes and tariffs on LLINs, RDTs, and antimalarial drugs, while at the same time encouraging the private sector in Indonesia to develop capacity to manufacture these commodities according to WHO standards.

Much serious work on incrimination and characterization of the major vectors of malaria remains to be done, particularly in eastern Indonesia. In districts where Anopheles have been captured—which the exception of a few research sites—no sporozoite ELISA has been done. Thus, the identity of the species transmitting malaria in some areas is to a large extent speculative. Good vector incrimination studies— which will require backup from good research institutions capable of molecular identification—would allow Indonesia to better deploy environmental management for the species susceptible to this intervention (primarily An. aconitus, An. sundaicus, An. farauti, and An. subpictus).

Integration of routine ANC with screening and treatment and LLIN distribution was

Di daerah Indonesia Timur (Papua, Maluku, Nusa Tenggara Timur dan Nusa Tenggara Barat), merupakan daerah dengan endemisitas malaria yang tinggi dan belum mendapatkan manfaat dari cakupan LLIN. Tantangan utama dalam mencapai cakupan ini adalah keuangan. Ketika kelambu dibeli dengan dukungan GF, membutuhkan biaya bersih kurang lebih $5 per LLIN dan bebas dari pajak. Jika dibeli dengan dana Depkes, biayanya menjadi lebih dari dua kali lipat, karena dikenai pajak. Sementara itu, WHOPES—LLIN yang direkomendasikan—belum diproduksi secara local dan tidak tersedia di Indonesia. Sehingga, untuk LLIN, RDT, dan obat antimalaria dianjurkan untuk menghapus pajak dan tarif. Pada saat yang sama, negara mendorong sektor swasta di Indonesia untuk mengembangkan kapasitas dan memproduksi komoditas tersebut sesuai dengan standar WHO.


Integrasi rutin ANC dengan deteksi dini, pengobatan dan distribusi LLIN awalnya
initially developed in 11 target districts in Eastern Indonesia from 2005-7. After some early hesitation, cooperation between the maternal health and malaria sections of the MOH is generally good. Operations are carried out by maternal health, whilst the policy or where the program is to be implemented and details of treatment are left to the malaria section. Procurement of drugs, RDTs, and LLINs is at present the responsibility of the malaria section. The team observed great variation in the prevalence of malaria infection in pregnant women in our field visits. In Papua, in both Jayapura and Timika Districts, the prevalence may be as high as 10%, while in Kalimantan and North Sulawesi, only a handful of several thousand women screened were infected.

Surveillance, monitoring and evaluation are very essential in any health programme. Indonesia’s NMCP generates data through three (3) mechanisms: (a) routine data collection at implementing site level, (b) evaluation tools during field visits and supervision, and (c) specific surveys and research. The core indicators used in malaria surveillance activities are the number of clinical (suspected) cases, number (%) of confirmed cases, proportions of Pf, Pv, and mixed cases, API, SPR and deaths due to malaria.

There is no system for data QA. In terms of completeness of reports, all the 33 provincial health offices submit reports to the central level. However, only around 80% of the districts actually submit reports to the province. There is no information on the completeness of the reports from puskesmas to the district. Thus at the maximum,
surveillance data consolidated at central level is only around 80% of the data generated by the public health facilities.

In malaria elimination program WHO recommends that NMCPs conduct two reorientations: one for the shift to pre-elimination and another one for the shift to elimination. Indonesia has not yet conducted malaria program re-orientation training to facilitate the shift to elimination. Operational guidelines and training curricula form the pre-requisite for conducting such training at national, provincial, and district levels for all stakeholders who are to be involved in the elimination effort.

The overall program management tools and procedures are in place. However, there are several tools that need to be sharpened, side by side with building up the appropriate skill and knowledge on malaria elimination to all concerned staff will be of a great asset in improving program management. It is more important to have a critical mass of training for trainers at least at the provincial level in sustaining malaria elimination program. Emphasizing the utilization of real-time data for planning and implementing control operations at the sub-district level in areas where the burden has decreased and revisiting the human resource needs for malaria control at the province and district

dikonsolidasikan di tingkat pusat hanya sekitar 80% dari data yang dihasilkan oleh fasilitas kesehatan masyarakat.

Dalam program eliminasi malaria, WHO merekomendasikan Program Nasional Pengendalian Malaria melakukan dua reorientasi: masa peralihan ke pra-eliminasi dan masa peralihan ke eliminasi. Indonesia belum menyelenggarakan pelatihan re-orientasi untuk memfasilitasi pergeseran fase eliminasi malaria ini. Dibutuhkan pedoman operasional dan kurikulum pelatihan sebagai prasyarat untuk melakukan pelatihan tersebut pada tingkat nasional, propinsi, dan untuk semua pemangku kepentingan yang terlibat dalam upaya eliminasi.

Pedoman dan prosedur manajemen program secara keseluruhan telah tersedia. Namun, ada beberapa alat yang perlu diperjelas, untuk meningkatkan keterampilan dan pengetahuan tentang eliminasi malaria kepada semua staf sehingga akan meningkatkan pengelolaan program. Oleh karena itu, diperlukan penekanan dalam pelaksanaan ToT setidaknya di tingkat provinsi dalam mempertahankan program eliminasi malaria. Pemanfaatan data real-time perlu ditekankan dalam perencanaan dan pelaksanaan program pengendalian malaria di tingkat kecamatan, dimana beban penyakit telah menurun. Peninjauan kembali sumber daya manusia untuk pengendalian malaria di tingkat provinsi dan kabupaten diperlukan dalam kondisi desentralisasi dan akan menjadi investasi yang berharga, tidak hanya untuk mencapai target eliminasi tetapi juga keberlangsungan program.
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1. INTRODUCTION

1.1 LOCATION AND CONTEXT

Indonesia the fourth largest country in terms of population after China, India, and the United States and is classified as a lower middle-income country in South-East Asia. The country is also known as the most populous Muslim-predominant country. The country consists of 17,504 islands with total land area over 1.9 million square kilometres and shares borders with Singapore, Malaysia, Papua New Guinea, East Timor, the Philippines, and Australia. Since Indonesia is situated at the rim of earth plates along the equator line it is prone to major earthquakes and volcano eruption (Departemen Dalam Negeri, 2004, 2008). Indonesia is a republic with its president as the head of state and head of administration. Indonesia has been considered to consist of 33 provinces, 497 districts, 6747 sub-districts and 78,198 villages in 2011 (Badan Pusat Statistik, 2011). The estimated population is 238 million people (Badan Pusat Statistik, 2011) with average density of 118 people/ km². Sixty percent of Indonesians lives on Java and Bali, representing only 7% of Indonesia land area (Departemen Kesehatan, 2008). Central agencies are responsible for defence and national security, foreign affairs, fiscal policy and religion.
1.2 POPULATION AND DEMOGRAPHIC INDICATORS

The Republic of Indonesia makes up most of the Indonesian archipelago that straddles the equator and stretches 5200 km from west Malaysia to Papua New Guinea (Figure 1). The archipelago comprises seven main islands including Sumatra, Java, Kalimantan, Sulawesi, Maluku, the Lesser Sundas and Papua and only 6000 of the 17,504 total islands are inhabited. Since decentralization of government power in 2000 Indonesia consists of 33 provinces, 497 districts/municipalities, 6747 sub-districts and 78198 villages.

The country has an estimated population of 238 million people with an annual population growth rate of 1.3%. The overall average population density is 118 people/km² while the average density on Java and Bali (977 people/km²) is much higher than other islands (50 people/km²). Sixty percent of Indonesians live on Java and Bali, representing only 7% of the land area. More people live in rural (57%) than in urban areas (43%). The ratio of males to female is 1:1.

The age distribution is 30% young (0–14 years old), 65% productive (15–64 years old) and 5% old (>65 years old). Life expectancy increased from 52 years in 1980 to 69 years for males and 72 years for females in 2007. The Government’s Household Health Survey estimated an illiteracy rate of 7%, with more females (10%) than males being illiterate (4%) and with higher rates in rural (10%) than in urban areas. The highest illiteracy rates occurred in Papua (23%; rural 32% and urban 2%) and West Nusa Tenggara provinces (18%; rural 20% and urban 13%). As shall be seen, these are also two of the most malarious provinces in Indonesia.

The major demographic indicators of the country are summarized in the table below.

<table>
<thead>
<tr>
<th>Total population</th>
<th>238 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population growth rate (1990-2007)</td>
<td>1.4%</td>
</tr>
<tr>
<td>Gross national income per capita (PPP international $)</td>
<td>3,580</td>
</tr>
<tr>
<td>Life expectancy at birth male/female (years):</td>
<td>69/72</td>
</tr>
<tr>
<td>Gross birth rate</td>
<td>21</td>
</tr>
<tr>
<td>Maternal mortality rate</td>
<td>228</td>
</tr>
<tr>
<td>Infant mortality rate</td>
<td>34/1,00 live births</td>
</tr>
<tr>
<td>Under-five mortality rate</td>
<td>44</td>
</tr>
</tbody>
</table>

Source: Indonesia Health Profile 2008. Ministry of Health, Jakarta 2010
1.3 HEALTH SYSTEM ORGANIZATION

Indonesia’s Ministry of Health (MoH), situated in the capital Jakarta, has 4 Directorate-Generals, 2 Institutes, an Inspectorate-General and a Secretariat-General under which there are 14 Centres and Bureaus (Figure 2). The Directorate-General of Disease Control & Environmental Health has five directorates, where the Vector Borne Disease Control (VBDC) Programme Directorate oversees the malaria control programme. Under the Directorate-General of Disease Control & Environmental Health there is a planning unit, finance unit and a regulation unit that are involved in the overall management of the business of the Directorate-General.

The general decentralization process implemented in 2001 has had many impacts on the health system, even though it was not designed specifically with the health sector in mind. In particular, health financing, the health information system, human resources for health and service provision have been affected. Under decentralization, responsibility for health care provision is largely in the hands of district/city governments. Despite this, the central government continues to set the national agenda, targets for health and along with the provincial governments, provides a supervisory, support and monitoring role for district/city governments.
At the local level, each of the 33 provinces has one provincial health office and each of the districts has one district level health office. Each sub-district has at least one puskesmas providing curative, preventive and health promotion services. These puskesmas usually have vehicles or motorboats to serve as mobile health centres for underserved populations in remote areas. Most puskesmas are supported by Pustu (Health Post) – village based curative facility served by a nurse; Polindes (Village Delivery Post) – village based delivery post served by a midwife; and Pusling (Mobile Puskesmas) – monthly Puskesmas visit to Posyandu (integrated health service post) in the village. This monthly Puskemas visit to Posyandu is made to actively provide immunization, weight monitoring, antenatal care, and limited curative services. Posyandu is an activity based post and is established and managed by the village community.

The overall health financing situation in Indonesia is complex and incompletely documented. In 2003, around 34% of total health expenditure was undertaken by public sector agencies while 66% was private. By far the largest single source of private expenditure was direct out-of-pocket payments by households, accounting for nearly half of the total expenditure. Insurance coverage has been increasing since the advent of the new social insurance scheme for the poor.
1.4 CONTEXT OF MALARIA CONTROL

Malaria control and elimination in Indonesia is divided into several periods:
1. Malaria control (1945-1959)
4. Period 2009 – present

1.4.1 Malaria control program (1945-1959)

Between 1945 and 1959, malaria control activities relied heavily upon DDT spraying. The success of DDT in various places in reducing malaria transmission motivated a broader application. Passive case detection and clinical examination became the dominant instruments for malaria diagnosis. In urban areas malaria was diagnosed by microscopy. Whatever the methods of identification, malaria was treated using chloroquine and quinine.

1.4.2 Malaria eradication period (1959-1968)

Starting in 1959 with the assistance of World Health Organization (WHO) and United States Agency for International Development (USAID), the country began a vertical malaria eradication programme known as the Komando Pembasmian Malaria (KOPEM) or Eradication of Malaria Command. In the same year the Department of Malaria Eradication was established in combination with the Institute of Malaria. A training centre for malaria was also established in Ciloto along with four field studies centres located outside of Java. In the first year, the eradication programme only covered Java, Bali and Lampung which encompassed 65% of the Indonesia population. The areas outside Java and Bali started implementing malaria eradication between 1961 and 1964.

Indonesia is divided into 66 zones, each zone with a population of about 1.5 million. Java, Bali and Lampung, the main population centres, consist of 42 zones. Up until 1965 the malaria eradication in Java and Bali made good progress but in 1963, DDT spraying was stopped in 11 zones followed by an additional 24 zones in 1964. In 1966 the program was halted without achieving eradication because:

- Funding from the government or foreign donors declined;
- Vector resistance (*Anopheles (An.) aconitus*) to DDT and dieldrin spread in Central and East Java;
- Parasite resistance (*Plasmodium (P.) falciparum* and *P. malariae*) to pyrimethamine and proguanil spread; and,
- Tolerance of *P.falciparum* to primaquine increased in Irian Jaya.
In 1968 KOPEM was dissolved and its activities integrated into the Directorate General of Communicable Disease Prevention and Eradication. The programme was changed to Malaria Control Program

1.4.3 Malaria control period (1969-2009)

In accordance with the policy of the MoH to gradually integrate malaria control activities into the health care system between 1969 and 1983, many malaria control activities were moved to primary and sub primary health care units having hospital and health laboratories. Some special measures such as spraying/fogging home, indoor residual spraying (IRS), mass treatment and control of outbreaks was conducted by special teams under the coordination of district, provincial or health centres.

With integration of malaria eradication activities into the health care system, many health workers—including the PMD (Village Malaria Eradication Officers), Head Malaria Eradication Officers (KPMD) Sector Commanders and others—in Java and Bali were transferred from the central to local governments.

In 1973 the first case of *P. falciparum* resistance to chloroquine was discovered in Yogyakarta in a traveller from East Kalimantan. Between 1975 and 1990 chloroquine resistant *P. falciparum* was found in all provinces. In addition resistance to sulfadoxine-pyrimethamine was reported in several places. *P. vivax* resistant to chloroquine was first reported on the island of Nias and in North Sumatra Province in 1991.

![Figure 4. Malaria Control Action Plan 2000 – 2010](image-url)
1.4.4. Introduction of malaria elimination program (2009 – onwards)

In 2009 a Ministerial Decree committed Indonesia to eliminate malaria in the whole country by 2030. Malaria Elimination is introduced in different phases for different area/island as target is set differently. The first areas to achieve elimination are Jakarta Province, Bali Island and Batam Island in 2010. The second are Java Island, Aceh Province, and Riau Islands Province in 2015. The third are Sumatra Island excluding Aceh and Riau Islands, West Nusa Tenggara, Kalimantan Island, and Sulawesi Island in 2020. The last areas are Papua, West Papua, East Nusa Tenggara, Maluku, and North Maluku, targeted to achieve elimination by 2030. As a guide for the implementation of the malaria elimination, the National Malaria Elimination Action Plan was completed.

Figure 5. National Plan of Malaria Elimination in Indonesia 2010-2014
1.5 MALARIA PROGRAM REVIEW

1.5.1 Rationale

Indonesia has made progress in controlling malaria but there are several areas where improvements are needed. The most recent external review of the National Malaria Control Program (NMCP) was conducted in 1991 so a comprehensive review was well overdue. In order to review NMCP performance and achievement as well as to inform the development a new Global Fund for AIDS, TB and Malaria (GFATM) proposal, an external independent review was conducted from 24 July to 6 August, 2011 involving outside experts in collaboration with WHO, UNICEF, USAID.

The WCO (WHO Country Office) Indonesia invited WHO/HQ and WHO/SEARO to support the review and provide technical support in the areas of epidemiology, programme management, vector control (insecticides, bed nets, and biological control), disease surveillance, outbreak management, Information, Education and Communication (IEC) social mobilization, procurement and supply chain management, malaria in pregnancy (MIP) and monitoring and evaluation. The overall aim was to assess programme performance in different eco-epidemiological settings with emphasis on data management, institutional reporting, system for outbreak response and the move towards malaria elimination.

1.5.2 Objectives of the malaria program review

The objectives of the Joint Review of the Indonesia NMCP are:

1.5.2.1 General objectives:

To conduct comprehensive in-depth review of the NMCP and recommend measures to further strengthen the programme with a view to achieving national and global targets on Millennium Development Goals (MDG) 6 related to malaria.

1.5.2.2 Specific objectives:

1. To review NMCP setup at national, provincial, district, sub-district levels and assess policies and strategies, political commitment, and internal and external support including technical and financial resources in relation to the current epidemiology of malaria in the country.

2. To assess the programme performance in the past five years (2006-2010) in the areas of (a) prevention (IRS, insecticide treated nets (ITNs)/long lasting insecticide treated nets (LLINs) and others), including entomology, (b) case management, (c) surveillance, epidemic preparedness and response, (d) behaviour change communications, (e) capacity development, (f) procurement and supply management, (g) monitoring and evaluation and other programmatic areas as per NMCP strategic plan.

3. To review community participation in malaria control and the partnership with various stakeholders, including WHO collaborative programmes; GF projects Round 1, Round 6 and
Round 8, involvement of non-governmental organizations (NGOs), government institutions (Malaria Sub-Directorate, National Institute of Health Research and Development (NIHRD), Medical Colleges and other research institutes) their contribution synergy and the outcomes, over the past 5 years.

4. To prepare specific recommendations for improving malaria control programme including key policies and strategies for scaling up and sustaining key interventions, aiming towards achieving MDG 6 in the medium term and malaria elimination in the long term.

1.5.3 Review team

The review team composed of experts from WHO-HQ, WHO-SEARO, WCO, UNICEF, USAID, GF, independent experts and NMCP experts. Four teams with cross cutting expertise were formed that met in a plenary session on the first day at the Gran Melia Hotel in Jakarta. The review team members included both external and national experts with expertise in different areas such as programme management, epidemiology, malariology, parasitology, entomology, vector control, policy, strategic planning, financial and human resources development, advocacy, communication and social mobilization, procurement and supply management, quality control laboratory, training and research.

The review process was launched by an address from the Director General, Disease Control and Environmental Health, MoH, Indonesia, the Acting WHO Representative, and the UNICEF Representative. The Director General requested that the Review Team suggest measures to achieve the goal of malaria elimination in Indonesia by 2030 or even earlier. The Director of the NMCP gave an overview of the status of malaria in the Country.

1.5.4 Methodology

A desk review of the both published and unpublished documents was not done prior to the arrival of the Review Team so the field teams lacked necessary documentation for their field visits. During the field visits the teams did their best to understand and assess what they observed at the provincial, district, and village levels but the job would have been much easier with the background documentation.

The four teams made two sets of visits: the first was from 26 July to 29 July 2012 after which they returned to Jakarta. The second set of visits was from 1 August to 4 August 2011. During each visit Members spent 3-4 days meeting with provincial and district health officials, with medical personnel in provincial and district hospitals, personnel responsible for logistics and supply chain management, and staff at puskesmas, posyandu and pustu. Team members also interacted with community leaders and members of households.

The four teams re-assembled in Jakarta from 30 July to 5 August 2011 where they presented their key findings and prepared a draft theme based report. The reports where then finalized and combined into this Report.
2. EPIDEMIOLOGY OF MALARIA

The epidemiology of malaria in Indonesia is complex due to various determinants such as numerous vectors with different bionomics, various ecotypes where malaria transmission occurs, presence of all human malaria parasites (as well as \textit{P. knowlesi}), varying levels of development in each province/island; drug resistance, including resistance of \textit{P. vivax} to chloroquine; varying capacities of the health system in the decentralized set-up, various socio-economic activities of the people that put them at risk of malaria. Overall cases are mainly adults; however, the age distribution varies across the country and even within the province indicating different factors effecting transmission.

The most affected locations are in Papua (33%), the Lesser Sundas (29%) and Sumatra (21%) (Koch, 1990). \textit{P. falciparum}'s prevalence was higher in the eastern Indonesia than in the rest of the country and it was not distributed equally across the island groups. \textit{P. vivax} which has been reported at 1786 location (75\% of all surveys), is the most common of the \textit{Plasmodium} in Indonesia after \textit{P. falciparum}. However, the assembled data reveal that these two \textit{Plasmodium} spp infections often occur together in Indonesia. Reports of \textit{P. malariae} and \textit{P. ovale} are relatively uncommon in Indonesia. To date, these parasites have been confirmed at 5\% and 0.6\% survey locations subsequently (Elyazar et al., 2011).

Malaria transmission is higher in the forest areas, particularly in the eastern part of the country with approximately 88.8 million (37\%) of total populations who lives in the high transmission district. The population at risk is probably over estimated. If proper stratification of risk areas would be carried out, most of the populations would be categorized under malaria free areas (WHO SEARO, 2008; WHO, 2011).

The past 6 years epidemiological profile of malaria in Indonesia (2005-2010) reveals that in the year 2009 reported deaths due to malaria increased by about 34\% which can be minimized by about 48\%. Only 20\% of the cases were confirmed and most of them due to \textit{Plasmodium falciparum} and mix infection (about 50\%).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspected case</td>
<td>1,736,718</td>
<td>1,754,444</td>
<td>1,548,439</td>
<td>1,398,790</td>
<td>966,052</td>
<td>903,608</td>
</tr>
<tr>
<td>Pf + mix</td>
<td>127,594</td>
<td>160,147</td>
<td>152,610</td>
<td>193,733</td>
<td>212,501</td>
<td>120,851</td>
</tr>
<tr>
<td>\textit{Pv}</td>
<td>165,870</td>
<td>177,006</td>
<td>159,179</td>
<td>232,463</td>
<td>237,929</td>
<td>108263</td>
</tr>
<tr>
<td>Deaths</td>
<td>-</td>
<td>494</td>
<td>-</td>
<td>669</td>
<td>900</td>
<td>432</td>
</tr>
</tbody>
</table>

Table 2. Epidemiological profile of malaria in Indonesia (2005–2010)
However, the Indonesian morbidity and mortality statistic are believed as under-reported and underestimated. In both 1995 and 2001, there were surveys conducted by Central Bureau of Statistics estimated there were 15-30 million people in Indonesia suffered from at least one attack of malaria in their life time. The estimation of death caused by malaria is 30,000—38,000 in those each years (Departement Kesehatan, 1995). However, the report from MoH is only 191 deaths in 1991 and 1774 death in 2001. The WHO accepted that there were no reliable records of mortality and reported that there are about 45—1774 deaths per year occurred in Indonesia between 1997 and 2003 (WHO SEARO, 2008). There're also found other discrepancies in some data reported during 2008 and 2009 which are over estimated. (World Health Organization, 2008b, World Health Organization, 2009c, Elyazar et al., 2011). The discrepancies show the difficulties in describing the burden of malaria in Indonesia. In 2007, Dellicour et. Al. calculated 6.4 million pregnancies occurred in area with \textit{P. falciparum} and/or \textit{P. vivax} transmission in Indonesia (Dellicour et al., 2010).

Malaria outbreaks occur in Indonesia every year. In 11 years (1998—2008), there are average 7564 cases and about 66 reported death of outbreak every year. Few of them are under unique conditions of non-immune human migration from hypo-endemic areas, which for instance created local epidemic after arrival (Baird et al., 1995). The correlation between climate changes, vector and host also can create the increase of malaria exposure risk and severe disease in highly susceptible populations. The low economic condition, the lack of knowledge, the limiting access to health care and the weakness of surveillance system are malaria outbreak contributing factors (Elyazar et al., 2011).

\section*{2.1 GEOGRAPHICAL DISTRIBUTION OF MALARIA}

Malaria transmission is concentrated on the outer islands of Papua, Maluku, Nusa Tenggara, Sulawesi, Kalimantan and Sumatra. It occurs with low frequency in Java and Bali where approximately 70\% of the population lives.

Malaria transmission is limited to rural areas; there is no evidence of transmission in urban areas. It is highly focal. Based on annual parasite incidence (API), there are huge variations in the level of malaria burden between districts and within provinces. Moreover, within each district the geographic distribution is focal and the level of endemicity varies between puskesmas service areas. For example in North Sulawesi province the API ranges from as high as 29.18/1,000 down to less than 1/1,000 population. Also, in East Java province most districts are already malaria free but three districts have APIs over 40/1,000 population.
Figure 6. API by district in North Sulawesi Province, 2010

Figure 7. API by district in East Java Province, 2010
Papua is the worst affected province. All districts are highly endemic. Of the 14 districts, 2 had APIs in 2010 over 200/1,000 population while 8 have APIs between 50 and 100/1,000 population. The remaining 4 Districts had APIs higher than the national API of 1.89/1,000 population. Unlike in other provinces, *P. falciparum* is the predominant malaria species in Papua.

![Figure 8. API by District in Papua Province, 2010](image)

### 2.2. POPULATION AT RISK

The total population of Indonesia is approximately 238 million. With district as the unit of stratification and API as the basis for stratification (please see section 2.3), each district is stratified as high risk, moderate risk, low risk or malaria free. In 2010, the NMCP reported that the proportion of population residing in high, moderate, low risk and malaria free Districts was 58%, 19%, 8%, and 15% respectively. The population at risk is probably over estimated. If proper stratification of risk areas would be carried out, most of the populations would be categorized under malaria free areas.
<table>
<thead>
<tr>
<th>Province &amp; Districts visited</th>
<th>Proportion of population</th>
<th>Proportion of malaria cases</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;5</td>
<td>5-9</td>
<td>10-14</td>
</tr>
<tr>
<td>Aceh</td>
<td>11%</td>
<td>9%</td>
<td>11%</td>
</tr>
<tr>
<td>Sabang</td>
<td>11%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>West Java</td>
<td>8%</td>
<td>8%</td>
<td>11%</td>
</tr>
<tr>
<td>Ciamis</td>
<td>8%</td>
<td>8%</td>
<td>11%</td>
</tr>
<tr>
<td>Central Java</td>
<td>8%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>BanjarNEGara</td>
<td>8%</td>
<td>8%</td>
<td>9%</td>
</tr>
<tr>
<td>East Java</td>
<td>5%</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Pacitan</td>
<td>5%</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Papua</td>
<td>9%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Timika/Mimika</td>
<td>9%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>East Nusa Tenggara</td>
<td>9%</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>Belu</td>
<td>9%</td>
<td>10%</td>
<td>14%</td>
</tr>
<tr>
<td>Central Kalimantan</td>
<td>9%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>Kotawaringin Timur</td>
<td>9%</td>
<td>10%</td>
<td>11%</td>
</tr>
<tr>
<td>North Sulawesi</td>
<td>8%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Minahasa</td>
<td>8%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>9%</td>
<td>9%</td>
<td>10%</td>
</tr>
</tbody>
</table>

In Central Kalimantan the proportion of reported malaria cases among the different age groups is similar to the national profile but in Kotawaringin Timur District where the Team visited only 3% of the population was under 5 while those 15 years and above, mostly males, comprised 87% of malaria cases indicating that malaria is primarily a disease of young adult males. The adults affected with malaria were mainly involved in small scale mining. In North Sulawesi the situation is different with only 47% of cases are 15 years of age and older while children < 5, 5 – 9 and 10 – 14 accounted for 23%, 17% and 13% of cases respectively.

The situation in Central Kalimantan indicates transmission is taking place outside of houses and is mainly related to occupational exposure. Health staff reported it was young men that are engaged in mining, forest related work or who worked away from their villages are most at risk. It appears that those within the oil palm plantations and those who reside villages along the main roads are less affected by malaria. On the other hand, data from North Sulawesi strongly indicate that most malaria infections are acquired in villages where the patients reside.

Pregnant women and children under 5 have normally considered to be at highest risk but in low transmission areas such as Central Kalimantan and North Sulawesi health staff very rarely see pregnant women with malaria. In four puskesmas and pustu visited by the Team LLINs are being provided to pregnant women. The midwife who has been working there for 13 years has
not encountered a pregnant woman with malaria. This raises the question whether pregnant women and children under five should be considered the primary risk group for malaria in Indonesia.

Systematic collection of data on MIP has been done since 2010. All pregnant women are being checked for malaria parasites on first ante-natal visit and during each subsequent if they have fever. It is expected that by end of 2011 more data would be available for and in-depth analysis of prevalence of malaria in pregnant women.

2.3 STRATIFICATION AND RISK MAPS

In 2007 the NMCP stratified districts based on API as follows: malaria free (API = 0); low case incidence (API = > 0 and < 1); medium case incidence (API = > 1 and < 5) and high case incidence (API = > 5). Based on the 2006 and 2010 data, malaria risk maps are shown below.

Figure 9. Stratification of Malaria Risk Areas by District, 2006
A comparison between the two maps indicates that more districts were considered high risk in 2010 than in 2006 particularly outside of Java - Bali. The increase is not due to increased transmission in 2010 but simply due to expansion of services in recent years supported from GF grant that has led to increased detection and reporting cases.

Starting in 2011 the NMCP will re-stratify each malaria risk areas by village for better targeting of interventions. This will require additional funding to support the development of guidelines, orientation of staff, and review of raw data from puskesmas level. In some areas, verification of the presence of malaria vectors will be needed.

### 2.4. MALARIA PARASITES

All four species of human malaria parasites are found in Indonesia. *P. vivax* is the predominant species except in Papua where *P. falciparum* slightly predominates (Figure 11). *P. malariae* and *P. ovale* were mostly found in the eastern part of Indonesia, Nusa Tenggara Timur and Papua. In the past few years, *P. knowlesi* was documented in humans in Kalimantan.
From late 1990s the total number of positive cases has been increasing, and the proportion of \textit{P. falciparum} cases also increased (Figure 12). The reason for the increasing trend of \textit{P. falciparum} is not clear but it could be partially explained by the fact that use of rapid diagnostic tests (RDTs) is increasing. It is also highly probable that high resistance to chloroquine and sulfadoxine-pyrimethamine could be a major contributing factor.
2.5 RESISTANCE TO ANTIMALARIALS

A major challenge in malaria control in Indonesia is parasite resistance to drugs. Resistance to chloroquine, amodiaquine and sulfadoxine/pyrimethamine is widespread (Figure 13 and 14). Even *P. vivax* is resistant to chloroquine. So far there is no indication of *P. falciparum* resistance to artemisinin drugs.

*Figure 13. Anti Malarial Drug Resistance in Indonesia, 1978 - 2003*

*Figure 14. Efficacy of CQ and AMO to Pv, 2000 - 2004*
Effective treatment is essential element of malaria control (Roll Back Malaria Partnership, 2008). The objectives of an antimalarial treatment policy are rapid and complete cure of infections, reduction of morbidity, prevention of progression, reduction of the risk infection in the fetus during pregnancy, reduction of the reservoir and help preventing the emergence and spread of drug resistance (World Health Organization 2008b). Test for treatment efficacy can be used to help establish the efficacy of antimalaria drugs which in Indonesia poses a major threat to malaria control efforts (World Health Organization, 2003a, 2005b).

There are 452 locations of the antimalarial susceptibility tests, especially CQ and SP since 1935. Resistance to antimalarial treatment was found in \textit{P. falciparum}, \textit{P. vivax} and \textit{P. malariae}, but no report of resistance in \textit{P. ovale}.

The resistance to antimalarial treatments has been reported in Indonesia prior to 1985. The susceptibility of \textit{P. falciparum} to CQ treatment have been evaluated since 1973 (Dondero et al., 1974) with the first resistance-cases report in East Kalimantan in 1974 by Verdrager and Arwati (Verdrager and Arwati, 1974). Rumans et al. first reported \textit{P. falciparum} resistance to SP in 1979 in Jayapura (Papua; Rumans et al., 1979). The distribution of \textit{P. falciparum} resistance to CQ from the percentage of the in vivo and in vitro data analysis shows that 52% and 59% of the test. The resistance of CQ for \textit{P. falciparum} treatment significantly higher in eastern Indonesia than in western Indonesia, using in vivo (56% vs. 43%; Z-test, \( p < 0.001 \)) and in vitro test (64% vs. 54%; Z-test, \( p < 0.001 \)).

Eighteen percent of the in vivo group test an 64% of the in vitro test revealed resistance to SP for \textit{P. falciparum} treatment. The resistance was bot significantly different from western and eastern Indonesia when only in vivo data take count (20% vs. 16%; Z-test, \( p < 0.001 \)). However, when in vitro data be counted, there is significant lower resistance of the usage of SP for \textit{P. falciparum} treatment in eastern than in western (43% vs. 72%; Z-test, \( p < 0.001 \)). One in three in vivo test and 7% of in vitro test of \textit{P. falciparum} to QN are resistance. The resistance of \textit{P. falciparum} to QN treatment only shows in Papua through the use of in vivo test. The in vitro tests showed that resistance was present on most of main islands.

\textit{P. vivax} resistance to CQ throughout the main islands is 48% in vivo tests which shows higher significantly in eastern Indonesia (57% vs. 23%; Z-test, \( p < 0.001 \)).

The first CQ resistant cases of \textit{P. malariae} were reported on the Lengundi island (Southern Sumatra) in 2000 (Maguire et al., 2002). Maguire et al conducted study which showed whole-blood chloroquine and desethylchloroquine concentrations were at an effective level (larger than 100 µg/l) on day 8 in both cases of persistent parasitemia occurred. However, no standard deviation of resistance supported that diagnosis and there is possibility that CQ-sensitive asexual blood stages may persist to the eighth day post-therapy for longer asexual cycle of this parasite. In the other study conducted by Siswantoro et al. in Timika, Papua, there is no CQ resistance of \textit{P. malariae} in 50 patients. There is single evaluation of CQ efficacy to \textit{P. ovale} conducted by Siswantoro et al. in Timika, Papua in 14 subjects. They found there is no recurrence within 28 days following treatment (Siswantoro et al., 2006).
From the evidences, the resistance to antimalarial drugs in Indonesia varies, depend on the drugs, the species of the parasites and the geographical location. The MoH guidelines has been changes and explained that the CQ and SP use is very much inappropriate and should not more be used for the malaria treatment. National policy has clearly stated the use of ACT for the treatment of falciparum and vivax malaria. However, still clinical malaria cases receive CQ and SP which are confirmed to be ineffective.

### 2.6 DISEASE TRENDS

The reported number of malaria cases increased from 2004 – 2009, and then dropped in 2010 (Figure 15). It is difficult to analyse trend of malaria in the country in the past 10 years since during this period case detection was scaled up in varying degrees in different parts of the country. Before GF support, malaria control was limited mainly in Java – Bali. However, with GF support, malaria control was intensified in the outer islands. The increasing coverage of case management may have resulted to more cases detected and reported. It would appear that drop in confirmed cases in 2010 could be due to the impact of intensified interventions in the past 2 years. As shown in Figure 10 and Figure 11, there are more high endemic districts in 2010 than in 2006 but this was not due to higher transmission in 2010 rather it a reflection of increased coverage of interventions and surveillance.

![Figure 15. Trend of Malaria Cases and Death, 2001 – 2010](image-url)
2.7 VECTOR CONTROL

Vector control is consisted of strategies that reduce larval vector density, human-vector contact or the duration of vector survival (Najera and Zaim, 2003).

2.7.1 Control of larvae

2.7.1.1 Larvaciding

The earliest effort to systematically control malaria in Indonesia involved larvaciding (Najera and Zaim, 2003). The effectiveness of larvaciding; including oils, chemical insecticides, insect growth regulators and microbial insecticides; depends upon the permanence of breeding sites and on their location in terms of the access provided to humans. Indonesia's MCP recommends insect growth regulators (methoprene, pyriproxyfen) and microbial insecticides (the bacterium Bacillus thuringiensis israelensis or BTI) as the preferred larvacidal measures.

Overall of the studies of larvacides in Indonesia showed prospectus control agent against the major anopheline vectors. The usage of slow release applicator of larvacides seems the most effective approaches. However, the larvacide usage strategy may only work effectively when the all breeding sites are coverage which requires entomological and mapping expertise. This need is not available in the district level. Although available, larvaciding may not suitable because the breeding sites of the vectors maybe simply too widespread and temporary to accomplish any significant coverage (Elyazar et al., 2011).

2.7.1.2 Larvivorous fish

Larvivorous fish is another biological control of malaria vector which constituted the core of MCP strategies before the introduction of DDT since long time ago (Fletchern et al., 1992; Howard et al., 2007; Kusumawatie et al., 2008; Roll Back Malaria, 2005; Roll Back Malaria Partnership, 2008; Sabatinelli et al., 1991; World Health Organization, 2006b). This approach has been most effectively applied in the men-made mosquito breeding sites. There are 35 species of mosquitoes which can be controlled by 216 fish species in 41 countries (Genberich, 1946). In 1984, the identified number of the larvivorous fish increases into 315 species (Sharma, 1984). The fish should be met into following criteria: carnivorous, surface feeder, rapid breeding in confined spaces, quick swimmer, tolerant of thick vegetation and broad fluctuation in temperature and acidity (WHO Study Group on Vector Control for Malaria and other Mosquito-Borne Diseases, 1995; Wickramasinghe and Costa, 1986).

The effectiveness of the fish’s role controls malaria larvae may also depend on the community awareness and knowledge. The effectiveness application of larvivorous fish requires studies about coverage requirements; community acceptance and real impact such a strategy could have upon malaria risk in those communities (Elyazar et al., 2011).
2.7.1.3 Source reduction by environment management

Historical called as species sanitation, environmental management conducts to create habitats not suitable for breeding site of anopheline line vector species. This approach is important for Indonesia because of the abundance of the vector and may thrive in agriculture settings. Agriculture practice, like irrigation, crop selection and rotation, impact the risk of malaria transmission.

Nalim carried out study using agricultural practice against malaria vector in Salatiga (Central Java; Nalim, 1980). The study concluded that three days of paddy drainage with a good drainage, irrigation mechanics for ease of draining and filling and the cooperation of focal authorities and farmer could reduce the density of larvae and the emergence of adult mosquitoes of *A. aconitus*, *A. annularis*, *A. vagus*, *A. indefinitus*.

In 1993, Pribadi et al. studied the community knowledge about, attitude towards malaria, and malaria prevention practices employed in Bintan (Riau; Pribadi et al., 1997). Species sanitation in Indonesia has very good record of positive results against malaria. Moreover, the studies show that such measures may be superbly effective in limiting the risk of transmission. Under Dutch colonial, it focused on economically important zones only. Meanwhile, the broader applicability which was untouched in Dutch colonial assessed in contemporary studies with limited scope of findings. No work in contemporary Indonesia has demonstrated the impact of village- or district-wide implementation of specific species sanitation measures upon the risk of malaria.

2.7.2 Control of man-vector contact

2.7.2.1 Mosquito nets and insecticide-treated mosquito nets

Sleeping under insecticides-treated bed nets has been approved to have positive impact on all-cause mortality in communities with hyper- to holoendemic malaria. However, there is lack of studies in hypo- to meso-endemic setting which is the typical of most endemic zones in Indonesia. There are unclear benefits of ITNs distribution even though Indonesia aggressively distributes ITN, targeted 80% coverage.

In all of Indonesia provinces, surveys found low ITN usage rates in Indonesia (BPS and Macro International, 2008; Soemantri et al., 2005; Pradono et al., 2005a). The low rates of coverage maybe related to the lack of data demonstrating the efficacy of this intervention. The lack of coverage also has correlation with knowledge which may increase the negative practice of malaria prevention (Arsunan et al., 2003). Health education by local cadre can improve the use of ITN slightly especially in Mimika (Papua; Suhardjo et al., 2003). Unfortunately, there is very low rate of trained health personnel and no villages has ITN-maintenance trained cadre in Eastern Indonesia (Sekartuti et al, 2004b).
The usage of the ITN is very important due to its function to prevent malaria. In a study, ITN application was effective to reduce the level of malaria endemicity from high endemicity to low endemicity in the treated village in Mimika, Papua (Sutanto et al, 1999). The influence of permethrin ITNs application also proven could reduce the risk of malaria infection, lead to lower parasite burden and reduce the host immune suppression in East Mimika (Sutanto et al., 2003). The use of permethrin impregnated into nylon nets were superior possible method then in cotton material against anophelines, especially \textit{A. maculatus} and \textit{A. barbirostris} (Barodji et al., 1999). The other insecticide is cyfluthrin. Cyfluthrin ITN could reduce mosquito landing density of \textit{A. sundaicus} and \textit{A. subpictus}, decrease malaria prevalence for 3—6 months after application and no reported side effect by inhabitants and health workers in East Florest, Lesser Sundas in 1996 (Barodji et al., 2004). Hakimi et al. compared the mosquito mortality rate among permethrin, deltamethrin and lamda-cyhalothrin ITNs at dosage of 0.5 g/m2 against \textit{A. sundaicus} in Ciamis (West Java) in 2006 (Hakimi et al., 2008). In the laboratory setting, after net treated by those insecticides and mixed with adhesive glue (86% acrylic and 14% arthathrin), they concluded that the presence of acrylic and arthathrin was effective to maintain ITN’s efficacy against \textit{A. sundaicus}.

Noticed of the 2.4 million ITNs distribution at 2004—2007 (World Health Organization, 2008b, 2009c), no study has yet demonstrated that this intervention reduces the risk of malaria or morbidity and mortality burdens in Indonesia. No studies about the effective requirement coverage and little evidence that children and pregnant women as the high-risk groups of malaria morbidity and mortality. The risk of age and ethnic groups are varies in many endemic setting in Indonesia. For example, Java adult transmigrant has fourfold higher risk to develop severe malaria than their children (Baird et al., 1995). Further study with a prospective, randomized and well-controlled study design of sufficient size to measure all-cause morbidity and mortality is needed in the setting of hypo- to meso-endemic area as Indonesia.

2.7.2.2 House screening

Ease the mosquito access to human dwelling impact on the risk of malaria. The screening of the windows, doors and open eaves represents an effective barrier to entry by feeding anophelines. The simple modifications to the design of indigenous houses can protect people from mosquitoes and malaria (Kirby et al., 2009; Lindsay et al., 2002).

The screening of the house may represent an effective means to avoid the malaria risk with applying barriers of the floors, walls and roofing in more traditional Indonesian homes. The barriers can be as plastic over the wood plank floor and insecticide-treated eave covers and curtains (Elyazar et al., 2011).
2.7.2.3 Personal protection

Personal protection against malaria biting represents a potential important means of diminishing the risk of the disease and may appear depend on the awareness of malaria and the means of its transmission.

The primary means of avoiding at locations where and when malaria transmission occur is behavioral and more practical for travelers than for residents. For example, the traveler aware of seasonal malaria risk and avoid in the countryside after dusk. Other, the use of repellants, long sleeve shirts, pants and shoes with socks diminish risk to be bitten by malaria-mosquitoes.

Personal protection in endemic area in Indonesia seems varied and quite common. The rates of mosquito coil usage are high, compared with bed nets and screening. The coils aren't provided by the government (in contrast to ITNs) and relatively inconvenient. Leverage of this positive behavior to improve barriers seems an obvious means of ramping up the effectiveness of malaria control.

2.7.2.4 Zooprophylaxis

Zooprophylaxis defined by WHO as the use of wild or domestic animals which are not reservoir hosts, to divert the mosquito vectors from the human hosts of that disease’ (Bouma and Rowland, 1955). It may be active or passive. Active zooprophylaxis is a reduction in malaria or human biting resulting from the deliberate deployment of domestic animals as a barrier between mosquito breeding sites and human settlements (Bouma and Rowland, 1955; Seyoum et al., 2002). Passive zooprophylaxis is serendipitous reduction on malaria purported to occur when cattle density increase within the community (Bultery et al., 2009; Giglioli, 1963).

There are several studies in Indonesia about possibility of zooprophylaxis. Kirnowardoyo and Supalin’s study shows that A. aconicus prefers feeding on animal rather than humans at 3 villages in Wonosobo and four villages in Purworejo (both in Central Java; Kirnowardoyo and Supalin, 1982). These outcomes may impact the strategies concerning cattle placement. Other study by Boewono et al. in Kendal (Central Java), the placement of the cattle shelter in the homes is six fold higher mosquito densities of A. aconicus than in a distant cattle shelter. This value was fourfold when compared to homes with a cattle shelter attached (Boewono et al., 1991).

2.7.3 Control of adult mosquito

2.7.3.1 Indoor residual spraying

IRS is the application of long-acting chemical insecticides on the walls, doors and ceiling of all houses and domestic animal shelters in a given area in order to kill the adult vector mosquitoes that land and rest on that surfaces (World Health Organization, 2006a). The effect which lasts 2—6 months, is very effective to control adult mosquito and reduction of malaria risk (World Health Organization, 2008b). The efficacy of IRS depends on the feeding behavior of mosquitoes,
such as the indoors (exophagic) type or the type which fly outdoors without resting on interior walls. Efficacy also depends upon the dose and coverage degree of interior surfaces of the home.

According to Indonesia MCP guidelines, IRS is targeted at endemic areas with an API > five cases per 1000 population, areas with malaria positive infants or areas with a high potential of malaria outbreak. The guidelines suggest that IRS be conducted 2 months prior to the median peak of malaria case numbers at houses, ‘dangau/ saung’, animal shelters and public places where evening activities are common. The median value is derived from the last 3—5 years of monthly malaria cases. Alternatively, spraying should be done 1 month before the peak density of the local malaria vector (Departemen Kesehatan, 2006a). The recommendation is full coverage with IRS to a height of 3 m.

2.7.3.2 Cattle shelter indoor residual spraying

According to the BHS in 2007, 9% of Indonesian households raised livestock such as cattle and horses and 1% of Indonesian households kept the cattle shelters inside the house and about 8% kept them outside the house (NIHRD, 2008).

The MoH recommends cattle shelter spraying as a supplement to IRS of human dwellings (Departemen Kesehatan, 2006a). The impact of cattle shelter monthly spraying on *A. aconitus* at Jepara in 1983 and 1984 was the reduction of human-vector contact occurred at human dwellings; five times lower indoors, nine times lower outdoors and eight times lower in cattle shelters. Reduction of application into bimonthly would increase human-vector contact among human dwelling into four times higher indoors, three times higher outdoors and three times higher in cattle shelters. Repetitive applications did not decrease susceptibility of *A. aconitus* after 15 applications of fenitrothion. Monthly cattle shelter IRS for 12 months brought insecticide saving 78% compared to two cycles a year IRS application (Barodji, 1985, 2003). The cattle shelter IRS could diminish the risk of malaria in area where *A. aconitus* represents an important vector of malaria too in Banjarnegara (Central Java) in 1985 (Nalim, 1986).

2.7.4 Community knowledge

Community support is very important as the success key of the malaria vector control, such as IRS. Sometimes IRS was not accepted by the community due to its effects on home (foul smell, fouling the furniture, fear toxicity), payment of the spraying, knowledge of IRS function and adverse effects of IRS such as headache (Saikhu and Gilarsi, 2003; Sanjana et al., 2006; Sekartuti et al., 2004a; Sukowati et al., 2003;
2.8 POLICY IMPLICATION

2.8.1 Malaria case detection

Based on Indonesia’s National Malaria control guidelines (Departemen Kesehatan, 2007), case detection activities cover active case detection (ACD) and PCD, mass fever surveys, MBSs, malariometric surveys, migration surveillance and contact surveys.

Active case detection (ACD) is conducted by the team (village malaria workers, health personnel or village malaria cadres) who take blood slides from symptomatic patients visited at home and give presumptive treatment. After the positive result of blood slide proven from microscope examination, the team returns to the home and deliver radical treatment. The frequency of such visits depends on the endemcity class. In region with high API (API > five cases per 1000 per annum) or medium case incidence (API ≥ one case per 1000 per annum), biweekly and monthly home visits respectively are advised by the MoH. Meanwhile, the PCD consists of patients seeking treatment at hospital, primary health centres or sub-primary health centres. In some cases, teams may enter communities and aim to collect a blood film from every resident with a fever or compliant of fever; this is called mass fever survey (MFS). The MFS is prescribed in area with monthly parasite incidence exceeding three per 1000 people (or annual rate 36/1000) has doubled from one month to the next, or in low risk area following a case in infant (indicating high likelihood of local transmission). An MBS aims to collect blood films from all residents regardless of symptoms, provides the most accurate estimation of the true prevalence of active malaria in the community. High endemcity and malaria outbreak areas are the places which MBS should be conducted. Meanwhile, malariometric survey is MBS conducted at children below10 years old. Finally, MoH prescribes migrating surveillance for residence of non- or low-endemic area returning from Indonesia highly malarious areas and contact surveys as blood microscope examination in minimal 5 neighbors of malaria patient.

2.8.1.1 Active case detection

Studied by Utarini et al. that ACD detected more cases than PCD (ratio 1.4:1), covered broader area (4.7 vs. 4.1 km, p < 0.05) and detected more malaria cases among children (33% vs. 22%, p < 0.001) during 1994—1998 in Jepara (Central Java; Utarini et al., 2007). At the same time, they also documented the major problems of ACD, such infrequent sending slides to the health centre, unavailable of microscope examination services at health centre 7 days per week, the beginning of the treatment is the following next day (1.2 days), and the limited number of village workers. So, the role of performance ACD should be continued in highly endemic setting only. In other study, Ompusunggu et al. noted that a failure to provide the compensation to village malaria worker diminishes case detection coverage significantly (ACD slide collected drop to 54%, p < 0.001; Ompusunggu et al., 2005).
The community participation as malaria cadres is very important in brings successful malaria case detection. Not only in knowledge transfer to the community, but also coverage of the case detection. The community malaria cadre is elected by the community and trained to increase their knowledge of malaria. In the malaria control, Ompusunggu et al. suggested that health personnel should provide continuous support to malaria cadres (Ompusunggu et al., 2005). The cadre can help the chemoprophylaxis programme and diminish the percentage refused the drug or agreed in irregular basic in Riau (Sumatra; Pribadi et al. 1986). In East Kalimantan, the acceptance of cadres also seemed to hinge upon the perception of their skill by the community (Sukowati et al., 2000).

2.8.1.2 Passive case detection

Outside Java and Bali, primary health centres rely almost completely upon PCD as the primary means of case finding (Departemen Kesehatan, 2007). Therefore, improving PCD represents an important goal in supporting malaria control in those relatively high endemic settings. The efforts to increase the quality and coverage of PCD are grabbing the community leaders, students and their parents, school health units and their teachers (Hunt et al, 1991; Sekartuti et al., 2004b; Shinta and Sukowati, 2005). Improving the effectiveness of PCD provides additional benefits such improving microscopy, competency and community awareness (Sekartuti, 2000).

2.9 MALARIA DIAGNOSIS

Malaria reliable diagnosis is inside the core of successful control with all patients: residents in endemic setting or travelers from non-endemic area for tour, business or military activities. The National MCP of Indonesia lists three diagnostic tools for routine use: clinical diagnosis, microscopic diagnosis and RDTs (Departemen Kesehatan, 2007).

2.9.1 Clinical diagnostic

The clinical diagnosis of malaria depends on the instincts of the providers. Tjitra et al. studied 560 symptomatic adults and children attending the primary health care in West Sumba (Lesser Sundas) in 1998 (Tjitra et al., 1999). A diagnosis of clinical malaria was based on fever or history of fever in the last 48 h and no other evident cause of fever. The half of them (53%) was known parasitemia when diagnosed by microscopy. The MoH guidelines call to treat the clinically diagnose patients with chloroquine or sulfadoxine/ pyrimethamine and conserve ACTs for confirm malaria diagnosed patients. This comes with very important pitfall even if the provider happens to be good at identifying malaria due to the high probability of failed therapy if the patient actually does have malaria.
Diagnoses supported by microscopy or RDT were infrequently available in primary health centres. They also rarely recorded the many clinical diagnoses of malaria that were made. About 84% of malaria patients were diagnosed clinically in primary health centres between 2001 and 2003 (Sekartuti et al., 2004b) that presumably treated with CQ and SP. Indonesian health authorities call for all primary health centres to confirm malaria using microscopy (Departmen Kesehatan, 2009).

2.9.2 Microscopic diagnosis

Microscopic examination of Giemsa-stained thick and thin blood films (Wongsrichnalai et al., 2007) consider as the most suitable diagnostic instrument for malaria control. It can differentiate between species and give the detailed information about stages present and their counts per unit volume blood. There are 65% of health centres in six districts in eastern Indonesia had microscopes (Sekartuti et al., 2004b). Microscopic diagnostic requires highly specialized equipment and persistently applied technical training and certification of competency. However, the number of false negative and false positive from this diagnostic is probably more harmful to the patient and malaria control than good clinical diagnostic. The poor microscopic diagnostic can lead the high rates of error, in health centres and district health offices, which should be investigated and remedied.

Multiple factors contribute the poor performance of microscopic diagnosis in Indonesia. The factors are the low compliance to minimal laboratory standards, poor quality of slide preparation, inadequate or absolute microscopes, lack of supply stocks, heavy workload and inadequate quality insurance (Elyazar et al., 2011). Reporting system is also bad. The absence of system for cross-checking, together with minimal or even no feedback from supervisors, also contributed to the poor performance of microscopic examination as a diagnostic tool (World Health Organization, 2009b).

2.9.3 Rapid diagnostic test

Immunochromatographic test (ICT) allows for a simple, one-step device for the diagnosis of malaria. The device is employing antigen capture by monoclonal antibodies malaria and produces a colored line within 5-20 min (Wongsrichanalai et al., 2007; World Health Organization, 2006c). In some of areas, RDT products offer great promises in extending reliable diagnosis to area where traditional microscopy may be difficult to establish or maintain (World Health Organization, 2003b). From WHO systematic review for 41 commercial RDTs, the performance between products varied widely at low parasites densities (200 parasites/µl) and most products showed a high level of detection at 2000 or 5000 parasites/µl.

In Indonesia, several studies at 1995 conducted to evaluate the performance of RDTs. Fryauff et al. tested the sensitivity of the ParaSight F test in detecting *P. falciparum* infection among malaria-immune Papuan and non-immune (transmigrants) in four hyperendemic areas in
Papua. They suggested there are different sensitivity and specificity of the test related to the age-dependent immune status of population. The sensitivity was lower in the older generation of Papuan who had had life-long exposure to *P. falciparum* malaria and had therefore developed clinical immunity. Fryauff et al. in 1997 evaluated the performance of OptiMAL in Armopa (Papua; Fryauff et al., 2000). From the study, they concluded that OptiMAL shouldn’t be used for diagnostic but could be made commercially available for research purposed only. It was markedly less sensitive than expert microscopy in term of discriminating between different malaria species. Meanwhile, the other study concluded that the malaria ICT was reliable enough to be used as a malaria test (Arum et al., 2006). Tjitra et al. in 1998 evaluated new combined *P. falciparum* and *P. vivax* combination ICT (ICT Malaria Pf/Pv) in Sumba (Lesser Sunda; Tjitra et al., 1999). In the study, there was a modest increase in the rate of overtreatment of microscopy-negative patients from 7% to 15%. They concluded, however, that the cost remained a major obstacle to widespread use of ICT Malaria Pf/Pv in areas of endemicity. The performance of the Parascreen Pan/Pf test was evaluated in Mandailing Natal (North Sumatra) in 2006 (Ginting et al., 2008). The sensitivity test was 81% for parasitemia of 100-200/µl, 87% for 200-400 parasites/µl and 100% for more than 400 parasites/µl. However, the test had very low sensitivity for parasitemia less than 100/µl (0%).

Several studies have evaluated RDTs in the context of malaria control strategies. Utami et al. conducted the evaluation of RDT application by village malaria cadres in Purworejo (Central Java) in 2005—2006 (Utami, 2004; Utami et al., 2008). High specificity levels were found for *P. falciparum* (98%) and *P. vivax* (100%) although there was low sensitivity compared to microscopic diagnosis (60% for *P. falciparum* and 57% for *P. vivax*).

### 2.9.4 Improving malaria diagnostic accuracy

Improving diagnostic accuracy is a technical, financial and human investment. Chadijah et al. suggested several technical solutions, such as repeated diagnostic training, standardized examinations, microscopist certification, regular supervision and cross-checking and the updating of equipment (Chadijah et al., 2006). To improve the quality of microscopic examinations, the glass slides must be clean, with proper staining and sufficient time must be allocated for slide reading (Sekartuti, 2003). Correct microscopy requires persistence, experience and dedication by the microscopists and the system supporting them (Chadijah et al., 2006). The establishment of quality assurance system requires standardizes operating procedures, along with materials and training modules for improving or demonstrating the competence of microscopists.
2.10 MALARIA TREATMENT

2.10.1 Access to treatment centres

Most Indonesians have difficulty accessing adequate health services and this problem effect on the treatment of malaria. Accessibility to the health facility was assessed by NIHRD (National Institute of Health Research and Development, 2008), by Basic Health Survey in terms of distance from the facilities. Households located within 1 km of health services is about 48% (western Indonesia: 49% vs. eastern 46%). Another 46% were located between 1 and 5 km from the services (western Indonesia: 47% vs. eastern 46%). About two-thirds of households were within 15 min of health facility (western: 71% vs. eastern: 56%) and most of remainder were between 15 and 30 min (western: 22% vs. eastern: 27%). Only 9% of households need over 30 min to be reached (western: 7% vs. eastern: 13%).

Upaya Kesehatan Berbasis Masyarakat (UKMB: community-based health efforts) can be reached by community easier because 79% of household were within 1 km of health centre, compared to 48% which were within a kilometer of a health centre, and UKMB can be the appropriate resources for antimalarials and information about malaria.

The village drug post is a source of common anti-infective including antimalarial drugs which manned by limited trained volunteer. However, 90% BHS respondents didn’t use this service, overwhelmingly (95%) as a consequence of there being no such post in their villages (National Institute of Health Research and Development, 2008). The effectiveness of village drug post in providing easier access to antimalarial cannot be adequately assessed until more such posts are established.

2.10.2 Treatment seeking behaviours

People exhibit distinct behavior seeking in treatment for malaria or malaria-like illness which is influenced by the accessibility to care, risk, experience, economics and culture. The action taken by community were classified into: no action, self-treatment (modern and or traditional medicines) and consultation (traditional healer, malaria worker, midwife, paramedic, doctor, health centre or hospital; Utarini et al., 2003).

Sanjana et al. study malaria knowledge, attitudes and practices in communities experiencing epidemic malaria in Purworejo (Central Java) in 2001 (Sanjana et al., 2006). From the study conducted, about 409 households got the malaria in the year prior to the survey, 52% respondents had treated the last malaria illness in the family with medicine without going to a health facility, mostly from local drug vendor (64%) and community health workers (25%). They (about 88%) also sought advice or treatment outside the home to the health centres (28%) and private healthcare providers (22%). The median time required to reach the place of consultation was
15 min (range: 0—240 min). Transportations are on foot (51%), by motorcycle (23%), by local village transportation (16%) and by bicycle (7%). The median cost of treatment reported by those who self-treated was Rp. 6000 (US$ 0.6) and by those who sought treatment outside the home was Rp. 7250 (US$ 0.7).

The other survey conducted by Karyana et al. about malaria treatment seeking practice in Timika in 2007 (Karyana et al., 2007). They concluded that indigenous Papuans were less likely than immigrants to use health facilities as their source of malaria treatment.

The Indonesian Health Household Survey (HHS) was implemented in 2004 by Indonesian NIHRD in 9082 household and 41, 764 respondents (Pradono et al., 2005; Soemantri et al., 2005). The studies revealed that 4% of respondents had experienced malaria fever in the last year who 21% took no action, 31% self-treated and 48% obtained medication from health facilities. The reasons for not seeking treatment are did not consider malaria to be threatening illness (67%), did not have sufficient funds for care (37%), did not have sufficient funds for transportation (23%) or had no transportation available at all (16%; Pradono et al., 2005b).

A delay in receiving medication is well known to create the risk of a poor treatment outcome with malaria. Indonesians often tend to visit health facilities until pressed to do so by the worsening symptoms. The mean number of days between onset and seeking treatment was 3—4 days (Hunt et al., 1991; Mardiana and Santoso, 2004; Shinta et al. 2005). Most of them missed 5 days of work or school (Hunt et al., 1991). Health education improves people's understanding of malaria treatment and improves adherence to prescribed therapy.

### 2.11 MALARIA SURVEILLANCE

Malaria surveillance in Indonesia begins with patient registration and data collection primary health centres (Pusat Kesehatan Masyarakat or ‘Puskesmas'; Departemen Kesehatan, 1997). The malaria reports from primary health centre, containing of out-patient services and malaria case detection activities, send to the district malaria control officer who comply all reports into a district health profile on malaria. The profile describes monthly and annual malaria cases reported at village level. The district health office sends aggregated malaria reports three times a year to the provincial heath office and Sub-Directorate of Malaria Control at Directorate of Vector-borne Disease in Jakarta (Departemen Kesehatan, 2006b,c, 2007). Laboratory examination in hospitals also sends the data in a collecting form to Directorate General of Medical Care through Hospital Reporting System, (Sistem Pelaporan Rumah Sakit or ‘SPRS’). The data are then passed to the Sub-Directorate of Malaria (Departemen Kesehatan, 2003).

Malaria surveillance according to the Indonesian MCP guidelines (Departemen Kesehatan, 2006b), is needed to support three activities: early warning, outbreak management and post-outbreak management. The monthly transfer of analyzing data from the primary health centres
to the district health office, to be created graphs to show the trends, distribution and minimum-
maximum case loads. Another important aim of data collection is the informing of maps of malaria risk. The maps inform the placement of the limited control resources precisely where and when they are needed. However, primary health centres didn't have the sufficient capacity to analyze these data (Elyazar and Rachmat, 2004; Elyazar et al., 2007).

Effective surveillance of malaria in Indonesia requires important challenges to be overcome. The big number of unconfirmed clinical malaria cases and the existence of people with malaria who don’t seek treatment or do self-treatment lead to the under-reporting of malaria case figures given by MoH. Another problem is the limited coverage of malaria cases treated by private clinics, physicians and hospitals. The ongoing malaria surveillance used by Indonesia’s MCP hasn’t accommodated data generated at those sources. There’s no adjustment of API in the MCP reports to take into account the low contribution of data from clinics, physicians and hospitals. Therefore, the API data reported by district health office is unreliable (Elyazar et al., 2011).

2.12 MIGRATION SURVEILLANCE

The mobility of Indonesians among its thousands island is a challenge of malaria control. Transmigrations is the movement of the people within country’s borders, typically from dense population islands (Java and Bali) to the sparsely populated and usually high endemic outer islands. These migrants routinely return to Java and Bali either permanently or usually for family reunions and holidays. The impact of transmigration on malaria and vice versa is an important consideration for malaria control.

Simanjuntak reported that all transmigrant located in 21 provinces had malaria, average 33—69 clinical malaria per 1000 of the population (Simanjuntak, 1999). The highest number reported from Papua, East Nusa Tenggara and West Nusa Tenggara. The delaying of IRS newly arrived migrants, lacking of antimalarial drugs, delaying of medical personnel and poor site criteria of the selecting are the factors, contribute increasing the malaria infection among transmigrants. The lands usually occupied by them are primary forests (52%), secondary forests (13%), bushes (21%), swampy forests (5%) and plantations (7%).

There are age-related differences in the immune systems of children and adults to onset of severe disease caused by primary exposure to *P. falciparum*. That was the explanation for the Javanese transmigrants that previously lived in the low-incidence of malaria (less than 1 infection/10,000 person-years for most areas since the mid-1960s) move into northeastern Papua (Arso XIV) then the attack rates for malaria about 0.5—4 infection/person-year (Baird et al., 2003).
Baird also documented epidemics of malaria within 3 months of arrival of new migrants at palm oil plantation at Arso (Papua) (Baird et al., 1995). Malaria blood survey of those sites showed 30—70% prevalence of parasitemia with virtually universal symptomatic malaria. The incidence of malaria at that place stays two to five infections per person per year (Jones, et al., 1994). The case finding of malaria in transmigration villages mostly depend on the clinical diagnose. Therefore, the asymptomatic carriers went undetected and fuelled the conditions for an epidemic. The new transmigrants brought to highly malarious areas merited additional resources not usually prescribed for all new settlements. Following the arrival of newcomers, it should be established MBS monthly among the residents and on-site microscopic diagnostic capabilities (RDTs did not exist at that time) (Baird et al., 1995).

Krisin et al. documented the patterns of disease experience by the Javanese transmigrants at Armopa (Papua) from the time of first settlement in September 1996 until 1999 (Krisin et al., 2002). During the 34 months of observation, there is 16% new malaria cases in Javanese transmigrants in all health clinics visitors. In the same area, Barcus et al. documented the malaria incidence is 1.1—1.5 infection/ person-year (Barcus et al., 2003).

Migrations within Indonesia certainly bring malaria cases from high to low endemic areas and classified as imported cases. Baird et al. reported 3-72% malaria cases were imported into West Java, Central Java and East Java between 1985 and 1987 (Baird et al., 1993). Other study reported that 82% malaria cases from 1964 to 1980 was imported into Jakarta from Sumatra, West Java, East Timor and Papua (Dakung and Pribadi, 1980). More recently, Lederman et al. evaluated 240 civilian and military patients diagnosed with malaria in Jakarta hospitals and the result was most of them contracted malaria during recent travel to Papua and South Sumatra (Bangka Island and Lampung) (Lederman et al., 2006). Less than one week of travel is much more common in civilian than in military travelers who almost stay for longer periods of duty. The number of people coming from outer Java and Bali sites reaches million annually and the risk of malaria associated with these human migration (or travel) must be considered an obstacle to control.

The economic importance of tourist destinations in endemic settings needs special attention for malaria control. Traveler in Indonesia or the health professionals advising them, should be aware of high-risk areas and give appropriate awareness, personal protection measures or chemoprophylaxis to those venturing to such sites.

### 2.13 CONCLUSION

The epidemiology of malaria in Indonesia is complex due to various socio-economic determinants and a very diverse ecology that supports numerous vectors. Transmission is focal: it occurs in rural areas primarily along the coastal, plain, or in hilly and forested areas depending on the presence of vectors. There is no evidence of transmission in urban areas.
All four human malaria parasites are present; overall *P. vivax* slightly predominates except in Papua where *P. falciparum* is more common.

In recent years *P. knowlesi* has been documented in humans.

Resistance to chloroquine and sulfadoxine-pyrimethamine is widespread. Therapeutic efficacy of artemisinin-based combination therapy (ACT) is high and there is no indication yet of resistance to artemisinin.

All age groups are affected; the distribution of cases among age groups varies from one district to another. The proportion of cases among 15 years old and above is statistically higher than in other age groups. In some provinces a high proportion of cases are adult males due to occupational exposure but in other provinces malaria among 5 children less than 5 comprises 23% of cases.

Malaria among pregnant women is rare in the provinces visited except in Papua.

The current stratification by district is useful for setting priorities at national and even at provincial level but revising the stratification based on individual villages will be important for targeting interventions especially in areas of low transmission and areas moving towards malaria elimination.

It is apparent that epidemiological analyses are not being utilized as a tool for better planning and implementation of interventions at provincial, district and puskesmas levels.
3. PROGRAM MANAGEMENT

3.1 INTRODUCTION

In 2000 Indonesia decentralized its health system. This has changed the roles, functions and tasks of each administrative level within the country. The national level mainly formulates policies, sets norms and standards, and sets procedures and criteria for diseases control. The function of the provinces is mainly to ensure the quality of the services they and the districts provide. In terms of malaria control the role of the districts is mainly to implement and ensure the coverage and quality of control strategies and interventions.

In support of Indonesia attaining the MDG goals, the President of Indonesia issued a decree (No. 3/2010) that ordered the following:

- Road map of MDGs achievements acceleration;
- Facilitate the provincial government to formulate action plan on MDGs together with national related institutions;
- Formulate mechanism on private partnership and corporate social responsibility on MDGs achievement;
- Synergize target MDGs program and activities between national and international institutions; and,
- Mainstreaming achievement of the MDGs in the 2010-2014 RPJMN by determining programs and activities, targets, indicators and measurable targets as well as ensuring the availability of financial resources for malaria control program as a higher priority.

In the Long Term Health Development Plan 2025, more emphasis is given to preventive rather than curative approaches, which will improve public health and achieve the MDGs by 2015. Objectives 6.C (6.6, 6.7, and 6.8), have already been achieved due to the success of malaria control nationally even though there are still some areas of high transmission. But in order to accelerate the achievement of objectives 4 (under-5 and infant mortality rates) and 5 (maternal mortality rate), integrated malaria control focusing on pregnant woman and children still needs to be strengthened in areas where malaria in these two groups is a problem. This can be done by effectively combining malaria control with immunization campaigns, distribution of mosquito nets through maternal and child health services, and a stepped up campaign on the importance of rapid treatment of fever cases.

The second major policy related to malaria was the Ministerial Decree issued in 2009 that committed Indonesia to eliminate malaria in the whole country by 2030. As a guide for the implementation of malaria elimination, the National Malaria Elimination Action Plan was
completed. The National Malaria Elimination Action Plan is a five-year program for the implementation of malaria control/elimination from 2010 to 2014.

Table 4. Target of Malaria Elimination in Indonesia

<table>
<thead>
<tr>
<th>YEAR</th>
<th>AREAS TARGETED FOR ELIMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Thousand Islands (DKI Jakarta), Bali and Batam</td>
</tr>
<tr>
<td>2015</td>
<td>Java, NAD, Riau Islands</td>
</tr>
<tr>
<td>2020</td>
<td>Sumatera Island (except NAD and Riau Islands), NTB, Kalimantan and Sulawesi</td>
</tr>
<tr>
<td>2030</td>
<td>Papua, West Papua, NTT, Maluku, North Maluku</td>
</tr>
</tbody>
</table>

The strategy includes: early detection and treatment of all fever cases; improving access to quality services; empowerment and mobilization of communities; improvement of IEC; promoting partnerships; improved surveillance systems; improved monitoring and evaluation system; improving the quality of human resources. The target is to achieve the national goal of malaria elimination by 2030 meaning that the whole country will enter the pre-elimination stage (as defined by WHO) by 2020; and the whole country will have achieved elimination of malaria by 2030. This is a major task!

The national policy for elimination is:

- Stop clinical malaria: All malaria diagnoses must be confirmed by microscopy or RDT;
- Stop monotherapy: All confirmed malaria patients must be treated with ACTs;
- Malaria prevention by LLINs, IRS and repellents;
- Expand health services especially in remote area;
- Establish village malaria posts and create village malaria cadres.

3.2 ORGANIZATIONAL STRUCTURE AND FUNCTIONS

The organizational structure of malaria control is regulated by a Ministerial decree from 2010, and as such is a part of the organizational structure of MoH (see figure 2 section 1.2).

The Directorate General of Disease Control and Environmental Health consists of 5 Directorates; (a) The Directorate of Immunization, Quarantine, Surveillance, and Matra Health (144 personnel), (b) the Directorate of Direct Transmitted Diseases (98 personnel), (c) the Directorate of Vector-Borne Diseases (104 personnel), (d) the Directorate of Non-Communicable Diseases (80 personnel) and (e) the Directorate of Environmental Health (99 personnel).
Responsibility of malaria and vector control lies in the Directorate of Vector Borne Diseases. This includes formulation and implementation of policies, and preparation of norms, standards, procedures, and criteria for malaria and vector control. The Directorate also responsible for zoonotic diseases control. It has seven sub directorates; one of them is the Sub-Directorate of Malaria.

The Sub-Directorate of Malaria has the following functions:

- formulation and implementation of policies for malaria control;
- formulation of norms, standards, procedures and criteria for malaria control;
- provide technical guidance and coordinate partnership/collaborations in the field of malaria control; and,
- monitoring, assessment and reporting on the implementation of malaria control policy.

The Sub-Directorate of Malaria Control consists of two sections that are:

1. Standardization section, having the task of formulation and implementation of policies and elaboration of rules, standards, procedures and criteria in the field of malaria control; and,

2. Guidance and Evaluation Section, having the task for technical guidance, coordinate partnership/collaborations, monitoring and evaluation of malaria control policies implementation.

The other sub directorate related to malaria and located within Directorate of VBDC is the Sub Directorate of Vector Control which is responsible to support the vector control activities for malaria and other vector borne diseases.

At the provincial level, the organizational structure is determined by Provincial Government and varies according to the needs and capacity of provinces to manage disease control activities. Most provinces follow the same organization and structure as the national level.

The organizational structure at the district is determined by District Government and varies according to the needs and capacity of the district to manage disease control activities. In most cases, therefore the districts have the same organizational structures as the province.

At the sub-district level health services are coordinated by the puskesmas under which there are pustu and posyandu (see section 1.2). The puskesmas is the basic operational unit for the malaria control program. Malaria control in Puskesmas is coordinated by a full time malaria program manager. Malaria service is provided by doctors, nurses, midwives, microscopist, and sanitarian.

At the village level with support of GF Posmaldes have been established with community volunteers that are provided with incentives to detect and refer clinically suspected cases to
village midwives. At puskesmas level malaria programme officers meet with the district communicable diseases control (CDC) team every three months to review, plan and coordinate their malaria control work in all sub-districts. Posmaldes was established by and for the communities themselves as self-reliant and sustainable extension to support malaria control activities. The duties include identification of the suspected malaria cases and refer to the midwives and prepare regular activity report. Based on the monthly report these caders receives 200000 IDR every three months as an incentive. Currently 3 641 posmaldes have been appointed and assigned in high case incidence villages (API ≥5).

The PKD are the focal points for community empowerment to support the general health programme activities at village level. They were established by and for communities themselves as a self-reliant and sustainable extension of the district to support general health activities.

Table 5. Malaria Control Services by Health Facility

<table>
<thead>
<tr>
<th>Health Facility</th>
<th>RDT</th>
<th>Microscopy</th>
<th>ACT</th>
<th>IV Artesunate</th>
<th>Larval control</th>
<th>LLIN</th>
<th>IRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rumah Sakit (Hospital)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Puskesmas (Primary Health Centre )</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Pustu Sub HC (SHC)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Polindes (VM DP)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pusling (mobile HC)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Posyandu (CIP)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pharmaceutical (drug dispensary)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Posmaldes (Village malaria post)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Poltekes (Health multistream academy)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Toko obat (Drug store)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

The puskesmas at the sub-district level is the basic unit for planning, managing and delivery of all malaria control services.
3.3. GUIDANCE

As mentioned above, the President of Indonesia issued a decree for accelerating the actions for the achievement of the MDGs and there has been a Ministerial Decree issued mandating the elimination of malaria throughout Indonesia by 2030. The Government has also provided further directives and guidance for the timely elimination of malaria in Indonesia. The overall Government policy and strategy for malaria control includes:

• Strategies for social mobilization that focus on promoting community awareness;
• Activities tailored to specific regional and community situations and client orientations;
• Strengthened health information
• Health awareness having a central role in awareness raising, control and treatment;
• Long term and predictable funding
• Good governance including
  » Strengthen oversight system
  » Collaboration (public-private partnership)
  » Better use of external funding with comprehensive national strategic planning
  » Ensured drug quality and efficacy
  » Institute clear framework, result-based management and evidence-based plan and good financial reporting
• Resource mobilization
• Supply chain management, communication and M&E system

To facilitate the performance of targeted malaria elimination activities at the operational level the following standard guidelines have been instituted:

• Vector control
• Examination of parasites
• Malaria case management
• Malaria elimination
• Malaria surveillance
• Health promotion
• Malaria epidemiology
• Case detection
• Early warning system and outbreaks
• Integration between malaria and mother’s health and Extended Programme on Immunization
• Program management manual

As per the annual plans of action monitoring and evaluation teams constantly visit the puskesmas, checking on the progress of activities. In addition, quarterly meetings are held at the district level to monitor progress.

3.4 HUMAN RESOURCES, TRAINING AND CAPACITY DEVELOPMENT

The staffing structure for malaria down to puskesmas level is part of the MoH structure. The officer in charge of the malaria control program is a member of the VBDC section at district and province levels. At the puskesmas level, a sanitarian is generally in-charge of all CDC programmes including malaria control. In Kalimantan Province (with population of 2.1m) where the Team visited, there were 461 Doctors, 254 Medical Technicians, 280 Pharmacist, 2,403 Nurses and 1,732 Midwives.

Due to the rapid turnover of staff at the peripheral level, the Team found that staff rarely receives proper training for the jobs that they are doing. Malaria laboratories in some districts did not function due to lack of microscopists while in the outer islands, laboratories lacked necessary equipment. In one district out of 13 puskesmas visited there were only 7 where malaria microscopy was available. In Banda Aceh province, 16 entomologist positions exist but remain unfilled.

Effective training programs need further exploration especially in areas of data management, surveillance, microscopic diagnosis, case management, entomology, and management of the malaria elimination program.

Recently in the North Sulawesi, a set of 7 action points for effective performance was adopted. The first point states that training programs must be organized for staff in all health facilities on the diagnosis and treatment of malaria. Currently, case management training is being given to 75% of staff: half are being trained on malaria microscopy and the other half on case management. Though follow-up assessment of the competency and its utilization has not been done yet, competency levels are being regularly assessed during supervisory visits.

WHO recommends that NMCP go through a process of reorientation for malaria elimination that includes a review of the performance framework for malaria elimination. One of the indicators related to human resources is that a strategy is in place that appropriately allocates human resources.
Further human resources issues and measures for capacity building are reflected in the respective technical areas of this report.

### 3.5 STRATEGIC AND ANNUAL PLANNING

To achieve the national development goals in health as mandated by regulation No. 25 of 2004 concerning national development planning, the MoH developed a strategic plan for 2010-2014, in accordance with the Ministerial Decree of 2011. The program's objectives and indicators are to be achieved by 2014; one of them is to reduce morbidity from infectious diseases, in particular reducing the malaria API from 2 cases to 1 case per 1000 population.

The National Strategic Plan is composed of:

1. Determine problem areas (stratification) by collecting malaria data including case data (clinical cases data, positive infants, and malaria outbreaks) and malaria vectors (species and breeding patterns) by geographic region.
   - Determine the magnitude of the problem in each region:
     i. Determine primarily by API and supported by active case detection (ACD) and laboratory examination results;
     ii. Report deaths based on clinical or laboratory diagnosis;
     iii. Vectors present as determined by adult and larval collections plus type and extent of suitable mosquito breeding sites;
     iv. Mobility of the population.

2. Determine the appropriate control strategies including:
   - ACD performed by village malaria volunteers that make house-to-house visits and take blood films from people with fever;
   - Passive Case Detection (PCD) based on parasite diagnosis (blood slide or RDT) performed at all health care facilities;
   - Surveys including mass blood surveys and mass screening;
   - Focused investigations including contact surveys of people living in close proximity to positive cases.
   - Drug sensitivity testing to determine the efficacy of drugs used for treatment;
   - Treatment based on clinical diagnosis, blood films or RDTs.
3. Vector control targeting either adult and/or immature stages of vector mosquitoes using: IRS, ITNs/LLIN, larviciding and environmental modification/manipulation including biological control.

4. Identify resources including financing that comes from Government and is calculated based on number of personnel and training needs.

Based on this national strategic plan, annual plans have been developed at all levels: national, provincial, district and puskesmas. The plans include activities to be carried out on a monthly basis focused on achieving the targets in line with the indicator spelt out in the national strategic plan.

In some areas implementation of the strategic plan has been difficult due to the lack of capacity to utilize epidemiologic and other data for planning. There is a general lack of capacity to effectively collect and utilize data including basic skills to map disease incidence, and to show data graphically in the form of charts and graphs. This often results in the inefficient application of control strategies such as IRS in places where there is little or no transmission.

Malaria control/elimination is a priority CDC program with the required district, provincial and national health system inputs. Provincial malaria policy is in line with national policy and national malaria guidelines are available at all levels. There has been recently increased provincial guidance and orientation to move towards district malaria elimination with the puskesmas doing follow up of all positive malaria cases with epidemiological investigation, local mass blood surveys and vector control through environmental management.

3.6. FINANCING

The principal financing source is from the government budget. After the decentralization, the budgetary distribution is made directly to the province and districts. Generally the health budget amounts to 15% of the total district budget. The contribution to specific malaria interventions is about 1.257%. As an example in 2009 the total health budget was USD 150,000,000, the malaria budget was USD 1,886,743 and the actual expenditure was USD 1,811,273. However as it is an integrated budget, a majority of the costs will be incurred from the comprehensive health system expenditure. The government contribution takes place in three components: district allocation, local funds and national special allocation fund based on the district fiscal index.

Malaria remains a major public health problem in Indonesia with an estimated 42,000 deaths annually. The population at risk is estimated at around 107 million from a total population of 220 million. There are 20 Provinces with an API above the national average of >2.4 per thousand population. The elimination of malaria is one of the priorities of the MoH.
3.7. GLOBAL FUND

Since 2003, GFATM, often referred to as GF for short, has contributed substantially to strengthening the Indonesia malaria control program and expanding access to and coverage of service delivery. Round 1 supported the malaria control activities in five provinces with highest endemicity: Papua, Papua Barat, Maluku, North Maluku, and East Nusa Tenggara. As a result of the December 2004 tsunami there was a need to finance malaria programs in Aceh and Nias Island. Approximately 10% of the grant was committed for this activity. The Round 1 malaria grant contributed to the successful reduction of malaria incidence from 56.5 in 2004 to 25.6 cases per 1,000 population in 2008. The grant ended in June 2008. Subsequently support was continued in Round 6 and Round 8 in specified areas of the country shown below (Figure 16 – 18).

![Figure 16. Global Fund Grant for Malaria](image)

While the GF provides a significant level of funding for malaria, it is notable that local budgeted funds amount to 26% of total funding for malaria (Figure 17).

![Figure 17. Indonesia: Operational Funding](image)
3.7.1 Program description summary

In Round 1, the MoH aimed to enhance the capability and skill of staff to implement and manage the intensification of malaria control; to ensure monitoring and evaluation including timelines and adequacy of reports to the GF; to increase coverage and improve quality of vector control through ITS and ITNs/LLINs; and to increase coverage and improve quality of early diagnosis and prompt treatment.

In Round 6, the MoH aims to reduce malaria transmission to the lowest possible levels by combining interventions that are epidemiologically and culturally appropriate. This will be done by building partnerships and added integration of malaria control with antenatal care and Expanded Programme of Immunization (EPI) activities to ensure sustainability through integration. The program targets pregnant women and children under the age of five and the general population in six provinces of Eastern Indonesia and Sumatra Island. The program supported by this grant targets the population at risk of malaria in 13 districts in the provinces of Papua, North Maluku, Maluku and East Nusa Tenggara. Grant funds are being used to establish project management units at the district, provincial and central levels that will increase the capacity of health centre staff, such as medical doctors, hospitals and health centre laboratory
staffs; procure supplies and equipment; and to increase coverage and improve quality of early diagnosis and prompt treatment. Also, grant funds will be used to enhance the capability and skill of staff to implement and manage the intensification of malaria control; to ensure monitoring and evaluation including timelines and adequacy of reports to the GF; to increase coverage and improve quality of vector control through IRS and ITNs; and to increase coverage and improve quality of early diagnosis and prompt treatment.

In Round 8, the MoH aims to reduce morbidity and mortality associated with malaria transmission in Kalimantan and Sulawesi islands to the lowest possible level with epidemiologically appropriate interventions by scaling up improved malaria diagnosis and treatment in poor and remote endemic areas; improve coverage of LLINs in high risk population as well as system building for sustainable malaria diagnosis, treatment and prevention by forging links with parts of existing health system (ANC and EPI) to reduce not just malaria morbidity and mortality, but also maternal mortality and morbidity; and mortality due to vaccine preventable diseases. The target group is the population of 73 districts in poor and remote areas of Kalimantan and Sulawesi Islands. The Program is being implemented by two Principal Recipients (PRs) and the MoH. The MoH acts as the policymaking body and regulator for health related issues of national malaria program and will remain the leader in the partnership by providing policy and technical guidance. One of the PRs is PERDHAKI, a faith-based organization with a network of hospitals, clinics and parishes which are mostly located in remote rural areas and which are dedicated to improve health services at the community level. Target areas (districts) are divided into three stratifications; high endemic, middle endemic and low endemic areas. Activities are conducted relatively to the level of the endemic.

The areas covered by the Round 8 Malaria grant (signed in October 2009) differ from those targeted by the Round 6 grant. While Round 6 covers Eastern Indonesia and Sumatra, Round 8 covers Kalimantan and Sulawesi Islands. Therefore no programmatic overlap and funding redundancies exist between these two GF funded programs.

3.7.2 Global Fund Project Management and Challenges

The Indonesian Government and UNDP partnered to strengthen the capacity of national PRs to improve implementation of GF programs. After a 2007 assessment found weaknesses in program management that prompted new restrictions, the MoH and UNDP developed a project to provide capacity-building support to PRs so they could meet performance targets. These included training for managerial and financial staff and national certifications in the areas of procurement, human resources management, and behavioural analysis. Within two years, the grants were rated as “high-performing.”

Operations occur at district level, whereas provinces should supervise. In planning for phase 1 of the Round 1 grant, implementation occurred in only 14 districts (increased later to 20), so the MoH directly worked with district staff during activity planning and implementation. In some cases it was found that reports from districts did not reflect what was actually occurring on the
ground. As a result, the MoH conducted a series of staff deployments to districts for up to two months at a time to ‘shadow’ district health staff, assist in implementation and evaluation, and report on actual progress. The strategy proved useful, but as the number of districts increased to 67 in six provinces in Eastern Indonesia, and nearly 100 districts in 10 provinces in Sumatra, staff numbers were not sufficient to sustain the strategy. In phase 2 of the Round 1 proposal, the strategy included working among and strengthening MoH relationships across provinces so effective supervision and follow up could be carried out.

3.7.2.1 Round 6

PR: MoH (the Directorate General of Disease Control and Environmental Health of the Ministry of Health)

No significant program or financial management issue challenged the implementation of the program (with the exception of procurement). The MoH, acting as PR disbursed funding to its 16 SRs according to work plans and budgets in a timely manner, and took appropriate action to address the following management issues noted by the auditor.

The two PRs use voluntary pooled procurement (VPP) under Phase 1 of Round 8 and have placed orders for LLINs and RDTs (see Logistics section). The performance of the second semester continued to be severely affected by the late delivery in November 2010 of the key pharmaceuticals and health products such as LLINs (prevention), RDTs (diagnosis) and ACTs (treatment). This state of affairs was captured in the previous DDMF as well. The NMCP in Sulawesi and Kalimantan was derailed during the first year of implementation because of the late delivery of these key products via VPP which is an issue beyond the control of the PRs. Setting of some of the key targets were not realistic considering the lead-time necessary to order bed nets, ASAQ (artesunate (AS) and amodiaquine (AQ) combination) and RDTs through the VPP mechanism. The poor performance cannot solely be attributed to the weaknesses of the PR but also because the VPP mechanism did not manage to deliver bed nets, RDTs and ASAQ in a timely manner despite the advance planning done by the Secretariat and the PR in November 2009. For semester 2, in light of the fact that none of the health products ordered by VPP (bed nets, RDTs and ASAC or ASAQ) were delivered by the procurement agents of the GF and that crucial training to be conducted by the MoH was delayed, the rating was upgraded to B1. The grant performance is still strong but regretfully rating went down from A2 to B1 given that several top-ten indicators were underachieved, due notably to bottlenecks in the procurement of RDTs (procured with MoH funding so delays are not to be attributed to the Secretariat) and LLINs that could not be overcome by VPP.

Many of the targets set during grant negotiations were unrealistic as delivery in country and distribution was expected within a six-month period. Performance targets need to be set mindful of typical procurement cycles and the necessary time for products to be delivered to facilities and consumed. Procurement and M&E units should have in that regard consulted with the VPP team during grant negotiations to ensure that targets set on the performance
framework were realistic. RDTs were ready for shipping pending the MoH approval which came late and was then blocked for weeks from distribution in Jakarta due to customs clearance issues. The procurement agent of the GF did not facilitate this process smoothly. Initially, the GF procurement agents took longer than expected to come up with price quotes and the MoH took up to two months to sign the price quotes. These delays hindered the capacity of the Secretariat to wire funding to the procurement agents to secure the relevant production slots. It is also worth noting that the demand for LLINs was greater than the supply in the first half of 2010 due to increased efforts to meet universal coverage targets, resulting to higher prices and longer lead times.

Under Phase 1, 1.17 million bed nets were delivered in November 2009 via VPP. While Phase 2 was only signed on 28 February 2010, the PR requested in March 2010 the procurement of 900,000 bed nets to bed delivered on 30 June 2010 (3 months: unrealistic timing) and 500,000 to be delivered on June 2011 (realistic). The price quotation that was submitted to the MoH for LLINs in May 2010 was only signed by the PR in August 2010 (2 month-delay) which prevented the secretariat to wire the funding to the procurement agent to start production immediately. Regarding RDTs, the request to procure 1.5 million RDTs was received by the Secretariat on 17 March 2010 for 1,000,000 RDTs (realistic) to be delivered on 30 September 2010 and for 500,000 (realistic) to be delivered on 30 June 2011.

Segregation of duties in administration and finance has not been adequately implemented at the province and district levels.

1. The PR has recruited administrative staff to ensure the segregation of duties in the administration and finance function. However, for efficiency purposes the administration staff were only recruited at the provincial level which manages 10 districts or more.
   a. Weakness on inventory management at the SR level (i.e. Lampung, Riau Islands, Bangka Belitung, Papua and West Papua Provinces) and SSRs (i.e. Mataram Municipality, West Lombok, Centre Lombok, Pangkal Pinang and Bangka).

2. The SRs has recruited logistics staff to manage inventory. This new personnel was trained by the PR in Quarter 7 and started their activities in Quarter 8.
   a. The PR has distributed standard forms for inventory reports that should be submitted by the SRs on a quarterly basis.

3.7.2.2. Round 8:
Grant scorecards for Round 8 are not yet available for the PRs on the GF website.
3.7.3. Coordination

Round 6: The PR has achieved good results overall at the time of Phase 2 review. The PR has demonstrated effective financial and programmatic management of this program during Phase 1 of Round 6 and has ensured that the SRs implement activities in a timely manner.

Round 8: For the 1st semester, the PR achieved excellent results on the coordination-related indicator:

Coordination and partnership development (national, community, public-private): Number of stakeholders attending advocacy workshops: 124%.

3.7.4. Procurement

Round 6: The PR experienced delays in procuring LLINs that were mostly due to the inability of UNICEF to cope with the large requested volume. As a remedial step, the PR joined VPP in April 2009 and placed an order for LLINs with People Services International which is the procurement agent of the GF.

PR – PERDHAKI: The RDTs procured through VPP were delivered in Jakarta in November 2010, and the distribution (and use for diagnosis) of these RDTs to Village Malaria Posts located in remote areas could not be completed one month before the end of the reporting period. There was a general stock-out of ACTs due to the non-delivery of ACTs via VPP which affected the achievement of indicator 1.4., an issue which was clearly beyond the control of the PR. The late arrival of both LLINs and RDTs has slowed down the NMCP in Kalimantan and Sulawesi Islands whereby LLINs and RDTs are integrated into routine Antenatal Clinics (ANCs) and Extended Program Immunization.

3.7.5. Roles of Other Partners

The fight against malaria is an inclusive process involving many partners at all levels. Provincial Health Offices are SRs and district health offices are SSRs, as an illustration, the PR is working with 16 SRs which are mainly provincial health offices. These SRs were selected due to the fact that these 16 provincial health offices are located in malaria endemic areas in Eastern Indonesia and Sumatra. The MoH worked very closely with UNICEF and WHO during the implementation of the first phase of the program. In October 2009 a grant was signed with a faith-based organization, PERDHAKI, for over US$ 9 million to fight malaria in Kalimantan and Sulawesi to complement the actions of the MoH in remote areas. WHO, UNICEF, USAID, the University of Indonesia, the Malaria Transmission Consortium and the Eijkman Institute for Molecular Biology play important roles in providing technical assistance, while the Ministry of Finance and BAPPENAS have important roles in mobilizing funding for the provinces and districts to substitute for eventual decreases in funding from the GF in the future.
### Figure 19. Malaria Partnerships

<table>
<thead>
<tr>
<th>Type of Partnership</th>
<th>Partner-Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria Technical Assistance</td>
<td>WHO, UNESCO</td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
</tr>
<tr>
<td>Financial Partners</td>
<td>GFATM</td>
</tr>
<tr>
<td>Inter-sectoral Collaboration</td>
<td>Professional Assistants: Regional Hospital Association ARSI, IBI, IMA, IDA, IRSPI, PERSI, PDPI, PPNI Dep. Justice, army, police</td>
</tr>
<tr>
<td>• Health care provider linkages</td>
<td></td>
</tr>
<tr>
<td>• Government sectors</td>
<td></td>
</tr>
<tr>
<td>Community based TB</td>
<td>Aisyiyah, Muhammadiyah, NU, PELKESI, Perdhaki, PSI, PKK, Buddhist Organization</td>
</tr>
<tr>
<td>Private Company (CSR)</td>
<td>Batu Tua (Copper), Malcon (Free port), Axon mobile, British Oil, Krakatau Steel</td>
</tr>
</tbody>
</table>

### Figure 20. Partnership & Integration

[Map of Indonesia with various partnership and integration points marked]
3.7.6. Reporting and Data Quality Assurance (QA)

Round 1: It was noted that the PR submitted inaccurate information of actual results claimed by the PIUs and DIUs (there were 16 out of 18 indicators that were inaccurately reported). The inaccurate results in the PR's report indicate that there is still a lack of a QA process by the PR for data reported by the PIUs and DIUs.

Round 6: There is no material issue concerning the quality of the data apart from the usual imperfection of the programmatic and financial reports submitted by the SRs to the PR and by the SSRs to the SRs.

A recently conducted data quality audit has not revealed any major data quality issues. However, there were some weaknesses in the data management system regarding proper transmission of data from the district to national level, which should be addressed during Phase 2. Physical safeguards are necessary for records and documents (i.e. some records in ABIPRO for Quarter 1 and 2 could not be read since it was infected by virus). During the LFA VOI of Quarters 5 and 6 the LFA noted that the PR resolved this issue by downloading a free virus safeguard program from the internet and by using back up data. Going forward, the PR will ensure that all data is properly backed up on a regular basis.

Performance on reporting indicators show the need for improvement as follows:

- Number and percent of puskesmas submitting accurate and timely reports to the districts during the last month: 71% but equal to 87% as calculated by the algorithm.

- Number and percentage of reports received at district level from health centres among expected during the reporting period: 67%

- Number of supervisory visits made to the puskesmas and supervisory check list/feedback report submitted to the district level: 569%. Actually, only 1,839 supervisory visits took place and were adequately documented and could be counted as results out of the 3,140 planned to be carried out over 2 semesters. The PR must properly document the supervisory visits with checklists for these visits to be counted as results.

Round 8:

The PR achieved excellent results on a key reporting-related indicator:

HSS: Information system: Number and percentage of reports received at district level from health centres among those expected during the reporting period (1st semester: 120%; 2nd semester: 155%).
3.7.7. Assessment of How Management of GF Grants Impacted the Overall Management of the NMCP

The GF projects brought out the challenges in implementing a national strategy through a de-centralized structure for malaria control and elimination. The centralized management approach applied in Round 1 proved to be adequate for the relatively small-scale coverage required; however, upon scaling-up under Round 6, the MoH realized that a different approach would be required for larger-scale coverage. The lessons learned have provided the impetus for development of the management strategies to successfully implement Rounds 6 and 8. These form the basis for not only the expected success for Round 11 but should also provide the necessary basis for the sub-national approach to elimination of malaria.

3.7.8. Policy Communication and Application:

Given the size of the country and the district-decentralized structure of public sector finance and governance, this remains one of the major challenges to the NMCP in managing the GF and the national strategy for elimination.

- Stratification: Indonesia has developed a clear system of stratification using API as the basis for application of appropriate measures. Experience gained from implementation of the GF projects has provided the necessary lessons learned for the MoH to set guidelines for implementation of a sub-national approach to elimination under the NMCP based upon stratification by the level of incidence of cases (endemicity) from high case incidence (>5), to medium (>1), to low (<1). The use of the API > 5 appears to be more appropriate than the WHO recommended criteria of SPR > 5% due to the nature of the SPR as more of an operational indicator than an epidemiological indicator.

- Procurement: The experience so far from Rounds 1, 6, and 8 indicate that the procurement of essential health commodities for malaria control and elimination (RDTs, ACT, LLINs) at the central level has proven highly problematic; de-centralizing the procurement of these commodities by the NMCP would not be feasible. It remains to be seen how the MoH could support a district-decentralized program to manage the procurement of essential commodities in a cost-effective and timely manner using the national, provincial, and district-level budget allocations.

- Reporting, Monitoring and Evaluation: The reporting, monitoring and evaluation requirements imposed by the GF have resulted in the development of a new lever of rigour in the reporting system of the NMCP. The overall impact on the program is very positive in upgrading the indicators, frequency, timeliness, and relevance of reporting for the NMCP.
3.7.9. Financing

The contribution of the GF will culminate in 2010 at 65% and will start decreasing to 63% in 2011, down to 46% in 2012, 38% in 2013 and finally 31% in 2014. Interestingly, there is a significant increase of funding coming from provincial governments while the funding coming from the central level is decreasing which is reflecting the decentralized nature of the health system of Indonesia. UNICEF continues to provide significant funding while WHO has decreased its contribution to around US$ 200,000 annually. The conclusion can be drawn that GF funding is additional and it will tend to become even more so starting in 2011.

3.7.10. Achievements

Achievements reported by the MoH to the GF for Rounds 1, 6 and 8 through 2010 appear below (Table 5).
Table 6. Achievement in GF Support (R1, R6, R8)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDT Exam</td>
<td>524,604</td>
<td>543,941</td>
<td>599,216</td>
<td>729,878</td>
<td></td>
</tr>
<tr>
<td>RDT Positive</td>
<td>155,102</td>
<td>223,899</td>
<td>271,103</td>
<td>317,523</td>
<td></td>
</tr>
<tr>
<td>Probable Malaria</td>
<td>149,275</td>
<td>187,207</td>
<td>185,809</td>
<td>159,221</td>
<td></td>
</tr>
<tr>
<td>Microscope Exam</td>
<td>485,251</td>
<td>512,862</td>
<td>499,296</td>
<td>381,424</td>
<td>275,374</td>
</tr>
<tr>
<td>Plasmodium falcifarum (Pf)</td>
<td>149,399</td>
<td>149,931</td>
<td>167,562</td>
<td>121,636</td>
<td>70,941</td>
</tr>
<tr>
<td>Plasmodium vivax (Pv)</td>
<td>50,667</td>
<td>62,057</td>
<td>52,256</td>
<td>40,167</td>
<td>29,944</td>
</tr>
<tr>
<td>Confirm Pf Treat with ACT</td>
<td>149,399</td>
<td>305,033</td>
<td>391,461</td>
<td>392,739</td>
<td>358,464</td>
</tr>
<tr>
<td>Confirm Pv Treat with CQ</td>
<td>50,667</td>
<td>62,057</td>
<td>52,256</td>
<td>40,167</td>
<td>29,944</td>
</tr>
<tr>
<td>Probable Malaria Treat with CQ</td>
<td>475,297</td>
<td>149,275</td>
<td>187,207</td>
<td>185,809</td>
<td>159,221</td>
</tr>
</tbody>
</table>

Figure 22. Indonesia Success Story

- Total 3.8 million nets were distributed
- Achievement in Sumatra (rapid assessment 1 month after campaign):
  - % HH who has 1 or more ITNs, increased from 2.2% (2/91) before the campaign to 94.5% (86/91) after the campaign.
  - But the % ITNs that was used/ hanged = 44.8% (64/143).
  - % children under five years of age who slept using ITN increased from 1.9% (2/106) to 51% (54/106) after the campaign.
- Figures from other district were more or less similar
- Benefit for other program was noted and appreciated (high coverage of EPI, nutrition and mass drug administration of filariasis)
3.7.11. Data QA System in Districts Where GF Grants are Being Implemented.

Round 1:
It was noted that the PR submitted inaccurate information of actual results claimed by the PIUs and DIUs (there were 16 out of 18 indicators that were inaccurately reported). The inaccurate results in the PR's report indicate that there is still a lack of a QA process by the PR for data reported by the PIUs and DIUs.

Round 6:
A data quality audit has not revealed any major data quality issues. However, there were some weaknesses in the data management system regarding proper transmission of data from the district to national level, which should be addressed during Phase 2. There is no material issue concerning the quality of the data apart from the usual imperfection of the programmatic and financial reports submitted by the SRs to the PR and by the SSRs to the SRs.

3.8. WORLD HEALTH ORGANIZATION

WHO has contributed technical support especially in the finalization of elimination guidelines, continuous support to the Malaria Transmission Consortium and for conducting operational research through local universities. In the 2010-2011 biennium WHO will assist in the development of an integrated vector control management policy and guidelines, reviewing the national malaria treatment policy, together with technical assistance for the implementation of...
Phase 1 of Round 8. The key challenges technical problems facing the Program are drug resistant malaria requiring a change in the national treatment policy, the poor quality of data that has hindered the estimation of the malaria burden, low usage of bed nets by communities, lack of community ownership of the malaria control program; and the need to strengthen national capacity in malaria control. The WHO budget and expenditure for the NMCP is presented in the following tables. (Table 7 and 8)

### Table 7. WHO Biennial Budget Provision for Malaria Control

<table>
<thead>
<tr>
<th>Biennium</th>
<th>Voluntary Contributions (USD)</th>
<th>Regular Budget (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Expenditure</td>
<td>Budget</td>
</tr>
<tr>
<td>2006-2007</td>
<td>216,524</td>
<td>325,134</td>
</tr>
<tr>
<td>2008-2009</td>
<td>137,747</td>
<td>173,438</td>
</tr>
<tr>
<td>2010-2011</td>
<td>354,271</td>
<td>498,572</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 8. Annual WHO Expenditure by Strategy (USD)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Disease prevention</td>
<td>14,827</td>
<td>16,464</td>
<td></td>
</tr>
<tr>
<td>2. Disease management</td>
<td>205,815</td>
<td>67,478</td>
<td>3,8970</td>
</tr>
<tr>
<td>3. Surveillance</td>
<td>18,791</td>
<td>78,477</td>
<td>31,550</td>
</tr>
<tr>
<td>4. IEC &amp; Community mobilization</td>
<td>15,274</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Research &amp; Training</td>
<td>24,574</td>
<td></td>
<td>60,308</td>
</tr>
<tr>
<td>6. Strengthening health system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Strengthening partnership</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Monitoring and evaluation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>319,291</td>
<td>162,419</td>
<td>95,755</td>
</tr>
</tbody>
</table>

As far as disbursement and expenditure of GF are concerned constant monitoring will be required. In 2010, for the Round 6 during the period of March to December 2010, the approved budget was USD 5,700,883 but the actual expenditure was only USD 5,537,728 (97%). The under spending for Round 8 during the period January to December 2010 was even lower: the approved budget was USD 14,785,251 but the actual expenditure was USD 11,655,941 (78%). The same was seen in the period 1 March to 30 August 2009 (42%) and March to May 2009 (14.8%).
3.9. RESOURCE GENERATION AND POOLING

Total expenditure on health in Indonesia is relatively low representing only 2.2 percent of GDP, among the lowest in the region. Expenditure for malaria accounts for about 2 percent of the total health expenditure and US$1.2 per person at risk in 2010.

Analysis of the financing for malaria control revealed that the Indonesia malaria program is driven by the international agencies, mostly by the GF. As of July 2011, the total GF approved US$130 million and disbursed US$124 million for malaria. For 2010 the GF accounted for 92 percent of total malaria funding and 7 percent of the other external support for malaria. Other external funding included UNICEF and WHO that accounted for only 1 percent of the total external funding.

The government funding is relatively low accounting for about 7 percent of the total malaria funding in 2010. It is observed that there was a significant drop in government financing in 2008 and 2009 as compared to 2006 and 2007 when the government share was 59% and 71% respectively. This difference could be at least partially associated with the decentralization of the overall health system. The following figure (24) presents the trends in funding for malaria from different sources. This data suggests that government financial decisions on allocations levels for malaria are fully based on the availability of the GF resources meaning that where there is GF money the government has reduced its allocation for malaria control. This use of GF money to directly replace the local investment and diverting it to other programmes rather than using the funds in addition to local funding is against GF policy. GF money should always be additional to what is already provided by government or other sources.

Figure 24. Annual Malaria Funding by Partners, 2006-2010
Another observation was the fragmented character of the health financial reporting that is a consequence of decentralization of the health system. The information on the GF expenditure is easier to obtain due to its strict requirements for reporting on the actual malaria spending as a prerequisite of the quarterly disbursements.

3.10. RESOURCE ALLOCATION:

Decentralization has complicated health financing of malaria program in Indonesia because the provision of health care including malaria control currently depends more on local revenue-raising than it did previously. Presently a larger proportion of government budget now goes directly to the districts. In part, this merely reflects the transfer of responsibility for meeting salaries of civil servants from central to regional governments. However, a large proportion of program operating expenses continue to be provided in a tightly earmarked fashion to provincial and districts governments from the decentralized component of the national-level budget.

The following table (9) shows the sources of financing for malaria program in North Sulawesi province. Of the total government funding for malaria control, about 7 percent is funded by the government. The remaining is private expenditure including out-of-pocket payments, the level of which is difficult to estimate due to the fragmented character of the financing monitoring and reporting.

<table>
<thead>
<tr>
<th>Source of Financing</th>
<th>2008</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government to Districts</td>
<td>51,140,000</td>
<td>25,000,000</td>
<td>35,000,000</td>
</tr>
<tr>
<td>Global Fund to Provinces</td>
<td></td>
<td>2,874,901,222</td>
<td>1,320,390,416</td>
</tr>
<tr>
<td>Global Fund to Districts</td>
<td></td>
<td>3,713,743,278</td>
<td>4,418,269,584</td>
</tr>
<tr>
<td>Global Fund Total</td>
<td></td>
<td>6,588,644,500</td>
<td>5,738,660,000</td>
</tr>
</tbody>
</table>

In the public sector, resources for malaria control flow from the national, provincial, and district sources through various channels. National budgets for malaria control are channelled to the level of provincial and district health providers through the general allocation fund which is mainly used for procurement and infrastructure strengthening. These allocations are based on the fiscal index that is calculated based on local revenues and population. The detailed funds flow for the malaria programme in Indonesia is presented in the following figure, which was developed based on interviews with malaria program experts.
As it was observed, the presence of a variety of private and public insurance arrangements has resulted in fragmentation of the system that caused exclusion of some risk groups from any sort of insurance coverage, administrative costs are high and inequities are wide. It also should be noted that there are problems with risk selection; certain schemes will only insure those with an income above a certain threshold, limiting pool size.

**Figure 25. Financing flows for Malaria control in the public health sector in Indonesia**

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**Legend:**
- DAU: Dana Alokasi Umum, General allocation fund by district and province used by sector mostly for salaries (40-50%) also activities by sector; (10% of total of APBD); DAK: Dana Alokasi Khusus, Special allocation fund that is usually used for procurement by district and province based on the fiscal index; PAD: Pendapaton Asli Daerah, provincial or district revenues; PNPM: national program for community empowerment (using the nets, eliminate the malaria breeding sites, etc.); PDD: national program for community empowerment (using the nets, eliminate the malaria breeding sites, etc.); BOK: Direct national allocations for operational cost at the health centre level; Decon: allocations from the national level to province for the implementation of the national policy; Tugas Pembantuan: allocations from the national level by sector (ex. health) not regular and used to urgently address the situation, negotiated at the national level; Jamkesmas: allocation for poor; Askes: Insurance for the government employees and retired civil servants;
3.10.1. GF resource allocation for malaria programs by interventions and endemic profile in North Sulawesi province

Figure 26 shows the GF budget for malaria control in 2010 by interventions. In 2009 (US$ 37.3 million) and 2010 (US$ 36.7 million), the disbursements for malaria program from the GF in Indonesia were the highest as grants under the Round 6 and 8 were simultaneously implemented. The figure reveals that the distribution of resources among interventions bears no obvious relationship to a province’s endemic profile. There is a consistent pattern across all sub-districts of allocation the majority of funding goes to wages (range from 31 to 44 percent), mass LLIN distribution (25 to 46 percent) and malaria training in ANC (range from 21 to 51 percent). It strongly suggests that the North Sulawesi sub-district endemicity levels and distribution, density, behaviour and physiology of the local vectors. Figure 27 below presents the API levels by province in Indonesia and bears little relation to a country’s allocation of resources among malaria control interventions.

![Figure 26. Allocation of the Global Fund investment by interventions and sub-districts in North Sulawesi province in 2010](image)
3.11. OTHERS

Limited interventions may need to be implemented and routinely monitored depending on the studies of the local endemicity and bionomics of the local vectors. The detailed information on the expenditure incurred at different levels for the key strategic interventions will empower the malaria program managers to formulate and plan the financial resources for the evidence-based malaria control strategies at different levels. More information on the financial monitoring of malaria programs could be obtained from the Guidelines on Malaria subaccounts developed by WHO.

3.12. SUCCESSES, BEST PRACTICES AND FACILITATING FACTORS

- It is highly evident that the API has dramatically declined, from 5 to 10 times, during the last ten years. There are strong indications that the API will continue to decline.

- The Minister of Health’s decree followed by the circular letter from the Minister of Internal Affairs, together with decrees from the Governor and District Head provided strong advocacy at all levels of the health system in support of malaria control and malaria elimination.

- Instituting the VMPs at the community level is another success and facilitated the availability of appropriate intervention measures in the remote areas where the health services do reach. At the same time PNPM funding from the central level directly to the village has been a supporting factor for community empowerment and intensified community support for malaria control/elimination.
• Operational funding from BOK at the central level directly to the Puskesmas level is an effective motivating factor for peripheral initiatives to meet immediate community needs.

• As far as organizational structure is concerned, the provincial malaria program manager is also the provincial CDC officer. At the health centre level and below, the programme is well integrated as part of PHC health system. At the health centre level, the malaria program manager is well supported by all other staff.

• The GF provides incentives to increase the focus of delivery and reporting. All positive cases are followed up at household level and contact surveys are done.

• Quarterly malaria review and planning meetings are taking place during which operational issues including reporting are discussed and decisions made that are followed-up. Annual district profiles including the malaria component and all guidelines are available at all levels but more copies of the profiles need to be made available.

3.13 PROBLEMS AND CHALLENGES

The malaria control/elimination program has the commitment of the President supported by the Ministerial Decree mandating country-wide elimination by 2030 however there are several operational problems and challenges. The main problem is the lack of human resources both in number and the competency of staff to perform their assigned functions; secondly there are financial gaps that negatively affect malaria control activities in some districts.

Rapid changes in posts and functions in the periphery is one of the dominant factors. An appropriate level of sound epidemiological judgement is essential at all level of the service staff. There were several training programmes conducted with both the government and external funding support. It is critical to assess the impact of those training programmes and the level knowledge and skill imparting into the target activities. Focus on supervision of skill of both the technical staff and supportive staff will strengthen the management.

It is the most opportune time to review the data recording, reporting and its information flow from source to the national level, collectively among all active partners in the health system: preventive, curative, NGOs, private sector and the community. This would provide the platform in developing uniform practices in program management and will be sharpened up for the assessment of indicators.

All program activities are accosted in the approved work plan. It is critical that the approved budget should be absorbed within the given timeframe. If it is not so, it will pave an adverse effect to the activities spelt out in the forthcoming period. Absorptive capacity at all level needs further improvement.
During 2010, there was a significant delay in receiving commodities that resulted in a low level of achievements for some indicators. Commodities are directly linked with several service delivery areas. It was a coincidence that the country engaged with VVP for the first time using off-shore procurement for LLINs, RDTs, pharmaceutical products, etc. In addition to a slow process of procurement, on arrival the commodities were held up due to anti-corruption regulations imposed by the Finance Ministry. The new Finance Ministry rules mean that the paper work is very complicated and clearance of goods ends up being delayed. Some shipments have been held for up to 6 months. The MoH is powerless in this situation and must follow the set procedures but delays have created major problems for the malaria programme. Tax exemptions for LLINs, RDTs and drugs used for malaria control need to be explored.

In addition strict regulations imposed by the Finance Ministry blocked the integration of malaria control with other health programmes planned under Round 8 of funding from the GF. The Sub-Directorate of Maternal Health opened an account to hold funds to support the integration but because of the regulation the people that were supposed to implement the integration were reluctant to use the funds so the account was closed and the planned activities never took place.

One other legal barrier that is having a negative impact on malaria control efforts especially in remote areas is the rule that nurses and midwives are not allowed to administer malaria treatment. In areas where there are no doctors it is important that other health staff including cadres that carry out ACD be allowed to give treatment as long as it follows the national treatment guidelines. This rule denies effective malaria treatment for those at the highest risk.

### 3.14. CONCLUSION AND RECOMMENDATIONS

In conclusion, the overall program management tools and procedures are in place. However there are several tools that need to be sharpened, side by side with building up the appropriate skill and knowledge on malaria elimination to all concerned staff will be of a great asset in improving program management. It is more important to have a critical mass of training for trainers at least at the provincial level in sustaining malaria elimination program. Emphasizing the utilization of real-time data for planning and implementing control operations at the sub-district level in areas where the burden has decreased and revisiting the human resource needs for malaria control at the province and district levels in the context of decentralization will be of valuable investment not only to reach the elimination targets but also its sustainability.

Based on the findings from the field visits, the following recommendations are made:

1. A comprehensive competency based training assessment should be done that covers all categories of health personnel by the NMCP in collaboration with the appropriate division of the MoH responsible for training.
2. Based on that assessment, a comprehensive human resource allocation and training plan should be drawn up, funded and implemented that takes into account the current and future needs of the Programme as it moves towards malaria elimination. Malaria elimination requires a combination of strengthening existing skills especially related to malaria diagnosis and learning some new skills specifically related to surveillance.

3. Effective monitoring and evaluation will become more and more critical as the Programme moves towards malaria elimination. For this reason the malaria information system including key indicators should be reviewed and where necessary strengthened. Data from the field needs to be accurate and reported in a timely manner at all levels of the health system.

4. Delivery of malaria control interventions to remote areas and islands should be drastically strengthened. Although the Country as a whole is moving towards elimination there are still places that have not been reached by even the most basic malaria control interventions. The first step should be mapping: it will show the underserved areas and provide the basis for operational planning. A GIS based mapping system where feasible will be the best approach and allow the eventual expansion of surveillance down to the village and household levels.

5. Private-public partnerships and community mobilization should be further strengthened and expanded. Active engagement with the private sector and effective community mobilization should be high priorities for the NMCP.

6. Provincial and district malaria control/elimination strategies should be more closely aligned at the level of strategic planning to ensure the efficient transition from control to elimination.

7. Annual plans at all levels should be linked with realistic financial estimates, commodity needs and training plans, ensuring that the overall strategic targets are reached.

8. It is recommended that the country use the expertise of the Financial Officers that are currently working on the GF grants:

9. Immediate action should be taken to conduct an expenditure review of malaria sub-accounts in order to better understand the full picture of national malaria funding

10. The NMCP should gradually introduce a system of financial monitoring for key interventions such as the following:
   a. distribution of the bed nets (including the cost of the nets as well as the HR cost, logistics, etc.)
   b. anti-malaria treatment (inpatient/outpatient, including the cost of the drugs and cost of the services provision at different levels);
   c. diagnostics;
   d. environmental management;
   e. monitoring and evaluation.
11. The government should identify the reasons for the decreased allocation of government funds for malaria in places receiving funds from the GF that appears to be due the reallocation of government funds away from malaria-related interventions to other health programmes. Such a pattern or reallocation of resources goes against the GFs basic principle that money from GF should be “in addition” to normal government support for the Programme.

12. WHO’s future collaboration should emphasize:

   a. training medical doctors those will serve at provincial and district levels;
   b. supporting an effective response to the emergence of malaria parasites that are resistant to drugs and mosquitoes that are resistant to insecticides;
   c. building up capacity in the areas of clinical management of malaria;
   d. supporting the Programme Manager to attend international meetings and conferences;
   e. strengthening collaboration with other WHO programme so that MDG 4 and 5 are achieved;
   f. surveillance and scaling up intervention and monitoring and evaluation of the impact of interventions (e.g. bed net distribution);
   g. monitoring and evaluation of malaria elimination programme;
   h. provide continuous support in writing proposals for the intensification of malaria elimination in Indonesia; and
   i. strategic support in resource mobilization.
4. PROCUREMENT AND SUPPLY CHAIN MANAGEMENT

4.1. POLICY

Current MoH policy is that DHP is the first line treatment for acute malaria. Artesunate amodiaquine is still in use, and has in the past been procured with GF resources directly by Malaria Sub Directorate through the VPP, but DHP is the preferred treatment.

There are two key policy issues that constrain uniform malaria treatment at the district level:

1. Policy regarding access to DHP

Under existing MoH policy, district (and provincial) medical stores should provide DHP on request to both primary health facilities (e.g., the puskesmas system) and hospitals. The Papua/Central Java team found evidence that this policy is not clearly understood everywhere and at all levels.

For example, in Timika District (Papua province), both the district medical stores manager and the director of the RSUD were not aware of this policy. Typically, the district medical stores in Timika provides DHP directly to the puskesmas and posyandu systems, but the Yanfar stores manager was clearly taken aback when informed that he should also provide DHP to the MoH hospitals in the district, should the hospitals request the drug. Similarly, the RSUD director did not know that DHP could be obtained from the Yanfar stores.

2. Policy regarding the recommended treatment for malaria

It is clear that chloroquine is still in use, perhaps widely, for first line treatment of malaria. Either official treatment guidelines have not been sufficiently promulgated, or health workers in some cases may be ignoring the guidelines out of personal preference.

4.2. GUIDELINES

In 2010, MoH published a comprehensive PSM manual which is designed to be used as part of a training program. The manual (Materi Pelatihan Manajemen Kefarmasian di Instalasi Farmasi Kabupaten/Kota), published with support from JICA, covers supply planning, storage, distribution, reporting, and supervision and evaluation, as well as non-SCM issues such as home pharmacy care and rational drug usage.

At nearly 200 pages, the manual is a bit intimidating and is not necessarily the ideal tool for a course aimed exclusively at supply chain managers. However, many of the components of the manual could be extracted, simplified and more widely socialized.
4.3. REGISTRATION OF PRODUCTS

Although the MoH can procure DHP (under the trade name Arterakine) through the Yanfar system, using APBN funding, the drug cannot be purchased with GF resources because it has not yet been formally approved for use by WHO.

To date in Indonesia, only Artesunate amodiaquine has been approved for procurement with GF resources. Thus the dilemma: it would be useful if MoH could procure DHP via the GF, but this can’t happen until WHO approves the drug. It is highly unlikely that DHP can be procured under the R11 proposal application.

In this case, it would seem to be preferable to use GF R11 resources (assuming the proposal is successful) to procure malaria-related supplies and equipment (e.g., RDTs, LLINs, insecticide, sprayers, etc.) and to continue using APBN funding to procure DHP.

4.4. QUANTIFICATION, PROCUREMENT AND DISTRIBUTION

Presently, procurement needs are estimated by the Malaria Sub-Directorate based on the expected number of malaria cases likely to present during the year. Drug procurement is thus anticipated to cover all of Indonesia’s treatment needs over a given time frame, across all provinces.

Procurement at the national level is paid for with both APBN and GF funding. Things get a bit confusing when we consider (a) the primary sources of funding, and (b) the actual procurement channels for different malaria-related drugs and supplies.

For example, Yanfar procures DHP through Kimia Farma, using APBN funds, and then Kimia Farma distributes DHP directly to provincial medical stores. Artesunate amodiaquine is procured directly by the Malaria Program using GF funds, through the VPP, and is then distributed to provincial level through the Yanfar network.

RDTs are procured by Yanfar, using both APBD and GF funding, and are distributed through the Yanfar network. LLINs, however, are procured directly by Malaria Sub-Directorate (presumably because Yanfar does not want to get involved with LLINs), and then distributed directly to district-level CDC offices, with a buffer stock sent to the provincial medical stores.

MoH recognizes that procurement and distribution should be consolidated (e.g., the “satu pintu” concept), and it’s clear that the current system evolved over time and in response to internal and external demands and constraints. It’s also logical that procurement quantification might initially be “top down,” but this approach will be problematic over the longer term.

It’s probable that Malaria Sub-Directorate’s calculations are based on data that may be out of
In Wonosobo district, for example, the field team observed a probable overstock of Arterakine at the district medical stores. Dinkes has done a highly effective job of reducing malaria in the district; presently cases are less than 100 per year. But the Wonosobo stores recently received a shipment of over 400 packets of Arterakine, and it has around 50 packets. It’s clear that existing quantification models have not taken into account Wonosobo’s actual treatment requirements, and it’s likely that some other district could make use of Wonosobo’s stock. The current stock reporting system, while better than in many places, is still slow and relatively inflexible, and obviously not based on actual consumption.

4.5. INVENTORY (STOCK) MANAGEMENT

The quality of inventory/stock management is highly variable, from medical stores that are hopelessly cluttered, dirty and disorganized to examples seen in the field of exceptionally well-organized and managed facilities. However, communication and information flow between district and provincial levels is often poor.

For example, the provincial Yanfar facility in Jayapura is an impressive, professional and well-organized warehouse. But there have been problems in the past with DHP stock in Timika district, largely due to poor communication between Jayapura and Timika, and because there are variable “opinions” on appropriate and actual stock levels. Essentially, Timika and Jayapura have in the past not agreed on stock levels or requirements, and the lack of real time data flow and routine communication has led to at least one recent stock-out.

It’s also clear that stock management training is either insufficient or nonexistent in many places. Some guidance on stock management is available in the new PSM training manual mentioned above, but the manual is a recent publication, and it does not appear that standardized guidance has been widely available in the past.

Fortunately, there are plenty of opportunities to learn from current good practices. In Wonosobo district, for example, there are 3 separate computerized stock management systems “on the ground.” One system isn’t in use because it did not meet local needs, another system was developed locally and is used by the Yanfar facility, and a third is a component of a health information system developed by UGM that is in use at the Dinkes office. Neither of the 2 systems in use are linked or integrated in any way, and in fact the stock management module at the Dinkes office is not yet fully utilized, but the potential is there to develop a real time stock management system throughout the district (and possibly at the provincial level over time).
4.6. QUALITY CONTROL

The Papua/Central Java team did not see any obvious problems with drug or supplies quality, with the possible exception of soon-to-expire drugs mentioned above.

It would be useful, however, to conduct some quality control testing. At a Puskesmas in Jayapura, for example, local staff showed the Papua/Central Java team a packet of Arterakine in which the pills had changed color. The color change was not dramatic, but it may be cause for concern.

4.7. SUCCESSES, BEST PRACTICES AND FACILITATING FACTORS

The Papua/Central Java team observed several examples of good pharmaceutical practices in both provinces. It’s difficult to quantify why one facility or district might “work” so much better than others, but there are at least two closely related factors that seem to be relevant:

• Leadership

  The Yanfar facilities in Jayapura and Timika are led by professionals who obviously take pride in their work. That leadership is reflected in neat, clean and well-organized storerooms, proper use of stock cards for individual products, and diligent (if not always accurate) reporting. It’s also apparent that support staff are motivated and inspired by their managers. It’s not possible for a single individual to maintain high quality practices in a large warehouse with dozens of products; it is feasible to do so if support staff are ably led.

• Initiative

  Wonosobo district is a stunning example of the potential for achievement at the local level. The Dinkes has successfully implemented its malaria control program without any support from GF grants. In addition to being an excellent leader, the Kepala Dinkes also knows what he’s doing and takes initiative in program implementation.

  Wonosobo district staff are similarly motivated and enthusiastic. At the Yanfar facility, one young staffer adapted a computerized stock management system obtained from another district for use in Wonosobo. The system isn’t perfect, and as mentioned above is not linked in any way to either the district health office or the province, but it nevertheless demonstrates what is possible with the right staff in place.
4.8. ISSUES AND CHALLENGES

- Communication

Communication is problematic both horizontally at each level of the health system and vertically between different levels of the system. Field observations indicate a great deal of inflexibility. Communication problems seen in the field also involve an unwillingness or inability to compromise and to try to understand the constraints in place at different levels.

- Uniform awareness or understanding of policy and (Standard Operating Procedures) SOPs

The DHP access policy discussed in section 4.1 above is the clearest example of this issue, but it is also apparent that SOPs for best practices in PSM have not been disseminated either sufficiently or widely enough.

- Skills and enthusiasm for the job

None of the PSM staff that the Papua/Central Java team met had ever received formal training in PSM. Most picked up what skills they had on the job. In some cases, the system was lucky: the right person ended up in the right job. In many other cases, however, both a lack of training and perhaps inappropriate staff characteristics have led to poor supply chain management.

It’s not technically difficult to stack boxes neatly, or to dutifully maintain stock cards, or to keep a storeroom clean and organized. The problem is that not everyone is cut out for that sort of work – it takes a certain attention to detail.

4.9. CONCLUSIONS AND RECOMMENDATIONS

Many of the ingredients necessary for proper pharmaceutical supply management are in place, although not everything is all together in one place. Fortunately, the systems and tools needed are relatively simple and clear-cut. Unfortunately, introducing or strengthening systems is always difficult and time-consuming in practice, primarily because no one likes to change their behaviour and it’s hard to achieve consensus in the first place on what needs to be done.

Even so, some fairly straightforward interventions, implemented widely and in the short term, could have a significant impact on pharmaceutical supply management in general, and thus malaria prevention and treatment in particular.
• **Simplification and standardization**

PSM would be strengthened through an intensified effort to (a) simplify and reform PSM information and (b) simplify and widely disseminate SOPs for supply chain management.

*Pharmaceutical information*

It would help to focus on the simplification and standardization of pharmaceutical information, not on developing a nationwide pharmaceutical information system. (Accurate pharmaceutical information should not be dependent on the availability of computers.) A standardized set of “essential pharmaceutical indicators” calculated at all levels of the health system should be established, as well as simple and standardized guidance for capturing, compiling, and calculating indicators. The most important element of this effort would be to strengthen the local analysis and use of pharmaceutical information.

It will not be very helpful at this stage for the central level to introduce centrally-determined reporting forms, stock cards or other information tools. Forms and registers can be designed, tested and implemented by staff in the provinces and districts, and it’s preferable to let local staff experiment and test their own designs. Rather, the focus should be on:

- the content of the pharmaceutical information system(s);
- the information-related roles and responsibilities of PSM staff;
- the flow of pharmaceutical information and the timing of information exchange

*Simple SOPs*

In order to more effectively disseminate best practices and good SOPs it might help to develop and disseminate “case studies” of best practices currently in use in provinces and districts. The case studies could be used as an effective means to disseminate SOPs more widely.

• **Strengthen communication between levels of the health system**

Many of the problems encountered by the Papua/Central Java team could be resolved through more routine, effective and cooperative communication between central, provincial and district levels. Better communication would help to increase the system’s flexibility and could lead to fewer misallocations of drugs and supplies.

It’s not possible or useful to force people to communicate. Instead, until a more self-sustaining “information culture” evolves, it will help to develop and disseminate recommendations for communication protocols and guidance for better communication.
• **More comprehensive approach to training**

A standardized training course should be established for SCM managers and staff. Components from the new training manual can be extracted, simplified where possible, and implemented as a multi-module training course, possibly online eventually.

The objective is to conceptualize PSM/SCM training as ongoing. One-off short courses will be ineffective for many people; a focus on continuing education, on-the-job training and mentoring would be preferable.

Experience in other countries has demonstrated that good supervision systems can help to build and maintain PSM capabilities. Province-level SCM supervisory teams should be established and should conduct routine field visits for mentoring and capacity building. Supervisory teams need to be staffed by real professionals, with experience not only in SCM but also in skills transfer.

• **The longer run**

There are many opportunities to develop, refine and integrate PSM systems at the provincial and district levels.

Ideal PSM laboratories are available in Jayapura and in the Wonosobo district in Central Java. Staff in both places indicated a willingness and considerable enthusiasm to serve as a test sites to model PSM systems development and integration.
5. MALARIA VECTOR CONTROL

As Indonesia straddles Wallace’s line, its malaria vectors are unusually diverse, with representatives from both the Asiatic and Australian-Papuan fauna. In Papua, Maluku, and North Maluku, members of both broad faunal groups may be found, while in the remainder of Indonesia only Asiatic vectors are present. These species vary in key characteristics. First, the degree to which different species support replication of malaria parasites within their bodies varies, with those most susceptible to infection more likely to transmit malaria. Second, the degree to which these species tend to bite humans also varies greatly, with those most prone to bite humans the most efficient vectors. Third, mosquitoes differ in the places and times of biting and resting, which makes them more or less susceptible to interventions aimed at preventing biting. Finally, mosquitoes differ in their larval habitats, with some species laying their eggs in habitats susceptible to environmental management or other larval control measures, while other species have habitats that are refractory to such measures. Because of these basic differences, good knowledge of the distribution, abundance and behaviour of malaria vectors and transmission dynamics of malaria is extremely useful in planning effective vector control interventions.

5.1. POLICY, GUIDANCE AND ORGANIZATIONAL STRUCTURE

Vector control policy is under the Directorate General for Communicable Diseases and Environmental Health, the Directorate for Vector Borne and Zoonotic Diseases, and the Sub-directorate for Vector Control. Policies on vector control have been prepared and promulgated, including policies for insecticide rotation. A policy for pesticide management has been prepared. However, there is not yet a comprehensive policy for insecticide resistance management. Policies and guidelines for surveillance of LLIN physical condition and effectiveness have not yet been prepared.

Guidelines for level of stratification of LLIN distribution have been much discussed in the NMCP. For the first two years of operation of GF R8 funded activities in Kalimantan and Sulawesi, districts were stratified as high, medium, and low transmission, with LLINs distributed to all households in high transmission districts, and to pregnant women and children in medium transmission districts, while in low transmission districts no nets were distributed. In fact, the level of transmission varies widely among villages throughout Kalimantan, Sulawesi and Sumatra. Thus, a low transmission district may have high transmission villages, and high transmission districts may have low transmission villages. Because of this fact, the NMCP has recently decided that LLIN distribution should be stratified by village, not district.
IRS guidelines stipulate that this be used for control of outbreaks of malaria. In addition, IRS may be applied in high risk villages, though the definition of high risk is not clear.

Policies for environmental management and larval control have not been prepared. Many districts use fish for larval control, but this distribution is carried out on an ad hoc basis.

5.2. HUMAN RESOURCES, TRAINING AND CAPACITY DEVELOPMENT

No formal training for a PhD in entomology is available, though medical entomologists with PhDs in Biology from Indonesian universities exist. However, the leading Indonesian medical entomologists have PhDs from Japan, Australia, and Thailand. Formal training in medical entomology to MS level is available at the Agricultural Institute of Bogor. Plans to begin an MS program in medical entomology are underway at the University of Hasanuddin in Makassar, while the University of Diponegoro in Semarang has a bachelor's degree program in entomology.

Technical training in entomology is given to sanitarians throughout the country via a system of polytechnic institutes. The program is three years and includes training in basic water and sanitation and pest control, including mosquito control. In theory, these sanitarians should provide technical support to districts and community health centres for vector control. Polytechnic institutes also provide training to midwives, nurses, laboratory analysts, nutritionists, and dental nurses. As a subset of one speciality, entomology is thus not greatly emphasized in polytechnic training.

In the past, the NIHRD vector biology institute functioned as an effective training centre, but does not do so now. In addition, the Asian Development Bank (ADB) funded a network of vector biology training and surveillance centres which remains operational, but underutilized in some areas.

5.3. ANNUAL PLANNING

Vector control planning, where it exists, is integrated into the normal annual government planning process.
5.4. SERVICE DELIVERY OUTPUTS AND OUTCOMES

At present, policies for vector control of malaria emphasize LLIN distribution and IRS. IRS is generally reserved for control of outbreaks, though some districts may routinely spray in highly endemic villages. As these may occur in any province, in theory every province should have IRS teams on standby equipped for rapid deployment. LLIN distribution is stratified according to level of endemicity of malaria. In high transmission areas, LLINs are to be distributed in mass campaigns to all community members (GF R8 proposal recommends 2 large nets with each sufficient to protect two adults per household), followed by routine distribution to pregnant women and infants via antenatal care and routine immunizations to maintain coverage. In middle transmission areas, no mass campaigns are carried out, but routine distribution to high priority groups—pregnancy women and young children—is done via integration with antenatal care and routine immunizations. In low transmission areas, LLINs are not distributed. These programs are carried out with various levels of efficiency, resulting in varying levels of coverage. Guidelines have recently changed so that stratification of LLIN distribution is by village rather than by district, which would improve program efficiency if operational challenges can be overcome.

Frequent problems with the logistics of procurement and distribution of LLINs have resulted in frequent stock outs and lapses in coverage. Capacity of districts and provinces for procurement of insecticides that meet WHO specifications is variable.

Environmental management practices, pioneered in Indonesia before WWII, are still practiced in Java for An. aconitus (a rice field vector) and An. sundaicus (a brackish water coastal vector). Outside of Java and Bali, community based larval control has been tried in one district (South Halmahera) with high levels of transmission with apparent success. Environmental management is likely underutilized in many parts of Sumatra, Kalimantan and Sulawesi, where some of the vectors are susceptible to this intervention.

While fish are often distributed for vector control, the evidence base for effectiveness of this intervention is weak.

5.5. SUCCESS, BEST PRACTICES, AND FACILITATING FACTORS

High malaria endemic South Halmahera district represents the MoH’s model district for integrated malaria control, with malaria mortality reduced to nearly zero, and malaria incidence reduced by 50% over a five year period. This district has distributed LLINs though both campaigns and routine systems (both ANC and EPI), has carried out focused IRS, and has carried out environmental management measures in most of its 250 isolated island villages. At
At the same time, the district introduced diagnosis-based ACT treatment throughout the district. Analysis is being carried to determine which interventions were most effective in reducing malaria incidence. Even if the contribution of community based environmental management is unclear, this district serves as an excellent example of success under extremely challenging geographic circumstances.

At the lower end of the endemicity scale, Wonosobo district in central Java illustrates how decentralization, coupled with creativity and a spirit of independence, can control a severe outbreak of malaria and move towards elimination. During the period 2000-2004, this district, along with much of highland central Java, suffered a serious outbreak of malaria, with thousands of cases annually. Wonosobo District raised local funding for focussed IRS in about 20,000 households per year over a period of four years. This brought the epidemic under control, with cases since 2006 numbering approximately 100. A similar effect was observed in Sabang, Aceh, where high coverage LLINs and IRS rapidly reduced malaria incidence by over 100 fold over a three year period. In 2006, Wonosobo brought additional passive case detecting into remote, malaria prone areas via a series of Village Malaria Posts. At the same time, the district has increased its ACD capacity by adding more positions for JMDs. The dinas kesehatan has done so despite inconsistent and irregular funding from the local parliament. Salaries of JMDs have been shifted to routine funding sources, and money from BOK has been used to fund migration surveillance—which now detects more than half of the cases in this district. It may be that some strategically applied MBS might lead to elimination of malaria in this district.

Overall, Indonesia has done a good job in developing integrated routine systems for LLIN distribution in ways that leverage existing systems (antenatal care and immunizations) in a synergistic way. Integration has improved LLIN coverage, improved antenatal care, and increased demand for routine immunizations. As extra-large nets are distributed, the program protects more than just the overt target population; if nets last three years, routine distribution alone will protect over 50% of the population. That said, additional campaign style distribution of nets to all members of the population or high coverage IRS need to be carried out in high endemic areas to knock down transmission. If LLIN or IRS campaigns are done, integrated LLIN distribution should continue to maintain coverage and continue synergistic benefits to ANC and EPI.

5.6. ISSUES AND CHALLENGES

Much serious work on incrimination and characterization of the major vectors of malaria remains to be done, particularly in eastern Indonesia. In districts where Anopheles have been captured—which the exception of a few research sites—no sporozoite ELISA has been done. Thus, the identity of the species transmitting malaria in some areas is to a large extent speculative.
Good vector incrimination studies—which will require backup from good research institutions capable of molecular identification—would allow Indonesia to better deploy environmental management for the species susceptible to this intervention (primarily An. aconitus, An. sundaicus, An. farauti, and An. subpictus).

As is the case for IRS, maximal impact of LLINs requires high coverage. In the context of eastern Indonesia, where routine access to villages is extremely difficult, LLINs have proven easier to implement than IRS. However, high community coverage of LLINs has been attained only in certain areas of Indonesia, including Aceh (with tsunami funding), much of malaria endemic Sumatra (with funding from the American Red Cross via UNICEF), some highly endemic parts of Kalimantan and Sulawesi (with funding from GF R8), and four districts in Papua (jointly funded by the GF and UNICEF). Programmatic implementation has been variable, whereby in some districts WHO targets of 80% coverage have been met, but in others coverage has fallen short of this.

Notably, much of highly endemic eastern Indonesia (most of Papua, the Malukus, and east and west Nusa Tenggara) has not yet benefited from high coverage of LLINs. The primary challenge in attaining this coverage is financing. When nets are purchased with GF monies, the cost is about $5 per net (or less) if free of tax. If purchased with MoH funds, the cost more than doubles, with part of the cost due to taxes. Locally manufactured WHOPES-recommended LLINs are not available.

In western Indonesia, careful stratification of endemicity based upon epidemiological data is required before planning LLIN distribution. In Kalimantan and Sulawesi, team observed areas with low levels of endemicity that had received mass LLIN distribution. This is a waste of valuable resources. Clearly, districts with overall high levels of endemicity (particularly in Sumatra, Kalimantan, and Sulawesi) require stratification to more focused geographic areas before LLINs, IRS, or other interventions are planned.

In areas where LLINs are the primary means of vector control, routine measures of coverage and quality should be in place. Routine calculations of LLIN coverage are generally not done.

Monitoring of quality is also not carried out. The nets that have been distributed since 2005 are not monitored for the elements of durability, which include physical condition of nets, insecticide effectiveness and attrition rate. The only systems in place—in some districts—are routine distribution via ANC and EPI to pregnant women and children. While laudable, these systems are insufficient to maintain high coverage (defined as at least 80%) in high endemic areas.

As Indonesia moves closer to elimination, the serious challenge of transmission occurring in forested areas amongst migrant workers (including illegal workers) outside of houses will need to be addressed. At present, no good interventions exist for reducing transmission occurring outside in remote areas.
Routine surveillance of insecticide resistance in major vectors is not carried out. The central level carried out sporadic surveys, but districts are unaware of results. In most of the districts we surveyed, entomologists were at best a peripheral part of the team involved in malaria control, while in some districts entomologists were not present. This is to a large extent the relegation of entomology to a narrow technical speciality.

Storage of insecticides is done in an ad hoc manner in Kalimantan and most districts visited. Some insecticides had expired. Plans for safe disposal were not available. In general, knowledge of standard good practices for insecticide management was not evident. This is likely due to the absence of good guidelines and proper training.

5.7. CONCLUSIONS AND RECOMMENDATIONS

5.7.1. Conclusions

Malaria remains highly endemic in the six easternmost provinces of Indonesia: Papua, West Papua, Maluku, North Maluku, West Nusa Tenggara, and East Nusa Tenggara. Indonesia's R11 proposal to the GF should support purchase of LLINs for mass campaigns in highly endemic areas of these provinces. It should also support LLIN purchases for sustained routine distribution in the same provinces. Looking to the future, ways must be found to ensure that LLINs can be purchased with local funds at a reasonable price. To support this, taxes on WHOPES-qualified nets should be removed. Indonesian companies should be encouraged to produce good quality LLINs and submit them WHOPES for evaluation. Finally, and most important, political leaders in malaria endemic districts should be encouraged by the MoH to purchase these life-saving commodities.

The interventions aimed at high endemics areas (mass LLIN distribution and IRS) should be focused on villages or areas served by health centres with high levels of malaria endemicity. Because of the high variability of malaria transmission within districts, stratification of transmission by village is ideal. If this is not possible, then stratification of transmission in catchment areas of health centres should be done. However, we note that such stratification, if based solely on routine HIS data, may underestimate malaria levels in remote villages where data may be underreported. Thus, the national program should work with colleagues with expertise in mapping to complement routine data with survey data to extrapolate transmission levels in remote areas. At the same time, district officials should be encouraged to critically assess data quality and completeness when mapping malaria endemicity in their respective districts.

Systems need to be put in place to monitor LLIN coverage via the routine HIS system. At the same time, systems need to put in place to annually sample net quality (both physical condition and insecticide activity) in provinces that routinely distribute LLINs. This will require training.
of staff at provincial level to carry out WHO tube test. BTKL staff should be mobilized for this effort. A central level laboratory with an insectary can carry out routine bioassays on samples of nets sent to it.

IRS was once widely used in Indonesia and remains an excellent intervention, particularly for control of epidemics. Capacity for rapid deployment of spray teams should be available in every province. Further, if geographic conditions allow, malaria endemic districts that wish to carry out IRS routinely should be encouraged to do so.

Larval control via environmental management, pioneered in Indonesia in the 1930s, remains an excellent intervention for certain vectors. However, intelligent deployment requires good knowledge of transmission dynamics. Environmental management can be effectively linked with community mobilization, which may be both cost-effective and sustainable.

At a more basic level, vector mapping and incrimination of vectors should be a priority for Indonesia over the next several years as plans for national elimination are put in place. The existing Malaria Transmission Consortium is a good starting point, but the network of Indonesian entomologists working in this consortium should be expanded. Links between the research and programmatic community in Indonesia should be strengthened via networks such as this, where both programmatic and academic workers jointly make decisions on what research projects to carry out.

Marginalization of entomologists in malaria planning might be ameliorated by incorporating training in basic epidemiology in the sanitary curriculum in polytechnic training institutes. In addition, practical training in entomology and vector control that was formerly provided by institutions within the NIHRD should be strengthened and improved.

Capacity for sound management of pesticides in the practice of vector control needs to be developed at central, provincial, and district level.

5.7.2. Recommendations

1. Remove taxes and tariffs on LLINs, RDTs, and antimalarial drugs, while at the same time encouraging the private sector in Indonesia to develop capacity to manufacture these commodities according to WHO standards.

2. Seek funding through GF R11 to carry out a mass LLIN campaign in highly endemic areas in the six provinces of eastern Indonesia.

3. The national program should continue to work with academic partners and the NIHRD to characterize, map, and incriminate malaria vectors in Indonesia via high quality focused surveys backed by modern molecular techniques.

4. Where vectors are susceptible to environmental management and larval control, work with communities and non-health sectors to implement this sustainable and cost-effective intervention.
5. Systems to monitor quality and coverage of LLINs, to monitor insecticide resistance, and to manage insecticides should be established. BTKL staff should be mobilized for this effort.

6. Mass LLIN campaigns and IRS should be focused on villages or health centre catchment areas which have high levels of malaria endemicity as shown by epidemiological analysis.

7. Every province should have the capacity to rapidly deploy IRS teams for control of epidemics.

8. The national program, universities, and the NIHRD should work together with BTKL and Polytechnic Training Institutes to ensure that Indonesia trains good quality entomologists who can take an active role in planning malaria control activities.
6. MALARIA DIAGNOSIS AND CASE MANAGEMENT

6.1 INTRODUCTION

Malaria control requires an integrated approach comprising prevention and treatment with effective antimalarial drugs. Early diagnosis of malaria and its effective and timely treatment has long been the primary target of malaria control in most parts of the world as it directly reduces morbidity and prevents death from malaria. Malaria diagnosis is mainly based on the detection of parasites on giemsa-stained blood films examined by light microscopy. However, this method is laborious, time consuming and requires experienced microscopists. Clinical diagnosis and RDTs are used in some health facilities where microscopy is not available.

The MoH adopted ACT as the first line therapy to treat malaria in 2004 and as a consequence of this policy clinical diagnosis is no longer acceptable as a basis for treatment with antimalarial drugs. To support this new policy the Malaria Sub-Directorate has started to establish and/or strengthen malaria microscopy at puskesmas where malaria is endemic. At the same time RDTs have also been provided to support the malaria diagnosis in remote areas. As a result of this policy it is expected that malaria microscopy will be readily available in all parts of Indonesia.

Until 2006, ASAQ combination was the only available ACT but therapeutic efficacy studies conducted in several sentinel sites documented various levels of efficacy and side effects. The recently introduced ACT, DHP showed a superior efficacy and post treatment prophylaxis against P. falciparum and P. vivax malaria in comparison to ASAQ in a therapeutic efficacy study (TES) conducted in Timika, Papua. As a result the MoH recommended DHP as the first line therapy for both uncomplicated falciparum and vivax cases since 2010.

Malaria case management is an integral part of the malaria control programmes and should be based on a clear understanding of epidemiology among vulnerable groups and residents of certain areas as well as data on the pattern of parasite resistance to antimalarial drugs. All four human malaria parasites are found in Indonesia. The dominant species across all regions include P. falciparum and P. vivax whereas P. malaria and P. ovale; they are endemic in eastern parts of Indonesia. A few cases of P. knowlesi infection in humans have recently been reported in South Kalimantan.

Most symptomatic malaria is treated at puskesmas or by health workers at the village level. Therefore, the capacity to diagnose, treat and report malaria promptly should be established at all health facilities in malaria endemic areas to ensure early diagnosis and prompt effective treatment. With the current intensive population movement to and from malaria endemic areas, the awareness of the health service providers at each level even in areas of low malaria transmission should be maintained to prepare for the appropriate response to malaria outbreak in areas where malaria burden has been successfully reduced or even eliminated.
6.2 POLICY AND GUIDANCE

The MoH has issued guidelines for malaria diagnosis and case management that have been regularly updated since 2006 in collaboration with the Malaria Expert Committee. The guidelines require that malaria diagnosis be based on laboratory confirmation either through microscopy or an RDT. The principle of the malaria treatment policy is to stop monotherapy and use the ACT for uncomplicated and complicated malaria cases (all species).

To support the capacity for malaria diagnosis the MoH has projected that by 2010 all puskesmas in the malaria endemic districts will be equipped with malaria microscopy. A system to check the quality of microscopists through a QA system is still in the process of being in most districts. This system will eventually provide reliable malaria microscopy services at all levels of the health system and thereby strengthen the case management system.

6.3 ORGANIZATION OF CASE MANAGEMENT SERVICES

Malaria diagnosis and treatment is provided at the village level by malaria volunteers (also called cadre) in collaboration with either the nurse or midwife that are associated with a puskesmas. The service at the village level includes active and PCD using blood smears. The puskesmas, public health facilities at the sub district level, mainly provide ambulatory service and some are equipped with a small hospitalization unit. The malaria blood smear is expected to be examined at the puskesmas by the microscopist; parasite positive patients are given medicine by the midwife. In the absence of a microscopist, an RDT is usually performed (if available) by the midwife. Currently, the law in Indonesia does not permit the malaria cadres to make blood smears and give medicine to positive malaria cases. Complicated cases are usually managed at a higher level such as a primary health centre with a hospitalization unit or at a district or provincial hospital (Figure 28).
The above system, in general has been well implemented in all provinces that visited by the Review Team. The hospitals at the provincial level have been well equipped for malaria case management. The provincial hospital in Jayapura managed over one thousand cases in 2009 over 30% of which were severe cases. In the provincial hospitals, malaria cases are usually managed by an internist or paediatrician who specialized in tropical medicine. In the other provincial hospitals where very few malaria cases are admitted proficiency of the microscopists has declined. At the district level, particularly in Bethesda Hospital in Tomohon District, North Sulawesi and in Mitra Masyarakat Hospital, Timika District, Papua, case management is systematically done so that early diagnosis and prompt treatment can be implemented but in other places such as in Ciamis District hospital, Central Java, the time required to diagnose malaria ranged from 3 to 5 days and that delays prompt treatment. In many sites the referral system for management of severe cases was either non-existent or not clearly defined.

6.4. HUMAN RESOURCES, TRAINING AND CAPACITY DEVELOPMENT

Human resources related to malaria activities in some areas visited seemed to be either improperly deployed or redundant. A rapid turnover of the health professionals that have been trained for malaria diagnosis or case management also sometime impacted the process. In certain areas in Central Java, the capacity to perform regular surveillance is also inadequate.
Microscopists are expected to be the proficient experts for malaria diagnosis but often exist in insufficient quantity and quality. Currently, there are approximately 9,000 microscopists throughout Indonesia and only less than 10% of that used to attend malaria trainings. No regular training system for malaria microscopy is in place in many of the areas visited, except for Central Kalimantan and North Sulawesi Province. Training for all of the health personnel involved in malaria is also arranged on an ad hoc basis. Therefore, capacity development at all levels of malaria health services is required.

6.5. ANNUAL PLANNING

Annual planning for malaria control is an integral part of the district, province and national annual development plans. The data for the annual plan are generated at the primary puskesmas and subsequently compiled at the district, province and national level. This includes human resources, malaria cases and management, antimalarial drug deployment to the sub-district and hospital. With the current decentralization system at the district level, this plan is usually not well coordinated with the provincial or central government. This phenomenon seemed to occur in Central Java, where commitment of the local governments seem to be diminishing as the malaria cases decrease, while the central or provincial governments still treat the district as before. The district government has to play a central role in the planning and implementation of programs to support the malaria elimination phase.

6.6. MALARIA DIAGNOSIS

Malaria diagnosis has been mainly based on microscopy and RDT but in certain areas clinical diagnosis is still carried out. Based on the data provide by puskesmas, the proportion of clinical malaria is still much higher than laboratory-confirmed malaria. In the puskesmas visited in Wonosobo District, Central Java, for example, almost all of the clinical malaria cases were negative by microscopy. Microscopists are based at the puskesmas, district or provincial hospitals and in most of the areas visited they still use a semi-quantitative system for counting parasites (+, ++, +++), except for several hospitals and puskesmas in Papua, East Nusa Tenggara and Aceh. The blood slide cross checking system in many sites was also either not in place or being done without a proper feedback by the cross checker at the district level. Currently, not all of the puskesmas in malaria endemic districts has microscopists and in this case, RDT is usually used. However, distribution of RDTs was not well planned so that many health centres at the village level with high or medium incidence of malaria did not have a stock of RDTs. The
effort to provide qualified microscopists requires considerable time, universal coverage of RDTs in the front line health post should be provided to compensate the absence of microscopists. In this regard, more systematic data on the availability of microscopists in all health centres in endemic villages needs to be generated ensuring the appropriate deployment of RDTs to the health centres/sub-health centres.

6.7. MALARIA TREATMENT

Malaria treatment in all the areas visited areas followed the guideline issued by the MoH. The first line drug for uncomplicated malaria is ACT, including dihydroartemisinin-piperaquine, artesunate-amodiaquine. The second line include quinine, doxycycline. Primaquine is used as a gametocytocidal drug for falciparum malaria and for radical cure of vivax, ovale and malariae. Provision of primaquine in vivax malaria cases is done without a glucose 6 phosphate dehydrogenase enzyme deficiency test. For complicated malaria cases, artesunate and arthemeter injections have been recommended but quinine injections are still used. Chloroquine and SP are still available at some puskesmas and are still occasionally used for laboratory-unconfirmed malaria even though its use is not recommended by the national malaria control programme.

In all sites visited, follow up treatment is not properly done and this depends on the compliance of the patients to come to the health centres which is often poor.

Delays in malaria diagnosis result in delayed or often incomplete treatment because the midwives or malaria cadres very often receive the results several days after the patient’s visit. Patients are either requested to come back for treatment or presumptive treatment based on clinical criteria is given. This totally negates the value of having malaria microscopy and in such cases RDTs if available should be used as a basis for treatment.

Antimalarials are considered to be “project drugs” so they are distributed through a special supply chain that is separate from the normal pharmacy supply system.

or

Supplies come through the Directorate General of Pharmacy Services to the MoH at the National level, then to provincial drug stores, district drug stores and then to hospitals and health centres.

The Provincial drug stores receive antimalarial drugs based on the previous malaria prevalence reported to the Malaria Sub-Directorate and MoH. This sometimes results in lack of drugs needed to respond quickly to malaria outbreaks.
6.8. MALARIA PROPHYLAXIS

Malaria prevention using antimalarial drugs is rarely done in the areas visited. Some people travelling from Java to the outer islands are still using a weekly dose of chloroquine as a regular prophylaxis. For short time visitors to endemic areas doxycycline is sometimes taken on a daily basis but this is not universal so most travellers do not take any type of prophylaxis nor do they routinely sleep inside mosquito nets.

6.9. PERFORMANCE INDICATORS AND TARGETS

The MoH projected that in 2010 all puskesmas in malaria endemic regions would have malaria microscopy. In the areas visited by the Review Team many puskesmas did not have a malaria microscopy laboratory so this target has not been achieved.

6.10. SERVICE DELIVERY OUTPUTS AND OUTCOMES

In puskesmas where the Team found microscopy the quality could not be ascertained because no routine quality control is done and many of the microscopists were never properly trained according to WHO or MoH standards. In some cases, the clinical pathology specialists in the hospital supervised the laboratory technicians and provided informal training on malaria smear readings but no cross checking of results was being done and neither the WHO or The Indonesian Ministry of Health Guidelines of Methods of Parasitological Confirmation for Malaria were available as a reference. The microscopists in the health facilities visited by the Team were unable to perform parasite quantification except in some laboratories we found them using the old highly subjective plus method (+, ++, ++++ so in most laboratories results were being reported only by species. From a review of malaria case registers we found that only rarely do reported results indicate the presence of gametocytes.

In some places the clinicians indicated that they have found that the microscopy results are not always reliable. This makes it difficult for them to confidently manage malaria cases because they often treat even when the microscopy results come back negative but the clinical diagnosis is clearly malaria RDTs are often used as a back-up for parasitological confirmation in the absence of microscopy but RDTs were either not available or there were no enough for routine use in some puskesmas. Procedures for quality control malaria microscopy and RDTs are not yet in place.
One of the underlying problems affecting parasitological diagnosis in areas of low endemicity is that the number of malaria cases is very low so that microscopists rarely see a positive slide. This has led to difficulties in maintaining the skills and motivation of microscopists to do a good job. Slides tend to be poorly prepared, poorly stained and insufficient time is spent examining slides so that low density infections are often missed. Regular training is important in maintaining quality but senior hospital microscopists responsible for assuring quality in the laboratory are sometimes considered to be busy and too experienced so that they are not included in refresher microscopy training conducted by the local health authorities.

6.11. TRAINING

The doctors assigned at the puskesmas and at district and provincial hospital in many of the areas visited had received training on malaria case management but the guideline for malaria case management produced by the MoH has not yet been properly disseminated to doctors so many of them are still not aware of the new policy for managing severe malaria cases. In Central Kalimantan training on malaria case management had been done in 2010 and this has significantly increase the awareness and knowledge of the local doctors on treatment including that for severe malaria.

6.12. SUCCESSES, BEST PRACTICES AND FACILITATING FACTORS

During the visit to the 6 Provinces, we have noticed several successes that deserve appreciation by the central government such as:

- Community (village)-driven malaria migration surveillance, which is a surveillance system to monitor malaria cases among people that travel in and out the village to and from malaria endemic region. In Central Java this system has been established and managed by a village midwife and malaria cadres backed by a village regulation (peraturan desa) that requires that visitors or travellers report to the village office within 24 hours of arrival. The cadre or midwife makes a blood smear and examines it on-the-spot. If the slide is positive treatment is given and the visitor followed-up before leaving.

- Commitment by political leaders. Commitment by local political leader in some places visited has also been instrumental in driving malaria control activities. In other areas though commitment is diminishing as the number of malaria cases decreases.
• Good malaria cases management system. The Team found that at Rumah Sakit (RS), Bethesda, RS Tomohon and RS Prof. Dr Kandou in Manado that there is clear policy on malaria diagnosis and case management (including procedures for identifying severe cases) and all malaria cases are confirmed by microscopy and treated with ACT and when required, with intravenous artesunate. At RS Bethesda, microscopy examinations includes parasite quantification and a semi quantitative method is used at RS Prof. Dr Kandou. This example of appropriate malaria case management could easily be reproduced in other area in Indonesia.

• Establishment of malaria QA system in Aceh. In collaboration between the Aceh Provincial Health Office, UNICEF and the Eijkman Institute, a system for malaria microscopy QA has been established based on WHO guidelines. This QA system includes development of a competence-based training curriculum for microscopists at different levels, standard training slide banks for competence testing, a slide cross checking system and on-site microscopic competence testing. There are plans to establish the same QA system in North Molucca and Papua Provinces.

6.13. ISSUES AND CHALLENGES

Based on the above findings, we summarize several issues and challenges as follows:

• Lack of systematic training for malaria microscopists;
• Inadequate number of properly trained microscopists;
• Lack of integration of malaria laboratory into the general laboratory services;
• Inadequate quantity of RDTs provided to the districts;
• Lack of a QA system for malaria microscopy and RDTs;
• Lack of accurate and timely malaria data (epidemiology);
• Inadequate information system for the drug supply chain;
• Difficulties in maintaining interest and awareness of malaria diagnosis and treatment of malaria cases in low transmission area;
• Inadequate coordination between hospitals, the district and provincial health offices that negatively impacts the quality of drug supplies and capacity building;
• Unclear referral system for management of severe cases;
• Inadequate surveillance system that fails to find and treat asymptomatic malaria cases.
6.14. CONCLUSION AND RECOMMENDATIONS

1. A system to ensure a reliable malaria diagnostic system should either be built or strengthened (malaria microscopy QA system) at all level of endemicity.

2. Adequate and sustainable supportive supervision by National, Provincial and District Health staff should be central to improving the quality of malaria case management in both primary health care and the hospital.

3. Coordination between hospital and the Local Health Authority should be clearly defined with regards to supply chain, quality control and capacity building in malaria diagnosis and case management.

4. ACT, artesunate injections/suppository and RDT and where applicable, microscopy, for early detection and prompt treatment should be available in all level of health care, including in the village health posts (universal coverage).

5. Refinement of the malaria information (distribution) in the low endemic areas to better device the appropriate intervention – Resources planning and deployment.

6. Infrastructures to support the village-based surveillance system to cover symptomatic and asymptomatic cases, such as migration surveillance at the village level should be enforced.

7. It is strongly suggested that malaria diagnostic capacity should be strengthened at the puskesmas and pustu levels, by providing sufficient RDTs to the villages with high incidence, to ensure prompt treatment.

8. Currently, artesunate suppositories have not been recommended by the MoH for use but this policy should be reviewed. Artesunate injection or suppository should also be available in pustu and other areas for pre-referral treatment of severe malaria cases.

9. Staff at pustu and private health centres have not received malaria case management and referral system trainings yet. It is important that an integrated referral system should be established from the pustu to the highest referral centres.

10. Continuity and consistency of reported malaria cases and supply status from pustu to the higher level of care should be improved. Supportive supervision from the Local Health Authority would be central to this issue, as this will affect overall program planning.

11. The system of “community eyes and ears” whereby visitors or travellers coming to villages especially in low endemic villages or villages targeted for malaria elimination are checked and when necessary treated for malaria can be an effective method for limited imported cases. The system should be documented, adapted and used in low endemic areas and/or areas moving towards malaria elimination.
7. MALARIA IN PREGNANCY

7.1. INTRODUCTION

Malaria infections in pregnancy are particularly insidious, with sometimes severe effects upon fetal development and maternal health. Until recently, global efforts have focused on the burden of MIP in Africa, which has clear guidelines for its control based upon decades of careful research. Asia, like Africa, faces a challenge in how best to treat asymptomatic infections. The method prescribed for regions of moderate to high transmission in Africa—Intermittent Preventive Treatment (IPT) has been considered unsuitable for the Asian context due to resistance to the only presently available drug, sulfadoxine-pyrimethamine, the high prevalence of P. vivax, and the possibility that health systems in Asia might be better positioned to deliver screening of asymptomatic women and treatment based upon parasitological diagnosis.

The scale of the problem in Asia is enormous: a recent study estimates the number of pregnancies at risk for any malaria infection in the SEARO and WPRO regions at 77.4 million in 2007, or nearly 62% of the world total (Dellicour et al 2010, Plos Med 7: e1000221). In areas of moderate transmission in eastern Indonesia, unpublished work by the Eijkman Institute shows that infections with either of the two most common malaria parasites (P. falciparum and P. vivax) occurs asymptomatically in over one-third of pregnant women and cause both maternal anemia and low birth weight in newborns. In terms of broader global recognition of the malaria problem outside Africa, the focus of the most recent meeting of the Malaria in Pregnancy Working Group of the Roll Back Malaria Partnership was MIP in the Asia-Pacific Region. The consensus of the meeting was that Asian countries should share their practical experiences and research results to work towards development of good policy and reasonable means of implementation. Notably, Indonesia has scaled up a screen and treat program for pregnant women via ANC using (for second and third trimesters) dihydroartemisinin-piperaquine, Cambodia is experimenting with a similar program, and India has amassed a large body of data on the burden of MIP in areas of low to moderate transmission. Policy development has been slow in Asia due to the wide variation of transmission levels in the region, uncertainty regarding the impact of MIP, and difficulties in ascertaining at what level of transmission an MIP program makes sense. It seems likely, however, that levels of transmission similar to those occurring in eastern Indonesia also occur in parts of India, Cambodia, Myanmar, and the Philippines, at least.

Operationally, though antenatal care is practiced in all member states and offers a strong platform for improving MIP interventions, in countries which have begun scale-up of MIP programs, the respective roles of maternal health and malaria programs have sometimes been unclear. Considering that MIP is a maternal and newborn health issue, MIP programming should ideally be managed through maternal health programs drawing on technical oversight from the NMCP. As this model is already in place in some countries, opportunities for mutual
learning and development of operational guidelines among national programs in the region are many.

7.2 SERVICE DELIVERY AND OUTCOMES

Integration of routine ANC with screening and treatment and LLIN distribution was initially developed in 11 target districts in eastern Indonesia from 2005-7. Beginning with GF R6 support and continuing with R8, the program has scaled up in most malaria endemic parts of Indonesia. The program has increased demand for ANC services while reducing risk of malaria in pregnant women. In addition, training of midwives and nurses in diagnosis and treatment of malaria has brought these services to entire communities living in remote, malaria-endemic villages.

An evaluation of the program to measure impact on key measures: maternal anemia, placental parasitemia, and low birth weight has been funded by the Wellcome Trust/DFID, and MRC. The evaluation will compare the present single screening program with multiple screenings and will begin early next year. The work will be conducted by the Eijkman Institute in collaboration with the Liverpool School of Tropical Medicine.

7.3 SUCCESSES AND BEST PRACTICES

After some early hesitation, cooperation between the maternal health and malaria sections of the MOH is generally good. Operations are carried out by maternal health, whilst the policy or where the program is to be implemented and details of treatment are left to the malaria section. Procurement of drugs, RDTs, and LLINs is at present the responsibility of the malaria section.

We observed great variation in the prevalence of malaria infection in pregnant women in our field visits. In Papua, in both Jayapura and Timika Districts, the prevalence may be has high as 10%, while in Kalimantan and North Sulawesi, only a handful of several thousand women screened were infected.

Indonesia is working with the ASEAN Secretariat and ACT Malaria to build a network of countries sharing experiences and good practices related to control of MIP.
7.4 ISSUES AND CHALLENGES

The primary issue has been stock outs of needed supplies of RDTs and LLINs. The program cannot operate without these. Standardization of training has been achieved, such that nurses and midwives are generally confident of their ability to diagnose and treat malaria.

7.5 CONCLUSIONS AND RECOMMENDATIONS

This is a good, innovate program that conserves resources through effective integration, prevents and treats malaria in a particularly vulnerable group, and expands diagnosis and treatment to communities that otherwise would not benefit from good access to treatment. Obstacles related to supplies and logistics of drugs, RDTs, and LLINs need to be overcome to ensure good quality service delivery with no lapses due to stockouts.

We note that at some lower level of transmission, an integrated MIP program is no longer cost effective. Evidence should be sought to allow the program to make a rational decision as to level of transmission below which an MIP program is no longer needed. The upcoming evaluation of the MIP program to be carried out by the Eijkman Institute should help the MOH in determining at API threshold the MIP should be implemented.

Indonesia’s leadership in the field of MIP with ASEAN is commendable.

A steady, reliable supply stream of LLINs, ACTs, and RDTs need to be provided to the maternal health program to facilitate successful implementation of this program. Evidence should be sought to determine at what low level of transmission a dedicated MIP program
8. SURVEILLANCE, MONITORING AND EVALUATION

8.1. INTRODUCTION

Surveillance, monitoring and evaluation are very essential in any health programme. Indonesia’s NMCP generates data through three mechanisms: (a) routine data collection at implementing site level, (b) evaluation tools during field visits and supervision, and (c) specific surveys and research. The core indicators used in malaria surveillance activities are the number of clinical (suspected) cases, number (%) of confirmed cases, proportions of Pf, Pv, and mixed cases, API, SPR and deaths due to malaria.

8.2. DISEASE SURVEILLANCE

Malaria surveillance in Indonesia begins with patient registration and data collection at the point of service delivery either at the puskesmas, hospitals and private clinics (Figure 29). The puskesmas generate monthly malaria reports from out-patient services and malaria case detection activities. The puskesmas are responsible for analysing data and producing a local area monitoring report about the distribution and trends of the disease. In the specific cases of malaria, puskesmas staff send a report to the District Malaria Control Officer who in turn compiles the reports into a district health malaria profile. The profile describes trends in the monthly and annual malaria cases reported at facility level. The district health office then sends aggregated malaria reports three times a year to the provincial health office, as well as to the Sub-Directorate of Malaria Control at the Directorate of Vector-borne Diseases in Jakarta.

Detection of malaria cases is done passively through the formal health service as well as actively through the community and by surveys. Passive case detection includes all cases of clinical malaria contracted via the formal health sector. Active case detection is routine case detection via scheduled house visits by Village Malaria Workers. Mass fever surveys involve taking of blood samples from all people in a particular area who show signs of clinical malaria. Mass blood surveys involve taking of blood samples from all members of a village whether showing malaria symptoms or not. This is usually done in villages with a suspected high endemicity of malaria. Migration surveillance is part of the increased effort to detect emergence of malaria symptoms in those who have returned home (usually to Java or Bali) after migration to malaria endemic areas in the outer islands. In some districts, the movement of population from one village to the other village is notified by the village chief to the sub-health centre. Contact surveys, involve epidemiological investigation (in areas of low endemicity with a malaria outbreak) of neighbours and family members of individuals who test positive for malaria and have received treatment.
In each endemic district, the puskesmas undertake mass blood survey once in 3 months in very remote areas. The field staff involved in the mass survey includes microscopists, malaria coordinators from health centre, and paramedics. Monthly outreach clinics are being done in villages where access to health facilities is difficult.

While PCD is being done as part of routine integrated service delivery at health facility level, ACD, MFS, MBS and migration surveillance are being done as special activities. For example, with funding support from central level, puskesmas conduct mobile clinics once a month in remote areas and once in three months in very remote areas. In some remote islands “floating clinics” are also being done.

The village health workers and the communities play an active role in motivating the public to go to the health centre for testing in case of fever and to receive early treatment. The quality of microscopy is assured through regular cross-checking of the slides and through regular training and refresher training for all health staff.

The private medical practitioners and private laboratories are supposed to report cases every month to the District Health Officer. In practice this is not the reality since there is no system to track who is reporting and who is not, and to follow-up and provide feedback. One private hospital in North Sulawesi provides regularly monthly reports on malaria to the district but it was not clear if the District Health Office incorporates the report into the overall district malaria report that goes to the province.
There are only two reporting forms used for malaria surveillance. The epidemiological data pertains to (age and sex of positive cases), Pv, Pf cases and treatment given with special reference to pregnant women. One important aspect of the reporting form is the last column showing how long since the last report was received. The monthly surveillance report is expected to reach the central level prior to the 5th day of every month. If the monthly form is received after the 5th day of any month it is considered as late reporting by the health facility. This method is useful in directly monitoring the surveillance reporting and programme implementation at the periphery. There is a separate form for reporting deaths by the hospitals in the districts and provinces.

In was noted that below the puskesmas level recording of malaria data is not standardized or formalized. Reporting from sub-centres to the puskesmas is ad hoc and only takes place during monthly meetings so there is no standard format but normally the information is incorporated into the standard reporting form at puskesmas level.
8.3 VECTOR CONTROL AND ENTOMOLOGICAL SURVEILLANCE

Aside from reporting data on disease surveillance, the puskesmas and the district malaria control offices also report on vector control activities such as IRS, LLINs, and larviciding. Reports on IRS include the number of houses sprayed, number of people residing in sprayed homes, the type and quantity of insecticide used and the date of spraying. Also reported are the number of ITNs distributed, the number of people protected, and the dates of net distribution. At sub centre level the name of recipients of LLINs are recorded. In some areas where larviciding is being done, information on coverage area, quantity of larvicides used and the date of application are being recorded. Records are also being kept at health centres and the district malaria control office on biological control activities such as the introduction of larvivorous fish into mosquito breeding sites. The review team was not able to visit areas where larviciding and biological control are being done.

With support from GF, vector surveillance is carried out in 10 sentinel sites of which 7 are in highly endemic areas and 3 in low endemic areas. The frequency of entomological data collection is once a month. The field team comprises of 2 entomologists, 4 supporting staff and 24 insect collectors.

The vector parameters examined by these surveys include vector species presence, density, parity rate, human blood index and larval density. In non-sentinel sites spot checks are made once in a year.

8.4 HUMAN RESOURCES

There appears to be adequate health staff for malaria surveillance. At central level a unit is responsible for supervision, monitoring and evaluation. One of the strengths of the program is the availability of staff whose functions include surveillance. Key staff include Malaria Program Officers at puskesmas and in each district and province. Medical officers appointed to serve in puskesmas undergo training in various aspects of health programmes; two days are devoted to malaria prevention and control, including surveillance. The paramedics working in the sub health centres are graduates in health science with specialized 2-years of training in public health. Aside from human resources, each health facility is provided with a computer.
8.5 MONITORING AND EVALUATION

Cascade supervision and monitoring is being done from central level to province, district, puskesmas and sub-centres. At the central level there are periodic meetings of personnel from the provinces to review the surveillance data and malaria control activities. The meeting is chaired by the head of the CDC department. Similarly 6-monthly meetings are conducted at the provinces for district officers. After the review meetings there is a feedback system to inform provincial and district staff about the deficiencies observed during the review of the programme activities.

Annual evaluations at national level together with other health departments/programmes and with representatives from central level provinces and districts are being done. There are no systematic annual reviews at province and district level, but periodic meetings are being held to assess progress, identify challenges and to plan accordingly. At puskesmas level, monthly meetings are being held.

The population at risk is the total population of an endemic district. As discussed in the previous section malaria is highly focal so by counting the entire population of a district rather than just the population living in endemic areas the actual population at risk is grossly overestimated. This is not good for planning and targeting of interventions.

There is no system for data QA. In terms of completeness of reports, all the 33 provincial health offices submit reports to the central level. However, only around 80% of the districts actually submit reports to the province. There is no information on the completeness of the reports from puskesmas to the district. Thus at the maximum, surveillance data consolidated at central level is only around 80% of the data generated by the public health facilities. Moreover, a survey
in 2010 indicated that around 80% of suspected malaria cases seek care in public sector and are therefore not captured in any routine data collection.

8.6 STRENGTHS

There is a clear system in place for data collection from the lowest health facility level where services are being delivered. The data are consolidated and transmitted all the way up to the national level. Essential information that has epidemiological and operational significance (e.g., age, sex, address and parasite species) is being recorded.

In areas targeted for elimination, communities are involved in surveillance of internal migrants who could be potential sources for re-introduction of malaria. Monthly meetings to monitor progress and address challenges are being done at puskesmas, quarterly at district and provincial levels and every 6 months at central level. Annual evaluations are done at national level together with other health departments/programmes and with representatives from central level, provinces; and The NIHRD conducts periodic surveys on health including information on malaria prevention and control.

8.7 WEAKNESSES

12. Only 80% of the districts report. The level of completeness of reports from puskesmas is not clear.
13. Checking for completeness and quality of data is ad hoc; there is no data QA system in place.
14. Data analysis and utilization for action seems to be weak in some districts and provinces visited. For example it is obvious that the health staff knows who is getting malaria and the location of malaria transmission but LLINs are being distributed in non-endemic areas.
15. The use of information technology including GIS has yet to be fully optimized to enhance surveillance.
16. Data from the private sector is not systematically collected.
17. Data on deaths is only reported those from health facilities; there is not systematic way of capturing malaria deaths occurring outside the health facilities.
18. Although the system for data collection and reporting upwards is clear, the periodic analysis and feedback system seems to be inadequate. It is being only done during periodic meetings and supervisory visits.

8.8 RECOMMENDATIONS

1. Case-based surveillance should be done in all areas in pre-elimination and in elimination phase and should be initiated in low endemic Districts that are not yet in pre-elimination and in elimination phase.

2. Computerized surveillance data management system, including GIS, should be set up at all levels with data entry to be done in every endemic Puskesmas. The system should allow easy compilation at district, province and national levels.

3. The malaria program officers/managers at Puskesmas, District and Provincial levels must periodically analyse the data and use the information for planning, decision making and for advocacy to generate more support. In this regard, they should be properly trained on the epidemiology and control of malaria, including surveillance, monitoring and evaluation.

4. Data QA system should be established and institutionalized.

5. Simple supervision and monitoring check list should be used at different levels and feedback should be done regularly.

6. Internal annual program evaluation at District, Province and National levels should be institutionalized. Central and provincial levels should give priority to known endemic districts that do not provide regular reports as well as those where the burden is very high. The findings and recommendations should be used for planning and decision making.
9. ELIMINATION

9.1. POLICY AND GUIDANCE

In 2009, the MoH issued Ministerial Decree No.293/2009 on the Elimination of Malaria in Indonesia. As a guide in implementation of malaria elimination, the National Malaria Elimination Action Plan was completed and it covers a five-year program implementation period from (2010 – 2014) and estimated costs.

- Malaria elimination is comprehensive and integrated by Government, local authorities, together with development partners, including NGOs, business community, donor organizations, professional organizations, civil and social organizations.

- Elimination is being implemented in phases from the area/city, province, and one island or several islands throughout Indonesia in stages depending on the malaria situation and condition of existing resources.

The elimination program is to be undertaken according to the following phases:

<table>
<thead>
<tr>
<th>Elimination Phase</th>
<th>Year</th>
<th>Elimination Target Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>2010</td>
<td>Thousand Islands (DKI Jakarta, Bali and Batam)</td>
</tr>
<tr>
<td>Phase 2</td>
<td>2015</td>
<td>Java, NAD, Riau Islands</td>
</tr>
<tr>
<td>Phase 3</td>
<td>2020</td>
<td>Sumatra Island (except NAD and Riau Islands), NTB, Kalimantan and Sulawesi</td>
</tr>
<tr>
<td>Phase 4</td>
<td>2030</td>
<td>Papua, West Papua, NTT, Maluku, North Maluku</td>
</tr>
</tbody>
</table>

The strategy includes early detection and treatment of patients, improving access to quality services, empowerment and mobilization of communities, improvement of IEC, promoting partnerships, improved surveillance systems, improved monitoring and evaluation system, and improving the quality of human resources. The target is to achieve the national goal of malaria in 2030, with the following targets: facilities are able to perform the malaria parasite examination by microscopy in 2010. The whole country will have entered into the pre-elimination stage in 2020; and the whole country territory will have achieved elimination of malaria by 2030.
9.2. TARGETS

To achieve the national goal of elimination of malaria in 2030, the targets have been set as follows:

- Facilities able to perform the malaria parasite examination (all patients with clinical malaria dosage checked the blood smear/laboratory confirmation) in 2010.
- The whole of Indonesia areas has entered the pre-elimination stage in 2020.

9.3. INDICATORS

District, Province, and the island where local transmission (indigenous) of malaria has been interrupted for three consecutive years and guaranteed ability to have good supervision.

Technical policy and the strategic elimination of malaria in Indonesia can be grouped into 4 (four) components such as the following scheme:

Figure 30. Scheme of Malaria Elimination

Malaria elimination activities are divided into 4 as contained in the Global Malaria Program, namely: Control, Pre-elimination, Elimination, and Maintenance.
Control:
- Health care unit not capable of examining cases in the laboratory (microscopic).
- Scope of services and resources are limited.
- If all patients with fever at health care unit examination of blood preparations, slide positively rate (SPR) is > 5%.
- The existence of intensive malaria control efforts to achieve the SPR < 5%.
- The involvement of governments, local governments, the private sector, NGOs, professional organizations, International Institutions and other donors (the formation of Gebrak Malaria team or other forum of cooperation that already exists at the provincial and district / province).

Pre-Elimination:
- All health care units have been able to examine the case in the laboratory (microscopic).
- All patients with clinical malaria in the health care unit of blood examination and preparation of the SPR reaches < 5%.
- There is increasing the quality and coverage of malaria control efforts (surveillance, detection and treatment, eradication of the vector) to achieve the API, 1/1000 of the population at risk.
- There is increasing involvement of governments, local governments, the private sector, NGOs, professional organizations, international agencies, donors and others (Gebrak Malaria Team or other forum of cooperation that already exists at the provincial and district/city).
- Availability of legislation at the province/district/city that supports policies and resources for implementation of malaria elimination.

Elimination:
- API has reached < 1/1000 of the population at risk in the unit area at least equivalent to the Regency /municipality.
- Supervision already well underway including the ACD.
- Re-orientation of programs toward the elimination phase for all public and private health workers involved in the removal has been achieved well. • Traffic-related sectors have been fully and synergistic roles of government, local governments, NGOs, professional organizations, international agencies, donors and others in the elimination of malaria as provided by law.
- Efforts to control malaria.
Maintenance:

- Maintaining a fixed zero indigenous cases
- A good surveillance activities are still maintained.
- Re-orientation of the Phase Maintenance program to all health workers, governments and the private sector involved in the removal has been achieved well.
- Consistency of local government responsibilities in the maintenance phase continuously in policy, provision of good resources and other infrastructure resources as stipulated in legislation or regulations in the Province, Districts.

9.4. ORGANIZATION

The Ministerial Decree No.293/2009 specifies regulations for sub-national elimination including establishment of teams at national and provincial levels.
9.5. HUMAN RESOURCES, TRAINING AND CAPACITY DEVELOPMENT

WHO recommends that NMCPs conduct two reorientations: one for the shift to pre-elimination and another one for the shift to elimination. Indonesia has not yet conducted malaria program re-orientation training to facilitate the shift to elimination. Operational guidelines and training curricula form the pre-requisite for conducting such training at national, provincial, and district levels for all stakeholders who are to be involved in the elimination effort.

Through support for training on avian and pandemic influenza for district Rapid Response Teams (RRTs), a foundation for rapid response to outbreaks has been established in some 70% of districts in Indonesia. This provides an opportunity to build upon by additional training of RRTs for malaria focal outbreak investigation and response, thereby integrating the malaria outbreak response capacity into the broader system for infectious disease surveillance and response.

9.6. STRATEGIC AND ANNUAL PLANNING

The overall strategic plan has been developed; however, district, sub-district, and village level plans to operationalize the specific measures for local level elimination still need to be formulated and budgeted in accordance with the National Malaria Elimination Action Plan based upon annual re-stratification according to the village level API and occurrence of indigenous cases. The process for bottom-up and top-down annual planning for elimination is not clearly delineated in terms of how central technical and logistical support will be programmed to support the national elimination plan at provincial, district, sub-district and village levels.

9.7. FINANCING

The key issue for financing elimination of malaria in Indonesia is the allocation of local district budget funds to support elimination with special emphasis on ACD throughout a three year period after cessation of transmission of locally-acquired infections into the maintenance phase until the village, sub-district, and district is certified for elimination of transmission by the Sub-National Committee on Certification of Elimination of Malaria.
9.8. BEST PRACTICES – DISTRICT LEVEL MODEL

Based upon the pilot model developed in Sabang District, Banda Aceh, the components that need to be in place for a district to move into elimination include the following:

- API of <1 during the previous year indicating the capacity to diagnose, directly treat, investigate and follow-up every case.

- Demonstrated political commitment including necessary regulations, formation of multi-sectoral elimination teams/committees at the district and provincial levels, commitment for continued funding at district and provincial levels, and informed leadership of the health services.

- Mapping of household by Geographical Information System (GIS) linked to a data base that can track reported cases back to household and quickly identify foci.

- Near full coverage/usage of LLINs.

- Ability to do high quality malaria microscopy for every fever case and treat positives within 24 hours. This means that there has to be a system of QA in place (RDTs are not well suited for elimination areas because of low sensitivity for detecting P. vivax),

- Ability to confirm cases by Polymerase Chain Reaction (PCR) is important in late stages including the ability to identify the source of infection and discriminate relapses from new infections.

- Ability to do directly observed treatment with ACTs of every positive case including 14-days of primaquine for vivax cases.

- Have in place a network of volunteers that do ACD, preliminary case investigations, and carry out directly observed treatment.

- In addition a system of community based “eyes and ears” to identify and have tested all new arrivals

- Capacity to follow-up every positive case: Pf monthly for 3 months and Pv monthly for 6 months.

- Capacity to rapidly respond to outbreaks including contact surveys, IRS in and around the patient’s house, and follow-up of all positive cases.

- Capacity to carry out mass screening of the population in identified hotspots to detect and treat asymptomatic cases

- Behavioural Change Communication (BCC), IEC messages re-oriented towards elimination. This includes modification of school curricula, media messages, and information for health staff.

- Integration with the private sector on diagnoses, treatment and reporting of malaria cases according to national guidelines.
### Table 12. Elimination: Issues, Successes, Best Practices and Facilitating Factors Problems and Challenges, Recommendations

<table>
<thead>
<tr>
<th>Malaria Elimination Issue</th>
<th>Successes, Best Practices and Facilitating Factors</th>
<th>Problems and challenges</th>
<th>Recommendations</th>
</tr>
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<tbody>
<tr>
<td>National Malaria Program re-orientation</td>
<td>WHO recommends NMCP reorientation; the WHO Bi-regional Malaria Indicator Framework for Malaria Control and Elimination (BMIF) includes this indicator: <em>Country has reoriented the NMCP towards an elimination program in targeted areas based on listed criteria:</em> 1. National strategy updated to incorporate elimination objective. 2. All malaria cases are microscopically confirmed and treated according to national policy (including all cases diagnosed and treated outside the public sector). 3. Microscopy QA systems are fully functional. 4. Implementation of public-private sector policy, where applicable. 5. All malaria cases are notified, epidemiologically investigated, and centrally registered in a database within 1 week after initial diagnosis. 6. Malarious areas are clearly delimited and an inventory of foci has been made. 7. The elimination database has been set up, including GIS–system based on foci, cases, vectors, parasite isolates and interventions. 8. Strategy in place to appropriately allocate human resources. 9. NMCP has conducted a detailed review to calculate projected costs of eliminating malaria over the next 5 years, and have broken this down into annual budgets.</td>
<td>The NMCP should use the WHO criteria to design and plan the process for program re-orientation from control towards elimination. Re-orientation training workshops should be conducted at all levels from national to sub-district for stakeholders including BAPPEDA and non-health sectors.</td>
<td>All cases microscopically confirmed in MCI and LCI areas; all cases treated according to national treatment regimen policy within the public sector and by private sector service providers. Ensure feedback of results of cross-checking to health centers and hospitals. Full integration of private service providers. Ensure case-based notification, 100% investigation, registration in central database for MCI and LCI areas by the end of 2012. Establish central database of foci by compiling district-level databases of foci. Establish elimination databases at provincial, district and central levels including GIS–system based on foci, cases, vectors, parasite isolates and interventions by the end of 2012. Malaria human resource allocation plan for national, provincial, and district levels formulated and approved by the end of 2012. As part of the process of formulating the proposal for GF Round 11, conduct a detailed review to calculate projected costs of eliminating malaria over the next 5 years, with a breakdown into annual budgets, showing budget source by national, district, and donor funds.</td>
</tr>
<tr>
<td>Program Management</td>
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<tr>
<td>Diagnosis and treatment</td>
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<td></td>
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<tr>
<td>Microscopy QA</td>
<td></td>
<td></td>
<td>Ensure feedback of results of cross-checking to health centers and hospitals.</td>
</tr>
<tr>
<td>Private sector integration</td>
<td></td>
<td></td>
<td>Full integration of private service providers.</td>
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<tr>
<td>Case-based notification and registration</td>
<td></td>
<td></td>
<td>Ensure case-based notification, 100% investigation, registration in central database for MCI and LCI areas by the end of 2012.</td>
</tr>
<tr>
<td>Inventory of foci</td>
<td></td>
<td></td>
<td>Establish central database of foci by compiling district-level databases of foci.</td>
</tr>
<tr>
<td>Elimination database</td>
<td></td>
<td></td>
<td>Establish elimination databases at provincial, district and central levels including GIS–system based on foci, cases, vectors, parasite isolates and interventions by the end of 2012.</td>
</tr>
<tr>
<td>Human resources allocation</td>
<td></td>
<td></td>
<td>Malaria human resource allocation plan for national, provincial, and district levels formulated and approved by the end of 2012.</td>
</tr>
<tr>
<td>Estimating budget required</td>
<td></td>
<td></td>
<td>As part of the process of formulating the proposal for GF Round 11, conduct a detailed review to calculate projected costs of eliminating malaria over the next 5 years, with a breakdown into annual budgets, showing budget source by national, district, and donor funds.</td>
</tr>
<tr>
<td>Malaria Elimination Issue</td>
<td>Sucesses, Best Practices and Facilitating Factors</td>
<td>Problems and challenges</td>
<td>Recommendations</td>
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<tr>
<td>Mobilizing domestic budget resources</td>
<td></td>
<td>10. At least 50% of annual malaria elimination budget is from domestic sources.</td>
<td>For GF Round 11, require matching funds from district budgets for implementation of elimination plans, e.g.,</td>
</tr>
<tr>
<td>Provincial-level policy commitment to elimination of malaria</td>
<td>Governor of Aceh Regulation No. 40 Regarding Guidelines for Malaria Elimination in Aceh; establishment of multi-sectoral teams at the provincial and district level; district budget allocation from 2009-2018 by BAPEDAs.</td>
<td>Advocate for the announcement of regulations for malaria elimination to be issued by provinces including budget allocation for maintenance for three years past the planned year when transmission will be interrupted.</td>
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<tr>
<td>Operational Research</td>
<td></td>
<td>Lack of documentation on development of successful models for elimination of malaria: methodology and costs.</td>
<td>Case study: Documentation of the process and costs of elimination of malaria transmission in selected sites (e.g., Sabang District, etc.)</td>
</tr>
<tr>
<td>Procurement and Supply Chain</td>
<td></td>
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<tr>
<td>Availability and timely supply of ACT in MCI and LCI areas</td>
<td></td>
<td>Quantification/prediction of needs in space and time in unstable low endemic areas.</td>
<td>Develop pharmaceutical supply logistics management systems for MCI and LCI areas with strategically located stocks and SOPs for just-in-time response to outbreaks, including distribution of IV and IM artemisinin to hospitals for severe cases.</td>
</tr>
<tr>
<td>Malaria Diagnosis and Case Management</td>
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<tr>
<td>Microscopic confirmation of all cases in MCI and LCI areas</td>
<td></td>
<td>RDTs are not appropriate for elimination areas due to low sensitivity for detecting <em>P. vivax</em>.</td>
<td>In MCI and LCI areas all cases should be confirmed by microscopy; RDTs should not be used unless a blood slide is also taken for microscopic examination.</td>
</tr>
<tr>
<td>Microscopy QA systems</td>
<td></td>
<td>Application of policy guidelines for cross-checking of slides is inconsistent regarding % of negatives cross-checked. In some areas, no feedback from cross-checking is provided to health centers. One province visited had more than 600 microscopically confirmed cases from &gt; 40,000 slides, but only 75 slides were cross-checked by 2 microscopists.</td>
<td>Policy guidelines for cross-checking need to be clarified at all levels. Supervision and monitoring SOPs need to be applied to ensure standards and feedback to health centers and refresher training based upon results of cross-checking.</td>
</tr>
<tr>
<td>PCR-based diagnosis for sub-microscopic parasitemia and asymptomatic cases</td>
<td>MBS was implemented in Sabang district in 2010; 10 asymptomatic cases were detected by microscopy, while 12 additional cases were detected by PCR. Laboratory technical support was provided by the Eijkman Institute with operational support by UNICEF.</td>
<td>Establishing capacity in provincial laboratory, availability of PCR machine, training, support for reagents.</td>
<td>Include OR on PCR high throughput pooling technique for targeted MBS and focal screening and treatment (FSAT) in LCI areas.</td>
</tr>
<tr>
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<tr>
<td>Treatment regimens used by hospitals for uncomplicated and severe/complicated malaria</td>
<td>Some hospitals in MCI and LCI areas have a policy to admit all malaria patients for supervised inpatient treatment.</td>
<td>Clinicians in MCI and LCI areas lack knowledge of treatment guidelines and iv artesunate is not available at some hospitals.</td>
<td>Disseminate treatment guidelines to all hospitals, conduct continuing medical education to periodically update clinicians in MCI and LCI areas.</td>
</tr>
<tr>
<td>Admission of malaria cases for inpatient treatment</td>
<td>Some hospitals in MCI and LCI areas have a policy to admit all malaria patients for supervised inpatient treatment.</td>
<td>Compliance with treatment regimens, especially 14 days of primaquine.</td>
<td>All malaria patients in MCI and LCI areas should undergo DOT through a combination of inpatient treatment and/or home visits by JML/JMD cadres for 3 days for Pf and 14 days for Pv.</td>
</tr>
<tr>
<td>Directly observed treatment</td>
<td>Voluntary return visits to hospitals for follow-up have a low success rate.</td>
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<tr>
<td>Follow-up</td>
<td>Follow-up visits by cadres on day 7 and day 14.</td>
<td></td>
<td>Patients in MCI and LCI areas should be followed-up by cadres with blood slides taken on days 7, 14, 21, 28 for P.f and days 60 and 90 for P.v.</td>
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**Surveillance, Monitoring and Evaluation**

<table>
<thead>
<tr>
<th>Malaria Elimination Issue</th>
<th>Successes, Best Practices and Facilitating Factors</th>
<th>Problems and challenges</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Risk mapping and stratification: elimination by de-activating foci of transmission</td>
<td>Sambang District approach to elimination of active foci (villages with transmission), stratification into foci A, B, C, D; targeted interventions based upon category of foci</td>
<td>Lack of database on foci of transmission, planning and targeting interventions by foci, lack of reporting on number of active foci</td>
<td>Stratify all foci (villages) by API, determine receptivity (risk of transmission) and vulnerability (risk of importation), target interventions in high risk active foci, track and report number of active foci</td>
</tr>
<tr>
<td>Area stratification</td>
<td>Using operational indicator for area stratification (control or pre-elimination: SPR &gt; or &lt; 5%)</td>
<td></td>
<td>Consider using epidemiological indicator for classifying highest endemic area by API rather than by SPR, e.g. Ciamis uses API &gt; or &lt; 5</td>
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<tr>
<td>Active case detection</td>
<td>ACD by village cadres (JMLs and JMDs) in MCI and LCI areas. District supports monthly subsidy, uniforms, status as public health staff</td>
<td>Need to target high risk foci and optimize the frequency of house visits (once or twice per month). Weak record keeping and supervision systems. Need guidelines on when to stop ACD. Single disease detection function is neither efficient nor sustainable in the long-term. How to enhance the role and function of cadres for integration with the health system?</td>
<td>Conduct ACD once a month in LCI foci and twice a month in MCI foci, continuing for three years after interruption of transmission in the maintenance phase. Once areas enter into maintenance phase, consider expanding the role of cadres to include functions related to ANC screening for malaria, dengue, TB, HIV, influenza, locally significant infectious diseases, diabetes, etc.</td>
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<tr>
<td>Special case detection</td>
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<td>Special ACD should be conducted in foci with high risk of importation and in-migration.</td>
</tr>
<tr>
<td>Case Investigations</td>
<td>Hospitals are not providing case-based notification to DHOs; cases treated in hospitals are not investigated.</td>
<td></td>
<td>Establish systems for case-based reporting from hospitals to DHOs; investigate all cases in pre-elimination, elimination, and maintenance areas. Train Rapid Response Teams for focal outbreak investigation and response.</td>
</tr>
<tr>
<td>Classification of cases by source of infection (import or indigenous)</td>
<td>The data on the geographical source of infection for imported cases is captured on the case investigation form; however, it is not used for breakdown of case classification of imports. For elimination purposes, it is necessary to determine if imported cases are from the same district, since the unit of analysis for interruption of transmission is the district.</td>
<td></td>
<td>Establish fields of data in the case investigation/classification system to indicate the source of imported cases, i.e., imported from: 1) another village, 2) another sub-district, 3) another district, 4) another province, 5) another country.</td>
</tr>
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<tr>
<td>Notification of imported cases to the DHO at the source of infection</td>
<td>Health officials responsible for elimination of transmission at sources of infection for imported cases are not notified of cases originating in foci under their responsibility.</td>
<td>Establish a system for notifying officials responsible for the source of infection of imported cases to register the cases at the foci where the infection was acquired.</td>
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<tr>
<td>Focal outbreak investigation contact surveys</td>
<td>The NMCP policy is to implement Mass Fever (contact) Surveys in the area within a radius of 100 meters from the house of the case. One site visited applied this within a radius of 50 meters. The flight range of malaria vectors can range to 2 km, thus the limited geographic scope of the contact survey is likely to result in missing some positive persons in the foci.</td>
<td>Conduct Mass Blood (contact) Surveys during focal outbreak investigations to identify asymptomatic cases by covering a larger area radius (e.g., 250 meters).</td>
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<tr>
<td>Focal Outbreak Response</td>
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<td>Implement IRS to respond to focal outbreaks.</td>
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<tr>
<td>Indicators for evaluating success towards elimination</td>
<td>Indicators currently being used are not specific for elimination phase: total API (indigenous + imported cases), positive cases (including imports)</td>
<td>The NMCP should consider using elimination program specific indicators for measuring progress and success (e.g., WHO Elimination Field Manual and Bi-regional Malaria Indicator Framework): API for locally-acquired infections (indigenous cases), percentage of districts where transmission has been interrupted (&lt; 3 years) or eliminated (&gt;3 years), number of active foci, population at risk (residing in active foci in current or prior year, WHO Field Manual for Elimination).</td>
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9.9. SUMMARY OF RECOMMENDATIONS REGARDING MALARIA ELIMINATION IN INDONESIA

- Program Re-orientation and Provincial Commitment: The NMCP should apply the WHO criteria to design and plan the process for program re-orientation from control towards elimination. Operational guidelines should be produced for dissemination through program re-orientation/advocacy/training workshops conducted at all levels from national to sub-district for multi-sectoral stakeholders including BAPPEDA and non-health sectors. The NMCP should advocate for announcement of provincial regulations for elimination of malaria.

- ACD and Special Case Detection: Conduct ACD once a month in LCI foci and twice a month in MCI foci, continuing for three years after interruption of transmission in the maintenance phase. Special ACD should be conducted in foci with high risk of importation and in-migration including targeted focal screening through mass blood surveys to identify asymptomatic cases, including using PCR techniques.

- Notification of Malaria Infection: A top priority should be enacting legislation to specify malaria as a reportable/notifiable disease for case-based reporting in the integrated disease surveillance and response system (ISDR), requiring timely notification by all service providers irrespective of the patient’s place of residence or their first point of contact with public/private health services. A system of classification of imported cases and notification to the
source of infection should be established for communication across districts and provinces to facilitate elimination of transmission in foci. This is the necessary prerequisite to prompt investigation of all cases and rapid response to outbreaks.

- Elimination Program Databases: The NMCP needs to establish elimination databases at district, provincial, and central levels including a geo-referenced national malaria patient register, and GIS-based system including foci, cases, vector distribution, and parasite isolates to support the national plan for elimination.

- Case and Focal Outbreak Investigation: All cases must be investigated in elimination areas. RRTs should be established at all District Health Offices in areas with high receptivity and vulnerability (importation). The RRTs should be trained in focal outbreak investigation and response, and equipped with the necessary equipment and supplies (spray cans, insecticide, LLINs, RDTs, and ACTs) ready for rapid deployment for focal outbreaks.

- Treatment and Follow-up: Provincial Health Offices with primarily MCI and LCI areas should set a policy to admit all malaria patients, implement directly observable treatment (DOT) through home visits by cadres for 3 days for *P. falciparum* and 14 days for *P. vivax*, with follow-up blood slides taken by cadres on days 7, 14, 21, 28 for *P. falciparum* and days 60 and 90 for *P. vivax*.

- Financing Elimination: During the process of formulating the proposal for GF Round 11, the NMCP should conduct a detailed review to calculate projected costs of eliminating malaria over the next 5 years, with a breakdown into annual budgets, showing budget source by national, district, and donor funds. As a condition precedent for allocation of GF Round 11 funds to districts, a proportional match of funds from district budgets should be required for support to implement elimination plans.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
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<tbody>
<tr>
<td>GF</td>
<td>80%</td>
<td>60%</td>
<td>40%</td>
<td>20%</td>
<td>0%</td>
</tr>
<tr>
<td>District</td>
<td>20%</td>
<td>40%</td>
<td>60%</td>
<td>80%</td>
<td>100%</td>
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- Measuring Success: The NMCP should consider using elimination program specific indicators for measuring progress and success e.g., from the WHO Field Manual for Elimination of Malaria and the WHO Bi-regional Malaria Indicator Framework (BMIF):

Examples include:

1. API for locally-acquired infections (indigenous cases)
2. number/percentage of districts where transmission has been interrupted (< 3 years) or eliminated (>3 years)
3. number of active foci
4. reduction of population at risk (population living in a geographical area (foci = village) where locally acquired malaria cases occurred in the current and/or previous year
10. CONCLUSIONS

It has been 20 years since the last Programme Review. During that time the National Malaria Control Programme has made significant progress and the Country is now officially moving towards malaria elimination.

Malaria continues to be a public health problem in Papua, Maluku, Nusa Tenggara, Sulawesi, Kalimantan and Sumatra. It occurs with low frequency in Java and Bali where approximately 70% of the population lives. The major disparity between the western islands including Java/Bali and the eastern provinces is the result of combination of environmental factors, characteristics of individual vector mosquitoes and a variety of socioeconomic factors that together represent the so-called intrinsic malaria transmission potential.

Important environmental factors include climatic elements such as average temperature, humidity, and rainfall all of which combined determine whether or not suitable mosquito breeding sites exist and how long adult mosquitoes survive.

Vectors vary in their potential to transmit malaria. Factors such as whether a specific species preferentially feeds on humans or animals, when and where mosquitoes bite determine a vector’s potential to transmit the disease. Mosquitos that primarily bite outside during the early evening hours pose the greatest risk because they tend to avoid most prevention methods such as insecticide treated nets and indoor residual spraying.

Socioeconomic factors such as the quality of housing, access to health care, migratory status, and land use also contribute to the disparity in the level of malaria seen across Indonesia. Overall the potential for malaria transmission is directly related to the level of socioeconomic development. Poorly developed parts of the country where a majority of the population are migrants that live and work in forested areas where housing tends to be poor and have limited are at the highest risk and are least likely to be covered by ITNs or IRS.

This difference in transmission potential means that the intensity of malaria control interventions required to have an impact. More resources are required to knock down the number of cases and as with most interventions the problem is to attain high levels of coverage. There is good evidence that with good coverage of ITN/LLIN, good quality targeted IRS, and a health system that is able to diagnose and treat malaria can reduce malaria even in the most difficult areas.

The same factors contribute to the frequent malaria outbreaks that are more common in some provinces and which tend to be reported in the media. The objective of malaria control is to reduce or interrupt transmission of the parasite and not to eradicate the vector mosquitoes so mosquitoes are and will continue to be present even in areas that have been verified as malaria free. The risk of and outbreak occurring is therefore always present but the level of risk can be reduced by regular use of insecticide treated mosquito nets, indoor residual spraying especially in areas where an outbreak is occurring. To be able to detect and respond
to outbreaks the health system needs to first have an active surveillance system and second to have in place staff with the skills and equipment to respond.

In areas with continuing transmission such as in the eastern provinces outbreaks are common and should be picked up by the malaria surveillance system. There are dedicated malaria staff available with the equipment to respond. In areas where cases are low outbreaks are less frequent but when they occur can result in large numbers of cases. In such low transmission areas an effective surveillance system whether it continues to be a separate malaria system or part of an integrated health information system is a necessary requirement. Once triggered a response has to follow standard operating procedures involving trained well equipped staff. If the response is rapid and effective an outbreak can be reduced but not prevented.

The need for good surveillance and the ability to rapidly respond to outbreaks will continue to be more important as provinces move towards elimination. There is clear political pressure for a rapid transition from control to prevention and there are examples of where this is effectively taking place but it should only happen when it has been determined that the necessary elements are in place.

One of the best examples is Aceh where the Review Team saw a rigorous surveillance system that is capable of detecting and responding to outbreaks. A system of community based surveillance, treatment and follow-up of cases effectively supplements efficient integrated health information systems that together are sensitive enough to detect and respond to changes in malaria transmission. The Review Team saw a similar system that is just beginning to be implemented in Wonosobo. Other provinces and districts need to learn from the experiences in Aceh and Wonosobo.

The question was raised whether the national target date for malaria elimination of 2030 could be moved up a few years. The Review Team although convinced that Indonesia will attain the goal of elimination felt that given the size of the country and the varied levels of transmission and economic development it would be counterproductive to try to speed up the process. We are already seeing districts in low transmission areas moving towards elimination but those are the easy ones. When we look at provinces such as Papua or the Moluccas where transmission is intrinsically more intense and where development has been slower it is going to take longer and a larger investment to attain elimination. The current strategy of a stepwise move to elimination fits with this longer view and unless there are major changes in control strategies over the next 19 years 2030 remains a reasonable and attainable target.

An important factor that may eventually impact on the national goal of malaria elimination is going to be the sustainability of funding. The availability of funds from the GF has been the key to the scaling up of malaria control over the past 10 years and has for the first time made the goal of elimination possible but it will not continue forever. There are some indications that 2010 represented the peak of GF funding and that from now on funds will be more and more limited. This might not turn out to be the case but the MoH needs to begin to think
about (1) How it can complete the job of malaria elimination, and (2) How it will be able to sustain the malaria free status once external funding either is reduced or stops altogether.

Integration of malaria control into the general health system will be a key to the sustainability of malaria control activities and to sustaining advancements already made. It will enable malaria control activities to continue in situations with limited resources but it can only do that where health systems are sufficiently developed to be able to implement specific control strategies on a continuing basis. It will also mean that the current vertical malaria control programme will have to change its ways and accept that it is a part of the general disease control component of the national health services. Such a change in the mind set of current malaria control workers will be difficult but integration is going to have to occur even if adequate levels of funding continue to be available because once malaria cases reach a point where the disease is no longer a public health problem the current vertical program has to be dismantled and resources shifted to other communicable diseases.

In Indonesia de-centralization represented the initial step towards integration of malaria control into the general health services. Rather than being a negative factor for malaria control the Review Team general felt that from the country visits it looked like de-centralization has had a positive effect on malaria control. Without a rigid national structure individual provinces have been able to adapt in terms of staff and other resources while at the same time adjusting their control activities to be more in line with local needs. The Review Team clearly saw this in some of the provinces visited. In Wonosobo the Team found a clearly independent programme headed by a highly innovative supervisor who once removed from central control and a “one size fits all” approach was able to apply basic principles to his local situation and come up with an effective elimination plan that is being funded in large part by the District. The Team found the same in Aceh where the province has had the additional support of UNICEF and other external partners. An example of this level of independent thinking was seen in Aceh where the BAPPENAS officer showed a clear understanding of the need for long term funding to maintain elimination once it is achieved.

The final important point is that Indonesia has already met Millennium Development Goal 6.B: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases. Except in some of the eastern provinces the incidence of malaria has clearly been reduced but nationally incidence has been reversed. The reduction of malaria has also contributed to the reduction of maternal mortality (MDG 5.A) in most provinces although the Review Team did not see data that directly supports this.

This report clearly reflects that major accomplishments made by the NMCP but it also indicates areas where changes need to be made. Overall the Review Team found that malaria control in Indonesia is strongly biased towards treatment and has neglected prevention based on vector control and personal protection. It was difficult to get data on coverage with ITN/LLIN and IRS and during visits to the field it was clear that there was a lack of priority placed on this component of the Programme. Rather than concentrating on attaining high levels of coverage with nets and spraying the distribution of nets appeared to have been
poorly organized and monitored. Similarly there was no indication that spraying operations were being carefully planned and lacked any sort of quality control mechanism. If the goal of malaria elimination by 2030 is to be attained especially in areas with higher levels of transmission more emphasis must be placed on this set of interventions. Treatment by itself is not going to be enough.

The Review Team was not able to clearly understand the HR and training components of the Programme even though it was clear that there was a need to improve malaria diagnosis especially malaria microscopy. Staff at all levels need training in the concepts and practical aspects of malaria elimination.

The other area that the Review Team was not able to address was community mobilization, BCC and IEC activities. Communities are involved in most areas and this was clearly shown in the areas visited that were moving towards malaria elimination. Community based diagnosis and treatment and community based surveillance including active case detection represent examples of best practices that other programmes in the Region should use as examples.

The models for malaria elimination that the Team saw in Aceh and Wonosobo included the full set of strategies in the hands of well training and motivated staff that have full political support from the district and provincial levels. These and other examples of elimination models now need to be incorporated into a set of national malaria elimination guidelines. This will ensure that as new districts move into pre-elimination they are able to benefit from the experience and lessons learned by places like Aceh and Wonosobo but it is important that at the same time districts are given the necessary technical support to adapt and develop models based on local situations that address the key factors determining the intrinsic malaria potential mentioned above.
REFERENCES


Lindsay, S.W., Emerson, P.M., Charlwood, J.D., 2002. Reducing malaria by mosquito-proofing houses. Trends Parasitol. 18, 510–514.


