

Papua New Guinea



DEPARTMENT OF HEALTH

NATIONAL MALARIA STRATEGIC PLAN 2014-2018

*Achieving and sustaining universal coverage and access to
malaria control interventions.*

24 March 2014



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FOREWORD



Malaria remains one of the major public health concerns in Papua New Guinea (PNG). It continues to seriously affect our most vulnerable populations such as our pregnant mothers and our young children.

Since the implementation of the last National Malaria Strategic Plan 2009 – 2013, the program has moved forward providing quality diagnosis and effective treatment. The National Malaria Control Program (NMCP) was successful in the roll out of the Long lasting insecticide treated Nets (LLINs) with the program partners Rotarians Against Malaria (RAM). Through this partnership the NMCP has achieved LLIN distribution coverage of over 95% nationwide. The utilization of nets has also increased among the most at risk populations as a result of the advocacy efforts by Population Services International (PSI).

These efforts with resources from the Global Fund (GFATM) have resulted in the continued decline in Malaria prevalence according to Papua New Guinea Institute of Medical Research (PNGIMR) surveys. The National Health Information System (NHIS) also demonstrates a continued downward trend in reported Malaria cases.

After the end of the National Malaria Control Strategic Plan 2009-13 (NMCSPP 2009-13) ended in 2013, an extensive review was conducted of the program to see the achievements, strategies applied and further improvements to the highlighted changes in the epidemiology of Malaria in PNG.

The Program Review further highlighted many issues and recommendations to improve on the gains made over the last decade. This review laid the foundation for the development of this next National Malaria Control Strategic plan 2014-18 (NMCSPP 2014-18). This plan will aim to maintain the gains made and further intensify control efforts for continued reduction of Malaria as a public health problem.

The Program is faced with a mammoth task of increasing the clinical adherence by the 6000 plus health care workers throughout the country to be fully compliant with the new diagnosis and treatment protocols, continue mass distribution of Long Lasting Insecticide Treated Nets (LLINs), behaviour change communication (BCC) efforts and community based distributor (CBD) program to ensure the availability of good diagnosis and treatment at the village level to reach the unreachable.

Sustaining tolerable levels of Malaria and moving into eliminating of Malaria in PNG within the next decade will require a high level of political commitment, strengthened in-country cooperation, and strengthening the Public Private Partnership (PPP) as a government endorsed policy. The fight against Malaria needs to be integrated into

the overall development agenda in the country. We cannot achieve further progress unless we work tirelessly to strengthen the health system (HSS) and ensure that sustained and predictable financing is available. This National Malaria Control Strategic Plan 2014-18 shows how far the NMCP has come in the struggle against Malaria and provides a strategic direction on the way forward for the NMCP. It is now going to be a collective effort as a country to collectively act with urgency and determination to maintain this tremendous progress and further improve on these achievements gained.

I challenge all stake holders, including governments at all levels, NGOs, community and church based organizations, the resource sector, multi and bilateral donor partners and most importantly the citizens of this country to implement this plan and achieve its goals to stop the unnecessary suffering and the easily avoidable deaths.

Thank you

Honourable Michael Malabag (MP)
Minister for Health and HIV

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The production of this document has involved so many stakeholders through a very wide consultation process. These consultation process included hospital managements, provincial and district authorities, multi-lateral and bilateral partners, our traditional partners in RAM, PSI and OSHF and many other stakeholders.

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Thank you

Mr Pascoe Kase

Secretary

Acronyms

AQ	Amodiaquine
ANC	Antenatal Care
AMS	Area Medical Store
AL	Artemether-Lumefantrine
ACT	Artemisinin-based Combination Therapy
AMT	Artemisinin-based Monotherapy
ADB	Asian Development Bank
AusAID	Australian Agency for International Development
BCC	Behaviour Change Communication
CA	Central Agency
CPHL	Central Public Health Laboratory
CQ	Chloroquine
CHS	Church Health Services
CMC	Churches Medical Council
CHW	Community Health Worker
CBO	Community-Based Organization
DSP	Development Strategic Plan
DDT	Dichlorodiphenyltrichloroethane
DHM	District Health Manager
DWU	Divine Word University
EHO	Environmental Health Officer
FBO	Faith Based Organization
GF	Global Fund for AIDS, TB and Malaria
GPIRM	Global Plan for Insecticide Resistance Management
GoPNG	Government of PNG
GDP	Gross Domestic Product
HC	Health Centre
HEO	Health Extension Officer
HIS	Health Information System
HSIP	Health Sector Improvement Programme
HSS	Health Systems Strengthening
HMM	Home-based Management of Malaria
HIV	Human Immunodeficiency Virus
HR	Human Resources
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Bednet
IMR	Institute of Medical Research
iCCM	Integrated Community-based Case Management
IPC	Inter-Personal Communication
IPTp	Intermittent Presumptive Treatment during pregnancy
IPTc	Intermittent Presumptive Treatment in children

LLIN	Long Lasting Insecticide-treated Bednet
MPR	Malaria Programme Review
MSCU	Malaria Surveillance and Control Unit
MTEF	Medium Term Expenditure Framework
MP	Members of Parliament
MDG	Millenium Development Goal
M&E	Monitoring and Evaluation
NDoH	National Department of Health
NEC	National Executive Council
NHIS	National Health Information System
NHP	National Health Plan
NMCP	National Malaria Control Programme
NMSP	National Malaria Strategic Plan
NTG	National Treatment Guidelines
NZA	New Zealand Aid
NGO	Non-Governmental Organization
OSHF	Oil Search Health Foundation
oAMT	oral AMT
OPEC	Organization of Petroleum Exporting Countries
PNG	Papua New Guinea
PAF	Performance Assessment Framework
PSB	Pharmaceutical Services Branch
PSSB	Pharmaceutical Services Standards Branch
PSI	Population Services International
PR	Principle Recipient
PSM	Procurement and Supply Management
PDCO	Provincial Disease Control Officer
PHA	Provincial Health Authority
PHIO	Provincial Health Information Officer
PHO	Provincial Health Officer
PIP	Provincial Improvement Programme
PMS	Provincial Malaria Supervisor
QA	Quality Assurance
RDT	Rapid Diagnostic Test
RLC	Regional Logistics Coordinator
RBM	Roll Back Malaria
RAM	Rotarians Against Malaria
SCF	Save the Children Fund
SMS	Short Message Service
SOP	Standard Operating Procedures
SP	Sulphadoxine-Pyrimethamine
TA	Technical Assistance
TWG	Technical Working Group
ToR	Terms of Reference

TES	Therapeutic Efficacy Study
TOT	Training of Trainers
TSS	Tropical Splenomegaly Syndrome
UNDP	United Nations Development Programme
UG	University of Goroka
VBA	Village Birth Attendants
VHV	Village Health Volunteer
WHO	World Health Organization

1. BACKGROUND

1.1. Introduction

Malaria remains one of the most important public health problems in Papua New Guinea (PNG) and the National Health Plan 2011-2020 identifies reducing malaria-related morbidity and mortality as one of its key objectives.

PNG has been scaling-up the essential package of malaria prevention and control interventions over the last five years and experiencing a consistent reduction in the number of reported malaria cases and deaths (both confirmed and clinically diagnosed). Between 2009 and 2012, there has been a 39% reduction in the number of reported cases (down from 1,431,395 to 878,371); a 60% reduction in malaria admissions (down from 22,986 to 9,238); and, a 50% reduction in reported malaria deaths (down from 604 to 301)¹.

PNG is party to a number of international health initiatives, conventions, and treaties, which place certain health and health-related obligations on the country. The Millennium Declaration of 2000 assumes primary importance in the achievement of the country's Millennium Development Goals (MDGs) across several sectors, including health. The health sector has a significant role in achieving Goals 4, 5 and 6: 'Reduce Child Mortality'; 'Improve Maternal Health'; and, 'Combat HIV/AIDS, Malaria and Other Main Infectious Diseases'. In addition the health sector contributes towards achieving MDG 1 'Reduce Poverty' and MDG 7 'Ensure Environmental Sustainability'.

The 'National Malaria Strategic Plan' (NMSP) provides the framework for the selection, development and deployment of malaria interventions, itself informed by the 'Regional Action Plan for Malaria Control and Elimination in the Western Pacific Region (2010-2015)'. The most recent NMSP was developed for the period of 2009-2013. This new NMSP covers the period 2014-2018. Its development process started with a comprehensive Malaria Program Review (MPR) commissioned by the National Department of Health (NDoH) in April 2013. Findings from the MPR were presented to partners and stakeholders, and the priority areas for the next period of implementation were highlighted. A series of regional malaria meetings were then conducted with the participation of provincial stakeholders during which feedback was gathered on the MPR findings and on the priorities identified. The National Malaria Control Programme (NMCP) then worked with technical partners to develop a draft NMSP based on the findings of the MPR and the subsequent consultations. The draft NMSP was disseminated and discussed and then fine-tuned based on feedback before being finalized and adopted during a final NMSP workshop attended by a wide range of stakeholders from both the public and the private sector, including provincial health officers, senior NDoH staff and Australian Agency for International Development (AusAID) and World Health Organization (WHO) advisors.

¹ World Malaria Report 2013.

1.2. Country profile

PNG is an island country 160 kilometres north of Australia. It comprises the eastern half of the island of New Guinea plus some 600 smaller islands. With a total land area of approximately 465,000 square kilometres PNG is the second largest island country in the South Pacific region after Australia. In the west it shares a land border with Indonesia's Papua Region.

1.2.1. Ecosystem, Environment and Climate

Parts of the mainland and larger islands are mountainous and rugged. The highest mountain range rises to more than 4,700 meters. The mountains are the source of fast-flowing rivers that descend to the coastal plains to form some of the largest river systems in the world including the Sepik River in the north and the Fly River in the south. Land types range from swamps and savannah grasslands on the coast through tropical rainforests to alpine forests and grasslands in the highlands. PNG is tectonically active and has a number of large active volcanoes.

Figure 1.2.1. Papua New Guinea.



The climate is tropical and monsoonal with only two seasons, the wet and the dry. Rainfall varies from 1,000mm *per annum* in Port Moresby and some other coastal areas to more than 8,000mm *per annum* in mountainous areas. Temperatures range from 20°C to 35°C in the coastal areas and from 4°C to 30°C in the highlands.

1.2.2. Political context

PNG has had an unbroken record of democratic continuity since its independence in 1975. Executive power is exercised by the Head of State and the National Executive Council (NEC, Cabinet) chaired by the Prime Minister, Rt. Hon Peter O'Neill. The Prime Minister is also the head of the People's National Congress Party. There are 109 elective seats (89 open constituencies and 22 provincial constituencies).

On 7 July 2010, PNG's Supreme Court ruled that sections of the 2003 '*Organic Law on the Integrity of Political Parties and Candidates*' were constitutionally invalid, including those provisions that required Members of Parliament to vote along party lines on matters such as the budget and motions of 'no confidence'. The ruling also freed Members of Parliament (MPs) to resign from or switch political parties, something that had previously been prohibited under that law. This ruling has opened up the Government to increased political challenge.

PNG is administratively divided into four regions and 22 provinces: Southern (Milne Bay, Gulf, Central, NCD, and Western Province, Oro); Momase (Morobe, Madang and Sepik provinces); Highlands (Eastern Highlands, Southern Highlands, Hela, Western Highlands, Jiwaka, Enga and Chimbu); and the New Guinea Islands (East and West New Britain, Autonomous Region of Bougainville, New Ireland and Manus).

PNG has 89 districts, and 284 local-level governments. Each local-level government has many wards (5,747 in total). Each ward is made up of many hamlets, villages, and non-traditional village areas.

The legislative functions of the various levels of Government in relation to Health are clearly defined under the 1996 '*Organic Law on Provincial Governments and Local Level Governments*', the 1997 '*National Health Administration Act*', 1994 '*Public Hospitals Act*' and more recently the 2007 '*Provincial Health Authorities Act*'.

1.2.3. Socio-economic context

PNG has a wealth of natural resources that includes gold, oil, gas, copper, silver, timber as well as productive fisheries. The population is diverse, and social groups are small and fragmented. Over 800 distinct languages are spoken. The economy is dualistic in that it has a formal sector on one side focused on the large-scale export of natural resources, and a large informal sector on the other side in which subsistence agriculture and fishing for survival is central. PNG is home to some of the most isolated communities on the planet.

Following a series of macroeconomic crises in the 1990s, PNG is now experiencing an economic recovery following a return to economic growth in 2003. While the rest of the world was feeling the affects of the Global Financial Crisis, PNG has experienced 5% growth in real Gross Domestic Product (GDP) since 2005². About 80% of the post-2003 economic growth was due to the mining and petroleum sectors³, with the US\$15 billion PNG-LNG investment being the most notable. However,

² Thomas Webster and Linda Duncan, eds. *Papua New Guinea's Development Performance: 1975–2008*, National Research Institute Monograph No. 41, 2009. Growth figures quoted in the Government of Papua New Guinea *Mid-Year Economic and Fiscal Outlook Report 2009* are slightly higher.

³ *Millennium Development Goals Progress Report for Papua New Guinea, 2009*.

other significant investments in communications, construction and real estate, for example, have also given the economy significant impetus and created spill-over into other sectors. These investments have supported growth in formal employment, creating shortages of skilled labour⁴.

Despite recent growth and investment, PNG is still one of the least urbanised countries in the world,⁵ with as many as 87% of the population living in rural areas.

The PNG population is estimated at 7.34 million, based on average annual growth rate of 3.2% (National Health Plan (NHP) 2011-2020). It has a young structure with 40% aged 0–14, 20% aged 15–24 and 16% aged 25–34. In total, 76% of the population is 34 years or younger.

In 2012 PNG was ranked 156 out of the 186 countries scored on the Human Development Index, which measures multiple dimensions of poverty⁶. Gross national income per capita was US\$2,386 in 2012, which was substantially lower than regional (US\$6,874) and global averages (US\$10,184). Poverty in PNG was calculated at 39.9% in 2009⁷, compared with 54% in 2004⁸. Adult and youth literacy rates are low, at 61% and 68% respectively in 2010⁹. The percentage of the population with access to an improved source of water is low at 16.4% (DHS 2006), as is access to sanitation at 1.8% in rural areas and 46.7% in urban areas (DHS 2006).

Table1.2.3. Key development indicators in Papua New Guinea

Development indicators	Measure	Year	Source
Human Development Index	0.466	2012	UNDP
Gini coefficient	50.9	1996	World Bank 2012
Adult literacy	60.9% (♂63.9%, ♀57.3%)	2010	Index mundi 2014
Population living below the national poverty line (%)	39.9%	2009	World Bank 2014
Total health expenditure	4.28% GDP	2011	Index mundi 2014
Life expectancy at birth	62.8	2011	Index mundi 2014
Infant mortality rate	44.8 /1,000 live births	2011	Index mundi 2014
Under-5 mortality rate	57.8 /1,000 live births	2011	Index mundi 2014

⁴ World Bank, Papua New Guinea Overview, 2013

⁵ Based on the 2000 Census of Population and Housing. The next census will be carried out in July 2011.

⁶ United Nations Development Programme, 2010.

⁷ <http://data.worldbank.org/country/papua-new-guinea>

⁸ John Gibson, 2000. "The Papua New Guinea Household Survey," *Australian Economic Review* 33(4):377-380; and World Bank, Papua New Guinea Poverty Assessment 30 June 2004.

⁹ <http://www.indexmundi.com/facts/papua-new-guinea/literacy-rate>

Maternal mortality rate 230 /100,000 live births* 2010 Index mundi 2014

* Modeled estimate developed by WHO, UNICEF, UNFPA and the World Bank

1.2.4. Population Migration

The scale-up of activities in the mining and petroleum sectors has important consequences for controlling malaria, with a large mobile population of both national and international staff that tend to work on a fly in fly out (FIFO) basis. There is a heightened risk of non-immune populations being exposed to malaria, especially for workers moving between the highly endemic coastal areas and the highlands provinces.

Similarly the Regional Refugee Processing Centre in Manus, which holds refugees seeking asylum in Australia is an important concern as it is filled with migrant populations many of whom lack immunity to malaria. The associated influx of visitors to Manus (PNG and Australian government officials and commercial travellers) is also a concern in relation to non-immune populations.

1.3. Health Services in Papua New Guinea

1.3.1. Organization of health services and delivery systems

In PNG, health services are primarily the responsibility of the State, delivered through a decentralized public management system. The non-state sector through church health services also play a critical role in the delivery of health care, managing and providing a large proportion of the rural health services across the country. The Government provides 79% of total health expenditure, and subsidizes the church health services to such an extent that they are considered part of the public system. The system is financed predominately through tax revenue and donor funds, and at the health facility level user fees are charged to supplement the lack of operating funds (user fees will be phased out progressively province by province following the launch of the *Free Primary Health Care and Subsidised Specialist Services Policy* in 2013). The private sector involvement in the provision of health care is relatively small, with the majority of it provided through mining company employee-related health programmes. Health services in PNG are organised at five levels: central, provincial, district, sub-district, and village.

The health services system in PNG applies a primary health care concept, with health centres being the main operational units for the system. The health centres are backed up by a referral system consisting of: first-level hospitals (district hospitals); second-level hospitals (provincial hospitals); and a national referral hospital (Port Moresby General Hospital).

Almost all provinces have one provincial hospital. These hospitals are under the direct control of the national government. In addition, bigger towns have urban clinics, while rural areas have rural health centres, sub-centres, and Aid Posts.

In 2013, there were 22 provincial hospitals, 734 registered health centres and 1,672 Aid Posts that serve the majority of the provincial population.

Health centres are defined for catchment populations of between 5,000 and 10,000 with a 20-bed capacity. Health centres typically have at least one health extension officer, several nursing officers and community health workers. Urban clinics receive referrals from Aid Posts and health sub-centres with a catchment population away from the provincial capital of more than 10,000 people. Health sub-centres are staffed with one nurse and a few community health workers (CHW). Aid Posts serve a defined population of between 500 and 2,000 often in remote locations and have one CHW.

With the exception of two rurally located hospitals, church-run health services serve 80% of the rural population and make up the bulk of rural health services in PNG, managing around 46% of facilities and 52% of service delivery. Church-run health services are often located in more remote areas.

The private health sector is very small in PNG, principally consisting of mining sector facilities, private doctors, and traditional healers. There are approximately 80–100 private practitioners in PNG, with most located in Port Moresby and Lae. Traditional healers provide close to 5% of healthcare in rural areas, and slightly less in urban areas.

1.3.2. Health policy and regulatory framework

The National Government has overall responsibility for providing health services to its people, overseeing the health system, and establishing and implementing national policy. At national level the role is thus to guide and influence policy directions to the health sector, support the National Health Board to develop and recommend the National Health Plan to Government, develop standards that are evidence based and sustainable, monitor the implementation of the National Health Plan (and Standards) and provide technical assistance and support to Provinces. The Provinces and Districts are responsible for health service delivery and programs and for ensuring that sufficient funds are made available for operation of these services.

The National Government is responsible for setting the development directions of the country through a number of overarching plans and policies which are interlinked and which underpin the NMSP 2014-2018). These plans and policies include:

- **Vision 2050.** Vision 2050 maps out PNG's development initiatives for the next 36 years and identifies seven strategic pillars underpinning economic growth and development.
- **Papua New Guinea Development Strategic Plan (PNGDSP) 2010-2030.** The PNGDSP translates the seven strategic pillars of Vision 2050 into directions for economic policies, public policies and sector interventions with clear objectives, targets and indicators.
- **Medium-Term Development Plan (MTDP) 2011-2015.** The MTDP is guided by the PNGDSP on how development in PNG will be undertaken under the Public Investment Program. Resource utilization is outlined, focusing development efforts on key policy areas. The government's priority is to improve service delivery in rural areas and deliverables in all sectors of the MTDP are focused on rural communities. Rural prosperity is an overarching goal of both the PNGDSP and the MTDP.
- **Papua New Guinea National Health Plan (NHP) 2011-2020.** The NHP was developed within the framework of Vision 2050 and reflects PNG's international commitments. The NHP takes a back to basics approach for the current decade,

in order to strengthen primary health care for the rural majority and urban disadvantaged to reverse the deteriorating health indicators. It identifies seven explicit national priorities: improve service delivery, strengthen partnership and coordination with stakeholders, strengthen health systems, improve child survival, improve maternal health, reduce the burden of communicable diseases, and promote healthy lifestyles.

The NHP identifies malaria as a major contributor to PNG's communicable disease burden addressing the issue through its Key Result Area (KRA) 6: 'Reduce the Burden of Communicable Diseases' and associated objective and strategies:

Objective 6.1: Reduce malaria-related morbidity and mortality in Papua New Guinea.

Strategy 6.1.1: Strengthen political commitment for malaria control.

Strategy 6.1.2: Improve vector control measures, with a priority of all households having access to a long-lasting insecticidal net (LLIN), and a reintroduction of residual spraying where appropriate.

Strategy 6.1.3: Maximise access to prompt quality diagnosis and appropriate treatment for malaria.

(The NMSP 2009-2013 was one of the guiding documents for the development of the NHP's KRA6).

1.3.3. Legal context

The National Health Administration Act 1997 and the new non-mandatory Provincial Health Authorities Act 2008 are the key legal documents underpinning the structure of the PNG health system. Since the Global Fund Round 8 (GFR8) application, the country has begun to roll out the Provincial Health Authorities Act, a landmark amendment that enables the streamlining of provincial health service delivery to occur by transferring the management of public hospital services and rural health services to one Provincial Health Authority or entity. The aim of this act is to improve and provide for the delivery of curative services and public health services from one provincial health authority. Whilst it doesn't fundamentally change responsibilities and accountabilities of each level of Government as set out in the Organic Law, it does enable and enhance the ability of the Government to direct finance to priority areas for health services delivery.

1.3.4. Health Planning and Performance Assessment

The National Government has adopted the "Kundu approach" to health planning which illustrates the importance of ensuring that planning is always linked with the overarching objective of improved service delivery. Provincial development plans and district development plans should inform the corresponding health sector planning documents. The Kundu approach clarifies which bodies are responsible for developing key health sector planning documents for each level of government or administration, as well as those that screen and approve these plans.

The performance against the NHP 2011-2020 will be measured against the Performance Assessment Framework (PAF), which is the key guide to measuring progress towards the agreed targets, and to what is measured and when it is measured. All partners to the health sector will participate in joint annual performance

reviews, mid-term reviews and evaluations of the National Health Plan. Information on program progress will be gained through joint periodic review that meets the needs of government and development partners.

Nevertheless, the health care system is fragmented and as a result, leadership is weak. This, combined with weak governance has hampered efforts to improve other inter-dependent aspects of the system. Much work remains to be done over the long-term to ensure that new planning approaches start to make a difference to health outcomes.

1.3.5. Health service resources and management

For the purposes of this NMSP 'Health service resources and management' has been sub-divided into six areas: health infrastructure, financial management, human resources, information systems, drug management and laboratory services.

1.3.5.1. Health infrastructure

PNG has basic health infrastructure with enough health facilities to reach the minimum standard of one health centre for every 10,000 population. However, the population of PNG has uneven access to health care and essential drugs. Key issues affecting access to health care include geography, finance, human resources and poor quality of care. PNG has harsh physical terrain, which makes it costly for health and other services to be delivered to, and accessed by the population.

People living in remote rural areas face significant financial and non-financial barriers to accessing basic health services. The main problem is transport. PNG's transport infrastructure is poorly developed, with a limited road network that is not well maintained. Only 3% of the country's roads are paved and many villages can only be reached on foot. In some areas, planes are the only mode of transport. Provincial capitals are accessed from Port Moresby by air. PNG has 22 airports plus rural airstrips but 95% of rural airstrips no longer operate. The country also lacks adequate public water-based transport between islands and coastal areas. Seventeen small commercial ports and innumerable small wharfs, jetties and beach landings provide the basic infrastructure for maritime services, but the majority of this infrastructure is in poor condition and carries very little traffic. As a result of these issues, the cost of transport is very high. With many rural areas relatively inaccessible, a significant proportion of the rural population does not have easy access to basic services, such as health and education, safe drinking water, and modern sanitation.

Furthermore, approximately 90% of the population does not have access to electricity, and the progress in providing electricity to rural areas has been slow. In some areas, the level of electricity services has been deteriorating because of insufficient funding for maintenance.

One of the priorities of the PNGDSP is to construct a national road network, integrated with water and air transport linkages. This national network will support economic development in rural PNG, connecting fertile lands and fishing communities with major markets, and will improve the access of communities to health and education facilities, as well as improve access to clean water and sanitation. In addition, a national, well-maintained electricity grid will support investment in rural locations. By the end of 2015, 200 rural health Aid Posts will have electricity supplied via renewable energy systems such as wind or solar power.

To achieve the PNGDSP goal for health by 2030, over the next five years the government will focus on getting 'back to basics', rehabilitating the foundations of its

primary and preventive health care system. Key deliverables will include: refurbishing Aid Posts, trialling community health posts in strategic locations, and renovating health centres and district hospitals. Storage, distribution and procurement of basic drugs, vaccinations and medical equipment will also be improved. Implementing provincial health authority reforms, which will start during the MTDP 2011–2015 and be rolled-out across the country over the following 10 years, will enhance these interventions.

As part of the NHP's renewed focus on improving service delivery the 'Rural Primary Health Care Service Delivery Project' (RPHCSDP) will support the building of two community health posts and upgrading and refurbishing of eight rural health facilities in 16 districts, across eight provinces (with funding from Asian Development Bank (ADB), Organization of Petroleum Exporting Countries (OPEC), Government of PNG (GoPNG), AusAID and Japan Overseas Cooperation Volunteers). A number of other infrastructure projects under the 'Provincial Improvement Programme' (PIP) funding will also be conducted over the course of the next three years. A total upgrading of area medical stores and provincial transit stores is also under way, with funding from both PIP funds and the Global Fund Round 10 Health Systems Strengthening (HSS) grant.

1.3.5.2. Financial management

Expenditure on health is mostly funded publicly. As a proportion of total government expenditure PNG spent 12.75% on health in 2011, 3.38% of GDP. The country has a decentralised health care system where the national government is responsible for funding hospitals, and provincial governments are responsible for funding rural health services. Provincial and local governments may also generate their own internal revenue through taxation.

In 2008, a new health financing model, which pools health funds from the national and provincial governments, was approved by act of parliament: 'the Provincial Health Authorities Act'. Under this new model there is one provincial health authority (PHA) in each province to control finances, human resources, and monitoring and evaluation. Each PHA operates under a single accounting system with facility-based budgets. Pilots are underway in three provinces: Eastern Highlands, Western Highlands, and Milne Bay. The Autonomous Region of Bougainville and Manus are in the process of transitioning to PHAs. The PHA Act is however not mandatory, and the decision to transition to a PHA arrangement is up to the Province.

The central government provides provinces with health functions grants to cover the operating costs of rural health facilities. Health Function Grants must be used in-line with the three minimum priority areas of outreach, medical supplies distribution and funding for general maintenance of facilities and minor equipment.

Rural health facilities are also financed by internal revenue, through Health System Improvement Project (HSIP) grants, and Church Health Services (CHS) grants. Special funds created by parliament such as District Support Improvement Grants bypass provincial governments and the national government has directed that 20% of these funds must be used for health care.

In 2010, the total resources available to health were approximately K925 million (US\$3.3 million). Of this total, a little over 30% was provided by development partners. Development partners contributed to pooled funds, as well as K200 million (US\$72 million) in other program support. This non-pooled funding included money

from the Global Fund (GF), AusAID, New Zealand AID (NZA), ADB, and United Nations (UN) support and covered technical assistance, and support to the WHO and non-governmental organizations (NGOs).

Among donors, AusAID and the ADB are the largest external contributors to PNG's health sector. Other donors include the GFATM; WHO; the European Union; the Japan International Cooperation Agency (JICA); NZAID; the United Nations Population Fund (UNFPA); USAID; and the GAVI Alliance¹⁰. The main programs and projects supported by donors include the Health Sector Reform Program, the Health Services Support Programme, the Health Sector Capacity Development Programme through the Health and HIV Implementation Service Provider, the Rural Primary Health Care Service Delivery Project, and the Sexually Transmitted Infections (STI) Clinic Construction Project.

The decentralized health system complicates financing systems. Provinces invest limited amounts of funding into their areas of responsibility such as operating costs, medical supplies distribution, outreach, and supervision. The Medium Term Expenditure Framework (MTEF) has expanded and improved which has helped to reveal more information of how the health sector is financed. It is now clear that in recent times overall government funded recurrent service expenditure has increased substantially. In 2010, K925 million (~US\$370 million) was available (with only 30% donor funds), with the actual levels of funding for rural health service operation costs now almost matching the National Economic and Fiscal Commission estimates of what is required to cover the costs of the minimal service delivery. However, despite these improvements the additional funding is not being adequately transformed into tangible improvements in health outcomes. Too many funds are ultimately not reaching their intended destination. The recently developed Rural Health Services Costing Model revealed that lack of operating funds and medical supplies at the facility level have been key inhibitors of improved service delivery. Under the NHP 2011-2020, the NDoH will engage with the Central Agencies (CA) to rectify slow movement of funds through the governments financial management system, and also work to improve its own financial management systems and increase accountability. The NDoH will also implement direct facility funding. The strengthening of the MTEF will see enhanced use of the framework to demonstrate the total pool of funds available, estimated requirements, and linking this to policy making and financial allocations decisions.

The absorptive capacity of the current Health SWAp mechanism - the Health Sector Improvement Programme (HSIP) - remains weak. This has resulted in delays and difficulties in getting resources to provinces as well as to districts.

Improving financial reporting and compliance was not adequately addressed in Phase I of the GRF8 grant for malaria. Although a number of additional support positions were recruited for HSIP to strengthen internal auditing and oversight of financial management, weaknesses remained and these undermined implementation of the grant and expenditure of funds. The additional safe guard policy that PNG now operates under has again slowed the system to the extent that implementation is stagnating. Recognizing its capacity limitations, NDoH relinquished its role as one of the Principal Recipients (PRs) to the GFR8 grant at the end of Phase I, handing over

¹⁰ Formerly the "Global Alliance for Vaccines and Immunisation"

financial and administrative management of its component of the grant to a new Principal Recipient, Oil Search Health Foundation (OSHF).

1.3.5.3. Human resources

PNG is facing an emerging human resource (HR) crisis in its health workforce.¹¹ With critical staff shortages in skilled categories of health professionals, exacerbated by migration of qualified health workers to the Pacific and other countries. The health system is vulnerable to losing its most experienced health personnel to the international skilled labour market, which offers better compensation, employment, and study opportunities. Within PNG, skilled professionals are often attracted to Port Moresby and urban areas. In recent years, severe fiscal constraints required a moratorium on hiring new staff across the public sector imposed by the Public Service Commission. This moratorium also applied to the NDoH.

In 2009 a World Bank report cited that there were a total of 13,063 personnel who worked across the PNG health system. This workforce was made up of: 379 medical officers, 3,252 nurses and midwives, 4,398 community health workers, 318 allied health workers, 416 health extension officers, 258 laboratory staff, and 3,394 administrative and other support staff. This equates to only one doctor per 17,512 people; one nurse per 2,041 population, and one CHW per 1,500 population.

There are large geographical variations in population to staff ratios, and the data suggests these are not planned variations. Significantly, four provinces (five including NCD) would require a 20% or more reduction in staff numbers (Manus 52%; New Ireland 41%; Milne Bay 39%; and East New Britain 24%) and five provinces would require an increase in staff of more than 20% (Central 101%; Morobe 72%; East Sepik 60%; Southern Highlands 59%; and Madang 34%).

A number of scenarios were suggested in the World Bank report, with Scenario 5, being the most favourable, which would see staff numbers rise from 8,440 in 2009 to 18,406 in 2030 - an increase of 118%. This would sustain an improvement in the population to direct service-delivery staff ratio from 786 to one in 2009 to 616 to one in 2030. The NDoH has adopted the report from the review and has begun implementing recommendations.

The NDoH has also developed an HR Arrest Plan, which has been submitted to the National Executive Council for consideration. The Arrest Plan includes strategies to rapidly increase the number of health workers over the next three years while longer-term strategies are developed and implemented.

Strategies to increase medical officer numbers through recruiting externally are gaining momentum and are likely to be implemented in the near future.

In addition to this, NDoH has endorsed increases in the current training enrolments including:

- Increase intake of CHW to 250 per year in 2014/2015.
- Increase intake of nurses from 100 in 2014/2015 to 250 in 2015/2016.
- Increase intake of Health Extension Officers (HEOs) from 50 in 2014/2015 to 150 in 2015/2016.

¹¹ World Bank, *PNG Health Workforce Crisis: A call to action*, Port Moresby, 2011

- Increase intake of Medical Officers from the current 60 per year to 100 in 2015 and then to 150 in 2016.

The GFR8 malaria grant has provided additional HR capacity to the NMCP and has improved the ability of the program to conduct supervision and monitoring visits. The current rollout of the recruitment plan for the restructure is expected to see approximately 60% of the grant staff absorbed into the NDoH structure (this will be critical to ensuring the long-term impact of the GFR8 grant). Ongoing planning work by the NMCP with the provinces continues with advocacy for new positions to be added to provincial level structures.

1.3.5.4. Information systems

The National Health Information System (NHIS) managed by the NDoH collects data on caseload, hospital admissions and death registrations.¹²

The *National Health Information Monthly Report* is a four-page document that captures health information relevant to the major infectious and non-infectious diseases in PNG and details other significant causes of morbidity and mortality throughout the nation. This information is collected at all provincial healthcare delivery sites (provincial hospitals, district hospitals, health centres, and aid posts) and the monthly report is filled and forwarded to District Health Information Officers (DHIO) and Provincial Health Information Officers (PHIO) (or other provincial officers where PHIOs are absent). The reports are then passed on to the HNIS Office's Monitoring and Research Branch (MRB) in Port Moresby. PHIOs also report directly to Provincial Health Advisers.

The other main sources of government information on health in PNG include the National Census, which is undertaken approximately every ten years¹³; the Papua New Guinea Demographic and Health Survey, which was undertaken in 1996, 2006 and 2012; the 2009–2010 Household Income and Expenditure Survey, which was undertaken in 2010; the National Health Accounts; and, the Malaria Indicator Survey (MIS), which was undertaken in 2008/09 and 2010/11.

With the exception of the MISs, which are managed by the PNG Institute of Medical Research (PNG-IMR), these surveys are mainly organised by the National Statistics Office of the Ministry of National Planning in coordination with the MRB.

MRB is in the process of developing the National Health Information Strategic Plan 2011-2016; consultation meetings have already been undertaken.

MRB is also undertaking a three-year 'Health Net' project, which consists of three phases. The initial phase started in 2011 focusing on strengthening the Health Information System (HIS) at central level, the second phase will concentrate on improving the HIS at the provincial level, and the third phase will establish a link between the HISs at the central and provincial levels.

¹² For more information on the National Health Information System's establishment, see R.E. Cibulskis and G. Hiawalyer, 2002. 'Information Systems for Health Sector Monitoring in Papua New Guinea', *Bulletin of the World Health Organization* 80 (9):752–758.

¹³ The Census was last undertaken in 2000, but is now ongoing.

1.3.5.5. Drug Management

Procurement of medical supplies and vaccines and their distribution to health facilities in PNG remains a major challenge for the health sector, with health facilities hampered by consistent low availability or stock-outs of key medicines. Despite several attempts to address this critical issue, key reforms in the medical supply and improvement of procurement and distribution networks have not gained sufficient traction.

Ensuring that medical supply procurement and distribution services are efficient and accountable is highlighted as a priority in the National Health Plan 2011-2015 (KRA 3.3). The NDoH has consistently expressed its intention to address medical supplies reform in 2013 and to provide the necessary resources to achieve major improvements. The reform program for medical supplies encompasses a number of elements to improve the performance of the system which includes strengthening the governance of procurement and supply management, including the re-establishment of the 'Pharmaceutical Tenders Board', improving the supply chain and logistics management through installation and use of a logistics management information system, refurbishing Area Medical Stores (AMSs), improving availability and quality of vital and essential supplies to health facilities, and development of a 3 year procurement plan. The strengthening of quality assurance is another key element through ensuring standards are applied to quality of medicines in the procurement process.

Poor storage facilities and lack of space is still a concern. Phase I of the GFR8 grant provided additional secure storage for Rapid Diagnostic Tests (RDTs), and the GFR10 HSS grant is providing further rehabilitation and upgrading of the three main AMSs.

Unable to meet the GF's stringent quality requirements and international competitive bidding procedures for artemisinin-based combination therapy (ACT) and RDTs the NDoH opted into the GF's voluntary pooled procurement mechanism. Unfortunately this approach has proved highly problematic.

1.3.5.6. Laboratory services

The Health Laboratory Services (HLS) play a key role in the health care delivery system. As well as providing diagnostic support to the hospital-based curative service and quality assurance for microscopy at more peripheral health facilities, the HLS also supports public health programmes with disease surveillance and control, including environmental health monitoring. Despite being an important component of the health system, the HLS faces major challenges. There is a serious shortage of laboratory staff in all health settings, especially in rural health areas. The laboratories also have inadequate space, dated equipment and poor physical infrastructure. Quality assurance for microscopy is largely non-functional.

1.3.6. Implementing partners

Beyond the NDoH there are a broad range of non-governmental stakeholders involved in the implementation of the national malaria control effort. The Church Medical Council oversees primary, secondary and tertiary level health services provided by church groups of various denominations. These faith-based services

work in cooperation with governmental services providing healthcare for approximately 50% of the population. In 2007 the government started to provide an operational budget for these services. As well as providing routine diagnostic and treatment services for malaria the church based health services coordinate and support the distribution of insecticide treated bednets (ITNs) in their catchment areas.

A number of NGOs also play an important role in the national malaria control effort:

Rotarians Against Malaria (RAM) takes the lead in importing and distributing LLINs. The majority of these nets support the national GF supported bednet distribution campaign but some are also sold at cost price to other groups involved in bednet distribution such as NGOs and mining and plantation companies.

Save the Children Fund (SCF) provides broad-based support for health services in some districts, which includes support for malaria control and prevention. It has established community-based diagnostic and treatment services for malaria in some underserved communities.

Population Services International (PSI) established an office in PNG in 2007. PSI plays a major role in communication for health related behaviour change and is playing a leading role in the delivery of community-based diagnostic and treatment services for malaria (in partnership with SCF and the Burnett Institute).

A number of corporate groups working in PNG take an unusually ethical approach to supporting their employees, their employees' dependents and communities surrounding their facilities. Many gold mines, oil fields and oil palm plantations provide high quality health services in-line with NDoH guidelines. Staff accommodation is often screened against mosquitoes and sprayed with insecticide and LLINs are often provided for all occupants. The Oil Search Health Foundation (OSHF) recently adopted the role of Principal Recipient for GF support formerly channeled through the NDoH..

Academic institutions play a key role in training health workers. The Divine Word University (DWU), University of PNG and the University of Goroka (UG) are all well placed to provide additional support for training, quality assurance and operational research for the NMCP. The PNG-IMR is a leading research establishment with a long and distinguished history of academic research in the field of malaria.

A number of training institutions in PNG have specific health related training programmes leading to diploma and degree level qualifications. These include the University of PNG, Pacific Adventist University, UG, and the DWU. Community health workers, including village health volunteers (VHV) and village birth attendants (VBA), are trained primarily by the church health agencies. Rural laboratory assistants are trained to certificate level at the Malaria Training Unit in Goroka.

Professional societies: The PNG Medical Society, nursing associations and the Pharmacy Board play a vital role in enhancing the quality of malaria related training and are proactive in their support for malaria diagnosis and treatment.

WHO provides technical support for the NMCP including one or two full time malaria advisors and limited access to short-term technical assistance (TA). In the past it has also supported the procurement of equipment and commodities on request. WHO's Western Pacific Regional Office (WRPO) provides technical backstopping support and regional coordination. AusAID also provides substantial technical support to the NMCP and the broader NDoH.

1.3.7. Role of Development Partners

Development partner support also plays an important role in the strengthening of the health system with AusAID (now 'Australian Government, Department of Foreign Affairs and Trade'), the largest bi-lateral aid provider of technical assistance and financing to the health sector. WHO, GF, ADB, JICA, NZA, UNICEF and UNFPA amongst others, also contribute significantly to the development of the health sector.

1.4. Malaria in Papua New Guinea

Malaria remains one of the most important public health problems in PNG. This section describes the epidemiology of the disease in the local context, the history of control efforts, recent progress, and the challenges that remain.

1.4.1. Epidemiology of malaria in Papua New Guinea

This description of the epidemiology of malaria in PNG draws heavily on a paper by Müller et al., (2003)¹⁴.

PNG is a patchwork of different ecological zones (ranging from coral atolls and coastal swamps to rainforests and high mountains) inhabited by human populations of exceptional cultural and linguistic diversity (800 different language groups). This unusual degree of diversity is reflected in the remarkable complexity of malaria epidemiology in the country. Malaria is the main cause of morbidity in many health facilities in lowland areas, and is increasingly responsible for epidemics in the highlands (considered malaria free until recently).

Cases and deaths seen at health facilities: NHIS data from 2000 to the end of 2012 suggest that the number of malaria cases (outpatients and inpatients) and deaths have declined dramatically since 2007 (figure 1.4.1.1).

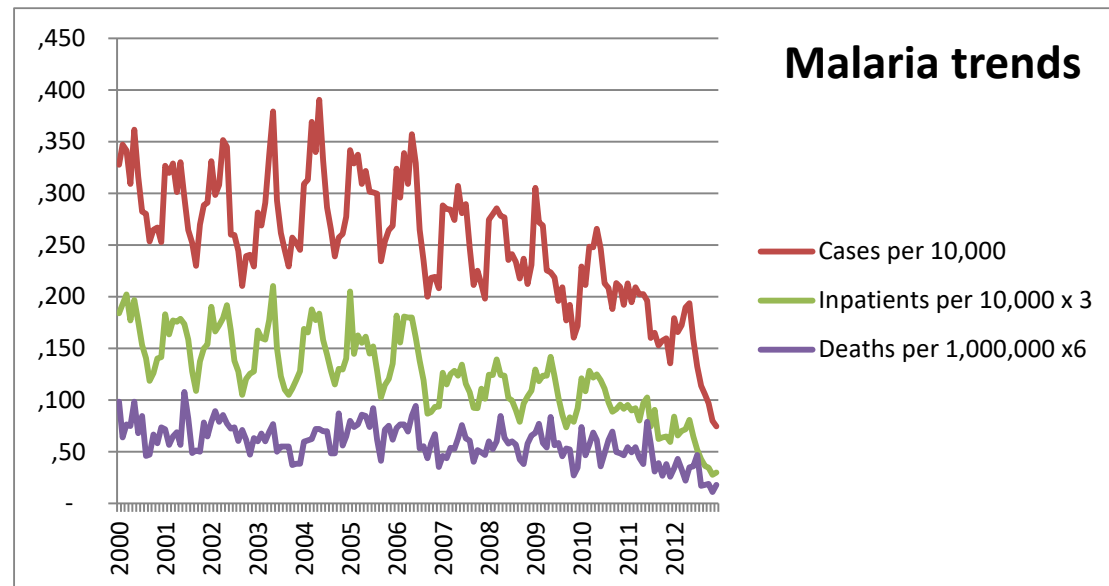
In 2012, 878,371 malaria cases were reported by the NDoH, down from 1,379,787 and 1,151,343 cases in 2010 and 2011 respectively. Over the same period, 301 malaria deaths were reported, down from 616 and 431 respectively in 2010 and 2011.

While these trends may represent a real reduction in malaria burden (as a result of malaria control interventions, improving socio-economic status, vector habitat destruction, etc.) they could also reflect a change in NHIS data collection processes, or changes in the reporting rate of health facilities (or a combination/all of the above). They therefore require careful interpretation. A more in-depth analysis by members of the 2013 MPR team revealed consistent levels of reporting from health facilities and a steady drop in malaria cases (outpatients and inpatients) and deaths as a proportion of all outpatients, inpatients and deaths. While this suggests that the data may reflect a real drop in the malaria burden, disaggregation of data by region indicated that the Islands Region was largely responsible for the post 2007 drop in reported cases and deaths. The conclusion was that further analysis of NHIS data quality and completeness would be required in the Islands Region before robust

¹⁴ Ivo Müller, Moses Bockarie, Michael Alpers and Tom Smith (2003). The epidemiology of malaria in Papua New Guinea. *Trends in Parasitology*, 19 (6), 253-259.

conclusions could be drawn on whether the large decreases in admissions are likely to reflect actual change or may in fact be due to changes in reporting etc.

Figure 1.4.1.1. Trends in malaria cases and deaths based on monthly NHIS data.



As malaria burden declines, the proportion of cases caused by *P. falciparum* usually also declines. However, an analysis of data from 16 of PNG's more reliable laboratories indicates that the proportion of cases caused by *P. falciparum* has remained approximately stable from 2000 to the end of 2012.

Recent data from IMR (Müller *et al*, personal communication 2013) indicated that children in the Sepik suffer on average 0.26 fever episodes/per year, down from as high as 6 episodes per year in the early 2000s. This suggests that the drop in malaria caseload and deaths revealed by the NHIS may reflect a real fall in malaria burden.

Population density: Population density is highest in the highland areas (31.1 people per km²). In the lowlands, population density ranges from 3.9 people per km² in the interior to 6.5 people per km² along the coast. Increased mobility in recent years has contributed to increased malaria transmission (especially *falciparum* malaria) in the highlands through frequent introduction of infections from the lowlands.

Influence of climate, altitude and other factors: The main climatic determinant of malaria endemicity in PNG is temperature, and because the country is located close to the equator, temperatures do not show much seasonal variation but depend mainly on altitude. In most parts of the lowlands there is perennial transmission, with only limited seasonality. Transmission is less intense on some of the islands and in some drier areas along the south coast (including Port Moresby). These south coast areas are the only ones that exhibit marked seasonality, with transmission virtually stopping during the dry season. As altitude increases, transmission decreases significantly becoming unstable at an altitude of 1,200–1,700 metres. Intense transmission is then limited to local epidemics, which generally coincide with the end of the rains and start of the dry season (April–July) and can be associated with a high incidence of relatively severe morbidity. Above 1,700 metres temperatures generally

tend to be too low for local malaria transmission. However this may be changing with global warming thought to be a key factor involved in the recent alarming increases in transmission at higher altitudes.

An estimated 94% of PNG's 7.17 million population live in areas that are classified as highly endemic for malaria (WMR, 2013). About 56% live at altitudes below 1,200 metres where malaria transmission is stable, 12% live at altitudes between 1,200 and 1,600 metres where malaria transmission is unstable (epidemic prone) and a further 23% live at altitudes between 1,600 and 2,000 metres where just *vivax* malaria is endemic. The remaining 9% live in areas above 2,000 metres where no significant malaria transmission occurs. However, the situation is complicated by the fact that many people with houses at relatively high altitudes have gardens at lower altitudes where they sometimes (seasonally) sleep to protect their crops. Thus, without detailed knowledge of an area, it is difficult to identify which villages have no risk of malaria.

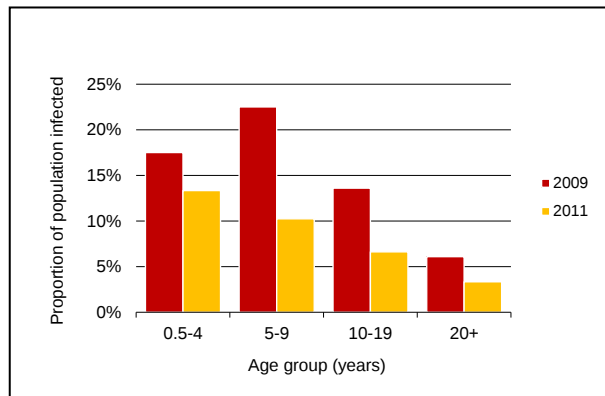
Substantial heterogeneities in malaria epidemiology are found not only along broad environmental gradients, but also between villages only a few kilometres apart and even between different clusters of houses within the same villages. Some of this variation is accounted for by drug and bednet usage patterns and nutritional differences could also play a role. Local heterogeneity in the spectrum of vectors present and in their densities is also thought to be important. In the highlands, one village can have endemic malaria, while a neighbouring village is malaria free, and epidemics tend to be localized rather than affecting large areas.

Parasite species composition: All four species of human malaria exist in PNG but the two main species are *P. falciparum* and *P. vivax*. In some low lying areas *falciparum* malaria reaches holoendemic levels that are rarely found outside sub-Saharan Africa. The distribution of *Plasmodium malariae* is patchy. In parts of East Sepik Province its overall prevalence has reached 13% in the past. *Plasmodium ovale* is reported only occasionally.

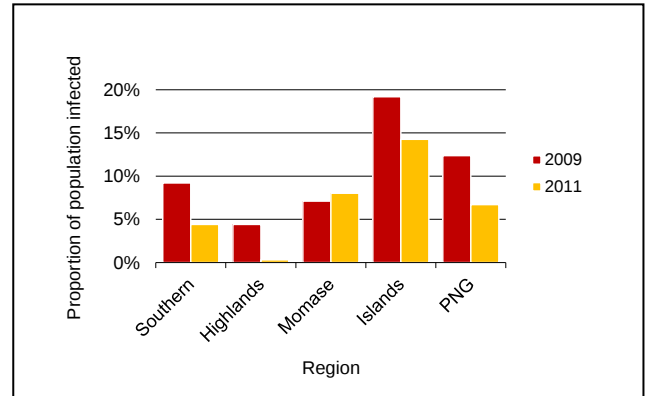
Malaria prevalence in sentinel sites: Figure 1.4.1.2. shows the change in malaria parasitaemia (all species combined) from 2009 to 2011 based on PNG-IMR household surveys in sentinel sites. Parasitaemia fell across all age groups with the largest decline in the 5-14 year age group. Parasitaemia also fell in 3 of the 4 regions. This data should however be interpreted with caution for a number of reasons: sentinel sites may not be representative of PNG as a whole; the situation in sentinel sites may improve faster than in surrounding areas as the prevalence surveys themselves have an impact (reducing burden and raising awareness); and, the timing of prevalence surveys in areas where transmission is unstable is critical and so data needs to be collected for a number of years for reliable interpretation of trends.

Figure 1.4.1.2. Results from malaria prevalence surveys conducted by PNG-IMR in 2009 (red) and 2011 (orange).

a. By age group.



b. By region.



Drug resistance: Although chloroquine-(CQ)-resistant *P. vivax* has been present in PNG since the late 1980s, it is far less frequent than CQ-resistant *P. falciparum*, which was first noted in 1976. By the early 1990s, the effectiveness of CQ or amodiaquine (AQ) was greatly reduced; however, these remained the first-line treatment until combination therapy with CQ or AQ plus sulphadoxine-pyrimethamine (SP) was introduced in 2000. Since the introduction of AQ a significant increase in SP resistance has been observed. Due to the above, the country revised its treatment protocol and introduced artemisinin based combination therapies (ACT) as the first line regimen since 2009. Artemisinin resistance, which has emerged in the Greater Mekong Sub-region, has not yet been detected in PNG. However, malaria Day 3 test positivity rate (microscopy), an indicator of early deterioration of artemisinin effectiveness is not routinely monitored.

Burden of malaria in pregnancy: Studies on malaria during pregnancy in Madang revealed peripheral parasitaemia rates reached 34% in the first, 30% in the second and 19% in the third or subsequent pregnancy resulting in high levels of severe maternal anaemia (17% had a haemoglobin level less than 7g/dl) and low-birth-weight. However, in low-endemic or epidemic prone areas such as the highlands, malaria infections are commonly symptomatic in all age groups.

Risk of severe malaria and deaths: Severe malaria and malaria mortality are less frequent in PNG than in areas of comparable endemicity in Africa. Verbal autopsies conducted in two lowland areas (Madang and Maprik) indicated that malaria was responsible for between 4% and 17% of child mortality. Co-infection with *P. vivax* probably significantly lowers the risk of severe malaria, and appears to cross-protect against simple *P. falciparum* morbidity in PNG. Genetic factors also contribute to reduced morbidity and mortality: A great variety of red blood cell traits are found in PNG including a number of different variants of G6PD deficiencies, three different α -thalassaemia gene rearrangements, patchy distributions of both β -thalassaemia and Gerbich negative blood group phenotypes, ovalocytosis, and several haemoglobinopathies including HbJTongariki. This wide variety of protective traits suggests independent evolution aided by the relative isolation of PNG's many different population groups.

Malaria vectors: The principal malaria vectors in PNG are members of the *Anopheles punctulatus* group of mosquitoes, which comprises at least 11 species. The different species vary in habits and in vectorial capacity. *Anopheles farauti* s.l. (made up of six morphologically identical sub-groups) is most common in coastal villages. It can breed in fresh or brackish water and larvae are found in permanent swamps, temporary pools and in streams near the coast. *An. koliensis* is most common in lowland areas more than 2 km from the coast. Larvae are generally found in temporary pools in grasslands and in pools around the edges of forests. *An. punctulatus* is most common vector in the hills. It breeds in sunlit water, road ruts and drains. All of these vector species are anthropophilic and anthropophagic, but also opportunistic and feeding on humans is reduced dramatically by the local availability of other hosts. Following the wide-scale use of dichlorodiphenyltrichloroethane (DDT) for house spraying during the malaria eradication era of the 1950s and 60s, *Anopheles farauti* changed from being a late-night indoor biting vector to being an early evening outdoor biting vector. The development of this behavioural resistance was widely documented across the Pacific region¹⁵. In the cases of *An. punctulatus* and *An. koliensis*, biting occurs mainly after midnight with peak activity taking place in the early hours of the morning.

Malaria stratification: No formal malaria stratification has been conducted in PNG. In view of the heterogeneity of the malaria epidemiology and impact of malaria interventions, a stratification exercise will be conducted early as part of the new strategic plan in order to better inform implementation strategies.

1.4.2. History of malaria control in Papua New Guinea

Malaria control started in PNG with the Second World War. The Australian Army (and probably the Japanese Army as well) was ill prepared to deal with malaria in the field. However, at least for the Australians, preventive measures were introduced, which included use of Atebrine (mepacrine) for prophylaxis, protective clothes, mosquito nets and repellents. Malariologists supervised Malaria Control Units, which moved in with attacking troops, and Entomological Sections were established, which provided advice on vectors of malaria and other arthropod-borne diseases. In successive campaigns the casualties from malaria decreased substantially, especially after active operations in particular campaigns had ended, except in the Aitape-Wewak area, where field observations suggested that some strains of *P. falciparum* were resistant to the standard dose of suppressive Atebrin¹¹⁶.

Large-scale malaria control operations only really started in PNG after the Second World War with the use of medicines, mosquito nets, drainage of swamps (such as parts of the Wahgi Valley), larviciding and residual spraying with insecticides. Yet it was not until 1957 that a pilot project in the Maprik area laid the foundation for an eradication campaign based largely on indoor residual house spraying (IRS) with

¹⁵ Russell TL, Beebe NW, Cooper RD, Lobo NF, Burkot TR: **Successful malaria elimination strategies require interventions that target changing vector behaviours.** *Malar J* 2013, **12**:56.
 Hetzel, M.W. Editorial- An integrated approach to malaria control in Papua New Guinea. *PNG Med J* 2009 Mar-Jun;52(1-2): PNG Institute Of Medical Research.

dichloro-diphenyltrichloroethane (DDT) and mass drug administration¹⁷. Although the aim of eradicating malaria from PNG was officially abandoned in 1972, DDT spraying remained a major method of control. According to reports, spraying operations achieved 100% coverage in Milne Bay, Northern, Chimbu, East and West New Britain, New Ireland, Manus and Bougainville in 1973. The overall goal of this program was to reduce the burden of malaria until it ceased to be an important public health problem in any part of the country. Full national program coverage was planned for 1978. Initially, DDT seemed to reduce anopheline populations, resulting in reduced parasite prevalence in some communities. However, operational challenges to keep up the laborious campaigns soon became apparent. In addition, the lack of sensitivity of campaign implementers towards local perceptions of IRS had led to resistance of villagers towards the spraying campaigns. Therefore, the 1974 National Health Plan proposed a better integration of malaria control with other health services and measures to improve community collaboration and participation. Following a major review of the malaria control program in 1983, IRS was stopped and the responsibility for all control operations was transferred to the provinces. It was during this time that the PNG-IMR conducted one of the first trials demonstrating the health impact of treating mosquito nets with insecticide. The study, carried out in 1985 near Madang, showed a reduction of *P.falciparum* incidence and prevalence in children below five years of age sleeping under permethrin-treated nets. Additional research in the Wosera area demonstrated that mosquito nets (even if not treated) protected not only the individuals using them, but also those living nearby.

The protective effect of insecticide-treated nets (ITNs) was confirmed in many other trials around the world. As a consequence of such findings, the national malaria control program started emphasizing the use of ITNs in 1989. However, no regular or large-scale distribution of ITNs was carried out. In the following years, coverage with mosquito nets and other control interventions remained patchy and low in many parts of PNG.

It was during this period that Rotarians Against Malaria (RAM) was created from the Port Moresby Rotary Club. Using a donation of 150,000 treated nets donated by the National Department of Health (originally from AusAID), RAM successfully ran a revolving fund whereby nets were sold at a slightly profitable price and the proceeds used to buy more nets. This they did successfully for many years, distributing about 45,000 nets a year from 2000 to 2004.

At the same time, increasing resistance of malaria parasites to the most commonly used drugs became evident. The first cases of chloroquine-resistant malaria were reported in 1976¹⁸. This progressed rapidly to widespread resistance of *P.falciparum*, and to a slightly lesser extent *P.vivax*, to chloroquine, amodiaquine and sulphadoxine-pyrimethamine. In studies conducted between 2003 and 2005, even combination regimens of these drugs faced up to 29% resistance with *P. falciparum*².

The reinvigoration of the malaria control programme began again in 2003 with the introduction of the GFR3 grant. From 2005 to 2009 the malaria programme delivered about 2.3 million nets throughout the country at a rate of one net for every 2.5

¹⁷ Fenner F. Malaria control in Papua New Guinea in the Second World War: from disaster to successful prophylaxis and the dawn of DDT. *Parassitologia*. 1998 Jun;40(1-2):55-63. John Curtin School of Medical Research, Australian National University, Canberra, Australia.

people. The delivery of nets was under the provincial health authorities and reached most parts of the country. However, while the programme was very successful in some areas it was not so successful in others. Problems included slow release of funds from central to provincial level, some provinces not following technical guidelines resulting in some areas not being covered, and weak technical and financial reporting in many of the provinces. With the GFR8 grant, it was elected that RAM would take over the coordination of the LLIN programme which has led to better movement of funds and clear technical and financial reporting in all provinces. From January 2010 to October 2013 RAM has coordinated the distribution of about 3.5 million nets to household level and a further 320,000 LLINs to vulnerable groups, particularly to women receiving antenatal care.

GFR8 also saw the introduction of arthemeter-lumfantrine branded as Mala-1 and Intermittent Preventative Treatment during pregnancy (IPTp). In addition the international NGO 'Population Services International' (PSI) joined PNG's malaria team to improve mass communication and behaviour change and support home based management of malaria (HMM) and integrated community case management (iCCM).

1.4.3. Recent progress in malaria control in Papua New Guinea

The implementation of the 2009-2013 National Malaria Strategic Plan has been largely successful based on programme coverage and many useful lessons have been learnt.

Just over 2 million LLINs were distributed under GFR3 and 6.6 million under GFR8, sufficient to cover 53% and 100% of the population at risk respectively. Household surveys conducted by PNG-IMR in 2009 and 2011 indicate an increase in the proportion of households with at least one LLIN, from 65% to 82%. The fraction of the population sleeping under a LLIN the night before the surveys increased from 33% to 49% during the same period. This rapid increase in LLIN coverage is laudable. Coverage rates still however fall below PNG's ambitious national targets.

PNG has also experienced a large increase in the use of appropriate antimalarial treatment, from approximately 5% in 2009 to approximately 40% at the end of 2012. However, survey results indicate low rates of parasite-based diagnostic testing among those who had a fever in the past two weeks (4.4% overall and only 0.9% in children under age 5). Antimalarial treatment rates for the same subjects were 38% and 46% respectively. Presumptive treatment for malaria clearly remains the norm.

Of all individuals receiving an antimalarial in 2011, only 23% received an antimalarial treatment consistent with the guidelines of the time (32% in children under age 5). More encouragingly, health facility surveys indicate that the percentage of Health Centres and Aid Posts with ACT has risen from 0% and 0% respectively in 2010 to 88% and 19% respectively in 2012. Although simply having stocks of ACTs does not mean that they are being used (or used appropriately), this dramatic increase in availability over such a short period of time is promising.

Community-based management of malaria shows great promise and is receiving enthusiastic support from senior officials within NDoH. Variations on the approach are being piloted by a number of implementing partners and the various models will be reviewed and the national strategy fine-tuned accordingly prior to expansion of the scheme.

In recognition of its achievement, PNG was highlighted in the 2012 World Malaria Report as a success story for scale-up of LLIN coverage and associated declines in parasitaemia.

High coverage has been achieved with most of the interventions described in the NMSP 2009-2013 but quality remains poor in many cases, often due to broader health system issues.

1.4.4. Challenges to be addressed in the National Strategic Plan (2014–2018)

High coverage has been achieved with most of the interventions described in the NMSP 2009-2013 but quality remains poor in many cases, often due to broader health system issues. NDoH now needs to place emphasis on an innovative approach to tackling health system strengthening and improving the quality of services generally. In addition malaria specific activities need to be strengthened in-line with the recommendations set out in the 2013 Malaria Programme Review. The new National Strategy has been developed accordingly.

2. NATIONAL STRATEGY 2014–2018

Emphasis now needs to be on consolidating the gains made to date, building program capacity through health system strengthening (including human resource development), improving the quality of service delivery and expanding access to essential services through partnerships where appropriate. At the same time technical partners need to place added emphasis on piloting new approaches that can be scaled-up once capacity exists.

2.1. Vision

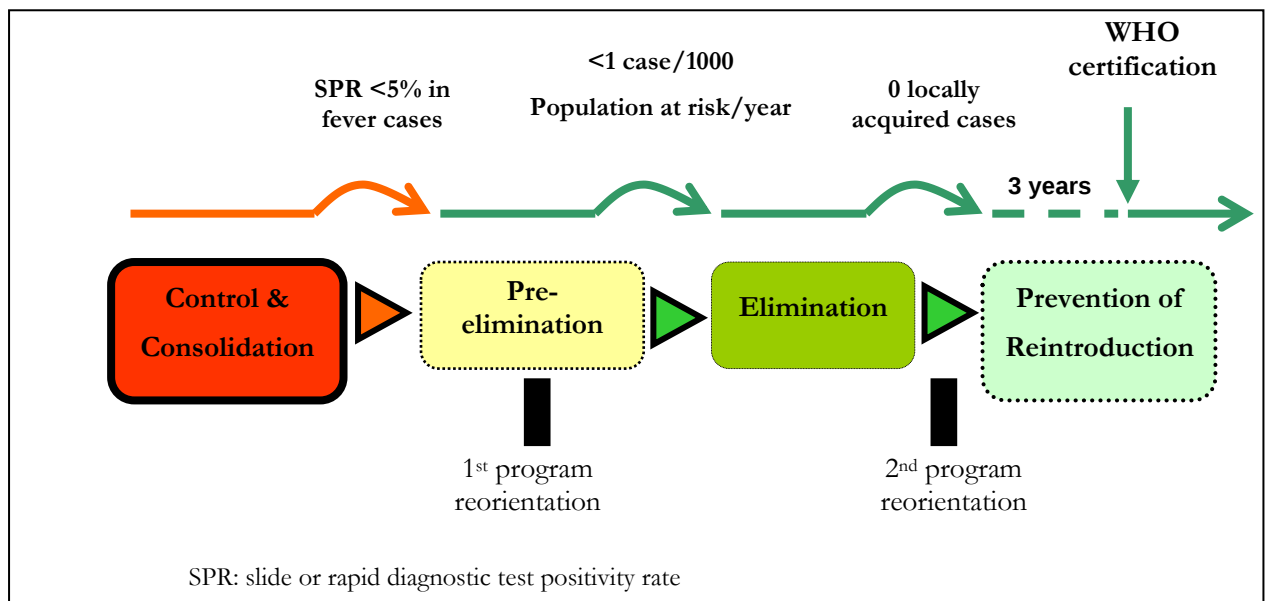
The vision of the national strategic plan is a substantial and sustained reduction in the burden of malaria in the near term (2014 – 2018) and mid-term (2019-2024), and the elimination of malaria in the long term (from 2025 onward), when existing and new tools in combination with strengthening of health systems will make national elimination feasible.

2.2. Policy direction

From a programmatic perspective, there are five stages in the malaria control-elimination continuum: Control; Consolidation; Pre-elimination; Elimination; and, Prevention of reintroduction (figure 2.2). Different stages have different requirements and standards for interventions. Current coverage and impact data in PNG, with an overall test positivity rate above 40% as per NHIS data, suggest that the country is yet to reach the milestone for a first program reorientation. Therefore, over the next five years, national efforts will be geared towards intensification and aggressive malaria control to sustain and expand gains through universal access to all malaria interventions, with a major emphasis on the rural majority (especially through the expansion of community-based diagnostic and treatment services) and the urban

disadvantaged. Overall malaria surveillance systems will be strengthened as part of the wider national health information system review on-going in the country. Progress will be reviewed regularly and the overall strategic direction adjusted accordingly.

Figure 2.2. The malaria control-elimination continuum (WHO).



To achieve and maintain a better impact for its malaria interventions, the NMCP will place increased emphasis on adopting a multi-sectoral approach. This will mean transparent involvement of all stakeholders and partners (including at provincial and district level) in the planning, implementation and, where appropriate, the monitoring and evaluation of activities. The framework for this multi-sectoral approach will be informed by the following:

i. Three guiding principles

- Health sector leadership
- Priority investment in high impact, quick win measures
- Adherence to the “three ones” principle (One Action Plan, One monitoring and evaluation (M&E) Plan and One Coordinating Authority).

ii. Three governance mechanisms

- Transparent recruitment of implementing partners
- Equitable access to malaria control resources
- Performance monitoring and mutual accountability.

iii. Three implementation instruments

- Roles matrix for all the groups of implementing partners
- Technical working groups (with membership from relevant stakeholders) as avenues for joint planning, implementation, monitoring and evaluation
- Semi-annual performance review and planning meetings at provincial and national levels.

2.3. Strategic approach by thematic area

2.3.1. Prevention: vector control, intermittent preventive treatment in pregnancy and infants, epidemics and emergency preparedness and response

2.3.1.1. Vector Control

The NMCP will continue to support the mainstay of vector control operations in PNG: high coverage with LLINs. Emphasis will also be placed on increasing the utilization of LLINs through targeted communication efforts (see 2.3.6 below). The programme will not support mass preventive IRS but focal responsive IRS will be carried out in response to outbreaks in epidemic prone provinces (see 2.3.3 below).

PNG has adopted WHO's universal coverage targets for bednets (LLINs for all at risk, not just women and children) achieving >80% ownership coverage following the mass distribution in 2013. Bednet ownership will be increased to 100% from 2014 through periodic free mass distributions targeting all age groups, and by 'topping-up' between mass distributions with free LLINs delivered through ante-natal care services, health facilities and other means as necessary. The timing of mass distributions will be based on the internationally accepted effective lifespan for the LLINs in use. In order to maximise utilisation, rigorous local evidence on preference and acceptability of various LLIN types will be used strategically to inform the procurement of LLINs. Only WHOPES¹⁹ approved LLINs will be procured. Procurements will be made through a competitive process.

At present the public sector does not have the robust management and financial mechanisms to deal with the large sums of money needed for GF funded LLIN delivery at provincial and district levels. In the short-term the management of the LLIN project will therefore continue to be outsourced to a suitably qualified external agency. This agency will ensure that the robust approach to financial management and micro planning developed over the last five years continues. Furthermore it will be tasked with building the capacity of NDoH at central, provincial and district levels to take over the management of the LLIN project after 2018. From the outset NDoH staff in the periphery will be involved in the analysis of net coverage and distribution data and in the broader planning process.

The proportion of villages that have been targeted by mass distributions of LLINs in the last three-years is very high even in very remote areas. Nevertheless, some village level gaps in distribution remain even in areas that are accessible. Furthermore coverage within villages that have received LLINs is patchy in some areas. LLIN project staff and their NDoH counterparts will conduct a geographical gap analysis using the most appropriate method available and thereby strengthen quantification of LLIN requirements. Groups such as 'slash-and-burn' farmers and immigrants to shanty settlements who are not effectively targeted under the current system will be covered by mass distribution campaigns in future. LLINs will also be provided by the programme for use in hospitals, barracks and other institutions.

¹⁹ WHOPES – World Health Organization Pesticide Evaluation Scheme.

Finally LLIN project staff and their NDoH counterparts will work with established commercial bednet distributors to ensure that they provide LLINs rather than untreated bednets. This initiative will expand to all major commercial centres at district level by 2018.

The NMCP will work with partners to coordinate the distribution, promotion and collection of information on LLIN coverage and use. Small-scale tracking surveys will be carried-out by a suitably qualified independent group to monitor fluctuations in bednet utilization and thereby augment the findings of the larger-scale periodic Malaria Indicator Surveys.

2.3.1.2. Intermittent preventive treatment in pregnancy and for infants.

The NMCP will support the provision of intermittent presumptive treatment for malaria during pregnancy (IPTp) at antenatal clinics as part of the ante-natal care (ANC) package. The aim will be to provide women attending ANC with 3 doses of sulphadoxine-pyrimethamine (SP) at least one month apart from the second trimester of their pregnancies. Training on the administration of IPTp will target all ANC clinics. In order to minimize transaction costs and maximize cost effectiveness this training will be integrated into the NMCP's biannual clinical refresher training. Events will be organised at community level to raise awareness on the benefits of IPTp (see X below). When feasible, the Family Health Tally Sheet used at ANC facilities will be amended to support the monitoring of IPTp activities.

There are no plans to target infants with IPT in PNG at present.

2.3.1.3. Epidemic and emergency preparedness and response (EEPR)

The NMCP will build its EEPR capability in order to minimize the impact of malaria outbreaks in epidemic prone areas and in emergency situations (e.g. following tsunamis or floods). The main emphasis of the NMCP will be on strengthening EEPR capability in the epidemic prone highland provinces.

The Malaria Surveillance and Control Unit (MSCU) in Goroka will be re-established. Its buildings will be refurbished and reequipped. As soon as is feasible a surveillance system, based on reporting from health facilities in general (down to Aid Post level) and from sentinel sites in particular, will be developed and rolled-out. Systems for monitoring, review and analysis will be established and maintained. Standard operating procedures (SOPs) for outbreak investigation and response will be developed. Specialist staff will be recruited, trained and deployed.

The NMCP will re-establish indoor residual spraying (IRS) in response to outbreaks. Spray teams will be recruited and trained.

A storage facility for emergency supplies will be established in each of the seven highland provinces and supplies and equipment will be procured and stock-piled for outbreak investigation, case management and vector control. Stock-rotation will be linked to stocks for routine operations to ensure that commodities do not expire.

The NMCP will work with the NDoH emergency taskforce to ensure that financial mechanisms are in place to enable a rapid response with both materials and human resources in the event of an emergency.

External technical assistance will be utilized as required to support a range of activities including quantification of commodity requirements, targeting of operations, developing SOPs, training specialist staff and trainers and fine-tuning the EEPR strategy.

2.3.2. Diagnosis and Case Management

The current **National Treatment Guidelines** (NTGs) are aligned with WHO recommendations and have been widely distributed through an expansive training program. The NMCP will review and update NTGs as necessary according to the latest WHO recommendations and based on the results of annual Therapeutic Efficacy Studies (TES). NTG related algorithms and materials for pre- and in-service training will be updated to ensure that they are comprehensive and to ensure that they emphasise the high sensitivity of modern RDTs (while at the same time stressing the importance of clinical judgment in case of a false negative result) as well as the role of differential diagnosis in the event of a negative test result. IMCI's²⁰ '10 steps' will be updated to include the use of RDTs where available. [Currently clarification is required on policy relating to: artesunate vs. artemether; artesunate suppository for pre-referral treatment in children; and, treatment of tropical splenomegally syndrome (TSS). In future NTGs will identify the most appropriate line of action for each level in the health system].

The NMCP will continue to support and strengthen **case management** and improve access to early diagnosis and appropriate treatment for malaria. Rapid Diagnostic Tests (RDTs) and artemisinin-based combination therapy (ACT) have now been introduced in all health centres. Services are currently being extended to peripheral areas with the roll-out of RDTs and ACT to Aid Posts and with the gradual expansion of **integrated community case management** (iCCM) which provides RDT based diagnosis and ACT treatment through community-based volunteers. By 2018 the NMCP aims to achieve nationwide coverage of iCCM (targeting all communities beyond one hours walk from a health facility).

In the past parasite-based **malaria diagnosis** has been based primarily on examination of specially stained blood films by microscopists. Microscope-based diagnosis remains the gold standard where staff are highly skilled and adequately supported. In these settings microscopy is more sensitive than RDTs and can be used to quantify parasitaemia and give species-specific diagnoses both of which are beneficial for clinical management. However, where microscopy support systems are weak RDTs are generally far more sensitive and specific than microscopy. The NMCP may therefore opt to strengthen microscopy at hospital level and focus on improving RDT-based diagnostic services elsewhere. A decision will be made based on the findings of a diagnostic policy review and Central Public Health Laboratory (CPHL) needs assessment, which is to be conducted in 2014.

Whatever the outcome of the diagnostic policy review, the NMCP will work to strengthen the capacity of the CPHL to manage **microscopy quality assurance** (QA) and training services. Laboratories will be refurbished and equipped and a database of laboratory services will be established. Staff will be trained and external competency assessments will provide QA for senior microscopists. A slide bank will be established at CPHL for spot testing and training purposes. Regular QA will be established as part of routine supportive supervision for microscopists.

The **RDT-based diagnosis** skills of public sector healthcare providers will be strengthened through training, supportive supervision and needs-based refresher training. This will all be integrated into broader clinical training and supervision.

²⁰ Integrated Management of Childhood Illnesses

The NMCP will provide biannual **clinical refresher training** for all healthcare providers. This will be integrated with broader training initiatives where possible. The NMCP will also hold periodic technical meetings with provincial hospitals and clinics to discuss implementation issues related to the NTGs for malaria.

In order to improve **access to good quality appropriate treatment** for malaria in the private sector as well as the public sector, the NMCP will collaborate with the NDoH Pharmaceutical Standards Branch to enforce the ban on marketing/use of artemisinin-based monotherapy. The NMCP will also collaborate with the PNG Medical Association and National Doctors Association to engage private sector doctors to improve management of malaria in-line with the NTGs. An annual meeting will be held to provide clinical updates for private sector healthcare providers and compliance will be monitored periodically during the course of each year. **Batch testing** will be performed to ensure the quality of all RDTs and ACT supplied through the public sector. [The Pharmaceutical Services Standards Branch (PSSB) is now acquiring HPLC²¹ capability so will be able to conduct batch testing in-house. Minilabs are now just coming into use, with CPHL providing the necessary training for provincial staffs.]

NMCP will work to improve the management of **severe malaria**. Referral centres (Level 3 Facilities) will be mapped at district level, staff will be trained and all essential supplies for the management of severe cases will be provided. Peripheral health facilities (including Aid Posts) will be trained on the administration of pre-referral treatment (using artesunate rectocaps). The capability of referral centres in terms of management of severe malaria and the capability of peripheral health facilities in terms of the provision of pre-referral treatment will be audited regularly as part of routine supervision visits by provincial malaria supervisors.

G6PD deficiency poses a major threat to malaria control efforts, undermining the radical cure of vivax malaria and preventing the widespread use of transmission blocking drugs for falciparum malaria. The NMCP will therefore establish a priority pilot project to evaluate new point of care tests for G6PD deficiency as they become available, with a view to rolling-out routine use of these tests as soon as they are proved viable.

2.3.3. Epidemiology, surveillance, monitoring, evaluation and operational research

NMCP will work to strengthen and maintain independent malaria monitoring and evaluation (M&E) systems, to strengthen the National Health Information System (NHIS) and to continue to develop the national capacity for surveillance.

Independent **M&E** of the NMCP will be maintained through three-yearly malaria indicator surveys and through longitudinal studies carried out in sentinel sites (currently under the management of PNG-IMR).

Emphasis will also be placed on strengthening routine internal programmatic M&E: An in-depth assessment of M&E will be carried out and an M&E system strengthening plan will be developed and implemented. Access to transportation will

²¹ High-performance liquid chromatography.

be improved through better car pool management and this in turn is expected to improve activity and performance monitoring at district and health facility levels.

Steps will be taken to improve the quality and efficiency of the **NHIS** for Malaria. NHIS malaria indicators and reporting processes will be subjected to external review and revised and simplified as appropriate in association with the Technical Working Group and Health Information System Committee. At provincial level data analysis and reporting capacity will be boosted through tailored training, and reporting adherence will be strengthened through intensified monitoring and supervision. At the same time a reporting system for Aid Posts and iCCM networks will be developed and strengthened and incorporated as a module in the NHIS (Aid Posts and HMM/iCCM will become increasingly important as diagnostic testing and treatment for malaria are rolled-out beyond health centre level.). A web based NHIS reporting system for malaria will be piloted.

The NMCP will also work to strengthen the capacity for national and provincial level **malaria surveillance** and wherever possible data review will be integrated into routine meetings. NDoH and provincial staff will be trained in malaria surveillance techniques including data analysis. Computer software will be updated to allow easier analysis of trends and differences between geographical areas. A data management and reporting systems will be developed for MSCU. An annual data review workshop will be held for malaria officers/health information officers. A data review module will be developed to facilitate annual reporting by providing analysis of trends over time and a summary of key indicators by district. A "malaria scorecard" will be developed which will be used to provide stakeholders with clear periodic updates on programme progress. The NMCP will also produce a "Progress and Impact Report" with the assistance of Roll Back Malaria (RBM) (a glossy publication that can be used to highlight the progress made to a wider audience).

The malaria databases held at national and provincial level will be restructured to enable trends over time to be more easily assessed.

The NMCP will work to strengthen **research** focussing on areas of high operational significance. It will support regular meetings of the Malaria Technical Working Group to review latest research findings (well prior to publication) and identify priority operational research projects and contract them out to appropriate organizations. Topics for study may include: acceptability and relative cost-effectiveness of extra large LLINs; physical and insecticidal deterioration of LLINs with time; barriers to LLIN utilization; infectivity of falciparum patients treated with artemether-lumefantrine (AL) vs. AL+PQ; relative efficacy of various spray regimen for IRS; status of private sector anti-malarial supply (to inform policy development); the impact of IPTp and IPT in children (IPTc) using SP in different transmission settings; the impact of user fees on utilization of health services; benefits of introducing modest incentives (including mobile phone credits and financial incentives) for VHVs; G6PD rates, primaquine use and the implications for programme policy; effectiveness of weight-specific packaging for ACTs in light of weight-specific stock-out issues; effectiveness of behaviour change communication campaigns; malaria elimination pilot projects (including research on prevention of reintroduction) on small islands with established private sector malaria control operations;

2.3.4. Advocacy, information, education, communication and community mobilization

At present the NDoH and NMCP do not have the capacity in-house to make the necessary improvements in advocacy, communication and social mobilization (ACSM) to maximize utilization of preventive and curative services and to maximize participation in community based support efforts. NDoH and NMCP will therefore work together to identify a technical partner agency willing and able to support it in the development of a comprehensive program of ACSM. Wherever appropriate ACSM efforts will be fully integrated with broader health related initiatives. Technical management and direction will be strengthened through the provision of regular inputs of technical assistance.

An external ACSM needs assessment will be carried-out every second year followed by a planning workshop to adjust strategies as necessary. Training sessions supported by external technical assistance will be held annually to strengthen ACSM capacity within NDoH and NMCP and where possible staff NDoH/NMCP will be embedded within the NGO led ACSM team to maximize opportunities for on-the-job training and technical mentoring.

The program will develop and test its own ACSM materials and methodologies locally. A broad range of approaches will be employed including school visits, sports campaigns, drama sessions, social events, phone text messaging, mass media (utilizing free opportunities such as news broadcasts and radio chat shows wherever possible) as well as more conventional billboards, pamphlets, posters etc. The timing of certain ACSM initiatives is key to maximizing their impact and careful consideration will be given to timing ACSM campaigns to ensure that they fit well with NMCP interventions, peak transmission periods and timetabling of activities in other sectors such as exams and holidays in the case of school-based ACSM campaigns.

The ACSM will lobby local authorities and convince local community leaders to actively support malaria control efforts. It will also engage with churches, local NGOs and women's unions, training selected people on community based information, education and communication (IEC) and behaviour change communication (BCC) in order to raise awareness of malaria control efforts within target communities. The NMCP will arrange special high-profile events in support of World Malaria Day. National champions will be engaged to influence public opinion and high-profile officials will be engaged to lobby the Prime Minister and members of the Cabinet. The lead NGO involved in ACSM will support the NDoH to work with MPs to politicize malaria.

The NMCP will work within NDoH to strengthen the skills of health staff to effectively deliver key health messages related to malaria control through inter-personal communication (IPC) during consultations. The focus will be on strengthening the nurse-training curriculum in this regard and on educating provincial nurse training managers to place the necessary added emphasis on BCC. These IPC based efforts will be supported by the development, production and provision of tailored visual aids such as poster-based pictorial algorithms.

NGO partners involved in the ACSM program will support NDoH to engage with the corporate sector to encourage support and sponsorship for malaria control efforts.

A primary school-based malaria information program will be developed and then extended to cover secondary level education through the incorporation of a vector-borne disease module into the national curriculum as part of a broader health

education effort. The lead NGO involved in ACSM will support the NDoH to link-in more effectively with the Education Department and ensure a greater role for children and young people in the process.

The Healthy Village Model is a community based health promotion scheme, in which communities act with the support of NDoH or NGOs to improve the health of their members. Support can include community training, community profiling, development of community action plans and monitoring activities. As part of its integrated approach to malaria control the NMCP will work in cooperation with national and provincial health authorities to support the progressive rollout of this model focussing on communities where population density is high and malaria transmission is intense in order to maximize cost effectiveness.

2.3.5. Programme management

2.3.5.1. Programme management and supervision

The NMCP will conduct an annual review of programme policies, strategies, SOPs, forms and checklists and revise as appropriate. A policy on Vector Control and Personal Protection including Indoor Residual Spraying (and integrated vector management if appropriate) and policy to guide the deployment of RDTs versus microscopy at different levels will be developed in year 1. It may be decided to make RDTs available for patients at first point of contact at every level of the health system, including hospital out-patient departments, with certified microscopy being used for referrals and on admission.

The NMCP will implement an annual joint planning exercise for malaria control with provinces at provincial level to ensure greater provincial ownership of provincial level activities (all of these activities will be included in provincial Annual Health Implementation Plans).

Malaria program management at district levels will be strengthened through targeted operational and capacity building support. District Health Managers (DHM) will conduct regular joint supervisory visits with Provincial Malaria Supervisors (PMS) to all health centres (HCs) (on a six-monthly basis). Supervisory checklists will be refined to cover key malaria related activities.

NMCP will work with partners including through the Asia Pacific Leaders Malaria Alliance (APLMA) to increase the resources available for malaria by diversifying donor sources and increasing government allocations.

NMCP will improve access to transportation by outsourcing car-pool management to a private accountancy firm for an initial period of three years, with a move to in-house car pool management once capacity exists.

NMCP will work to strengthen coordination of the national malaria control effort. At central level the Malaria Technical Working Group (TWG) will expand to incorporate representation from the 'Rural Primary Health Care Service Delivery Project' (RPHCSDP), the Churches Medical Council (CMC) and the private sector. It will meet on a six-monthly basis to review programme implementation against the NMCP Action Plan. At provincial level NMCP M&E officers will support health authorities to conduct regular 6-monthly coordination meetings for malaria control involving the PMS, Provincial Disease Control Officers (PDCO), Environmental Health Officers

(EHO), DHMs, and Hospital Director Nursing Services and Director Medical Services, Provincial Laboratory Technologist, Provincial Health Information Officer.

2.3.5.2. Procurement and supply management

The NMCP will support the work of NDoH to strengthen **procurement and supply management** (PSM). The 'Msupply' pharmaceutical supply management system will be rolled-out to all provincial transit stores as quickly as possible (funded under health systems strengthening). Procurement activities at national level will be overseen by the PSM advisor in order to: improve the timeliness of procurement; minimize procurement overlaps; ensure compliance with relevant national policies and guidelines; and, provide transparency in procurement processes.

Procurement of health products and health equipment will all be executed on a transparent and technically sound basis to obtain the best value for money, in accordance with both Global Fund and Australian aid approved procurement policies and in line with international standards.

The procurement method selected for each item will be determined in accordance with the PSM Guidelines. Non-competitive procurement will only be conducted when technical reasons require the procurement of a specific single-source product (in this case a preferred supplier agreement will be required). Where competitive procurement is required, the type of procurement method will be determined according to the anticipated value of the procurement contract.

NMCP Regional Logistics Coordinators (RLCs) will be maintained in the mid-term with a phased role transition to the Medical Supplies Branch as the PSM system strengthens. A pharmacist will be appointed in each province to oversee local PSM (either through new appointments or a change in job description for current provincial/hospital pharmacists). The terms of reference for specialist pharmacists will be expanded to cover pharmacovigilance and oversight of private sector compliance with national drug and medical supply guidelines. Staff at all levels in the supply chain will be trained to properly manage medical supplies in accordance with national standards. The current PSM infrastructure support programme will be continued and extended to all levels of the supply chain, providing conditions to ensure minimum international drug and medical supply storage standards can be met.

2.3.5.3. Human resource management

NMCP will develop human resources (HR) at all levels through recruitment, targeted training and supervision. A staffing and training-needs analysis will be carried out based on required technical competencies and an HR capacity development plan will be developed. Additional staff will be recruited as required. Staff will be given needs-based training to graduate/diploma/MSc level. Performance-based scholarships will be provided for health staff including CHWs. Staff sent for training will be bonded to work with the NDoH for an agreed period based on the investment made.

The NMCP will work with technical and funding partners to recruit TA to support programme management and capacity development as required. Long-term TA will be recruited to support a range of program areas including vector control, case management, epidemiology and administrative management. Short-term TA will be called down on an ad hoc basis as required

NMCP will seek skilled international volunteers to support Provincial Health Officers (PHOs) and work alongside PDCO's/PMS etc providing day-to-day technical support for management, planning and operations in under-performing provinces.

2.3.5.4. Financial management

In order to strengthen implementation in under-performing provinces where financial management systems are not sufficiently robust, GoPNG will pilot the outsourcing of financial management to an accountancy firm for an initial period of three years. Officers of the accountancy firm will be embedded within provincial treasuries and provide support to provincial and district treasuries to strengthen implementation and strengthen overall financial management capacity.

NMCP and implementing partners will commission annual external financial audits.

2.4. Goal and main objectives

Goal. To achieve a substantial and sustained reduction in the malaria burden in PNG (reduce Annual Parasite Incidence to 84/1,000 by 2015 and to 72/1,000 by 2018).

Objective 1. Maintain high coverage of long-lasting insecticide treated bednets (LLINs) and increase the utilization of appropriate malaria prevention measures.

Objective 2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria (EDAT).

Objective 3. Strengthen malaria epidemic preparedness and response capacities at all levels.

Objective 4. Maintain malaria monitoring and evaluation (M&E) systems and continue to develop the national capacity for surveillance.

Objective 5. Expand Public Private Partnerships (PPP) for key malaria interventions.

Objective 6. Strengthen malaria advocacy, communication and social mobilization (ACSM).

Objective 7. Further strengthen malaria program management at all levels with district level as the priority.

2.5. Objective and activities

Objective 1. Maximize access to and utilization of appropriate measures for vector control and personal protection from vectors.

1.1. Maximize access to long-lasting insecticide treated bednets (LLINs) to achieve universal coverage by 2015.

1.1.1. Conduct regular mass LLINs distribution campaigns.

1.1.2. Distribute LLINs to vulnerable groups/special populations through health-facility based scheme.

1.1.3. Work with established commercial bednet distributors/retailers in all major district level commercial centers to ensure that they provide LLIN rather than untreated bednets.

1.2. Indoor Residual Spraying (IRS) in response to outbreaks.

1.2.1. Establish storage facilities for emergency supplies [one in each of 7 highlands provinces].

1.2.2. Procure supplies and equipment for IRS.

1.2.3. Train IRS spray teams [integrated into implementation].

1.2.4. Implement focal responsive IRS operations in response to outbreaks.

1.2.5. Support quantification, targeting, fine-tuning strategy etc. [External technical assistance].

Objective 2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria (EDAT).

2.1. Facility-based Treatment - Strengthen malaria diagnostic and treatment capacity for all healthcare providers.

2.1.1. Strengthen the capacity of the Central Public Health Laboratory (CPHL) to manage microscopy QA and training services.

2.1.2. Establish a slide bank at CPHL for spot testing and training microscopists.

2.1.3. Strengthen the quality of microscopy at hospitals (and selected health facilities if appropriate).

2.1.4. Strengthen RDT- based diagnostic skills of public sector healthcare providers.

2.1.5. Maintain QC systems for RDTs.

2.1.6. Update National treatment guidelines (NTGs) periodically.

2.1.7. Provide biannual clinical refresher training for all healthcare providers [include RDT, IPTp3 etc.]. This will entail training of trainers by central level staff at Provincial Hospitals followed by closely supervised training of peripheral staff by the newly trained provincial trainers.

2.1.8. Hold periodic technical meetings with provincial hospitals and clinics to discuss implementation issues related to the NTGs for malaria.

2.2. Improve access to affordable and good quality malaria diagnosis and appropriate treatment through both public and private sectors.

2.2.1. Roll-out RDT based diagnostic services and ACT based treatment to Aid Post and selected private sector health facilities.

2.2.2. Collaborate with Pharmaceutical Standards Branches to enforce the ban on marketing/use of artemisinin-based monotherapy in public and private sectors.

2.2.3. Collaborate with the PNG Medical Association and National Doctors Association to engage private sector doctors to improve management of malaria in-line with the NTGs.

2.2.4. Annual meeting to provide clinical updates for private sector healthcare providers.

2.2.5. Monitor compliance of healthcare providers to national treatment guidelines.

2.3. Improve management of severe malaria cases.

2.3.1. Provinces identify and map referral centres (Level 3 Facilities) at district level.

2.3.2. Train staff at referral centres to manage severe malaria cases.

2.3.3. Train VHWS and Aid Post staff on identification of severe malaria and on pre-referral treatment using heat-stable artesunate suppositories.

2.3.4. Conduct regular audits of the status of referral centres in terms of management of severe malaria and the status of peripheral health facilities in terms of pre-referral treatment capability.

2.3.5. Ensure that referral centres are provided with all necessary anti-malarials, supportive drugs, equipment and supplies and ensure that all peripheral health-care providers who do not have access to injectable artesunate are supplied with pre-referral treatment.

2.4. Expand HMM to iCCM and scale-up as rapidly as feasible to cover all endemic communities more than one hour's walk from the nearest functioning health facility.

2.4.1. Conduct in-depth review to compare and contrast the various community-based case management strategies currently in operation across PNG.

2.4.2. Develop national iCCM implementation guidelines and training manual in collaboration with Family Health.

2.4.3. Strengthen and expand the implementation of iCCM in coordination with Local Level Government (LLG) structures.

2.4.4. Produce and supply prominent easily recognisable signboards for iCCM workers.

2.4.5. Conduct routine monitoring of iCCM programs.

2.4.6. Carry out annual evaluation of the effectiveness of iCCM programs.

2.5. Provide quality assured diagnostic tests and antimalarials to the public sector.

2.5.1. Conduct annual quantification of programme requirements for diagnostics and antimalarials.

2.5.2. Support process of procurement of quality assured diagnostics and antimalarials from WHO pre-qualified suppliers (oversight by programme manager).

2.5.3. Conduct batch testing on ACT/RDTs as well as random testing of samples collected from all levels of the supply chain.

2.5.4. Assist PLOs in quantifying malaria diagnosis and treatment supply demands.

2.5.5. Conduct regular periodic stock-takes, remove and dispose of all inappropriate anti-malarials (and other drugs) and redistribute excess supplies to other HCs if appropriate

2.5.6. Integrate malaria diagnosis and treatment supply chain management into the national drug supply chain management systems.

2.6. Provide intermittent presumptive treatment during pregnancy (IPTp) at antenatal clinics as part of the ante-natal care package (ANC) package.

2.6.1. Provide 3 doses of sulphadoxine-pyrimethamine (SP) at least one month apart to women attending ANC from the second trimester of their pregnancies.

2.7. Pilot the use of point-of-care G6PD tests and roll-out when appropriate.

2.7.1. Pilot the use of G6PD tests.

2.7.2. Roll-out G6PD tests when appropriate - *To be confirmed.*

Objective 3. Strengthen malaria epidemic preparedness and response capacities at all levels.

3.1. Strengthen epidemic surveillance and response capacity of the Malaria Surveillance and Control Unit (MSCU) in Goroka.

3.1.1. Refurbish MSCU.

3.1.2. Maintain infrastructure at MSCU.

3.1.3. Improve communication network/linkage between MSCU, NHIS and PHIS.

3.1.4. Recruit and train MSCU staff as well as the provinces to enable them to implement the surveillance system.

3.1.5. Establish sentinel sites and monitor data collection.

3.1.6. Analyse and review surveillance data on a quarterly basis.

3.2. Improve outbreak detection, preparedness and response in provinces and districts characterised by unstable malaria.

3.2.1. Develop a robust outbreak early warning system and standard operating procedures (SOPs) for outbreak investigation and response.

3.2.2. Train health staff in provinces and districts characterised by unstable malaria on epidemic detection, investigation and response.

Objective 4. Maintain malaria monitoring and evaluation (M&E) systems and continue to develop the national capacity for surveillance.

4.1. Improve quality and efficiency of National Health Information System (NHIS) for Malaria.

- 4.1.1. Maintain independent monitoring and evaluation of the NMCP (role currently played by IMR).
- 4.1.2. Conduct a review of the NHIS malaria indicators and reporting process and revise and simplify as appropriate.
- 4.1.3. Strengthen reporting adherence at provincial level through Monitoring and Supervision.
- 4.1.4. Strengthen data analysis and reporting capacity at the provincial level
- 4.1.5. Support the piloting of a web-based reporting system for the NHIS.
- 4.1.6. Develop and maintain a reporting system for Aid Posts and HMM/iCCM networks.

4.2. Develop capacity for national and provincial level malaria surveillance.

- 4.2.1. Identify priority provinces in each region for intensive malaria surveillance
- 4.2.2. Train NDoH and provincial staff in malaria surveillance techniques including data analysis.
- 4.2.3. Update computer software to allow easier analysis of trends/differences between geographical areas.
- 4.2.4. Implement data management and reporting systems in MSCU.
- 4.2.5. Conduct annual data review workshop for malaria officers/health information officers.
- 4.2.6. Produce a "Progress and Impact Report" with the assistance of RBM (a glossy publication that can be used to highlight the progress made to a wider audience).
- 4.2.7. Restructure databases held at national and provincial level to enable trends over time to be more easily assessed.
- 4.2.8. Integrate data review into routine meetings.

4.3. Strengthen research focussing on areas of high operational significance.

- 4.3.1. Support regular meetings of the Malaria Technical Working Group to review latest research findings (well prior to publication) and identify priority operational research projects and contract them out to appropriate organizations.
- 4.3.2. Support operational research.

4.4. Expand clinical monitoring.

- 4.4.1. Identify drug resistance monitoring sites and partners.

4.5.2. Establish SOPs for drug resistance monitoring and provide training as required to build capacity within NMCP to manage therapeutic efficacy studies (TES).

4.4.3. Implement annual TES in sentinel sites in collaboration with Pacific Drug Resistance Monitoring Network.

4.4.4. Establish a functional adverse drug reaction monitoring system at provincial hospitals and health centres (to be actioned by the Pharmacy Department with the support of the Pharmaceutical Advisory Committee)

4.4.5. Monitor possible treatment failures (those still positive under microscopic examination) and report.

4.4.6. Collect detailed consumption data on RDTs and antimalarials in sentinel sites to facilitate quantification of programme needs at Hospital, Health Centre and Aid Post levels.

4.5. Monitor the effectiveness of LLIN distribution in a random representative sample of communities to assess coverage achieved by campaigns and topping-up efforts [independent group].

4.6. Establish routine monitoring of insecticide resistance and vector bionomics. Routine surveillance of insecticide resistance will be established by NMCP (initially under the guidance of IMR and according to WHO's Global Plan for Insecticide Resistance Management (GPIRM)).

4.6.1. Establish and maintain a fully equipped entomology laboratory and insectary together with experimental huts.

4.6.2. Establish SOPs and provide training as required.

4.6.3. Procure standard WHO test kits for insecticide susceptibility testing.

4.6.4. Conduct routine surveillance of insecticide resistance and vector bionomics in sentinel sites and *ad hoc* surveillance of insecticide resistance where resistance is suspected.

4.6.5. Hold annual consultation meeting with entomology counterparts at the Ministry of Agriculture (MoA).

4.7. Develop a national stratification of malaria risk to improve targeting of interventions.

4.7.1. Develop stratification approach and methodology, implement stratification surveys, analyse data and finalize stratification documentation.

4.8. Conduct regular programme reviews.

4.8.1. Conduct a joint Malaria Programme Review (MPR) every 3 years led by a team of external experts.

4.8.2. Conduct annual programme review (programme experts) with emphasis on problem solving (integrated into MPR every 3 years).

Objective 5. Expand Public Private Partnerships (PPP) for key malaria interventions.

- 5.1. Establish MOUs between private sector partners and NDoH/Provincial Health Offices/PHAs.**
- 5.2. Strengthen capacity of private sector partners to align with national malaria control guidelines, systems and standards.**
- 5.3. Organize regular meetings/planning exercises attended by Provincial Malaria Supervisors, hospital pharmacists and private sector providers in support of the work of the Compliance, Licensing and Inspection Unit of the Pharmaceutical Services Branch (PSB) at provincial level.**
- 5.4. Strengthen monitoring and enforcement measures for combating the import, sale and use of fake or inappropriate anti-malarials in the private sector including the removal of oral artemisinin-based monotherapy (oAMT).**
- 5.5. Establish and support a Malaria Partners Forum/Malaria Coalition involving a broad range of stakeholders including church health groups, provincial representatives, pharmaceutical companies, large private sector companies, private pharmacies, the Department of Finance etc.**

Objective 6. Maximize utilization of malaria control services through implementation of a comprehensive advocacy, communication and social mobilization (ACSM) effort.

6.1. Plan and prepare for ACSM interventions.

- 6.1.1. Engage churches, community based organizations (CBOs) and NGOs.
- 6.1.2. Conduct ACSM needs assessment and hold strategic planning workshops (TA).
- 6.1.3. Train ACSM managers to strengthen capacity (TA).
- 6.1.4. Develop and test ACSM materials/methodologies. [Employ a broad range of innovative approaches in support of ACSM including sports campaigns, drama groups, SMS etc.].
- 6.1.5. Conduct operational planning exercise for implementation of ACSM strategy.
- 6.1.6. Procure and maintain IEC equipment
- 6.1.7. Produce IEC materials [Production of broad range of media, including billboards, pamphlets, posters, colouring books, teachers guides for educating students etc. Includes distribution costs].
- 6.1.8. Train ACSM implementers from NDoH/CBOs/ faith-based organizations (FBOs).

6.2. Implement ACSM interventions.

- 6.2.1. Implement community-based ACSM efforts [in support of malaria control efforts at community level - timed to coincide with the run-up to peak transmission].
- 6.2.2. Implement sensitization and mobilisation events targeting the policy makers and key players at central and peripheral levels.
- 6.2.3. Implement school-based ACSM efforts in collaboration with the Department of Education.
- 6.2.4. Implement mass media-based ACSM efforts [Airing radio spots and talk back shows utilizing free opportunities wherever possible e.g. news channels, chat shows etc.].

6.3. Support progressive roll-out of Healthy Village model for malaria control in selected high population density, high transmission sites.

6.4. Support World Malaria Day activities.

6.5. Conduct ACSM specific monitoring.

Objective 7. Further strengthen malaria program management at all levels with district level as the priority.

7.1. Hold annual NMCP meeting and conduct annual review of programme policies, strategies, SOPs, forms and checklists and revise as appropriate.

7.2. Implement annual joint planning for malaria control with provinces at provincial level to ensure greater provincial ownership of provincial level activities.

7.3. Strengthen malaria program management at district levels through targeted operational and capacity building support.

7.3.1. DHMs conduct regular joint supervisory visits with PMS to all HCs (on a six-monthly basis). Supervisory checklists will be refined to cover key malaria related activities.

7.4. Strengthen M&E.

7.4.1. Conduct in-depth assessment of M&E and develop and implement M&E system strengthening plan.

7.4.2. Improve activity and performance monitoring at district and health facility levels (linked to provision of adequate transportation).

7.4.3. Periodically review the status of activity and performance monitoring at district and health facility levels.

7.5. Strengthen procurement and supply management.

7.5.1. Support the introduction of the Msupply system with further roll-out to all provincial transit stores as quickly as possible (funded under health systems strengthening).

7.5.2. PSM advisor oversight of procurement practices at national level in order to: improve the timeliness of procurement; minimize procurement overlaps; ensure compliance with relevant national policies and guidelines; and, provide transparency in procurement processes.

7.5.3. Maintain NMCP Regional Logistics Coordinators (RLCs) in the mid-term with a phased role transition to the Medical Supplies Branch as the PSM system strengthens.

7.5.4. Appoint a pharmacist in each province to oversee local PSM (either through new appointments or a change in job description for current provincial/hospital pharmacists).

7.5.5. Expand terms of reference (ToRs) for specialist pharmacists to cover pharmacovigilance and oversight of private sector compliance with national drug and medical supply guidelines.

7.5.6. Train staff at all levels in the supply chain to properly manage medical supplies in accordance with national standards.

7.5.7. Continue the current PSM infrastructure support programme and extend it to all levels of the supply chain, providing conditions to ensure minimum international drug and medical supply storage standards can be met.

7.6. Increase resources available for malaria by diversifying donor sources and increasing government allocations.

7.7. Develop human resources in the district through targeted training and supervision.

7.8. Develop human resources (HR) at central and provincial levels.

7.8.1. Recruit additional staff.

7.8.2. Carry out a staffing and training-needs analysis based on required technical competencies and prepare a HR capacity development plan for program staff.

7.8.3. Train staff to graduate/diploma/MSc level (performance related scholarships for health staff including CHWs). Staff sent for training will be bonded to work with the NDoH for an agreed period based on the investment made.

7.8.4. Provide necessary TA to support programme management and capacity development. Long-term TA for vector control, case management, epidemiology, administrative management. Short-term TA as required. [e.g. ACT malaria training of trainers (TOT) - transferable training skills].

7.8.5. Support international agency volunteers to be placed within PHOs to work alongside PDCO's/PMS etc and provide day-to-day technical support for management, planning and operations.

7.9. Strengthen financial management.

7.9.1. Conduct annual financial audit.

7.10. Strengthen coordination of the national malaria control effort.

7.10.1. The Malaria TWG will expand to incorporate representation from the 'Rural Primary Health Care Service Delivery Project' (RPHCSDP), the Churches Medical Council (CMC) and the private sector. It will meet on a six-monthly basis to review programme implementation against the NMCP Action Plan.

7.9.2. NMCP M&E officers will support provinces to conduct regular 6-monthly coordination meetings for malaria control involving the PMS, Provincial Disease Control Officers (PDCO), Environmental Health Officers (EHO), DHMs, and Hospital Director Nursing Services and Director Medical Services, Provincial Laboratory Technologist, Provincial Health Information Officer.

7.11. Routine supervision visits by provincial level staff to district level and beyond. [Reduce frequency to six monthly but improve quality and broaden scope of HF supervision. Supervision targets should be tailored to each location taking logistical constraints into consideration. Assist second level pharmacy stores with logistics].

3. Financial framework

3.1. Budget

The budget for the period 2014-2018 is estimated at US\$ 285,316,455. The two tables below show the budget breakdown summary by main activities and by objectives by year.

A. Budget breakdown by major activity.							
Activities	Cost					Total US\$	
	2014	2015	2016	2017	2018		
1. Maximize access to and utilization of appropriate measures for vector control and personal protection from vectors.							
1.1. Maximize access to long-lasting insecticide treated bednets (LLINs) to achieve universal coverage by 2015.	12,327,559	12,162,481	18,173,014	15,867,222	14,638,179	73,168,455	25.8%
1.2. Indoor Residual Spraying (IRS) in response to outbreaks.	309,453	132,293	138,908	145,853	153,146	879,653	0.3%
2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria (EDAT).						-	0.0%
2.0. Procure drugs and diagnostic supplies.	3,960,950	4,750,851	5,498,145	6,224,526	6,911,952	27,346,425	9.6%
2.1. Facility-based Treatment - Strengthen malaria diagnostic and treatment capacity for all healthcare providers.	742,500	855,750	650,475	943,464	717,149	3,909,338	1.4%
2.2. Improve access to affordable and good quality malaria diagnosis and appropriate treatment through both public and private sectors.	312,000	840,420	110,691	129,654	122,037	1,514,802	0.5%
2.3. Improve management of severe malaria cases.	242,000	23,100	266,805	25,468	294,153	851,525	0.3%
2.4. Expand HMM to ICCM and scale-up.	7,592,000.00	25,291,350.00	15,530,917.50	15,890,718.38	16,685,254.29	80,990,240	28.4%
2.5. Provide quality assured diagnostic tests and antimalarials to the public sector.	84,000	88,200	92,610	97,241	102,103	464,153	0.2%
2.6. Provide intermittent presumptive treatment during pregnancy (IPTp) at antenatal clinics as part of the ante-natal care package (ANC) package.	10,000	-	-	-	-	10,000	0.0%
2.7. Pilot the use of point-of-care G6PD tests and roll-out when appropriate.	-	105,000	-	-	-	105,000	0.0%
Objective 3. Strengthen malaria epidemic preparedness and response capacities at all levels.						-	0.0%
3.1. Strengthen epidemic surveillance and response capacity of MSCU.	300,000	84,000	88,200	92,610	97,241	662,051	0.2%
3.2. Improve outbreak detection, preparedness and response in provinces and districts characterised by unstable malaria.	142,000	31,500	-	-	-	173,500	0.1%
4. Maintain malaria monitoring and evaluation (M&E) systems and continue to develop the national capacity for surveillance.	937,500	984,375	1,033,594	1,085,273	1,139,537	5,180,279	1.8%
4.1. Improve quality and efficiency of NHIS.	784,000.00	1,501,500.00	595,350.00	625,117.50	1,142,575.88	4,648,543	1.6%
4.2. Develop capacity for national and provincial level malaria surveillance.	53,000	282,450	35,280	11,576	12,155	394,461	0.1%
4.3. Strengthen research focussing on areas of high operational significance.	120,000	126,000	132,300	138,915	145,861	663,076	0.2%
4.4. Expand clinical monitoring.	140,000	94,500	99,225	104,186	109,396	547,307	0.2%
4.5. Monitor the effectiveness of LLIN distribution in a random representative sample of communities.	40,000	42,000	44,100	46,305	48,620	221,025	0.1%
4.6. Establish routine monitoring of insecticide resistance and vector bionomics.	1,000	185,220	51,156	53,714	56,399	347,489	0.1%
4.7. Develop a national stratification of malaria risk to improve targeting of interventions.	-	231,000	132,300	-	-	363,300	0.1%
4.8. Conduct regular programme reviews.	20,000	21,000	187,425	23,153	24,310	275,888	0.1%
Objective 5. Expand PPP for key malaria interventions.	22,000	23,100	24,255	25,468	26,741	121,564	0.0%
5.1. Establish MOUs between private sector partners and NDoH/PHOs/PHAs.	1,000	-	-	-	-	1,000	0.0%
5.2. Strengthen capacity of private sector partners to align with national malaria control guidelines, systems and standards.	150,000	157,500	165,375	173,644	182,326	828,845	0.3%
5.3. Organize regular meetings/planning exercises attended by Provincial Malaria Supervisors, hospital pharmacists and private sector providers.	22,000	23,100	24,255	25,468	26,741	121,564	0.0%
5.4. Strengthen monitoring and enforcement measures for combating the import, sale and use of fake or inappropriate anti-malarials.	10,000	10,500	11,025	11,576	12,155	55,256	0.0%
5.5. Establish and support a Malaria Partners Forum/Malaria Coalition.	2,000	2,100	2,205	2,315	2,431	11,051	0.0%
Objective 6. Maximize utilization of malaria control services through implementation of a comprehensive ACSM effort.						-	0.0%
6.1. Plan and prepare for ACSM interventions.	1,920,000	1,890,000	1,918,350	1,967,963	2,114,981	9,811,293	3.4%
6.2. Implement ACSM interventions.	600,000	892,500	937,125	983,981	1,033,180	4,446,787	1.6%
6.3. Support progressive roll-out of Healthy Village model for malaria control in selected high population density, high transmission sites.	300,000	735,000	1,212,750	1,736,438	2,309,462	6,293,649	2.2%
6.4. Support World Malaria Day activities.	50,000	52,500	55,125	57,881	60,775	276,282	0.1%
6.5. Conduct ACSM specific monitoring.	350,000	367,500	385,875	405,169	425,427	1,933,971	0.7%
7. Further strengthen malaria program management at all levels with district level as the priority.						-	0.0%
7.0 Hold annual NMCP meeting to review progress, identify issues and address problems.	50,000	52,500	55,125	57,881	60,775	276,282	0.1%
7.1. Conduct annual review of programme policies, strategies, SOPs, forms and checklists.	1,000	1,050	1,103	1,158	1,216	5,526	0.0%
7.2. Implement annual joint planning for malaria control with provinces.	110,000	115,500	121,275	127,339	133,706	607,819	0.2%
7.3. Strengthen malaria program management at district levels through targeted operational and capacity building support.	150,000	157,500	165,375	173,644	182,326	828,845	0.3%
7.4. Strengthen M&E.	81,000	1,050	1,103	1,158	1,216	85,526	0.0%
7.5. Strengthen procurement and supply management.	1,091,000	1,145,550	1,202,828	1,262,969	1,313,636	5,833,983	2.0%
7.6. Increase resources available for malaria by diversifying donor sources and increasing government allocations.	1,000	1,050	1,103	1,158	1,216	5,526	0.0%
7.7. Develop human resource capacity at district level through targeted training and follow-on supervision.	-	-	-	-	-	-	0.0%
7.8. Develop human resources (HR) at central and provincial levels.	1,633,000	2,155,650	2,020,883	2,376,604	2,228,023	10,414,160	3.7%
7.9. Strengthen financial management.	10,000	10,500	11,025	11,576	12,155	55,256	0.0%
7.10. Strengthen coordination of the national malaria control effort.	46,000	48,300	50,715	53,251	55,913	254,179	0.1%
7.11. Routine supervision visits by provincial level staff to district level and beyond.	800,000	840,000	882,000	926,100	972,405	4,420,505	1.5%
7.12. National staff salaries - Central level.	350,000	367,500	385,875	405,169	425,427	1,933,971	0.7%
7.13. National staff salaries - Provincial level.	120,000	126,000	132,300	138,915	145,861	663,076	0.2%
7.14. Office costs	1,895,000	1,989,750	2,089,238	2,193,699	2,303,384	10,471,071	3.7%
8. Grant Management						-	0.0%
8.1. Supervision - field visits to SRs and SSRs	50,000	52,500	55,125	57,881	60,775	276,282	0.1%
8.2. Expatriate support staff - PMU Manager.	350,000	367,500	385,875	405,169	425,427	1,933,971	0.7%
8.3. Expatriate support staff - Public Health Management Advisor.	320,000	336,000	352,800	370,440	388,962	1,768,202	0.6%
8.4. Expatriate support staff - HR, procurement, logistics advisor.	320,000	336,000	352,800	370,440	388,962	1,768,202	0.6%
8.5. Expatriate support staff - Accountant.	320,000	336,000	352,800	370,440	388,962	1,768,202	0.6%
8.6. Expatriate support staff - ICCM and ACSM.	350,000	367,500	385,875	405,169	425,427	1,933,971	0.7%
8.7. Expatriate support staff - ICCM and ACSM	350,000	367,500	385,875	405,169	425,427	1,933,971	0.7%
8.8. Project support (local).	84,000	88,200	92,610	97,241	102,103	464,153	0.2%
8.9. Provincial bookkeepers (embedded within PHDs).	-	-	-	-	-	-	0.0%
8.10. Office rental.	100,000	105,000	110,250	115,763	121,551	552,563	0.2%
8.11. Office expenses	10,000	10,500	11,025	11,576	12,155	55,256	0.0%
8.12. Communications.	20,000	21,000	22,050	23,153	24,310	110,513	0.0%
8.13. Office furniture.	5,000	5,250	5,513	5,788	6,078	27,628	0.0%
8.14. Office and IT Equipment.	10,000	10,500	11,025	11,576	12,155	55,256	0.0%
8.15. Vehicle hire.	245,000	257,250	270,113	283,618	297,799	1,353,780	0.5%
8.16. Grant management overheads associated with ICCM.	900,000	945,000	992,250	1,041,863	1,093,956	4,973,068	1.7%
8.17. Grant management overheads associated with ACSM.	700,000	735,000	771,750	810,338	850,854	3,867,942	1.4%
	42,016,962	63,339,390	59,274,516	59,411,140	61,274,447	285,316,455	

B. Budget breakdown by objective.	2014	2015	2016	2017	2018	Total US\$	
1. Maximize access to and utilization of appropriate measures for vector control and personal protection from vectors.	12,637,012	12,294,774	18,311,922	16,013,075	14,791,325	74,048,108	26.0%
2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria (EDAT).	12,943,450	31,954,671	22,149,644	23,311,071	24,832,647	115,191,483	40.4%
Objective 3. Strengthen malaria epidemic preparedness and response capacities at all levels.	442,000	115,500	88,200	92,610	97,241	835,551	0.3%
4. Maintain malaria monitoring and evaluation (M&E) systems and continue to develop the national capacity for surveillance.	2,095,500	3,468,045	2,310,730	2,088,240	2,678,854	12,641,369	4.4%
Objective 5. Expand Public Private Partnerships (PPP) for key malaria interventions.	207,000	216,300	227,115	238,471	250,394	1,139,280	0.4%
Objective 6. Maximize utilization of malaria control services through implementation of a comprehensive advocacy, communication and social mobilization (ACSM) effort.	3,220,000	3,937,500	4,509,225	5,151,431	5,943,826	22,761,982	8.0%
7. Further strengthen malaria program management at all levels with district level as the priority.	6,338,000	7,011,900	7,119,945	7,730,620	7,655,258	35,855,723	12.6%
8. Grant Management	4,134,000	4,340,700	4,557,735	4,785,622	5,024,903	22,842,960	8.0%
	42,016,962	63,339,390	59,274,516	59,411,140	61,274,447	285,316,455	

3.2. Key budget assumptions

Key budget assumptions are described for major activities costing >5 per cent of the overall 5 year budget. Annual inflation has been factored into each budget line @ 5 per cent.

Objective 1. Maintain high coverage of long-lasting insecticide treated bednets (LLINs) and increase the utilization of appropriate malaria prevention measures. [US\$ 74,048,108 - 26%]

1.1. Maximize access to long-lasting insecticide treated bednets (LLINs) to achieve universal coverage by 2015) [US\$ 73,168,455 – 25.6%]

6.8 million LLINs will be supplied to populations at risk through rolling annual mass campaigns designed to ensure that communities receive new LLINs every 3 years. The program will aim for 100% coverage based on 1.5 people per LLIN. An additional 2.23 million LLINs will be supplied through antenatal care services and through health facilities in order to maintain coverage at 100% between mass distributions (taking into account population growth and LLIN attrition). Costings are for large sized polyester LLINs (which are less bulky and so cheaper to transport than polyethylene LLINs).

Objective 2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria (EDAT). [US\$ 115,191,483 – 40.4%]

2.0. Procure drugs and diagnostic supplies [US\$ 27,346,425 – 9.6%]

The quantification of drug and diagnostic requirements has been based on models developed by NMCP with the assistance of WHO. These models rely on a number of estimates some of which are less robust than others. Where in doubt, estimates err on the side of caution in order to ensure supplies are adequate. In order to maximise the cost effectiveness of the programme in future, NMCP will focus on collecting robust consumption data so that quantification models can be revised annually and improved. In addition measures will be put in place in the short term to collect and redistribute excess supplies as necessary.

2.4. Expand HMM to iCCM and scale-up. [US\$ 80,990,240 – 28.4%]

iCCM will be scaled-up to cover an additional 1,000 communities in 2014 and a further 2000 communities in 2015.

Objective 3. Strengthen malaria epidemic preparedness and response capacities at all levels. [US\$ 835,551 – 0.3%]

Objective 4. Maintain malaria monitoring and evaluation (M&E) systems and continue to develop the national capacity for surveillance. [US\$ 12,641,369 – 4.4%]

Objective 5. Expand Public Private Partnerships (PPP) for key malaria interventions. [US\$ 1,139,280 – 0.4%]

Objective 6. Strengthen malaria advocacy, communication and social mobilization (ACSM). [US\$ 22,761,982 – 8.0%]

Objective 7. Further strengthen malaria program management at all levels with district level as the priority. [US\$ 35,855,723 – 12.6%]

Global Fund grant management costs. [US\$ 22,842,960 – 8.0%]

Annex 1: Performance framework

In separate Excel document

Annex 2: Program indicator Framework (PIF)

Indicator type and number:	Impact [Indicator 1]
Indicator name:	<i>Parasite prevalence.</i>
Associated objective/activity:	All
Definition:	Percentage of children aged 6-59 months with malaria infection (detection of parasitaemia by microscopy).
Numerator (N):	Number of children aged 6-59 months with malaria infection (detection of parasitaemia by microscopy).
Denominator (D):	Number of children aged 6-59 months tested for malaria infection.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Parasite prevalence is a key indicator for assessing the progress of a malaria program.
Baseline:	13.3% [2010-11]
Targets:	9% [2014]; 5% [2017].
Interpretation:	Falling prevalence is indicative of programmatic impact. Data will be disaggregated by species to give falciparum prevalence and vivax prevalence.
Data source:	<i>Numerator:</i> Malaria indicator survey. <i>Denominator:</i> Malaria indicator survey.
Method of measurement:	Microscopic examination of blood films collected during routine malaria indicator surveys. These surveys are timed to coincide with the peak malaria parasitaemia.
Measurement tool:	Prevalence survey microscopy registers.
Frequency of data collection/reporting:	Every 3 years as part of the routine Malaria Indicator Survey (2014 and 2017).

Entity responsible for data collection:	PNG-IMR.
Indicator type and number:	Impact [Indicator 2]
Indicator name:	<i>Annual parasite incidence.</i>
Associated objective/activity:	All
Definition:	Number of malaria cases confirmed by microscopy or RDT detected per 1,000 population during one year.
Numerator (N):	Number of malaria cases confirmed by microscopy or RDT during one year.
Denominator (D):	Total population of PNG (estimated) And PNGIMR sentinel surveillance sites
Multiplier (M):	1,000
Equation:	$(N/D) \times M$
Rationale/purpose	Annual parasite incidence is the most important criterion to assess the progress of a malaria program, especially towards elimination.
Baseline:	337 [2000] NHIS; 205 (2010/11) PNGIMR
Targets:	84 [2015]; 72 [2018], both NHIS/PNGIMR.
Interpretation:	Falling incidence is indicative of programmatic impact. Data will be disaggregated by species to give annual falciparum incidence and annual vivax incidence. [Note: To date this indicator has been based on clinical and confirmed cases in NHIS. PNGIMR data has been based on confirmed cases in sentinel sites. Thanks to improved access to parasite-based diagnosis, in future API will be reported based on confirmed cases in NHIS. This will improve the quality of epidemiological data. For consistency and in order to support the analysis of epidemiological trends over time, the reporting of API based on clinical and confirmed cases and the monitoring of incidence by IMR in sentinel sites will both continue in parallel to this new indicator.]

Data source:	<i>Numerator:</i> NHIS; febrile cases presenting to PNGIMR sentinel sites <i>Denominator:</i> Census; sentinel site catchment population
Method of measurement:	NHIS: Reporting against this indicator is based on NHIS reports. NHIS data will flow up from health facilities and Nurse Aid Posts to the National NHIS Office, via the Provincial NHIS Coordinators and then on to the NMCP M&E Unit. Every month routine NHIS reports are submitted by the health worker responsible for NHIS in each health facility to their local Provincial NHIS Coordinators. Provincial NHIS Coordinators send the health facility NHIS monthly forms on to the National NHIS Office. The National NHIS Office (Chief and Principal Statistician) compiles the data relating to RDTs and clinical malaria cases and sends a summary (by health facility) on to the NMCP M&E Unit by e-mail. PNGIMR: Based on routine screening of all febrile patients presenting to health facilities in sentinel site locations. Screening involves malaria RDT and blood slide collection. Data reported annually against the population of the sentinel site catchment areas. Population census conducted by PNGIMR and routinely updated.
Measurement tool:	NHIS; RDT and microscopy registry and population census
Frequency of data collection/reporting:	NHIS: Data collection at health facilities and Aid Posts will be continuous. Routine reporting by all health facilities to national level will be monthly within 2 weeks of the end of the reporting period. Provinces set their own deadlines for reporting from health facilities according to local logistical constraints. Malaria data from the national NHIS is sent to the NMCP M&E Manager every 6 months within 21 days of the end of the reporting period. API results will be reported by national level annually. Preliminary API for any given year will be available within 1 month of the end of that year. Final API results will be available (once late reports have been received from outlying health facilities) within 6 months of the end of that year. PNGIMR: annually
Entity responsible for data collection:	NHIS: Health workers are responsible for: Recording details of all patients tested for malaria in outpatient registers at the time of testing.

	• Completing and submitting NHIS reports to the Provincial NHIS Coordinator (hard copy, by phone or by radio). Provincial NHIS Coordinators are responsible for: • Compiling monthly NHIS reports from health facilities. • Sending hard copies of the monthly NHIS reports on to the National NHIS Officer. The National NHIS Officer is responsible for: • Entering data from monthly NHIS reports into the National NHIS Database. • Sending the NHIS malaria dataset to the NMCP M&E Manager. The NMCP M&E Manager is responsible for: • Summarizing microscopy data from the Malaria Epidemiology Monthly Report into the PCD Report. • Preparation of six monthly and annual reports based on the NHIS malaria dataset and PCD Report. • Data analysis and interpretation. • Provision of timely feedback to the National NHIS Officers and Provincial Malaria Officers and beyond. Supportive supervision: Provincial Malaria Officers, working in association with Provincial Nurse Training Officers, Pharmacy Officers, Health Promotion Officers and NHIS Officers, are responsible for: • Visiting health facilities and reconciling details of all patients tested and/or treated for malaria as recorded in the Outpatient Registers with those recorded in the NHIS Registers. • Providing feedback to the health facility. Assisting with the transfer of reports to provincial level where necessary.
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Indicator type and number:	Impact [Indicator 3]
Indicator name:	<i>Malaria Death Rate.</i>
Associated objective/activity:	All
Definition:	Number of deaths due to Malaria per 100,000 of population
Numerator (N):	Number of people with a parasite-based diagnosis of malaria who are admitted to health facilities as in-patients and die before discharge.
Denominator (D):	Total population of PNG.
Multiplier (M):	100,000
Equation:	$(N/D) \times M$
Rationale/purpose	Mortality is a major component of the burden caused by malaria, and reducing malaria related mortality is a key aspect of the overall goal of malaria control efforts globally.
Baseline:	11.9 [2010]
Targets:	<3 [2015]; <1 [2018].
Interpretation:	Falling malaria specific mortality rate suggests that control efforts are effective and, depending on changes in API, may suggest better access to early diagnosis and treatment and/or more effective treatment of severe malaria.
Data source:	<i>Numerator:</i> Health facility inpatient/death registers. <i>Denominator:</i> Census
Method of measurement:	Staff from the NMCP M&E Unit compile data relating to confirmed malaria deaths from health facility inpatient/death registers.
Measurement tool:	NMCP M&E Unit malaria death records.
Frequency of data collection/reporting:	Data collection at health facilities will be continuous. Malaria deaths will be reported by central level annually within 1 month of the end of the reporting period.

Entity responsible for data collection:	Health workers at health facilities are responsible for: • Recording details of all malaria deaths at the time of death in the inpatient/death register. Provincial Malaria Officers are responsible for: • Gathering data from hospital inpatient/death registers. • Provision of malaria dataset to the NMCP M&E Unit. Staff from the NMCP M&E Unit are responsible for: • Gathering of data from hospital inpatient/death registers and Provincial Malaria Officers. The NMCP M&E Unit Manager is responsible for: • Overall coordination of the Malaria Officers. • Verification of all malaria deaths. • Data analysis and interpretation. • Policy/strategy review in light of findings. • Preparation of annual reports. Provision of timely feedback to Provincial Malaria Officers and beyond.
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Indicator type and number:	Outcome [Indicator 4]
Indicator name:	<i>Household LLIN rate.</i>
Associated objective/activity:	Objective 1: Maintain high coverage of LLINs and increase the utilization of appropriate malaria prevention measures.
Definition:	Percentage of households with at least one LLIN.
Numerator (N):	Number of households with at least one LLIN.
Denominator (D):	Number of households surveyed.

Multiplier (M):	100
Equation:	$= (N/D) \times M$
Rationale/purpose	This indicator measures household possession of long-lasting insecticide-treated nets (LLINs) among the population at risk of malaria.
Baseline:	86.9% [2011]
Targets:	>90% [2014]; >90% [2017].
Interpretation:	This indicator provides a measure for household ownership of LLINs at the national level among those at risk of malaria.
Data source:	<i>Numerator:</i> Malaria indicator survey. <i>Denominator:</i> Malaria indicator survey.
Method of measurement:	Interviews with household representatives regarding LLIN ownership.
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Outcome [Indicator 5]
Indicator name:	<i>LLIN utilization rate.</i>
Associated objective/activity:	Objective 1: Maintain high coverage of LLINs and increase the utilization of appropriate malaria prevention measures.
Definition:	Percentage of [people/children<5/pregnant women] who slept under an LLIN the previous night.
Numerator (N):	Number of [people/children<5/pregnant women] who slept under an LLIN the previous night.
Denominator (D):	Number of [people/children<5/pregnant women] covered by interview.

Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	This indicator measures the utilization of insecticide-treated nets among people who are at risk of malaria.
Baseline:	49%; 59%; 51% [2011]
Targets:	60%; 65%; 65% [2014]; >80% [2017].
Interpretation:	This indicator provides a direct measure of the utilization of insecticide-treated nets by people who are at risk of malaria. It reflects both the levels of coverage achieved through the various distribution efforts and the impact of communication efforts to maximize uptake/utilization of the LLINs available/provided.
Data source:	<i>Numerator:</i> Malaria indicator survey. <i>Denominator:</i> Malaria indicator survey.
Method of measurement:	Results will be based on interviews with household members/representatives regarding LLIN utilization carried out in a randomly selected representative sample of households (as part of the broader malaria indicator surveys).
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Outcome [Indicator 6]
Indicator name:	<i>IPTp2 rate.</i>
Associated objective/activity:	Objective 1: Maintain high coverage of LLINs and increase the utilization of appropriate malaria prevention measures.
Definition:	Percentage of pregnant women who attended ANC who received at least 2 doses of Fansidar (SP) during their pregnancy.

Numerator (N):	Number of pregnant women who attended ANC who received at least 2 doses of Fansidar (SP) during their pregnancy.
Denominator (D):	Number of pregnant women who attended ANC.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	IPTp is a key strategy for reducing the burden of malaria during pregnancy.
Baseline:	Not available.
Targets:	To be decided following baseline surveys.
Interpretation:	An increase in the IPTp2 rate will demonstrate progress towards reducing the burden of malaria during pregnancy either as a result of an increased rate of double ANC attendance by pregnant women or as a result of greater adherence to the use of IPTp2 by ANC practitioners, or both. [Note: 60% of pregnant women attend ANC clinics at least once, 40% attend at least twice.]
Data source:	<i>Numerator:</i> Malaria indicator survey. <i>Denominator:</i> Malaria indicator survey.
Method of measurement:	Results will be based on interviews with women who have recently given birth carried out in a randomly selected representative sample of households (as part of the broader malaria indicator surveys).
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Output [Indicator 7]
Indicator name:	<i>Access to LLIN retailers.</i>
Associated objective/activity:	Objective 1: Maintain high coverage of LLINs and increase the utilization of appropriate malaria prevention

	measures.
Definition:	Percentage of districts that have access to affordable WHOPES approved LLINs through retailer outlets.
Numerator (N):	Number of districts that have access to affordable WHOPES approved LLINs through retailer outlets.
Denominator (D):	Number of districts.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	This indicator measures the speed of roll-out of the Rotary Against Malaria (RAM) initiative to provide LLINs through the private sector.
Baseline:	0% [2013]
Targets:	10% [2014]; 30% [2015]; 60% [2016].
Interpretation:	Timely roll-out of the RAM initiative to provide LLINs through the private sector will help to increase the availability of LLINs to all in need and maximize the cost-effectiveness of the LLIN program.
Data source:	<i>Numerator:</i> RAM annual report. <i>Denominator:</i> District list.
Method of measurement:	Review of private sector collaboration by RAM.
Measurement tool:	RAM reports on private sector collaboration.
Frequency of data collection/reporting:	<i>Ad hoc</i> reports on private sector collaboration compiled and incorporated into the RAM annual report.
Entity responsible for data collection:	Rotary Against Malaria.

Indicator type and number:	Outcome [Indicator 8]
Indicator name:	<i>BCC recall rate.</i>
Associated objective/activity:	Objective 6: Strengthen malaria advocacy, communication and social mobilization.

Definition:	Percentage of household heads who can recall at least two key malaria prevention messages.
Numerator (N):	Number of household heads who can recall at least two key malaria prevention messages.
Denominator (D):	Number of household heads interviewed.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	This indicator measures the impact of communication efforts relating to malaria.
Baseline:	To be announced following analysis of 2011 MIS data.
Targets:	To be decided following analysis of 2011 MIS data.
Interpretation:	This indicator provides a measure of the outcome of malaria related communication efforts.
Data source:	<i>Numerator:</i> Malaria indicator survey. <i>Denominator:</i> Malaria indicator survey.
Method of measurement:	Interviews with household heads regarding malaria related knowledge.
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Outcome [Indicator 9]
Indicator name:	<i>Early treatment seeking rate.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria. Objective 6: Strengthen malaria advocacy, communication and social mobilization.
Definition:	Percentage of mothers/caregivers seeking treatment for their febrile child within 24 hours of onset of symptoms.

Numerator (N):	Number of mothers/caregivers interviewed with a child that had had fever in the last 2 weeks who sought treatment for that child within 24 hours of onset of symptoms.
Denominator (D):	Number of mothers/caregivers interviewed who had a child that had had fever in the last 2 weeks.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Early treatment seeking is key to preventing the development of severe symptoms and death. Promoting early treatment seeking is a key reason for the expansion of health services to community level and engaging with the private sector and a key focus of malaria related communication efforts.
Baseline:	To be announced following analysis of 2011 MIS data.
Targets:	To be decided following collection of baseline data.
Interpretation:	An increase in the percentage of mothers/caregivers seeking treatment for their febrile child within 24 hours of onset of symptoms is indicative of either improved access to health services or better understanding of the need for early treatment seeking or both.
Data source:	<i>Numerator:</i> MIS <i>Denominator:</i> MIS
Method of measurement:	Interviews with household representatives regarding treatment seeking for febrile children.
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Outcome [Indicator 10]
Indicator name:	<i>Appropriate treatment seeking rate.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.

	Objective 6: Strengthen malaria advocacy, communication and social mobilization.
Definition:	Percentage of people with fever in the last 2 weeks who sought treatment from recognized providers (disaggregated by type public, company, community based and private sector).
Numerator (N):	Number of people interviewed who had had fever in the last 2 weeks who sought treatment from recognized providers (disaggregated by type public, company, community based and private sector).
Denominator (D):	Number of people interviewed who had had fever in the last 2 weeks.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Appropriate treatment seeking is key to preventing the development of severe symptoms and death. Promoting appropriate treatment seeking is a key reason for the expansion of health services to community level and engaging with the private sector and a key focus of malaria related communication efforts.
Baseline:	To be announced following analysis of 2011 MIS data.
Targets:	To be decided following collection of baseline data.
Interpretation:	An increase in the percentage of people seeking appropriate treatment is indicative of either improved access to quality health services or a better understanding of the need for quality treatment or both.
Data source:	<i>Numerator:</i> MIS <i>Denominator:</i> MIS
Method of measurement:	Interviews with household representatives regarding treatment seeking.
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.
Indicator type and number:	Outcome [Indicator 11]

Indicator name:	<i>Case confirmation rate.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.
Definition:	Percentage of reported malaria cases confirmed either by microscopy or RDTs.
Numerator (N):	Number of reported malaria cases confirmed either by microscopy or RDTs.
Denominator (D):	Number of reported malaria cases.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Diagnosis plays a central role for the rational treatment of malaria (and non-malarial fevers), yet diagnostic issues have been given low priority by some programs and funding agencies. Presumptive antimalarial treatment for any fever with no obvious alternative cause is widely practised and leads to significant overuse of antimalarial medicines. With artemisinin-based combination therapy now the first line treatment for malaria, this high level of over-diagnosis has serious cost implications. It also has very serious health implications, as it is associated with a failure to treat alternative causes of infection.
Baseline:	Microscopy: 12% [2013] RDT: 44% [2013] [Note: Baseline refers to percentage of reported malaria cases 'tested' (rather than 'confirmed')].
Targets:	60% [2014]; 70% [2015]; and 80% [2016].
Interpretation:	This indicator provides a measure of rational treatment for malaria based on parasitological diagnosis at health facilities (including Nurse Aid Posts and community level volunteers).
Data source:	<i>Numerator:</i> NHIS <i>Denominator:</i> NHIS
Method of measurement:	Reporting against this indicator is based on NHIS reports. See 'Annual Parasite Incidence' above.
Measurement tool:	NHIS

Frequency of data collection/reporting:	Data collection at health facilities will be continuous. Routine reporting by all health facilities to national level will be monthly within 2 weeks of the end of the reporting period. Provinces set their own deadlines for reporting from health facilities according to local logistical constraints. Malaria data from the national NHIS is sent to the NMCP M&E Manager every 6 months within 21 days of the end of the reporting period. Results for this indicator will be reported by national level annually.
Entity responsible for data collection:	As for 'Annual Parasite Incidence' above.

Indicator type and number:	Outcome [Indicator 12]
Indicator name:	<i>Appropriate treatment rate.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.
Definition:	Percentage of confirmed malaria cases receiving anti-malarial treatment as per national treatment guidelines.
Numerator (N):	Number of confirmed malaria cases reviewed that received anti-malarial treatment as per national treatment guidelines.
Denominator (D):	Number of confirmed malaria cases reviewed.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Adherence to national treatment guidelines is the basis of ensuring appropriate treatment for malaria.
Baseline:	63% [2013]
Targets:	70% [2014]; 80% [2015]; and 85% [2016].
Interpretation:	This indicator will measure adherence to national treatment guidelines.
Data source:	<i>Numerator:</i> MIS

	<i>Denominator:</i> MIS
Method of measurement:	Interviews with household representatives regarding treatment of recent fever cases.
Measurement tool:	Household survey questionnaire.
Frequency of data collection/reporting:	Malaria indicator surveys will be carried out every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Output [Indicator 13]
Indicator name:	<i>AMFm roll-out.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.
Definition:	Number of private sector health outlets participating in AMFm scheme.
Numerator (N):	Number of private sector health outlets participating in AMFm scheme.
Denominator (D):	Not applicable.
Multiplier (M):	Not applicable.
Equation:	Not applicable.
Rationale/purpose	The AMFm strategy is an important aspect of the NMCP's effort to maximize access to appropriate treatment for malaria.
Baseline:	0
Targets:	To be decided.
Interpretation:	Not applicable.
Data source:	<i>Numerator:</i> AMFm annual report. <i>Denominator:</i> Not applicable.
Method of measurement:	Review of AMFm project records of private sector participation.

Measurement tool:	Not applicable.
Frequency of data collection/reporting:	AMFm Project records of private sector participation will be maintained whenever activity takes place. An AMFm Project report will be prepared annually.
Entity responsible for data collection:	The AMFm Project manager will maintain AMFm Project records and prepare the AMFm Project report.

Indicator type and number:	Outcome [Indicator 14]
Indicator name:	<i>Timely reporting rate.</i>
Associated objective/activity:	Objective 7. Further strengthen malaria program management at all levels with district level as priority.
Definition:	Percentage of health facilities submitting timely routine NHIS reports.
Numerator (N):	Number of health facilities submitting timely routine NHIS reports.
Denominator (D):	Number of health facilities.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Ensuring timely reporting is key to effective M&E and therefore to effective program management. It is also critical to ensuring timely disbursement under performance based funding.
Baseline:	78% [2011]
Targets:	87% by 2018.
Interpretation:	This indicator measures the timeliness of routine reporting by health facilities.
Data source:	<i>Numerator:</i> NHIS <i>Denominator:</i> Health facility list.
Method of measurement:	The NHIS records the date of submission for each routine monthly report submitted by health facilities. Submission dates are automatically reviewed and all reports submitted within the report submission deadline are classified as 'timely'.

Measurement tool:	NHIS.
Frequency of data collection/reporting:	Data is collected by the NHIS as reports are submitted. Reports on the timely reporting rate are generated every three months.
Entity responsible for data collection:	NHIS.

Indicator type and number:	Outcome [Indicator 15]
Indicator name:	<i>No stock-out rate.</i>
Associated objective/activity:	Objective 7. Further Strengthen malaria program management at all levels with district level as priority.
Definition:	Percentage of health facilities with no stock-out of diagnostics or first-line antimalarials of more than one week during the last 3 months.
Numerator (N):	Number of health facilities with no stock-out of diagnostics or first-line antimalarials of more than one week during the last 3 months.
Denominator (D):	Number of health facilities reviewed.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Ensuring adequate and continued supply of the recommended antimalarial drugs and diagnostics is key to the delivery of prompt and effective treatment at health facilities etc. and key to success in preventing and controlling malaria.
Baseline:	88% [2011] [Note: Based only on information from hospitals and health centres].
Targets:	60% by 2016, >90% by 2018. [Note: 2016 target lower than baseline reflecting the fact that health facilities at all levels will be covered by this indicator in future].

Interpretation:	This indicator measures the effectiveness of supply management. Results will be disaggregated according to type of facility/provider (hospital/health facility/ Aid Post/HMM volunteer).
Data source:	Numerator: At present NHIS, in future from stock control cards (and where these are not available health worker reports). Denominator: At present NHIS, in future from M&E supervision reports.
Method of measurement:	At present data is derived from the NHIS but in future stock control cards (or health worker/volunteer reports) will be reviewed during routine M&E supervision and stock outs of more than one week in the previous 3 months will be recorded. M&E supervisory checklist will be reviewed and compiled and stock out rates calculated and entered into the M&E supervisory report form.
Measurement tool:	Currently NHIS but in future routine M&E supervisory report forms.
Frequency of data collection/reporting:	In future data collection will take place during routine M&E supervision (monthly for HMM volunteers and six monthly for health facilities). Results will be reported every six months.
Entity responsible for data collection:	Health facility staff will be responsible for: • Reviewing HMM volunteer record sheets and compiling the relevant data in the HMM stock out register. Provincial Malaria Officers will be responsible for: • Collecting and collating data from HMM stock-out registers as part of routine supervision. • Collecting and collating data from health facility stock cards as part of routine supervision. • Reporting any issues relating to supply to Provincial Pharmacy Office. • Submitting reports to the NMCP M&E Unit within 21 days of the end of each reporting period. NMCP M&E Unit will be responsible for: • Compiling data from the Provincial Malaria Officers. • Preparation of summaries for six monthly and annual reports.

	• Submission of report to Case Management Unit • Provision of timely feedback to Provincial Malaria Officers and beyond. • Data analysis and interpretation.
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Indicator type and number:	Output [Indicator 16]
Indicator name:	<i>Microscopy QA coverage.</i>
Associated objective/activity:	Objective 2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.
Definition:	Percentage of microscopy-based diagnostic outlets receiving annual quality assurance review under National QA scheme.
Numerator (N):	Number of microscopy-based diagnostic outlets receiving annual quality assurance review under National QA scheme.
Denominator (D):	Number of microscopy-based diagnostic outlets.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	An effective QA system is an essential component of any malaria diagnostic network. Weak diagnostic services undermine treatment services leading to inappropriate use of drugs, which is both costly and potentially dangerous.
Baseline:	15% (20/137) [2010]
Targets:	50% by 2015 and 100% by 2018.
Interpretation:	This indicator will measure the coverage of microscopy QA. Data will be disaggregated by type of outlet (public, NGO, company, private sector etc).
Data source:	<i>Numerator:</i> CPHL QA report <i>Denominator:</i> List of all microscopy-based diagnostic outlets.

Method of measurement:	Review of CPHL QA reports.
Measurement tool:	CPHL QA coverage report form.
Frequency of data collection/reporting:	Ongoing with reporting six-monthly.
Entity responsible for data collection:	CPHL will maintain records of all microscopy-based diagnostic outlets checked and records of QA coverage will be compiled every six months using the relevant tool.

Indicator type and number:	Outcome [Indicator 17]
Indicator name:	<i>Adequate microscopy quality rate.</i>
Associated objective/activity:	Objective 2. Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.
Definition:	Percentage of laboratories showing adequate performance among those that received quality assurance reviews.
Numerator (N):	Number of laboratories showing adequate performance among those that received quality assurance reviews.
Denominator (D):	Number of laboratories that received quality assurance reviews.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	High quality diagnostic services are essential to ensuring quality treatment and appropriate use of drugs.
Baseline:	0% (0/20) [2010]
Targets:	20% [2014]; 40% [2015]; and 80% [2016].
Interpretation:	This indicator will measure changes in the quality of microscopy. Data will be disaggregated by type of outlet (public, NGO, company, private sector etc).
Data source:	<i>Numerator:</i> CPHL QA report <i>Denominator:</i> CPHL QA report

Method of measurement:	For the purposes of this indicator: • 'adequate performance' is defined as >90% sensitivity and 90% specificity based on a review of at least 20 slides amongst which at least 10 are positive for malaria. • a 'review' requires the analysis of at least 20 slides amongst which at least 10 are positive for malaria (in case sufficient slides are not available at the facility test slides may be used from the CPHL slide bank).
Measurement tool:	CPHL QA reporting form.
Frequency of data collection/reporting:	Microscopy-based diagnostic outlets will be assessed according to a rota with the aim of covering all facilities at least once a year. When feasible additional assessments may be scheduled for weaker outlets according to needs but results for these will be excluded from the analysis for this indicator.
Entity responsible for data collection:	CPHL

Indicator type and number:	Output [Indicator 18]
Indicator name:	<i>Timely outbreak response rate.</i>
Associated objective/activity:	Objective 3: Strengthen malaria epidemic preparedness and response capacities at all levels.
Definition:	Percentage of malaria outbreaks responded to within 2 weeks of detection.
Numerator (N):	Number of malaria outbreaks responded to within 2 weeks of detection.
Denominator (D):	Number of malaria outbreaks detected.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Timely responses to outbreaks minimize the risk of epidemics.
Baseline:	Not available.
Targets:	60% [2016]; and 70% [2018].

Interpretation:	An increase in the percentage of outbreaks responded to within 2 weeks of detection will demonstrate progress towards maximizing epidemic preparedness and response.
Data source:	<i>Numerator:</i> Outbreak response records. <i>Denominator:</i> Outbreak notification records
Method of measurement:	For the purposes of this indicator: • ‘outbreak’ is defined as rise in weekly case-load at district level to above the predefined outbreak threshold for that week. • ‘responded to’ is defined as investigated and intervention initiated according to SOPs.
Measurement tool:	Outbreak notification and response record.
Frequency of data collection/reporting:	Malaria caseload is assessed at district level (and below where possible) on a daily basis using outbreak threshold charts. As soon as caseload exceeds the week’s predefined outbreak threshold, provincial authorities and the NMCP are notified and a response is instigated. Response teams provide detailed response reports according to SOPs. Dates for all investigations and interventions are recorded. At the end of each year dates of outbreak notification and response are compiled and compared.
Entity responsible for data collection:	District staffs are responsible for submitting outbreak detection reports to provincial level and provincial malaria officers are responsible for passing these on to NMCP. Provincial malaria officers are responsible for completing outbreak response reports. The NMCP epidemic preparedness and response focal person is responsible for reviewing outbreak detection reports and outbreak response reports and compiling and comparing dates and calculating the ‘timely outbreak response rate’.

Indicator type and number:	Output [Indicator 19]
Indicator name:	<i>Mass LLINs.</i>
Associated objective/activity:	Objective 1: Maintain high coverage of LLINs and increase the utilization of appropriate malaria prevention measures.
Definition:	Number of LLINs distributed to end-users through mass campaigns.

Numerator (N):	Number of LLINs distributed to end-users through mass campaigns.
Denominator (D):	Not applicable.
Multiplier (M):	Not applicable.
Equation:	Not applicable.
Rationale/purpose	Mass LLIN distribution campaigns are key to attaining high LLIN coverage.
Baseline:	Not applicable.
Targets:	1,312,718 – 2014; 1,023,228 – 2015; 1,914,830 – 2016.
Interpretation:	Not applicable.
Data source:	<i>Numerator:</i> LLIN distribution records. <i>Denominator:</i> Not applicable.
Method of measurement:	Records are kept of all LLIN recipients (name and location).
Measurement tool:	LLIN recipient record forms.
Frequency of data collection/reporting:	Data collection is ongoing during distribution campaigns with compilation of distribution records and reporting at the end of each campaign.
Entity responsible for data collection:	RAM and district support teams.

Indicator type and number:	Output [Indicator 20]
Indicator name:	<i>Top-up LLINs.</i>
Associated objective/activity:	Objective 1: Maintain high coverage of LLINs and increase the utilization of appropriate malaria prevention measures.
Definition:	Number of LLINs distributed to end-users during topping-up operations.
Numerator (N):	Number of LLINs distributed to end-users during topping-up operations.

Denominator (D):	Not applicable.
Multiplier (M):	Not applicable.
Equation:	Not applicable.
Rationale/purpose	LLIN toping-up operations are key to maintaining the high LLIN coverage achieved as a result of mass campaigns.
Baseline:	Not applicable.
Targets:	450,954 – 2014; 449,955 – 2015; 452,305 – 2016.
Interpretation:	Not applicable.
Data source:	<i>Numerator:</i> LLIN distribution records. <i>Denominator:</i> Not applicable.
Method of measurement:	Records are kept of all LLIN recipients (name and location).
Measurement tool:	LLIN recipient record forms.
Frequency of data collection/reporting:	Data collection is ongoing with compilation of distribution records annually followed by reporting.
Entity responsible for data collection:	Staff at participating distribution points.

Indicator type and number:	Output [Indicator 21]
Indicator name:	<i>Supervision rate.</i>
Associated objective/activity:	Objective 4. Maintain malaria M&E systems and continue to develop the national capacity for surveillance. Objective 7: Further Strengthen malaria program management at all levels with district level as priority.
Definition:	Percentage of Districts receiving six-monthly M&E supervisory visits conducted according to SOPs.
Numerator (N):	Number of Districts receiving six-monthly M&E supervisory visits conducted according to SOPs.
Denominator (D):	Number of Districts.

Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Regular and rigorous supportive supervision is key to problem solving and to strengthening and maintaining program quality.
Baseline:	56% (50/89) [2008]
Targets:	40% [2014]; 60% [2016]; and >80% [2018]. [Note: Targets are initially lower than the baseline reflecting the more rigorous SOPs associated with this activity].
Interpretation:	An increase in the percentage of Districts receiving regular and rigorous supervision will demonstrate improved program monitoring and stronger program management.
Data source:	<i>Numerator:</i> Completed routine supervision reports and associated 'Supervision QA database'. <i>Denominator:</i> District list.
Method of measurement:	Supervision reports will be assessed for quality against SOPs and results will be recorded in the 'Supervision QA database'. Those that are classed as having been executed satisfactorily will be included in the numerator for this indicator. Those that are not will be reviewed with the supervisor responsible so that issues can be addressed. [Note: Based on lessons learned during previous GF grants the frequency of supervision visits has been reduced and the quality requirements have been increased. Supervision visits are now six-monthly rather than quarterly and SOPs will be developed to ensure that they are more in-depth than before, linked to analysis and problem solving at provincial level and linked to a feedback mechanism and rigorous QA from central level. Supervision visits are also expected to incorporate pharmacy supply-chain support where appropriate.]
Measurement tool:	Supervision QA database.
Frequency of data collection/reporting:	Data collection will be ongoing (during each supervision visit) with reporting annually.
Entity responsible for data collection:	The NMCP M&E focal person will be responsible for QA of supervision reports, maintaining the 'Supervision QA database' and calculating the 'Supervision rate'.

Indicator type and number:	Output [Indicator 22]
Indicator name:	<i>HMM coverage.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria.
Definition:	Percentage of eligible villages with HMM/iCCM services.
Numerator (N):	Number of eligible villages with HMM/iCCM services.
Denominator (D):	Number of villages eligible for HMM/iCCM services.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	HMM/iCCM services are key increasing access to early, high quality diagnosis and appropriate treatment for malaria, especially amongst the country's most marginalized populations.
Baseline:	300 – 2013.
Targets:	1,300 – 2014; 3,300 – from 2015
Interpretation:	An increase in the percentage of eligible villages with HMM/iCCM services will demonstrate progress towards maximizing access to early diagnosis and appropriate treatment for malaria.
Data source:	<i>Numerator:</i> HMM/iCCM annual reports. <i>Denominator:</i> List of eligible villages.
Method of measurement:	Data sources will be reviewed and relevant details incorporated into the NMCP's 'HMM coverage database'. For the purposes of this indicator: • 'Eligible villages' are defined as endemic villages >2 hours walk from a functional health facility. • 'Villages with HMM/iCCM services' are defined as villages for which monthly HMM/iCCM

	reports are received from volunteers (reporting frequency requirements will be reduced for very remote communities).
Measurement tool:	NMCP's HMM coverage database.
Frequency of data collection/reporting:	Case records collected from HMM/iCCM volunteers during routine monthly meetings will be compiled by the relevant partner agencies and incorporated into their annual reports according to an NMCP approved standard format. These annual reports will be reviewed by the NMCP HMM focal person and the relevant details will be compiled into the HMM coverage database and HMM coverage will be calculated and reported.
Entity responsible for data collection:	HMM/iCCM supervisors will be responsible for compiling data submitted by volunteers during monthly meetings. HMM/iCCM project managers (partner agencies) will be responsible for compiling annual reports according to NMCP standard formats. The NMCP HMM focal person will be responsible for compiling partner's reports into the HMM coverage database and HMM coverage will be calculated and reported.

Indicator type and number:	Outcome [Indicator 23]
Indicator name:	<i>HMM awareness rate.</i>
Associated objective/activity:	Objective 2: Maximize access to and utilization of early diagnosis and appropriate treatment for malaria. Objective 6: Strengthen malaria advocacy, communication and social mobilization.
Definition:	Percentage of mothers/caregivers in HMM/iCCM villages aware of diagnostic and treatment services available from trained volunteers.
Numerator (N):	Number of mothers/caregivers in HMM/iCCM villages aware of diagnostic and treatment services available from trained volunteers.
Denominator (D):	Number of mothers/caregivers in HMM/iCCM villages interviewed regarding the diagnostic and treatment services available from trained volunteers.
Multiplier (M):	100

Equation:	$(N/D) \times M$
Rationale/purpose	Awareness of HMM/iCCM services is key to ensuring utilization.
Baseline:	Not available.
Targets:	80% by 2017
Interpretation:	A high HMM awareness rate will demonstrate effective communication and support high levels of utilization of HMM/iCCM services.
Data source:	<i>Numerator:</i> MIS <i>Denominator:</i> MIS
Method of measurement:	Interviews with mothers/caregivers in HMM/iCCM villages regarding the diagnostic and treatment services available from trained volunteers.
Measurement tool:	Questionnaire.
Frequency of data collection/reporting:	Data collected during MIS every 3 years (2014 and 2017).
Entity responsible for data collection:	PNG-IMR.

Indicator type and number:	Outcome [Indicator 24]
Indicator name:	<i>District planning rate.</i>
Associated objective/activity:	Objective 7: Further Strengthen malaria program management at all levels with district level as priority.
Definition:	Percentage of District AIP with malaria control activities and funding allocated.
Numerator (N):	Number of District AIP with malaria control activities and funding allocated.
Denominator (D):	Number of Districts.
Multiplier (M):	100
Equation:	$(N/D) \times M$

Rationale/purpose	Inclusion of malaria control activities together with the necessary funding in District AIPs is key to the effective implementation of program activities at District level.
Baseline:	Not available
Targets:	40% [2014]; 80% [2015]; and 90% [2016].
Interpretation:	A high 'District planning' rate will demonstrate progress towards improved program management and implementation at District level.
Data source:	<i>Numerator:</i> District AIPs.. <i>Denominator:</i> District list.
Method of measurement:	Review of District AIPs and associated budgets.
Measurement tool:	District AIP review section of routine M&E supervisory visit reporting checklists.
Frequency of data collection/reporting:	Data collected during routine six-monthly M&E supervisory visits.
Entity responsible for data collection:	Officers leading M&E visits.

Indicator type and number:	Outcome [Indicator 25]
Indicator name:	<i>Provincial staffing rate.</i>
Associated objective/activity:	Objective 7: Further Strengthen malaria program management at all levels with district level as priority.
Definition:	Percentage of provinces with malaria staff.
Numerator (N):	Number of provinces with malaria staff.
Denominator (D):	Number of provinces.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Adequate human resources (HR) for malaria at Provincial level is key to the effective implementation of

	Program activities at provincial level and beyond.
Baseline:	TBA
Targets:	100% from 2016.
Interpretation:	Increased HR for malaria at provincial level will demonstrate solid progress towards improved program management and implementation.
Data source:	<i>Numerator:</i> Provincial HR levels. <i>Denominator:</i> Province list.
Method of measurement:	Review of Provincial HR levels.
Measurement tool:	Provincial HR section of routine M&E supervisory visit reporting checklists.
Frequency of data collection/reporting:	Data collected during routine six-monthly M&E supervisory visits.
Entity responsible for data collection:	Officers leading M&E visits.

Indicator type and number:	Outcome [Indicator 26]
Indicator name:	<i>District staffing rate.</i>
Associated objective/activity:	Objective 7: Further Strengthen malaria program management at all levels with district level as priority.
Definition:	Percentage of districts with malaria staff.
Numerator (N):	Number of districts with malaria staff.
Denominator (D):	Number of districts.
Multiplier (M):	100
Equation:	$(N/D) \times M$
Rationale/purpose	Adequate human resources (HR) for malaria at District level is key to the effective implementation of Program activities at District level and beyond.

Baseline:	TBA
Targets:	40% [2014]; 60% [2015]; and 70% [2016].
Interpretation:	Increased HR for malaria at District level will demonstrate solid progress towards improved program management and implementation.
Data source:	<i>Numerator:</i> District HR levels. <i>Denominator:</i> District list.
Method of measurement:	Review of District HR levels.
Measurement tool:	District HR section of routine M&E supervisory visit reporting checklists.
Frequency of data collection/reporting:	Data collected during routine six-monthly M&E supervisory visits.
Entity responsible for data collection:	Officers leading M&E visits.

