NATIONAL MALARIA STRATEGIC PLAN, VANUATU, 2015-2020

NMSP Working Groups,
Ministry of Health, Vanuatu

The Vanuatu Ministry of Health aims to progressively control and eliminate malaria in all 6 provinces of the country.

This National Malaria Strategic Plan for Vanuatu incorporates the findings of a comprehensive Malaria Program Review conducted in 2013 and extensive follow-up discussions with the national Vector Borne Disease Control Program, MOH and other partners, including non-Government and civil society stakeholders.

To achieve its malaria control and elimination targets, the VBDCP will work in close partnership with provincial health services and local communities to ensure that universal access to health promotion, prevention with long-lasting insecticidal bed nets, and quality-assured diagnosis and treatment is maintained.

Building on experience gained in pilot elimination activities in Tafea province, the Program will use indoor residual insecticide spraying to accelerate the reduction in malaria transmission in selected areas.

It will strengthen and maintain excellent surveillance and apply new knowledge as it becomes available in order to achieve malaria elimination and the prevention of reintroduction.

By 2020, Vanuatu expects to reach an annual parasite incidence below 1 per 1,000 nationally, and maintain zero confirmed deaths from malaria. Three provinces would have entered the elimination phase (including two provinces with zero – or close to zero – local malaria transmission).

Table of Contents

Foreword

The Ministry of Health is pleased to develop the National Malaria Strategic Plan 2015 – 2020. The document is a road map in the Ministry of Health's final effort to control and eliminate malaria by 2020.

In the last decade, Vanuatu has experienced drastic reduction of the malaria incidence through concerted effort and in the last five years, guided by the 2008 – 2014 National Malaria Strategic Plan the burden of the disease was reduced by over 70% by the end of 2013. A very low malaria mortality rate has been maintained since 2009. This indicated that the program is well guided through it's management and governance systems and continued interest by health development partners including the government to support the program technically and financially is a clear example of collaboration to tackle a public health problem with a clear goal. The success and progress of the program is a demonstration of commitment and high performance target aimed at a certain disease like malaria. As such, the Ministry of Health is committed to pursue the goal of malaria elimination by 2020.

In line with the Government priorities in the social sector, the Vanuatu Government is placing high priority on health services and will continue to raise the stake higher under the Priority Action Agenda (PAA) and it's commitment to fulfil the Millennium Development Goals (MDGs). The continuing reduction of malaria burden in Vanuatu is recognized as a public health historical achievement which the government and the people of Vanuatu can be proud of. It is crucial that such a success in malaria elimination should be a learning curve for other public health programs to demonstrate high level of commitment to address the disease burden in the population affected by Communicable and Non Communicable Diseases (NCD).

While existing challenges continue to hamper progress and achievements, it is the Ministry of Health's wish that the strong momentum of malaria free environment is high on the agenda by the Government and health development partners. The Ministry of Health recognizes these challenges such as the lack of human resources at all level, the deficiencies in the financial and administration systems, lack of capacity at the provincial level and the reduction of external funding that may greatly affect the successful implementation of the National Malaria Strategic Plan. Although it is not easy to draw conclusions overnight, there are opportunities that exist through technical assistance and health reform practices to redress the approaches of service delivery at the peripheral level and at the same time, improve and strengthen the capacity of health administration at the national level. The intention by the Ministry of health to re-prioritize it's priorities in the Malaria Strategic Plan is the basis of moving this plan forward. As such, I confirm the political commitment of the Vanuatu Government and the Ministry of Health to press toward malaria elimination as planned.

The Ministry of Health wishes to pay tribute to health development partners who have been committed to the Malaria control and elimination program namely, the Australia Government, Australian Initiative to Control and Eliminate Malaria (AICEM), Global Fund, Secretariat of the Pacific Community (SPC), and the World Health Organization for their technical and financial contributions to arrive at this point and formally request that the momentum of interest with malaria elimination should continue.

As Minister responsible of the health services in Vanuatu, I congratulate all actors in the Malaria Control and Elimination Program for this great achievement and endorse the National Malaria Strategic Plan for 2015 – 2020.

Honourable Minister of Health
(MP) George Andrew Wells

.....

Date signed: 30-10-14

Place of Signature: Port Vila

Acronyms and Abbreviations

ABER	Annual blood examination rate
ACD	Active case detection
AICEM	Australian Initiative for the Control and Elimination of Malaria
ACSM	Advocacy, communication and social mobilisation
ACT	Artemisinin-based combination therapy
ACT-Malaria	Asian Collaborative Training Network for Malaria
AL	Artemether-lumefantrine
API	Annual parasite incidence
APMEN	Asia Pacific Malaria Elimination Network
BCC	Behaviour change communication
CCM	Global Fund Country Coordination Mechanism
CMO	Provincial Chief Medical Officer
CMS	Central Medical Stores
CoMBI	Community mobilisation for behavioural impact
CQ	Chloroquine
DDT	Dichlorodiphenyltrichloroethane
DHS	Demographic and Health Survey
DOT	Directly-observed treatment
FIND	Foundation for Innovative New Diagnostics
FSaT	Focal screening and treatment
G6PD	Glucose-6-phosphate dehydrogenase
GDP	Gross domestic product
GIS	Geographic / geo-referenced household information system
GNI	Gross National Income
GOV	Government of Vanuatu
HIS	Health information system
HPO	Health Promotion Officer
HRH	Human resources for health
IEC	Information, education and communication
IMR	Infant mortality rate
IQK	Insecticide Quantification Kit
IRS	Indoor residual insecticide spraying
ITN	Insecticide-treated bed net
IVM	Integrated vector management
KABP	Knowledge, attitudes, behaviour and practices
LAMP	Loop mediated isothermal amplification for malaria parasites
LLIN	Long lasting insecticidal net
LSM	Larval source management
M&E	Monitoring and evaluation
MAP	Malaria Action Plan
MaST	Mass screening and treatment
MDA	Mass drug administration
MDG	Millennium Development Goal

MFEM	Ministry of Finance and Economic Management
MICS	Multiple Indicator Cluster Survey
MIS	Malaria information system
MMFO	Malaria Management for Field Operations
MMLL	Monthly malaria line listing
MNCH	Maternal, neonatal and child health
MOH	Ministry of Health
MPR	Malaria program review
MSC	Malaria Steering Committee
NCD	Non-communicable disease
NGO	Non-government organisation
NMSP	National malaria strategic plan
PacMI	Pacific Malaria Initiative
PacMISC	Pacific Malaria Initiative Support Centre
PCD	Passive case detection
PCD+	Enhanced passive case detection
PCR	Polymerase chain reaction
PHC	Primary (and preventive) health care
POC	Point-of-care (in relation to screening or diagnostic testing)
POE	Point of entry
PPP	Purchasing power parity
PQ	Primaquine
PR	Principal Recipient
QA	Quality assurance
QC	Quality control
RDT	Rapid diagnostic test
SCA	Save the Children Australia
SOP	Standard operating procedure
SP	Sulphadoxine-pyrimethamine
SPC	Secretariat of the Pacific Community
TA	Technical Assistance
TAG	Technical Advisory Group
TES	Therapeutic efficacy study
TWG	Technical Working Group (under TAG)
U5MR	Under-five mortality rate
UQ	University of Queensland
USD	United States Dollar
VanPHIS	Vanuatu Public Health information System
VBDCP	Vector Borne Disease Control Program
VCNE	Vanuatu College of Nursing Education
VHW	Village Health Worker
VUV	Vanuatu Vatu
WHO	World Health Organization
WHOPES	WHO Pesticide Evaluation Scheme

Acknowledgements

This *National Malaria Strategic Plan 2015-20* was prepared in late 2013 and early 2014 by Rob Condon (Consultant Public Health Physician), Charles Delacollette (Consultant Malaria and Public Health Specialist), Jean-Olivier Guintran (Malaria Medical Officer, WHO Vanuatu), Seyha Ros (Malaria Technical Officer, WHO Vanuatu), Maxine Whittaker (University of Queensland) and Bill Parr (Health Financing and Governance Consultant). They worked under the overall direction of George Taleo (Manager) and Timothy Quai (Acting Manager), Vector Borne Diseases Control Program, Ministry of Health, Vanuatu.

The drafting team consulted closely with members of the following Working Groups (from national VBDCP team unless specified otherwise):

- Program Management, Structure and Financing: Wesley Donald, Charity Whelan, Harry Iata, Winch Garae, Guy Emile, Esau Naket, Katimal Kaun (MOH), Saiven Timbaci (MOH)
- Diagnosis and Treatment: Esau Naket, Griffith Harrison (Vila Central Hospital), Kalo Kalkoa, Wesley Donald, Winch Garae, Harry Iata, Nancy Miyake (Save the Children, Australia), Guy Emile
- Vector Control: Timothy Quai, Wesley Donald, Winch Garae, Harry Iata, Nancy Miyake (SCA)
- Active Surveillance, Response and Elimination: Timothy Quai, Wesley Donald, Winch Garae, Kalo Kalkoa, Harry Iata, Simon George (Ministry of Education)
- Monitoring and Evaluation: Wesley Donald, Winch Garae, Kalo Kalkoa, Harry Iata

Special thanks to the Acting Director General of Health (Santas Wari), the MOH Finance Manager (Jameson Mokoroe) and the Provincial Chief Medical Officers (Olive Tanabose, Malampa; Selwyn Bage, Penama; Johnson Kaso, Tafea; and Graham Patas, Torba) for valuable discussion about Malaria Program implementation in the evolving context of the health sector reform agenda in Vanuatu.

Eleanor Sullivan (PacMISC Provincial Program Management Support Officer) participated in and assisted each of the working groups.

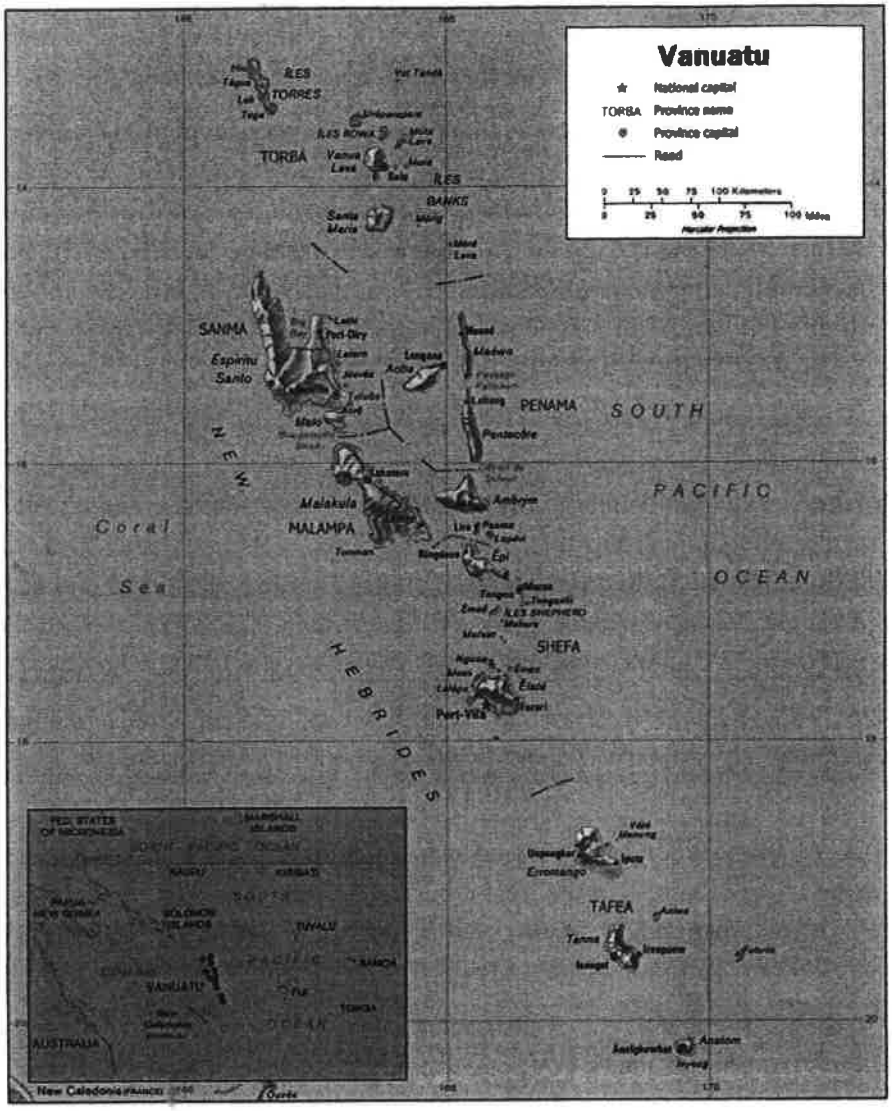
Helpful comments and insights were provided in separate meetings or sessions by: Amanda Sanburg (Central Medical Stores, MOH); Albert Concepción and Semisi Fukofuka (Secretariat of the Pacific Community); Susan Ivatts and Peter Wallace (World Bank); Ben Rolfe, Kevin Smith and Kendra Derousseau (Australian Department of Foreign Affairs, Canberra and Port Vila); Jacob Kool, Lasse Vestergaard, Michael Buttsworth and Rufina Latu (WHO Vanuatu and Western Pacific Regional Offices); and Gideon Mael (Prime Minister's Department, Government of Vanuatu).

Valuable discussion and feedback also took place with health sector development partners (through the Joint Partners Working Group) and a forum for civil society and non-Government partners in February 2014.

Many of the principles underpinning the new *Strategic Plan* were first discussed at a preliminary workshop in March 2013, facilitated by Marcel Tanner (Swiss Tropical and Public Health Institute). Marcel also undertook independent peer review of the final draft of the strategy.

RC, CD and BP were engaged by the University of Queensland through PacMISC / AICEM. They were closely assisted by the Senior Program Management Support Officers in Port Vila (initially Pat Field, then Christine Leonard).

Map of Vanuatu showing provincial composition



Executive Summary

Malaria Situation and Existing Program

Malaria has historically been one of the leading causes of ill health in Vanuatu. The whole population of the country – about a quarter of a million people – is considered at risk of infection.

Since 2004, the Ministry of Health (MOH) and its partners have implemented an intensified program to progressively control malaria through: widespread access to diagnosis by microscopy or rapid diagnostic test (RDT); widespread access to highly effective treatment with artemisinin based combination therapy (ACT); high coverage with long lasting insecticidal bed nets (LLIN); widespread community engagement; and intensive, targeted technical assistance. All interventions are provided free of charge to the end-user. This has seen the annual parasite incidence (API) fall from 74 per 1,000 in 2003 to 13.2 per 1,000 in 2012, and the virtual disappearance of confirmed malaria-related deaths.

Pilot malaria elimination activities commenced in Tafea province in 2009 and have just begun in Torba, using indoor residual spraying (IRS) of houses and selective larval breeding site management (LSM) to accelerate reduction in transmission while increasing LLIN coverage rapidly towards 100%; this is superimposed on a background of universal access to prompt diagnosis and treatment, and enhanced surveillance and rapid response to identified cases. Tafea achieved close to zero local malaria transmission in 2013 and is on track to achieve sub-national elimination by 2016.

Findings from a comprehensive Malaria Program Review conducted in June 2013 have been used as a basis for developing this revised *National Malaria Strategic Plan 2015-20* (NMSP).

Malaria services are currently centrally coordinated and managed, and draw significant development partner support. At a time when health financing in Vanuatu is under increasing pressure and donors provide just over one-third of the health budget, the Malaria Program absorbs about one-quarter of donor financing for health and its human resources represent about one-third of health sector employees. The NMSP proposes more efficient ways of making use of this investment.

Challenges also remain in the delivery of anti-malaria interventions in more remote areas, where some communities continue to have poor access to health and other services. The revised NMSP takes note of the Government of Vanuatu's emphasis on delivering integrated health services directly to the community level (under predominantly Provincial Health Office management and supervision).

The National Malaria Strategic Plan 2015-20

The MOH aims to progressively control and eliminate malaria in all provinces of the country, with a view to national level certification of malaria-free status between 2025 and 2028.

The Goal of the new Strategy, which will guide the work plan for the period 2015 to 2020, is:

> ***By the end of 2020**, to reduce the annual parasite incidence rate to < 1 per 1,000 nationally <u>and</u> maintain zero confirmed deaths from malaria.*

Under the Strategy, Malaria Program activities are grouped into three thematic operational areas:

Thematic Area 1: VECTOR CONTROL

Strategic Objective: *To maintain universal coverage with LLINs for the whole population of Vanuatu <u>and</u> accelerate reduction in malaria transmission in selected areas using IRS*

Thematic Area 2: DIAGNOSIS AND TREATMENT

Strategic Objective: *To achieve 100% testing of suspected malaria cases by microscopy or RDT and provide prompt treatment and care for 100% of confirmed malaria cases according to the national 'Guidelines for Treatment of Malaria'*

Thematic Area 3: ACTIVE SURVEILLANCE AND RESPONSE IN SUPPORT OF ELIMINATION

Strategic Objective: *Once a province has entered the elimination phase, to investigate and manage all malaria cases and identify, investigate and manage foci of infection according to national 'Guidelines for Malaria Elimination'*

An additional objective addresses **PROGRAM MANAGEMENT** to maintain core national functions and support provincial service delivery. The relevant Objective is: To *strengthen Malaria Program leadership and management capacity at provincial and national level to plan, deliver and report on malaria interventions in a well-coordinated, efficient and timely manner.*

Rationale and Implementation Strategies

Building on recent achievements at the national level, the Vector Borne Disease Control Program will work in close partnership with provincial health services and local communities to ensure universal access to health promotion, prevention with LLINs, and quality-assured diagnosis and treatment.

In order to reach and maintain universal coverage with LLINs, the Program will undertake systematic full replacement of LLINs (on the basis of one net per sleeping space) throughout the entire country on a three-yearly provincial and health zone cycle: just over 500,000 nets will be delivered over the 6 years of the Strategy. This will be supported by behaviour change communication to ensure a high level of net utilisation, and operational research to confirm the useful life span of LLINs and the best way to use or dispose of expired nets.

Drawing on successes and lessons from the pilot elimination activities in Tafea province, the Program will apply one, two or three (occasionally more) annual rounds of IRS in selected localities to accelerate reduction in malaria transmission towards pre-elimination levels; this will be based initially on stratification at health zone level, but will focus increasingly at the village and community level to increase precision and efficiency. Operational research will guide the selective use of LSM to supplement the effects of IRS (in combination with other interventions).

Quality assured diagnosis by microscopy or RDT and prompt, effective treatment of *P falciparum* and *P vivax* according to the national *Guidelines* are essential components of case management. The new Strategy seeks to maintain universal access to diagnosis and treatment while, at the same time, seeking greater efficiency by rationalising the number of microscopy points and ensuring effective external QA for all diagnostic methods.

Due to uncertainties about the risk and management of severe haemolytic reactions, less than 5% of *P vivax* cases are currently prescribed primaquine, compromising the feasibility of malaria elimination. To facilitate the safe administration of primaquine, the Program will establish G6PD screening in hospital and selected community settings as soon as accurate, cost-effective point-of-care testing is available. Subject to the results of international clinical trials, a short course of tafenoquine may be considered as an alternative strategy in later years of this NMSP.

In areas that have reached low levels of transmission (API < 1 per 1,000), provincial health teams will maintain excellent malaria surveillance, active case finding and response in order to achieve malaria elimination and the prevention of reintroduction. Annual blood examination rates by microscopy or

RDT will be maintained at 15% or above; cases will be investigated within 5 days according to national *Guidelines*; and known or emerging foci of transmission will be investigated and re-classified at least annually and recorded on a geographic information system. These functions will be progressively integrated into the Vanuatu health system as part of overall disease surveillance, contributing to stronger public health management of other diseases – especially those that are epidemic prone or targeted for elimination.

To make more efficient use of both malaria-specific and other MOH and donor resources, the Program and provincial health services will undertake trials of innovative service delivery options at the community level, providing multiple health interventions during community visits based on cost sharing between public health programs (which may have different funding streams). This will involve close partnerships with Village Health Workers and community nurses, with a view to supporting integrated community outreach more efficiently and effectively.

In "Small Island" or isolated community settings, proactive case detection using mass screening and treatment (MaST) by RDT may be undertaken for the entire community. Positive cases would be identified and treated simultaneously under direct observation by a local or visiting health worker. For operational and cost efficiency, MaST would be undertaken at the same time as bed nets are distributed, houses sprayed and other community and public health outreach services provided.

Planning, Governance and Management

The strategy will be rolled out and progressively consolidated, province by province, commencing in the designated elimination provinces of Tafea (in 2014, i.e. even prior to inception of this NMSP) and Torba, then progressively consolidating the acceleration interventions in other provinces.

Stronger harmonisation between national and provincial health planning processes will be achieved through consultative planning processes and an annual review meeting. Through an annual planning and budgeting cycle, the Program and provincial partners will develop an integrated annual malaria operational plan and budget for the coming year (national and for each province), ready for inclusion in national health budget submissions; the Program's detailed Malaria Action Plan will be finalised before the end of the preceding year.

The Program's existing governance bodies – the Malaria Steering Committee (MSC) and the Technical Advisory Group (TAG) – will be retained. The MSC (comprising Government, donor and technical partner representatives) will provide higher level inputs on the management and overall strategic directions of the Program, while the TAG will continue to provide technical oversight for the Program and individual thematic technical working groups, and technical recommendations for the MSC to consider.

As Vanuatu is considering applying for additional Global Fund assistance from 2015 under the *New Funding Model*, the new NMSP for 2015-20 will be used as a basis for that application.

Information Management, Monitoring and Review

Vector control and case management outcomes will be monitored through routine operational data and a monthly malaria line listing (MMLL). Subject to resources being available, this will be supplemented by a follow-up malaria indicator survey in 2016 (or a relevant module within the next Demographic and Health Survey).

Current information management capacity will be strengthened through the addition of one additional officer based at the national level, working closely with and supporting provincial

information and surveillance officers. Provincial health teams and information managers will collate data from the MMLL, and will increasingly produce and interpret their own monthly data and monitor provincial trends for selected indicators.

As better data on malaria incidence by village or community become available, the Program will move towards stratification of transmission risk at those more local levels. This will provide more focused guidance for better targeting of interventions and potentially improved cost-effectiveness.

The Program will generate a comprehensive national annual malaria report. Semi-annual reports will be compiled at provincial, health zone and even facility level to guide and support the planning and implementation of malaria interventions in the community.

Independent reviews of the Program and Strategy will be conducted in early 2017 (taking advantage of available survey data from 2016), and in late 2019 or early 2020 to prepare for the next Strategy and eventual certification of malaria elimination.

Budget and Principal Financial Risks

The cost of implementing the Strategy is estimated at USD 24.35 million across the full 6 years and USD 11.66 for the first three years (2015-17). Vector control is allocated 29% of the whole-of-Strategy budget, case management 7%, elimination activities 4% and program management 60% (including human resources, short- and long-term technical assistance and M&E costs).

If the Strategy can be fully funded, the Program will seek opportunities for collaborative planning and implementation with other public health programs at the provincial and community level. This will strengthen the cost-benefit to the national health system of a significant ongoing investment in malaria.

An anticipated 90% reduction in Global Fund support and recent contractions in the Australian aid program budget mean there is likely to be a funding gap of USD 6.56 million for the Strategy for the period 2015-17. If this funding gap cannot be closed, a prioritisation exercise has already been undertaken (within the budget and strategy) to protect the gains made in Tafea and Torba provinces and maintain elements of the Program that are considered absolutely indispensable.

Protection of achievements to date would also be addressed through a strong focus on ensuring and strengthening the quality of interventions.

Impact and Outcomes

The logic model and theory of change for the Strategy are summarised in the following diagram (page xiii).

As a result of implementation of all of the proposed activities, the national API is expected to decrease progressively to below 5 per 1,000 by the end of 2016 and below 2.5 per 1,000 by the end of 2018. There should be no confirmed deaths from malaria.

By the end of 2020, the national API is expected to have fallen below 1 per 1,000. At least three provinces (Tafea, Torba and Shefa) are expected to have entered the elimination phase (provincial API < 1 per 1,000), and at least two of those provinces (Tafea and Torba) are expected to have achieved and be maintaining zero local transmission.

Logic model and theory of change, National Malaria Strategic Plan, Vanuatu, 2015-20

Vision: A malaria-free Vanuatu by 2025-28, contributing to the good health and well-being of the population

Goal: By the end of 2020, to reduce the annual parasite incidence rate to < 1 per 1,000 nationally and maintain zero confirmed deaths from malaria

ISSUES and CHALLENGES	STRATEGIC APPROACH	OUTPUTS (Activity areas)	OUTCOMES Short term (2016) → Intermediate (2018) → Longer term (2020)		
High rates of malaria transmission (except Tafea) API = 13.2 per 1,000 (range by province 4.7–38.2, excluding Tafea); TPR = 10% (range by province 5–21%). ***Vector control*** Close to 100% LLIN coverage but sub-optimal utilisation: 52% nationally (87% in Tafea). ***Case Management*** Good access to RDT and ACT; microscopy under-utilised. PQ under-prescribed for *P vivax* (G6PD screening unavailable). ***Elimination*** Close to 0 local transmission in Tafea following intensive intervention; now needs to be extended – progressively and cost-effectively – to other provinces. ***Health system*** Recent decentralisation of health system. Pockets of poor access to services in remote areas. Inefficiencies in delivery of some malaria services.	***Vector Control*** • Maintain high LLIN coverage and utilisation • Targeted IRS to accelerate transition from control to pre-elimination phase ***Case Management*** • Maintain microscopy services as appropriate • Extend RDT network • Maintain ABER > 15% • Maintain universal ACT • Introduce G6PD testing ***Surveillance & Response to support Elimination Areas*** • Manage malaria transmission foci as per *Guidelines* • Detect and respond to individual cases ***Program Management*** • Collaborative strategic planning with provinces • MAP well reflected in MOH and provincial business plans • Strengthened capacity of information management team	***Vector Control*** Implementation of LLIN distribution (3-year cycle). IRS in targeted health zones and provinces. ***Case Management*** Skills and commodities for diagnosis and treatment. G6PD testing established in at least one centre (or via RDT). ***S&R and Elimination*** Responsive case detection and investigation systems. Support to village health and elimination committees. ***Program Management*** Annual MAP developed, aligned with national and provincial business plans. Effective M&E Framework Policies and guidelines. Expenditure tracking reports. Supervisory outreach visits from national and provincial level. ***Activities developed and implemented in partnership between MOH (TAG & MSC), provincial health services and donors***	***Transmission*** API < 5 per 1,000 nationally; 0 local transmission in Tafea. ***Vector control*** >80% LLIN coverage and utilisation in all areas Targeted IRS completed in Torba, initiated in Malampa and Shefa. ***Case Management*** Universal access to RDT and ACT; microscopy network rationalised, EQA in place. G6PD testing in ≥25% of *P vivax* cases, with ≥25% PQ uptake. ***S&R and Elimination*** Cases and foci well managed in Tafea. ***Program Management*** GOV leads the Program (via MSC, supported by TAG) ≥ 2 provinces actively engaged in planning and collaborative approaches to service delivery. Annual malaria conference to develop annual report and MAP.	***Transmission*** API < 2.5 per 1,000 nationally. ***Vector control*** >80% LLIN coverage and utilisation maintained. Targeted IRS completed in Torba and Shefa, maintained in Malampa and initiated in Penama. ***Case Management*** Universal access to quality assured diagnosis and ACT. G6PD testing in ≥50% of *P vivax* cases, with ≥50% PQ uptake. ***S&R and Elimination*** Cases and foci well managed in Tafea, Torba and Shefa. ***Program Management*** GOV leads the Program (via MSC, supported by TAG) ≥ 3 provinces actively engaged in planning and collaborative approaches to service delivery. Annual malaria conference to develop annual report and MAP.	***Transmission*** API < 1 per 1,000 nationally; 0 local transmission in Tafea, Torba and probably Shefa. ***Vector control*** >80% LLIN coverage and utilisation maintained. Targeted IRS scaled back but ongoing as required. ***Case Management*** Universal access to quality assured diagnosis, G6PD screening and treatment. ***S&R and Elimination*** Cases and foci well managed in Tafea, Torba, Shefa and (according to progress) other areas. ***Program Management*** GOV leads the Program (via MSC, supported by TAG) All provinces actively engaged in planning and collaborative approaches to service delivery. Annual malaria conference to develop annual report and MAP.

1. Introduction

1.1 Background – malaria in Vanuatu

Malaria has historically been one of the leading causes of ill health in Vanuatu. In 1990, it infected an estimated 198 per 1,000 people and caused many deaths (MOH 2013); as recently as 2010, it was among the top 5 notifiable diseases nationally (WHO 2011). Malaria is present on all of the 68 inhabited islands of Vanuatu except for Aneityum (where it was eliminated in the late 1990s) and Futuna (which lies south-east of the Buxton Line, the natural limit to the range of *Anopheles* mosquito vectors) (Kaneko 2010).[1] The whole population of Vanuatu is considered at risk of malaria infection (WHO 2012a).

Guided by the *National Malaria Strategic Vision 2007–16*, the national Vector Borne Disease Control Program (VBDCP) has been implementing a range of strategies and interventions with the aim of: a) strengthening malaria control throughout the country; b) ensuring that zero deaths occur from malaria; and c) eliminating malaria from Tafea province by 2016 (VBDCP 2010). These strategies include: improved diagnosis by microscopic examination of blood slides or rapid diagnostic test (RDT); highly effective treatment using artemisinin based combination therapy (ACT); protecting people from contact with infected mosquitos by sleeping inside long lasting insecticidal bed nets (LLIN); widespread community engagement; and – selectively (in Tafea and, more recently, in Torba province) – indoor residual spraying (IRS) of houses with insecticide (VBDCP 2010, WHO 2012a).

As a result, the annual parasite incidence (API) has decreased from to 74 per 1,000 in 2003 to 13.2 per 1,000 in 2012; confirmed malaria deaths have fallen from about 7 per 100,000 to less than 1 per 100,000 over the same period (MOH 2013).[2] (Malaria epidemiology is discussed in more detail in Section 3.1).

This work has been undertaken in collaboration with the neighbouring Solomon Islands, with strong support from development partners: the Global Fund to fight AIDS, Tuberculosis and Malaria since 2004, and the Australian government's Pacific Malaria Initiative (PacMI) since 2008. Since the original Global Fund grant was approved, the Global Fund has provided about USD 4.9 million for malaria control in Vanuatu (SPC 2013). The World Health Organisation (WHO) and the Secretariat of the Pacific Community (SPC) have provided technical and administrative support, respectively.

1.2 Malaria in the context of the national health plan

Although the *Vanuatu Health Sector Strategy 2010-2016* does not specifically mention malaria, it places a strong emphasis on improving the health status of the population through equitable access to quality health services at all levels of the community (GOV 2010). Health sector reforms announced in 2013 place additional importance on the role of provincial health offices in strengthening health service delivery at the community level (GOV 2013).

WHO has begun a process to provide technical support for development of the next version of national health sector strategy. Given the continuing presence of malaria as a public health problem in Vanuatu,

[1] Malaria elimination was achieved in Aneityum (population < 750) using a combination of weekly mass drug administration, universal bed net coverage, intensive community mobilisation and meticulous surveillance for introduced or relapsing cases.

[2] Earlier incidence data may actually under-estimate the true picture: only 10% of health facilities have microscopy, and RDTs were introduced in late 2008 (and only became widely available in 2010).

improving service delivery and health status at the community level will logically require malaria to continue to be addressed as a public health priority.

1.3 International context and commitments

The *Vanuatu Health Sector Strategy 2010-2016* includes a strong commitment to the Millennium Development Goals (MDG). Its MDG-specific targets include child and maternal health outcomes (MDGs 4 and 5) and improved access to safe water supply and sanitation (MDG 7); it does not identify any malaria- or other disease-specific targets (MDG 6) (GOV 2010).

However, Vanuatu is among 39 "elimination countries" participating in the international Malaria Elimination Group (Feachem 2009), and receives technical support through the Asia Pacific Malaria Elimination Network (APMEN). The *Australia–Vanuatu Partnership for Development* – endorsed by the Prime Ministers of both countries in 2009 – has an explicit, mutual commitment to "controlling and progressively eliminating malaria" (GOA-GOV 2009).

1.4 The planning period and reasons for selecting this period

While the *Vanuatu Health Sector Strategy* and *National Malaria Strategic Vision* both remain valid to 2016, the recently introduced health sector reforms are likely to be reflected in a revised national health sector strategy. In addition, the VBDCP is likely to reach several of its milestones or objectives before 2016: achievement of zero (or close to zero) local transmission in Tafea province is anticipated around the end of 2014, and this coincides with the conclusion of the current Global Fund grant.

An application to the Global Fund under its *New Funding Model* requires a new (or updated) national malaria strategic plan (NMSP) that will remain valid throughout the period of Global Fund support.[3] As Vanuatu is considering applying for additional Global Fund assistance from 2015, it is timely to develop a revised NMSP in advance of that application.

Technically, it is also timely for the VBDCP to review and revise its strategies with a slightly longer time frame in mind. As malaria transmission and incidence approach very low levels in some parts of the country, elimination strategies need to be integrated with provincial and community surveillance and response systems; the VBDCP is well placed to inform and guide the Ministry of Health (MOH) on new models of service delivery that will deliver integrated disease control and prevention services to the community in an efficient and effective way.

A preliminary workshop was held in Port Vila in March 2013 to discuss options for a revised NMSP and recommended that the new strategy covers the 6-year period from 2015 to 2020. This would align with the anticipated attainment of zero (or close to zero) transmission in several areas of Vanuatu by 2020.

1.5 Malaria Program Review and process of developing the strategic plan

Following the March workshop, a thematic desk review of key documents (VBDCP 2013) was undertaken in May 2013 followed by an external Malaria Program Review (MPR) in June 2013 (MOH 2013).

[3] Available information from the Global Fund suggests that a new NMSP would be required for any funding application under the New Funding Model, irrespective of whether this would be for additional funding or re-programming of the existing grant.

An international team visited Vanuatu in October-November 2013 to assist the MOH to revise the NMSP. They worked closely with WHO and five thematic working groups to examine different aspects of the Program (program structure and management; diagnosis and treatment; vector control; surveillance, response and elimination; and monitoring and evaluation [M&E]), review each of the specific recommendations of the MPR, and identify feasible and affordable options for implementation.

Strategic options were analysed and selected and the draft strategy presented to and reviewed with the VBDCP team and a small number of development partner representatives on 14 November. Further refinements were incorporated into the strategy document and presented to MOH leaders and decision-makers, a broader range of key development partners and non-government organisation (NGO) representatives on 6 February 2014. A final presentation was made to the health sector Joint Partners Working Group on 19 February.

A detailed costing exercise was undertaken in between late February and early April 2014. The final costed strategic options (prioritised) and an indicative budget for a range of funding scenarios were presented to and reviewed with the VBDCP team on 2 and 4 April.

The final draft of the NMSP underwent independent peer review in mid-April. Comments and recommendations arising from peer review have been incorporated into this version of the Plan.

2. Country Profile

2.1 Socio-political system

Vanuatu is a lower-middle income country located in the south-west Pacific.[4] It is a constitutional democracy with a republican political system headed by a President (elected by sitting members of Parliament and presidents of Regional Councils) and a Prime Minister (who is the head of the ruling party or coalition within Parliament). Members are elected every four years to represent multi-seat constituencies.

Governments may change more frequently than four-yearly due to shifting alliances within the Parliament. The most recent election was in 2012, and the current Government was formed on 16 May 2014. The previous Government was active in driving the health sector reform agenda.

2.2 Geography and demographics

2.2.1 Geography

Vanuatu is a Y-shaped archipelago consisting of approximately 82 islands of volcanic origin (65 of them inhabited). It lies between latitude 13° and 21°S (spanning 1,176 kilometres from north to south) and longitude 166° and 171°E. Total land area is about 12,274 square kilometres, within a maritime boundary of approximately 700,000 square kilometres. The highest point of elevation is 1,877 metres.

The country has been divided into six provinces since 1994. The names of the provinces derived from their constituent islands or island groups (refer Map, page viii). From north to south, they are:

- Torba (Torres and Banks Islands).
- Sanma (Santo, Malo)
- Penama (Pentecost, Ambae, Maewo)
- Malampa (Malakula, Ambrym, Paama)
- Shefa (Shepherds group, Efate)
- Tafea (Tanna, Aniwa, Futuna, Erromango, Aneityum)

2.2.2 Population and demographics

The population of Vanuatu is young and predominantly rural.

Based on projections from the 2009 census, the estimated population in 2013 is 251,784. The median age is 21 years, with 37.3% of the population aged 0-14 years and just 5.8% aged 60 or above. The population has a very slight male predominance (51.1%) (SPC 2011).

Almost 80% of the population lives on just 7 islands: Efate (where the capital Port Vila is located), Santo (the largest island, with the second-largest urban area, Luganville), Tanna, Malekula, Pentecost, Ambae and Ambrym (Van Met 2007). Approximately 76% of the overall population lives in rural areas – either in confluent coastal settlements that may span several kilometres, or in reasonably well-defined villages

[4] The World Bank's classification of national economies is based on Gross National Income (GNI) *per capita*. Lower middle income countries are currently classified as those with a *per capita* GNI for 2011 between USD 1,026 and USD 4,035. Vanuatu's classification potentially affects its ability to attract funding from some donor organisations – most notably, the Global Fund.

ranging in size from a few families to several hundred people. In Pentecost, Tongoa, Tanna and Santo, the interior is quite density populated.

The estimated annual population growth rate is 2.3–2.6%, with a projected national population for 2015 (the first year of this NMSP) between 260,000 and 277,500. The 24% of the population that lives in urban areas is growing more rapidly (3.5%) than the rural population (1.9%) (SPC 2011).

The population distribution by province in 2009 and the projected provincial populations for 2015 are shown in Table 1. The national population is expected to exceed 300,000 by 2020.

Table 1: Provinces of Vanuatu with Population and Growth Rate, 2009 and 2015

PROVINCE	No. of main islands	Population 2009	% of 2009 national population	Annual growth rate (%)	Estimated population 2015	% of 2015 national population
Torba	14	9,359	4.0%	1.9	10,091	3.9%
Sanma	11	45,860	19.4%	2.4	50,424	19.5%
Penama	3	30,819	13.1%	1.5	32,710	12.6%
Malampa	17	36,722	15.6%	1.2	38,517	14.9%
Shefa	15	78,723	33.4%	3.7	91,037	35.2%
Tafea	5	32,540	13.8%	1.1	33,996	13.1%

Source: Projected from Vanuatu Census 2009 http://www.vnso.gov.vu/index.php/data-catalog

2.3 Ecosystem, climate and environment

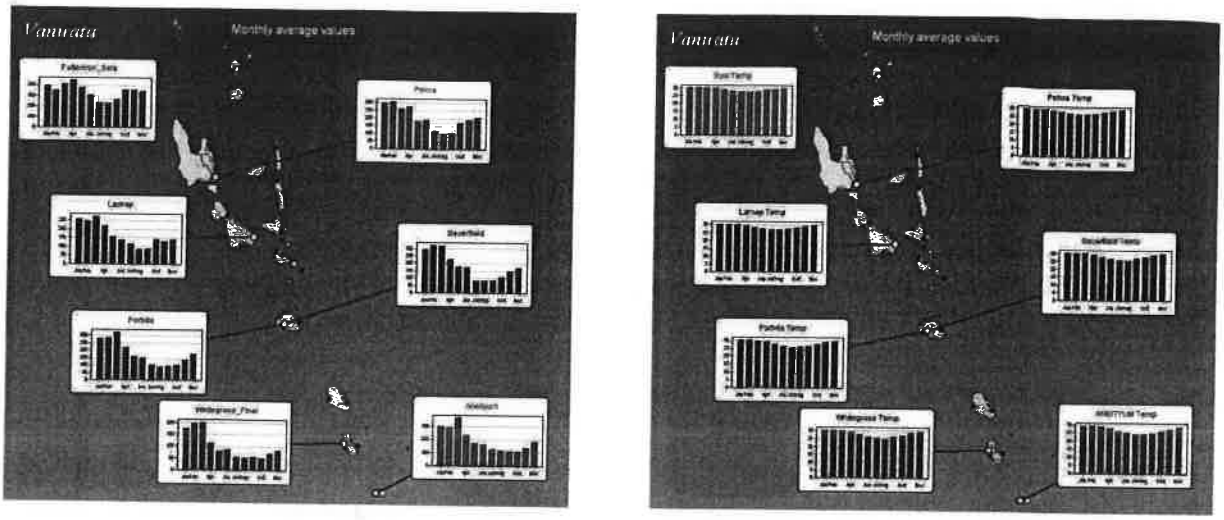
Most of Vanuatu's islands have a coastal fringe but are otherwise steep and lightly forested, with unstable soils and little permanent fresh water. An estimated 9% of land is suitable for agriculture (but only 6.9% is used for permanent crops) (SOPAC 2013).

There is a rainfall gradient from the north to the south of the country (Figure 1, left). Rainfall averages about 2,360 millimetres per year nation-wide, but ranges from around 2,000 mm in the southern islands (Tafea province) to 4,000 mm in the north (Torba province) (SOPAC 2013). The wet season is from November to April, and coincides with peak malaria transmission (see Section 3.1, *Epidemiology*).

The wet season is also associated with cyclone risk; the greatest frequency is in January and February. Vanuatu receives about between 20–30 cyclones per decade, of which three to 5 may cause severe damage and extensive disruption of services (SOPAC 2013).

There is also a slight north-south temperature gradient, but this is less pronounced than the rainfall gradient: Figure 1 (right) shows that Shefa and Tafea provinces have cooler and slightly longer winters than the more northerly island groups. In coastal areas, daily temperatures average 26°C in the hot season with an average maximum of 30°C and an average minimum of 24°C; night-time minimum temperatures in southern coastal areas may reach 13°C in the dry season (Van Met 2007).

Figure 1: Mean monthly rainfall (left) and temperature (right), selected sites, Vanuatu



Source: Vanuatu Meteorological Services http://www.meteo.gov.vu/VanuatuClimate/tabid/196/Default.aspx

In Vanuatu, both ground and surface water are used for domestic purposes. In urban areas the main water source is shallow aquifers whereas in rural areas various sources may be used: bores, wells, springs, streams and domestic or natural rainwater catchments (SOPAC 2013).

Poor drainage and waste management may create pools of water that provide favourable breeding sites for *Anopheles* malaria vectors (see Section 3.1.3, *Malaria vectors*).

2.4 Socioeconomic, health and development outcomes

The most recent available socioeconomic development data for Vanuatu are summarised in Table 2, and selected health output and outcome indicators are summarised in Table 3.

Vanuatu has made good progress in terms of improved life expectancy, which has risen from 56 years at the time of Independence from France and Great Britain in 1980 (Wang 2012) to 71.1 years in 2011 (SPC 2011, WHO 2013a) – higher than the average for Oceania as a whole (58.8 years) (Wang 2012).

Vanuatu is also on track to meet many of its health-related MDG targets. The under-five mortality rate (U5MR) has fallen from 39 per 1,000 live births in 1990 to 13 in 2011, while the infant mortality rate (IMR) has fallen from 31 to 11 per 1,000 over the same period (UNICEF 2013, WHO 2013a); neonatal causes account for a majority of infant deaths (7 per 1,000 live births). There is virtually no gender difference in either the IMR or U5MR.

The low rate of access to improved sanitation (Table 2) may contribute to the risk of childhood diarrhoeal disease and malnutrition. Under-nutrition (Table 3) increases the risk and severity of communicable diseases (including malaria and other parasitic diseases). There are disparities between provinces in each of these outcomes (UNICEF 2012a).

Despite the cost-effectiveness of vaccination as a public health intervention, maintaining immunisation coverage remains a challenge for Vanuatu (Table 3; see also Section 2.5). Measles vaccine coverage has been boosted to protective levels only through supplementary immunisation activities (UNICEF 2013).

Table 2: Summary of selected socioeconomic development indicators, Vanuatu

Economy and income		
Gross National Income *per capita* (2011)		USD 2,870
Gross National Income *per capita* (2011; purchasing power parity [PPP] in international dollars)[5]		I$ 4,500
Gross Domestic Product (2011; current USD)		USD 819.2 million
Demographics		
Total population (2011, projected)		251,784
Estimated population growth rate (2011)	National Range by province	2.6% (1.1–3.7%)
Median age of population (2011)		21 years
Life expectancy at birth (2011)	Total Males Females	71.1 years 69.6 years 72.7 years
Total fertility rate per woman (2010)		3.5
Proportion of population residing in urban / rural areas (2011)		24% / 76%
Social determinants of health		
Total adult literacy rate (%) 2007-2011		83%
Use of improved drinking water sources (2010)	Total Urban Rural	90% 98% 87%
Use of improved sanitation facilities (2010)	Total Urban Rural	57% 64% 54%

Sources: SPC (Pacific Island Populations 2011), WHO (World Health Statistics 2013), World Bank (World Development Indicators 2012, Health Financing Options Paper 2013)

The maternal mortality ratio is estimated to have halved from 220 per 100,000 live births in 1990 to 110 per 100,000 in 2010 (UNICEF 2013, WHO 2013a).[6] However, low rates of antenatal care and delivery attendance by a skilled provider (unchanged since 2007), low contraceptive prevalence rate among women (38% among all married women aged 15-49 years; 21% among those with low educational attainment) and high rates of teenage marriage may all compromise the rate of further progress in relation to MDG 5 (UNICEF 2013).

The observed declines in malaria (see Section 3.1) and the 96% tuberculosis treatment success rate (WHO 2013a) indicate good progress on MDG 6.

[5] PPP methods are designed to avoid distortions caused by variations in exchange rates and the costs of goods and services being lower in one country compared to another (where the actual "purchasing power" of the local currency may differ from other currencies). PPP uses a notional "international dollar" (I$) rather than the US dollar.

[6] Note: The maternal mortality ratio estimate in Table 3 lacks statistical precision due to small numbers and population.

Table 3: Summary of selected health indicators, Vanuatu

Neonatal, infant and child health	
Immunization coverage among one-year-olds (DPT3, 2011)	68%
Immunization coverage among one-year-olds (Polio3, 2011)	67%
Immunization coverage among one-year-olds (measles, 2011)	52%
Immunization coverage (newborns protected against tetanus, 2011)	75%
Neonatal mortality rate per 1,000 live births (2011)	7 per 1,000
Pre-term birth rate per 100 live births (2010)	13%
Infants exclusively breast fed for first 6 months of life (2005-12)	40%
Underweight children under 5 years of age (2005-12)	11.7%
Infant mortality rate per 1,000 live births (2011)	11 per 1,000
Under five mortality rate per 1,000 live births (2011)	13 per 1,000
Maternal health	
Antenatal care from a skilled provider (doctor, nurse and/or midwife), % with at least one visit (2007-12)	84%
Births attended by a skilled provider (doctor, nurse and/or midwife), % of total births (2007-12)	74%
Maternal mortality ratio per 100,000 (2010, adjusted)	110
Lifetime risk of maternal death (2010)	1 in 230
Relative burden of communicable and non-communicable disease	
Communicable, maternal, perinatal and nutritional conditions as % of total deaths, all ages (2008)	24%
Proportion of population at risk of malaria (2013)	~100%
Annual malaria parasite incidence (2012)	13.2 per 1,000
Malaria test positivity rate (microscopy and RDT)	10.0%
Confirmed deaths from malaria (2012)	0
Non-communicable diseases (NCDs) as % of total deaths, all ages (2008)	70%
Proportion of population aged 25 to 64 years with three or more NCD risk factors	22.3%
Proportion of population who are overweight (BMI ≥ 25 kg/m^2)	50.9%
Proportion of population with elevated fasting blood glucose (≥ 6.1 mmol/L) or currently on diabetes medication	21.2%

Sources: WHO (World Health Statistics 2013, NCD Country Profiles, STEPS survey), World Bank (World Development Indicators 2012), UNICEF (Vanuatu Statistics)

However, huge challenges are looming in relation to the growing epidemic of non-communicable diseases (NCD), which threaten to consume a large proportion of available health resources (World Bank 2012). Maternal and infant under-nutrition (Table 3) can initiate irreversible metabolic changes that carry a future risk of developing NCDs.

Periodic outbreaks of dengue fever continue to occur following importation from other Pacific Island countries. Despite the clear synergies with malaria surveillance and environmental monitoring, active

dengue case surveillance is reported to have ceased in March 2011 due to the concurrent demands of malaria control and elimination activities (MOH 2012).

2.5 Health System analysis

The Government of Vanuatu (GOV) has identified 5 groups of inter-linked strategic challenges in the health sector (MOH 2012):

- Weak health system (human resources, financial management, health information system [HIS], leadership and management);
- Resource allocation;
- Double burden of disease (NCDs superimposed on an existing burden of communicable diseases);
- Geographical location of facilities and communities;
- Vulnerability to natural disasters.

2.5.1 Service delivery system, access and equity

Government health services in Vanuatu are delivered through a four-tier system: the northern and southern regional referral hospitals (located in Port Vila and Luganville), Health Centres, Dispensaries and community-supported Aid Posts (WHO-MOH, 2012).

The type and number of government and community facilities in each province is shown in Table 4.

The provincial health office has overall responsibility for managing health facilities within their jurisdiction. Each province is divided into several health zones, and each zone has a principal Health Centre and several Dispensaries (WHO-MOH, 2012).

Table 4: Health facility access (2013) and utilisation (2012), by province, Vanuatu

PROVINCE	Hospitals	Health Centres	Dispensaries	Aid Posts	Total Facilities	Population (2013 est.)	Facilities per 1,000 population	Annual outpatient consultations per capita, 2012	No. of Villages	Villages per primary care facility
TORBA	1	2	6	23	32	9,903	3.23	1.53	34	1.1
SANMA	1	7	6	38	52	49,242	1.06	1.59	403	7.8
PENAMA	1	6	8	42	57	32,227	1.77	2.20	129	2.3
MALAMPA	1	7	14	45	67	38,060	1.76	1.17	N/A	—
SHEFA	1	3	7	42	53	87,789	0.60	0.61	N/A	—
TAFEA	1	5	6	41	53	33,626	1.58	1.21	245	4.6
TOTAL	**6**	**30**	**47**	**231**	**314**	**250,847**	**1.25**	**1.20**	—	—

Source: Vanuatu Health Service Delivery Profile (2012); updated using data from VHW Evaluation 2013 and VHW training program records held by Save the Children Australia. 2012 consultations were derived from the HIS.

Aid Posts are the most peripheral level of facility. They are owned, built and maintained by communities staffed by volunteer Village Health Workers (VHW) and operate under the oversight of a local Aid Post Committee; costs are covered through a revolving fund or small direct payments from patients.

The VHW program is a key strategy of the MOH for improving access to primary health care in rural and remote communities. However, the placement of VHWs is currently determined by the willingness of a community to support the construction and maintenance of an Aid Post and not by a MOH master plan for primary and preventive health care (PHC).

VHW training is contracted by the MOH to a NGO, Save the Children Australia (SCA); the MOH supplies basic medicines and consumables. VHWs receive three months' training in PHC, focusing mainly on community health education, treatment of minor ailments and patient referral (Laverack 2013); their training includes the use of RDTs for diagnosis of malaria and dispensing of ACT for treatment, and the supervision of patients taking primaquine (PQ) for radical cure of *P vivax* once they have initiated treatment under the care of a trained health professional.

In the provinces, VHWs are supervised by provincial health promotion officers (HPO) and/or an area nurse from the nearest Dispensary or Health Centre; supervisory visits are scheduled for every 6 months but, in practice, are usually less frequent (Laverack 2013). While VHW protocols and standards continue to evolve, their articulation with the main health policies and system – and the ability of the VBDCP to leverage the presence of VHWs to integrate community level delivery of malaria services – is dependent on the functionality and quality of these supervisory relationships. SCA has developed tools for VHW supervisors, but these may need to be reviewed or adapted to include malaria-specific or other community health surveillance functions.

In practice, the quality of care provided through Aid Posts is highly variable. Some have dedicated, long-serving and experienced VHWs who are well supported by the community; others appear to operate with minimal or no training for the VHW, little or no supervision, and without a community committee.

Table 4 indicates a considerable variation in the population and number of villages served by each primary care facility. The ratio of primary care facilities (Aid Posts, Dispensaries and Health Centres) to the number of villages is close to one in Torba province, where the large number of small islands requires that model of service delivery. Sanma shows the opposite ratio, with each primary care facility serving around 1,000 people and up to 8 villages.

Data on actual geographical access to care based on the intended MOH standard (distance to a health facility no more than one hour's walk or 5 kilometres) are not available in Vanuatu. Aid posts are not necessarily strategically located as they depend on community interest to build, fund and maintain them. Access to health and other services is often inhibited by a lack of road access through mountainous terrain or the need for boat transport from islands or remote coastal communities in order to reach health facilities, and will be dependent on the availability of transportation. Only Tanna and, to a certain extent, Santo have a road network to inland areas; others, including isolated coastal communities, may need a boat to reach health facilities. People without access to mechanical land or sea transportation (which may be too expensive for those living outside the cash economy) may need to walk long distances for health care.

WHO is currently supporting a Health Facility Survey (quarter 2, 2014). This could generate service readiness data that can be linked with population and malaria incidence data to map access to care in relation to malaria endemicity (see also Section 5.2: *Operational research for case management*).

Utilisation of primary care facilities may be used as a proxy measure for access (Table 4). In 2012, the HIS reported a significant difference in annual *per capita* outpatient visits – including Aid Posts – between and within provinces (among the non-urban provinces, ranging from 1.17 in Malampa to 2.2 in Penama). A malaria indicator survey of 4,741 people (all ages) in conducted in 2011 found that just 48.5% of the 933 respondents had the defined level of access to an Aid Post or higher level of health facility; among all respondents, 49% would seek treatment within 24 hours of the onset of fever or possible malaria symptoms and 94.6% would seek treatment within 48 hours.

In view of these constraints, the GOV recognises that there are likely to be significant pockets of under-utilisation of health services among more remote communities (AusAID 2009, GOV PMD 2010) – especially in Sanma and Malampa provinces (Table 4). This may result in undetected low vaccination rates among infants and children, low coverage rates for anti-malaria interventions like LLINs, poor access to malaria diagnosis and treatment, and difficulty conducting outreach interventions like IRS.

2.5.2 Health work force

Table 5 shows the distribution of trained health professionals and VHWs by province and population. Vanuatu has one of the lowest health worker to population densities in the Pacific; overall, there are 0.19 doctors and 1.58 nurses and midwives per 1,000 population.[7]

This is further exacerbated by urban-rural inequalities in health work force distribution. For example, in 2012, there was just one doctor per 47,250 people and one nurse per 218 people in rural areas (where 76% of the population live), while there was one doctor per 1,492 people and one nurse per 179 people in urban areas (Roberts 2012).

Table 5: Health Professionals and VHWs density per 1,000 population, by Province, Vanuatu, 2012

CADRE	Torba	Sanma	Penama	Malampa	Shefa	Tafea	TOTAL
Medical Practitioner	0.20	0.30	0.12	0.05	0.18	0.18	49
Registered Nurse	0.91	0.81	0.56	1.21	0.38	0.08	344
Midwife	0	0.16	0	0.21	0.10	0	51
Nurse Aide	0.10	0.06	0.03	0.92	0.07	0	162
VHW	2.32	0.75	1.24	1.05	0.47	1.22	222

Source: Vanuatu Health Service Delivery Profile (2012); Save the Children Australia (Aid Post Activity Data 2013)

Nurses are trained at the Vanuatu College of Nursing Education (VCNE). The 2013 MPR recommended that responsibility malaria-related training be transferred to VCNE (MOH 2013); however, that institution would appear not yet to have the capacity to provide such training to the diversity of health workers involved in malaria diagnosis and treatment (and potentially preventive activities under a more integrated service delivery model.

[7] The WHO regards a skilled health worker to population density of 2.3 doctors, nurses and midwives per 1,000 as the minimum needed to provide 80% coverage of basic essential services, e.g. skilled birth attendance and childhood immunization.

In addition, 25 ni-Vanuatu medical students are currently training in Cuba and the first graduates are due to return in 2015. While the Cuban curriculum and style of primary care aligns well with the intended decentralisation reforms, assessment by WHO and Fiji School of Medicine suggests that considerable planning will be required to enable new graduates from Cuba to re-integrate into Pacific health systems (WHO SPC 2013). In particular, little malaria is seen in Cuba and it does not feature strongly in the undergraduate medical curriculum there.

The few private health facilities and practitioners in Vanuatu include 6 private medical clinics and four private pharmacies. The pharmacies require a prescription in order to dispense anti-malarial medications. Government regulations prevent the importation of mono-component artemisinin preparations.

There are also traditional healers, with an estimated density of 3 per 1,000 population. People may prefer to attend traditional healers because of accessibility and affordability, i.e. where there is difficulty in accessing mainstream health services (WHO and MOH 2012).

Most malaria activities (including those in the provinces) are currently managed centrally through the VBDCP team. The **malaria work force** comprises an estimated one-third of all MOH employees (Toole 2010) – currently 82 Program staff countrywide and 18 in Tafea province (13 funded through the GOV, the remainder through the Global Fund grant or the bilateral Australian aid program). The VBDCP has a very flat management structure, and there is no formal organogram that defines lines of delegation or intermediate reporting (MOH 2013).

2.5.2 Other health system building blocks in relation to the Malaria Program

The **planning** context within the MOH is summarised at Section 1.2, above. The VBDCP prepares an annual Malaria Action Plan (MAP) and budget, which provide detailed technical guidance to the national team and its donors on malaria-specific interventions. However, little detail from the MAP is reflected in the national MOH and provincial health business plans, restricting the usefulness of either type of plan as management tools (e.g. to inform synergies with other programs, to guide the collaboration of provincial counterparts in the implementation of malaria interventions, or to help provincial health managers to understand the true cost of public health and disease control activities taking place in their jurisdiction).

Malaria Program **governance** consists of a two-tier arrangement. The technical advisory group (TAG) comprises Program and technical partners and meets approximately monthly to consider technical and – increasingly – some management issues. The Malaria Steering Committee (MSC) includes a broader group of Program, MOH, donor and development partner members; it meets approximately two-monthly to endorse TAG decisions and directions, make management decisions, authorise budgets and financial reports, approve annual work plans and consultancy arrangements, and coordinate with other stakeholders. During a period of Global Fund Country Coordination Mechanism (CCM) inactivity, the MSC has functioned as an interim CCM; however, a reconstituted CCM is expected to resume its functions in April 2014.

Overall **health financing** in Vanuatu is under increasing pressure, with expenditure on health having exceeded the original Government appropriation every year since 2008. The principal drivers are an increasing MOH wages bill (despite gaps in the numbers of front line health workers), and an unmet obligation for retirement payments. Hospital services absorb 48% of total health expenditure – more than twice the expenditure on community health centres (World Bank 2013).

Financial support from development partners heavily underpins the health budget (Table 6). For 2012, total MOH expenditure was just over VUV 2.4 billion (USD 26.9 million) and, of this, the GOV provided just under two-thirds and development partners just over one-third.

Table 6: Summary of selected health financing indicators, Vanuatu

Health financing and expenditure	
Total health expenditure as % of GDP (2011)	4.11%
Private health expenditure as % of GDP (2011)	0.5%
Public (i.e. GOV + development partner) health expenditure as % of total health expenditure (2011)	87.8%
General government expenditure on health (including external resources) as % total government expenditure (2010)	18.2%
External resources for health as % total health expenditure (2012)	37%
Per capita total health expenditure, current USD (2011)	USD 133
Per capita total health expenditure, PPP (2011)	I$ 190
Per capita total expenditure on malaria, current USD (2011)	USD 12.2

Sources: WHO (Global Health Observatory, World Malaria Report 2012, World Health Statistics 2013, National Health Accounts Database), World Bank (World Development Indicators 2012, Health Financing Options Paper 2013)

The cost of achieving the observed reductions in malaria incidence has been significant relative to overall health expenditure. Malaria attracted just over one quarter of all development partner financing in 2012: VUV 222 million (USD 2.4 million) (World Bank 2013).

There is a need to maintain and extend the gains already achieved, and risks associated with not doing so relatively quickly (e.g. the emergence of drug resistance in the malaria parasite) (Feachem 2009). In the context of the Vanuatu economy, the benefits of malaria reduction and elimination are often expressed in terms of tourism and a healthy work force; however, there have been no documented cost-benefit studies to confirm this.

There is also strong MOH and development partner interest in controlling what is perceived as disproportionate expenditure on malaria – estimated at just over USD 12 *per capita* in 2011 (WHO 2012b) – and/or gaining maximum technical efficiency from those resources (World Bank 2010). The MOH needs to take care to use the malaria budget sensibly to strengthen the health system functions that it can, but it should not try to use malaria resources to substitute for areas of core MOH activity (MOH 2013). This requires a clear analysis of the functions that naturally lie with the Program at central level, those that are core MOH functions, and those that can be integrated with public health surveillance and response close to the community level (consistent with an elimination focus and strategy) (WHO 2007).

There are limitations to the timeliness and accuracy of the national **health information system**: disease surveillance and data on health services provided are incomplete; less than half (48.6%) of health

facilities submitted the required HIS reporting forms during 2010, and this fraction fell to just 34% in 2011 (World Bank 2013).

The HIS does not record sufficient variables to inform the planning and implementation of the malaria program, so a malaria information system (MIS) was developed in 2010. Reporting is now through a monthly malaria line listing (MMLL) which lists diagnostic and case management variables for every treated case and aggregate data for patient testing and stock control; data entry takes place at provinc level. Remaining tasks include to roll the MMLL out to hospitals and to strengthen completeness of reporting from the most peripheral facilities.

- **Procurement and logistics** for malaria pharmaceuticals and commodities are generally funded through donor resources due to the limited GOV operational budget. SPC procures LLINs, laboratory supplies a RDTs through non-Government channels using the Global Fund grant; bed nets are distributed over a three year replacement cycle (with no continuous replenishment). Anti-malarial drugs are currently funded by AusAID through a direct funding agreement with the GOV and procured through WHO; they are then distributed by the Central Medical Stores (CMS) through the usual MOH pharmaceutical logistics system, which tracks stock using the *mSupply* software. These processes are described furthe in Section 3.2.6 under *Malaria program performance*.

Malaria drug stock-outs are reported to be uncommon,[8] although over-supply may occur when the forecasting system does not recognise the effect of a reducing incidence of malaria. However, a recen UNICEF study identified significant shortages of essential drugs and other commodities for managing obstetric conditions and a range of common ailments (UNICEF 2012b).

[8] Eighteen (8%) of 223 health facilities visited in 2012.

3. Malaria Situation Analysis

3.1 Epidemiology

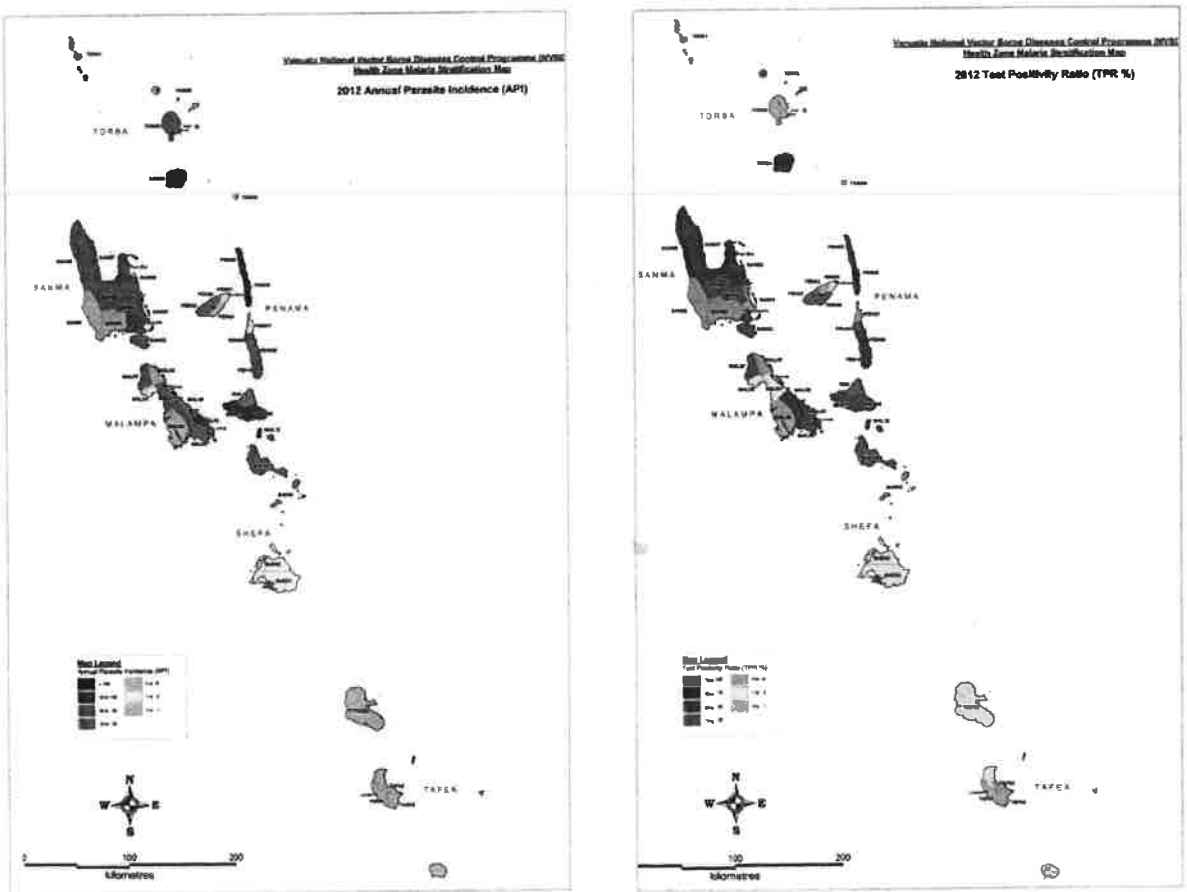
3.1.1 Malaria transmission by province

Within the provinces, malaria transmission is not uniform but varies greatly from place to place, indicated by the more darkly-shaded health zones and islands in Figure 2 and from year to year (see also Annex 1 for more detail by province and health zone).

Historically, the malaria burden in Vanuatu has always been reported as higher in Vanuatu's northern provinces than in the south. This is generally ascribed to the rainfall gradient and, to a certain extent, the temperature gradient between the north to the south of the country (Figure 1, Section 2.3). API data by island from 1985 to 1990 also suggest that the incidence may have been higher at that time on the larger islands (e.g. Santo, Malekula, Efate and Tanna) than on the smaller islands (e.g. Banks, Torres, Paama and Aniwa); this was also shown in prevalence surveys between 1988 and 1992 (Kaneko 1998).

The southern-most province, Tafea, has consistently recorded an API as low as 10 per 1,000 over several years whereas an API fluctuating between 10 and 50 per 1,000 is commonly reported from the more northerly provinces such as Torba (Figure 2; also Annex 1).

Figure 2: Annual parasite incidence (left) and test positivity rate (right), by health zone, Vanuatu, 2012



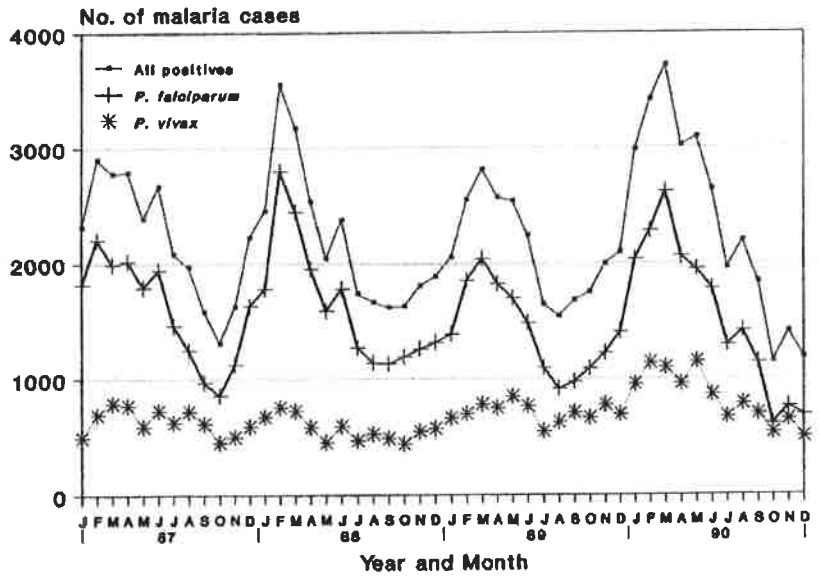
Transmission is usually highest close to the coastal zone where the primary vector (*An farauti*) is highly prevalent (MOH 2013). Inland foci of transmission may also occur, subject to the environment and ecosystem (natural or modified) providing suitable vector breeding sites.

As noted above (Section 1.1), the island of Futuna in Tafea province has always been malaria-free due to the absence of *Anopheles* vectors while the neighbouring island of Aneityum became malaria free in 1991 following an intensive, community-oriented malaria elimination campaign. The whole of Tafea province is earmarked for elimination by 2016 (described in more detail in Section 3.2.5, *Pilot eliminatio activities*).

3.1.2 Malaria parasites and seasonality of transmission

Both *P falciparum* and *P vivax* occur in Vanuatu. Historically, *P falciparum* transmission is seasonal, peaking clearly from February to April, whereas *P vivax* infections have occurred throughout the year with only slight fluctuations as shown in Figure 3 (Kaneko 1998). The relative proportion of *P falciparum* infections has been falling since the large scale introduction of insecticide-treated bed nets (ITN), and these patterns now appear to be becoming less pronounced (MOH 2013).

Figure 3: Seasonal fluctuation of malaria incidence in Vanuatu: number of microscopically confirmed malaria cases (passive case detection), January 1987 to December 1990, Vanuatu



Source: Kaneko *et al* (1998)

Recent parasitological surveys have shown that *P vivax* is now the dominant species. In a mass blood survey conducted by the MOH on Tanna Island in 2006, the parasite rate was found to be 3.8% (125/3,298) with a *P falciparum* prevalence of 1.7% and *P vivax* 2.1% (Cooper 2008). A subsequent prevalence survey of 4,716 children aged 2-12 in Tafea province in 2008 found a prevalence of 1% for *P falciparum* and 2.2% of *P. vivax* by microscopy and PCR (Reid 2010). A malaria indicator survey (MIS) o

4,741 people (all ages) in 2011 recorded a malaria prevalence of 0.6% by microscopy and 2.0% by PCR (of which 24% were *P. falciparum*, 71% *P. vivax*, 5% mixed infections) (MOH 2013).

3.1.3 Malaria vectors

The only vector present in Vanuatu is *An farauti* (Laveran), which belongs to a complex of seven isomorphic species (Beebe 1995). Larvae can tolerate organic pollution and up to 70% salinity (Sinka 2011). Breeding sites include swamps, salt marshes, blocked river outlets, river and stream margins with emergent or surface vegetation, springs, seepage areas, and ponds located near the coast (Russell 2010) as well as transient ground pools that are maintained by rainfall (Cooper 2008). Flight range is generally less than 1 km (Sinka 2011).

Entomological investigations on Tanna have shown that the breeding sites are generally within two kilometres of the coast; the 2006 and 2008 studies also indicated that the highest prevalence of malaria in Tanna children was among those living near the coast (Cooper 2008, Reid 2010, Russell 2010). Pending further entomological studies, it is expected that the same distribution occurs on other islands.

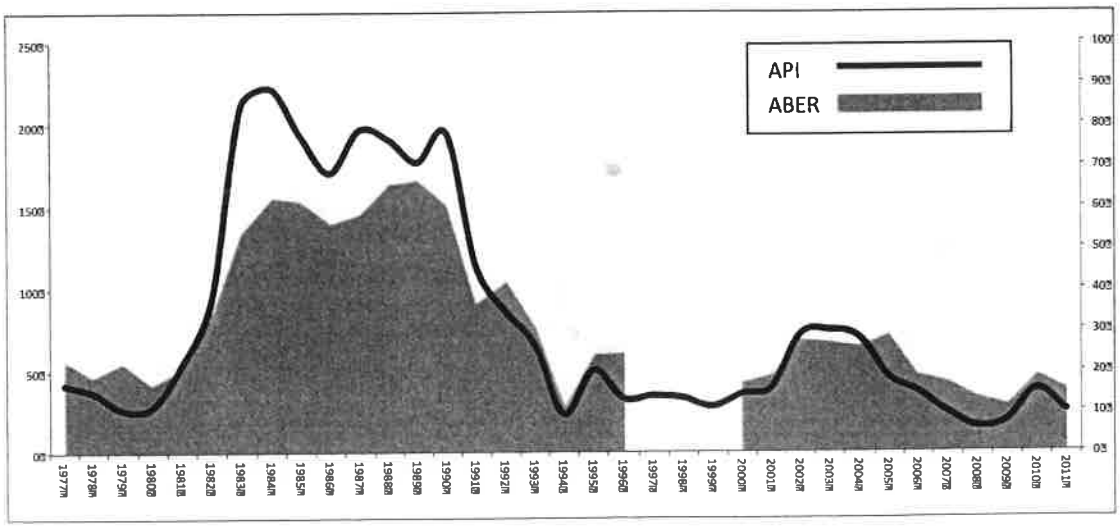
Adult females of *An farauti* readily feed on humans but will feed on other hosts if available. They will feed outdoors during the early evening and also enter houses to feed, but generally leave the house shortly after taking a blood meal (Sinka 2011). Adults feed throughout the night, both indoors and outdoors, with 70-80% of biting taking place while people are indoors (Cooper 2008). Resting places for males and females include any cool, moist, and shaded spot, including human dwellings (Sinka 2011). These observations have guided vector control activities during the elimination campaign on Tanna.

There are no data on vector resistance to commonly used insecticides, and no recent data from LLIN or post-IRS bio-assays. Although pyrethroids are used both in LLINs and for IRS, concurrent agricultural pesticide use is very low in Vanuatu and selection for pyrethroid resistance is also thought to be low.

3.1.4 Historical trends in malaria incidence

Figure 4 summarises the long term trends in API and annual blood examination rate (ABER) in Vanuatu since 1977.

Figure 4: Trends in API (line, Y1 axis) and ABER (shaded, Y2 axis), 1977 to 2011, Vanuatu



It should be noted that the criteria for reporting cases have varied over time, and may include both clinical (i.e. treated without diagnostic confirmation) and confirmed malaria cases.

It is instructive to view the trends in malaria incidence shown in Figure 4 in relation to the malaria interventions used at the time. IRS with DDT was conducted between 1973 and 1981 and this appears to have maintained the nation-wide slide positivity rate (SPR) below 20% and an API below 50 per 1,000. On cessation of DDT use, the incidence climbed quickly until ITNs were introduced in 1988 as part of the global ITN trials. This saw the SPR, the number of reported cases and the API all decline again from 1990 onwards.

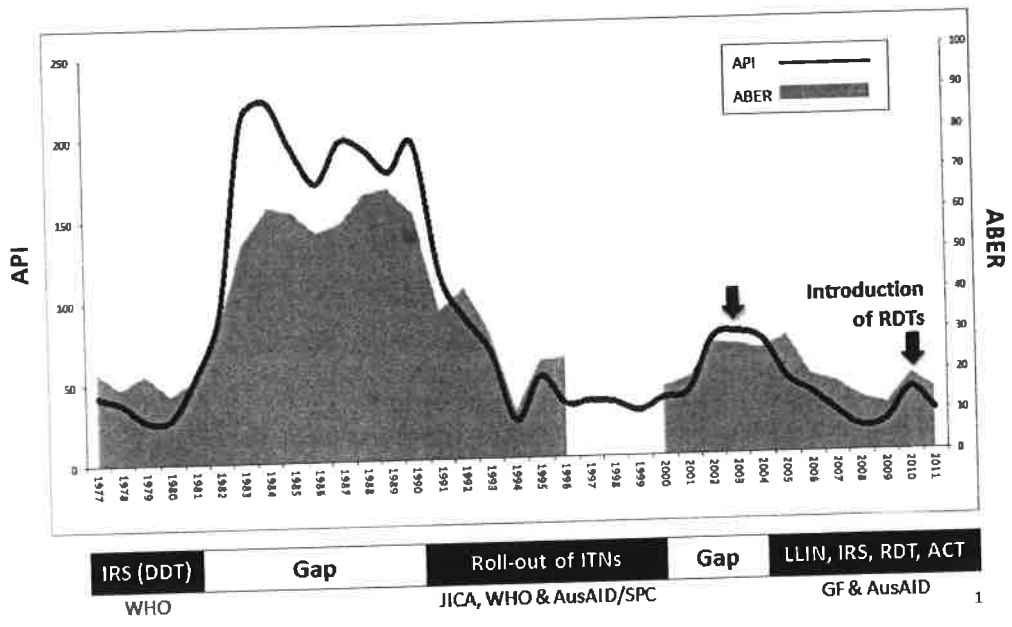
Between 1983 and 1991, three to four times the number of slides was examined each year than in 1981 and the detection rate by microscopy increased accordingly; this strengthened the ability of the Malaria Program to monitor the impact of interventions.

A gap in donor-funded assistance from 2000 to 2003 negatively impacted ITN coverage and saw a progressive resurgence of malaria incidence, SPR and the proportion of cases caused by *P falciparum* from 2001 to 2005-06. Confirmation of additional malaria financing through the Global Fund from 2003 onward allowed a resumption in distribution of subsidised ITNs – and later, free LLINs – reaching >80% coverage with LLINs from 2009 onwards.

These trends and influences are summarised in Figure 5, below, where it can be seen that the rebound in malaria incidence to almost 80 per 1,000 after 2001 (red arrow) coincides with a period of reduced commitment to malaria control.

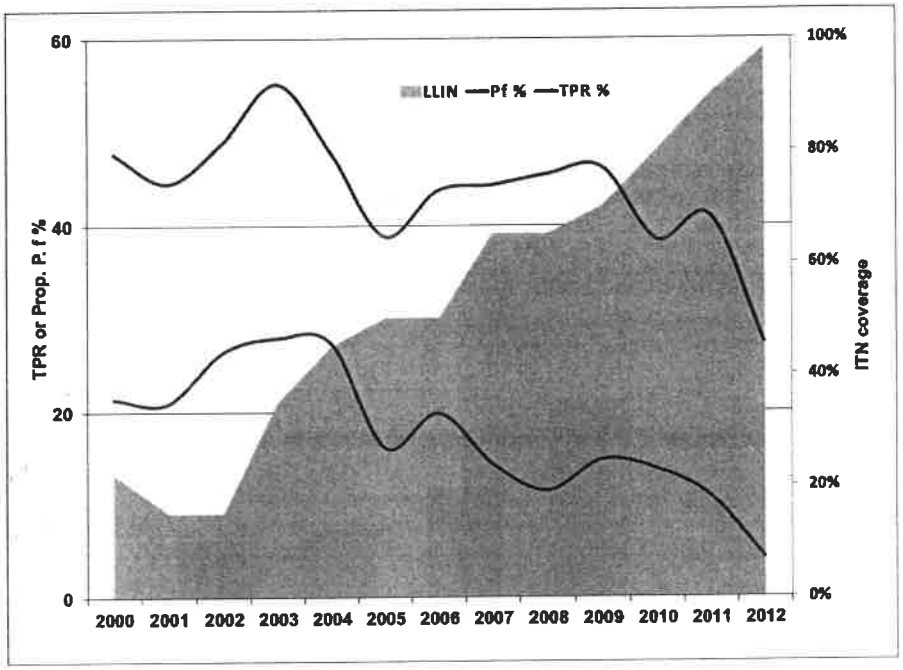
Additional interventions like IRS in selected highly endemic areas from 2009 and nationwide availability of free RDTs and ACT have further reduced malaria incidence. (The small secondary peak in reported incidence in 2010 [Figure 5; also visible in Figure 2] represents a case ascertainment bias coinciding with the widespread introduction of RDTs; this is shown in more detail in Figure 9).

Figure 5: Trends in malaria incidence relative to technical and financial commitment to malaria contro 1977 to 2011, Vanuatu



The recent impact of ITNs and ACT since 2003 – and especially more recently – on test positivity rate (TPR) is shown in Figure 6.

Figure 6: Trends in TPR and proportion of cases due to *P falciparum* (Pf %) in relation to LLIN distribution, Vanuatu, 2000 to 2012



3.1.5 Morbidity and mortality trends by province

Table 4 shows the annual trends in confirmed malaria cases (API and TPR) by province for 2010-12, noting also the number of slides and RDTs taken in the population (% detection rate as ABER).

API and TPR differ significantly by province, with the lowest rates in 2012 observed in Tafea (API 0.4 per 1,000, TPR 1%) and the highest in Torba (API 38.2 per 1,000, TPR 21%). Tafea has a well-established elimination program (see Section 3.2.5) and the ABER there of just 6% presumably reflects a fall in the incidence of febrile illness in the community (1.5% of Tafea children had a fever in the two weeks prior to the 2011 malaria indicator survey, compared with an average of 4.4% across all other provinces).

Table 4: Annual Parasite Incidence and Test Positivity Rate, reported confirmed malaria cases, by province and nationally, 2010 to 2012, Vanuatu

	MALAMPA			PENAMA			SANMA			SHEFA			TAFEA			TORBA			VANUATU		
Year	ABER	TPR	API	ABER	TPR	API	ABER	TPR	API	ABER	TPR	API	ABER	TPR	API	ABER	TPR	API	ABER	TPR	API
2010	17%	25%	44.1	6%	41%	22.6	26%	21%	53.9	19%	17%	31.5	8%	2%	1.9	24%	12%	29.4	17%	19%	32.6
2011	25%	22%	52.9	12%	29%	35.5	22%	15%	33.1	11%	10%	11.2	5%	1%	0.7	22%	21%	46.2	15%	17%	25.0
2012	16%	13%	20.3	11%	19%	21.2	23%	9%	21.3	10%	5%	4.7	6%	1%	0.4	18%	21%	38.2	13%	10%	13.2

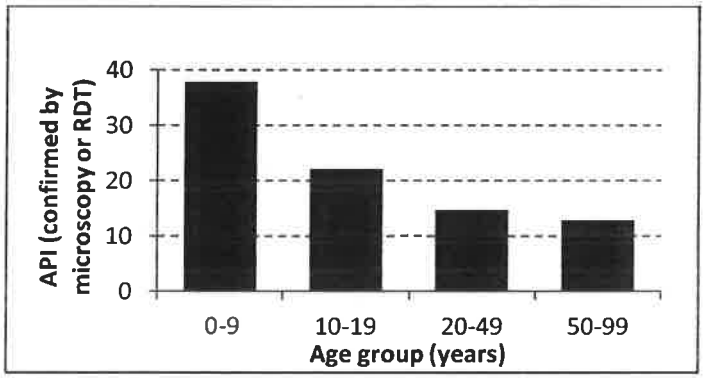
Very few malaria attributed deaths have officially been recorded within the national HIS during the last 10 years (from 2 in 2007 to zero in 2012). This might be due to better access to prompt and effective treatment, but may also reflect factors like the willingness of people to die at home rather than in hospitals or health care facilities, patients dying while in transit to a referral facility, or a lack of malaria diagnostic or *post mortem* capabilities at the referral centre.

The Program interacts with clinicians and HIS colleagues to fine tune the mortality data, and the HIS is embarking on a program for improving the recording of vital statistics and conducting death audits.

3.1.6 Malaria burden and species by age group

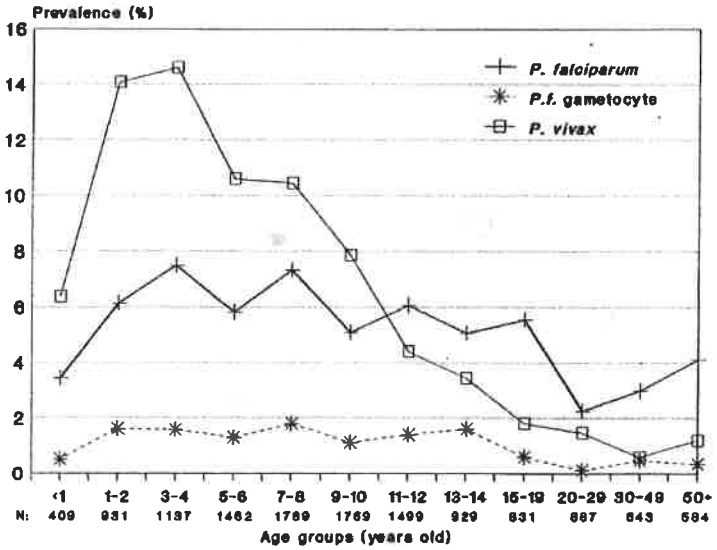
Children under 10 years of age comprise the most at-risk population, as shown in Figures 7 and 8.

Figure 7: Age-specific incidence of reported, confirmed malaria, Vanuatu, 2012



Source: MOH (2013)

Figure 8: Age-specific malaria prevalence in 16 islands of Vanuatu, 1988 to 1992



Source: Kaneko et al (1998)

The data on prevalence by age group from 1987 to 1991 show that *P vivax* infections are most prevalent in children under 5 whereas *P falciparum* infections occur more constantly across all age groups (Kaneko 1991). This suggests that children under 10 are the main reservoir of *P vivax*.[9]

3.2 Malaria Program Performance

3.2.1 Overview

Since 2009, significant external donor support (Figure 5) has seen a scaling-up of evidence-based interventions to initiate a malaria elimination strategy in Tafea province (and, more recently, Torba) and to enhance malaria control in the rest of Vanuatu.

While noting the disadvantages to the health system of a nation-wide, vertically implemented Malaria Program (see Section 2.5 and 3.2.7), these efforts have contributed significantly to a reduction in the national malaria burden (API 73 per 1,000 in 2003, 23.3 per 1,000 in 2007 and 13 per 1,000 in 2012; Figure 9), and have seen the province of Tafea reach almost zero indigenous cases in 2013 (Section 3.2.5).

Figure 9: API trends by year, 2000-12, Vanuatu

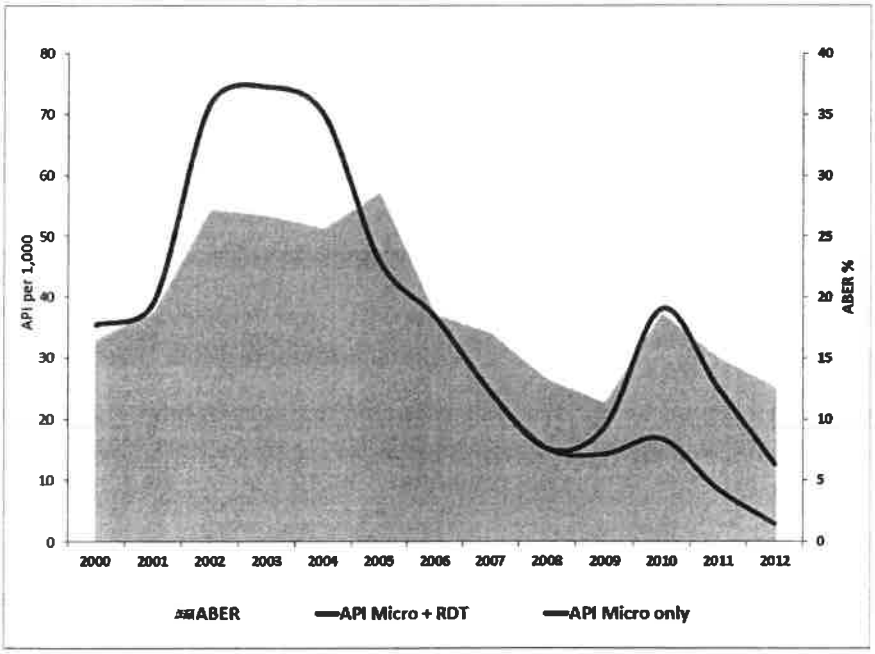


Table 5 (page 22) summarises Program performance against key indicators to the end of 2012 data to be added if possible), showing the achievement of most milestones and targets.[10]

[9] The *P falciparum* to *P vivax* ratio in Vanuatu has been consistently around 50% over many years, irrespective of the diagnostic method or prevailing malaria control interventions. This could be due to a lack of quality microscopy diagnosis, misclassification of clinically diagnosed cases, the use of different brands of RDT, etc. It is anticipated that, with improved capacity for species identification (microscopy, RDT and PCR), *P vivax* infections will become numerically more prominent as overall malaria incidence falls over time.

[10] The results shown in Table 5 need to be qualified by limitations or uncertainties in the data. In particular, in 2012, it was estimated that the MIS captured around 70% of malaria patients nation-wide (but is improving over time).

Table 5: Progress to 2012 relative to selected impact and outcome indicators, Vanuatu

Indicator	Source	Baseline (year)	2009	2010	2011	2012	Target (2014)
Confirmed malaria cases (by microscopy or RDT)	MIS	6768 (2000)	3316	7798	6126	3165	1692
Estimated proportion of treated patients being tested		Not known – probably very low				>90%	
Inpatient (severe) malaria cases (absolute cases)	HIS	NA	143	38	74		
Inpatient deaths due to malaria	MIS	2 (2009)	2	1	1	0	<2
Malaria test positivity rate (microscopy or RDT)	MIS	19% (2010)	15.9%	19.0%	16.7%	10.0%	10%
Percentage of cases due to *P. falciparum* or mixed	MIS	54% (2009)	53.7%	37.6%	37.3%	35.7%	40%
Confirmed cases of malaria per 1000 population at risk (API) by microscopy or RDT	MIS	74 (2003)	14.2	32.6	25.0	12.6	17
% of population covered by ITNs (@ 1 net per sleeping space)	Survey	16% (2009)	N/A	N/A	60%	—	95%
ITNs usage %	Survey	N/A			52%		
% of targeted population covered by IRS (denominator varies over years)	Opera-tional data	N/A		>90%	>90%	>95%	>95%

Note: Baseline varies according to year and data source (MIS or survey). A nation-wide malaria indicator survey was conducted in 2011

The 2013 MPR (MOH 2013) found that the following are the principal factors that have contributed to the rapid decline in malaria observed in Vanuatu:

- Provision of financial support through the Global Fund grant and PacMI (Australian Aid), and technical support through WHO and PacMISC (the Pacific Malaria Initiative Support Centre, University of Queensland)
- Strengthening malaria-specific human resources by engaging additional staff in essential point of care, provincial and central locations
- A variable but generally high level of LLIN ownership (around 80% coverage nation-wide at a ratio of one net per sleeping space, or one net per 1.5 people)
- IRS operations (1 to 3 rounds according to initial API) in Tafea and parts of Torba provinces, covering >80% of households within a two kilometre coastal perimeter (i.e. corresponding to the main vector breeding sites in provinces targeted for elimination)

- Free access of patients to microscopy and RDTs followed by free ACT for both *P vivax* and *P falciparum* infections (increasingly administered via directly-observed treatment; DOT) when needed; this has seen a decrease in the number of patients treated without parasitological diagnosis
- Strengthening the malaria information system (MIS) using the monthly malaria line listing in an effort to record all malaria cases identified though the PHC system.
- Engaging leaders, communities students and teachers to help them to understand the nature of malaria and the Program objectives and activities
- Provision of targeted (long-term and short-term) technical assistance (TA) to the national Program and the provinces

3.2.2 Vector control

Vector control has been the mainstay of the Program since the arrival of increased donor support, and was noted by the MPR to be a key factor in the reduction in malaria incidence in Vanuatu (MOH 2013).

Since 2009, an average 70,000 pyrethroid-impregnated polyester LLINs have been distributed each year through a rotating three-year provincial cycle. The targeted coverage rate is one bed net per sleeping space per household (one net per 1.25 people; effectively, one net per 1.5 people after allowing for population movement). Bed net utilisation is good in Tafea (87.9%) and acceptable in most other areas (68.9%). This has been achieved in spite of significant disbursement delays that slowed distribution relative to the intended schedule; the effect of these delays may be partially mitigated by the three to 5 years' net durability reported by the manufacturer.

Vanuatu has now initiated a second cycle of full bed net replacement. However, there is not yet an agreed policy on disposal or recycling of old nets.

There is a risk that bed net utilisation might decrease with declining malaria incidence, or because of the perceived additional impact of IRS in targeted areas.

The Program has delivered three rounds of IRS with good coverage of targeted structures on Tanna, two rounds in higher risk areas of Shefa (including those communities with direct social contact with higher incidence outer island provinces), and one round in Erromango, Aniwa and the Torres Islands.

Larviciding with methoprene at 3-monthly intervals has been implemented in up to 95 identified breeding sites in Tanna since 2011. Some communities also undertake clearance of vegetation from water bodies, while other provinces promote the seeding of standing water bodies with larvivorous fish for larval source management (LSM). To date, there is no demonstrable evidence of LSM having an impact in Tanna above what has been achieved through LLIN and three rounds of IRS; similar reductions in transmission (magnitude and rate) have been observed on other islands of Tafea and in the Torres islands with LLINs and IRS but without any LSM.

Entomological surveillance capacity is limited; Vanuatu relies on continuing external TA for conducting even routine vector control monitoring. Vector behaviours, insecticide resistance and other basic entomological parameters following widespread introduction of LLIN and focal IRS remain unknown.

3.2.3 Diagnosis

Prior to 2009, the only diagnostic test for confirmation of malaria in Vanuatu was microscopy. As microscopy was only available in 33 (10%) health facilities, diagnosis was frequently on clinical grounds.

Since then, the Program has made significant efforts to maintain the network of microscopy services through the Global Fund grant. However, assessment of malaria microscopists' competency by the Australian Army Malaria Institute (AAMI) in 2008, 2010 and 2011 yielded quite poor results: only four of the 35 participants achieved the Level 1 or 2 standard, with the remainder at Level 3 or 4 proficiency. None of the four Level 1 or 2 microscopists is currently providing malaria microscopy services.

To improve the standard of microscopy services, a review was undertaken in 2011. Training in microscopy and quality assurance (QA) was conducted in 2012, and supervisory visits and a microscope maintenance program were initiated, but no quantitative results are available. The QA program requires microscopists submit all positive slides and a 10% sample of negative to their Provincial health laboratory for cross-checking; a program of panel testing (using 10 slides with known results) has just been initiated.

However, the proportion of malaria cases confirmed by microscopy has declined markedly since RDTs were rolled out to all health facilities in 2009, dramatically improving access to parasitological diagnosis: in 2011, > 90% of health facilities reported access to microscopy and/or RDT.

Figure 10 shows that the number of RDTs performed in health facilities increased from 11,900 in 2010 to 14,791 in 2012, but with a decreased utilisation of microscopy in favour of RDTs over the same period. The Figure also shows that, since 2010, both the number of tests performed and the proportion of tests that are positive have declined due to the decreasing transmission and burden of malaria.

Figure 9: Trends in number of diagnoses by microscopy and RDT (Y1 axis), and ABER and TPR (Y2 axis), 2008–12, Vanuatu

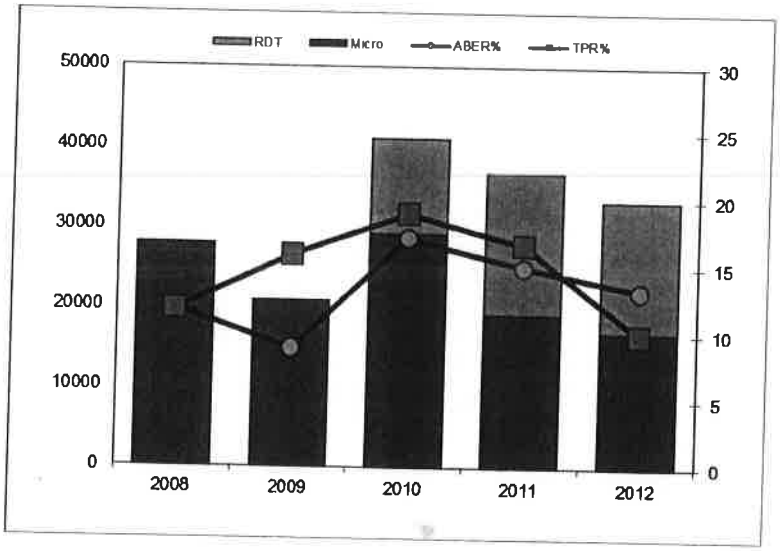


Table 6 summarises mean microscopy activity by province for 2012. Between 2010 and 2012, the number of slides taken annually in health facilities decreased from 29,180 to 16,981, with an average of less than two slides examined per day in 2012 in all but 5 sites.

Table 6: Microscopy activity per site, by province, Vanuatu 2012

Province	API 2012	Sites	No of slides examined, 2012	Mean no of slides examined per site per day
Shefa	4.7	6	5,295	3.5
Malampa	20.3	7	3,008	1.7
Penama	21.2	8	784	0.4
Sanma	21.3	4	5,877	5.9
Torba	38.2	3	1,174	1.6
Tafea	0.4	4	843	0.8
Total Vanuatu	**13.2**	**32**	**16,981**	**2.1**

Assumption: 250 working days per year. API based on both microscopy and RDT

There is no clear instruction in the *Guidelines for Treatment of Malaria in Vanuatu* (2009) on which patients should be tested for malaria. This leads some health workers to not test for malaria if they believe that there is a very low risk of malaria in their area (or even that it has been eliminated). This has probably also contributed to the progressively lower ABER noted in Tafea, for example (Section 3.1.5 and Table 4). While the case definition for 'suspected malaria' is fever or history of fever (as per the standard WHO definition), this may be interpreted quite variably (including between provinces); some lower incidence service delivery points are reported to be already implementing non-systematic screening of patients with a history of travel outside the area.

The proportion of suspected malaria cases receiving a diagnostic test is not measured directly. According to current indicators captured by the MIS, the proportion of reported malaria cases confirmed by either microscopy or RDT increased from 88% in 2010 to 97% in 2012. This may indicate a reporting bias (commonly seen in many countries) as it seems unlikely that as many as 97% of all cases treated for malaria would have received a diagnostic test.

3.2.4 Treatment

The introduction of new case management guidelines in 2009 was accompanied by extensive training for multiple cadres of health workers. The training program took advantage of the unique opportunity that arose from the newly introduced RDTs and ACT as the new first line treatment for both *P falciparum* and *P vivax*. Refresher training on malaria case management, malaria microscopy diagnosis and the use of the new RDTs was continued in 2011 and 2012.

Although health workers at Health Centre, Dispensary and Aid Post levels participated in the training, hospital staff and some Health Centre staff did not have the opportunity to take part. As a result, some doctors and nurse practitioners are unfamiliar with the up-dated treatment protocols (including for severe cases).

For health workers, there is limited 'on-the-job' supervision and support. Facility supervisory visits focus mainly on data and reporting without providing technical support or follow-up of training; because they are not conducted by nurses or clinicians, they do not include observation of treatment.

Some leeway to treat patients with negative tests according to clinical judgment is appropriate when there is diagnostic uncertainty, but this has led to large variation in actual clinical practices – particularly in poorly stocked Aid Posts where VHWs have had little (or in some cases no) training, and have few other treatments to offer a patient. Variable adherence to protocols is also reported from higher level health facilities, e.g. providing malaria treatment when a malaria-specific test is negative, or providing antibiotics without further investigation.

Therapeutic efficacy studies (TES) using WHO approved methodology were conducted on Epi in 2011 to assess the efficacy of artemether-lumefantrine (AL; *Coartem®*) against both *P falciparum* and *P vivax*. No cases of *falciparum* were identified. However, 80 *P vivax* cases were recruited and, among them, only one subject showed a reappearance of parasites within the 28 days follow-up period (justifying the continued use of AL as first line treatment for *P vivax* infection).

Treatment with primaquine for radical cure of *P vivax* infection is recommended in the treatment guidelines,[11] but is rarely practised and not well documented. The absence of a feasible screening test for glucose-6-phosphate dehydrogenase (G6PD) precludes the use of 14-day PQ therapy in most cases diagnosed in community settings as patients will need to be referred to a Health Centre to initiate treatment under clinical supervision. The MIS indicates that, in the first 6 months of 2013, only 4% (35/847) of reported *P vivax* cases were prescribed PQ.

A multi-centre study is currently under way around Lunganville in Santo to assess the efficacy of different 14-day doses of PQ against the strains of *P vivax* found in Vanuatu, and to measure the efficacy of AL on *P falciparum* and *P vivax*. Unfortunately, not a single *P falciparum* case has been recruited over a 6 months period. G6PD screening has been made available, and G6PD-deficient individuals are excluded (meaning the study will not address the crucial issue of PQ safety when used without knowledge of the patient's G6PD status). However it will establish the effective dose and adverse effects of PQ in persons with normal G6PD activity, to guide future policy.

3.2.5 Pilot elimination activities

As noted above, the first pilot elimination activity in Vanuatu commenced in **Aneityum** in Tafea province in 1991. Against a baseline prevalence of 10% *P falciparum* and 15% *P vivax*, weekly mass drug administration (MDA) using sulphadoxine-pyrimethamine (SP) and PQ was provided for to the whole population (718 individuals) for 9 weeks; in addition, 100% coverage with ITNs (by population), introduction of larvivorous fish (*Gambusia* species) into a neighbourhood swamp, and screening of arrivals for malaria at ports of entry (POE) (Kaneko 2000, Kaneko 2010).

A resurgence of local transmission with a small *P vivax* outbreak occurred in 2002 after an outbreak on Tanna and Erromango 2001-03. This was managed with a new cycle of MDA using chloroquine (CQ) four times weekly followed by 14 days of PQ.

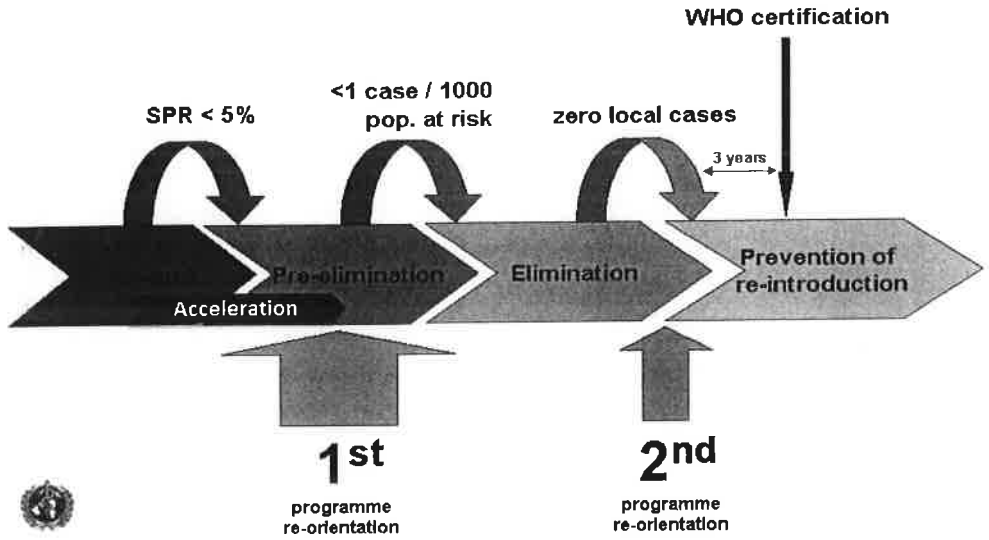
A small number of asymptomatic *P vivax* cases were detected in surveys during 2003-05. A serological survey in 2009 subsequently found 7 children under the age of 5 years who were seropositive for *P vivax*. One case of *P vivax* was detected through routine malaria surveillance in 2010 in an individual who had not travelled outside Aneityum. These observations suggest that low level transmission of *P vivax* may still be occurring.

[11] To minimise the risk of toxicity in the absence of G6PD screening, PQ is prescribed at a lower dose of 0.25mg/Kg/day.

In 2009, the whole of **Tafea** was selected as the first province-wide pilot elimination site in the country, with the objective of achieving zero local transmission of malaria by the end of 2014 (and sustained elimination by 2016). Tafea was selected based on the following criteria: a) the relatively low level of malaria endemicity and transmission (see Sections 2.3 and 3.1.5); b) the absence of malaria transmission in the island of Futuna; and c) the more recent, successful elimination of malaria transmission and reservoirs on Aneityum in the 1990s.

The interventions used in Tafea (summarised in Box 1) have been designed to accelerate the reduction in malaria transmission (API 23.3 per 1,000, TPR 21.7%) and move the province more quickly into an "elimination phase" strategy according to WHO criteria, shown schematically in Figure 11 (WHO 2007).

Figure 11: Acceleration strategy from control to pre-elimination phase, Tafea province, 2009-12



Box 1: Pilot Malaria Elimination Interventions, Tafea Province, 2009-13

Prevention: Vector Control and Personal Protection

Mass distribution of LLIN, topping-up and replacing nets

IRS x 3 rounds of all households within 2 km of the coast of Tanna, planned and managed using a sophisticated geo-referencing system

Blanket IRS coverage of Erromango and Aniwa x 1 round, followed by focal spraying targeting areas of local transmission

Case management: Diagnosis and Treatment

Diagnosis of every fever case using quality assured microscopy or RDT

Treating all *P falciparum* cases with AL, and all *P vivax* cases with AL plus 14 days of PQ (as per national *Guidelines*)

Administration of all malaria treatment by DOT

Vector control

Indicators of individual access to bed nets must be based on household surveys rather than estimated from distribution records. This will better inform procurement needs in future

planning cycles.

Better evaluation of larval source management interventions is required before this intervention can be replicated in other areas

Surveillance and Response

Notifying positive cases to the Provincial Malaria Office within 48 hours

Investigating cases

Following-up all cases by microscopy: once a month for 3 months for *P falciparum* and once a month for 6 months for *P vivax*

Conducting selective mass screening and treatment (MaST) where epidemiological data indicate continuing local transmission

Community surveillance for detecting possible imported cases of malaria

Monitoring and evaluation

Passive case detection at health facilities – entering line listing data onto the MIS and reporting to the Provincial Malaria Office monthly

Recording case investigation details in the MIS

Recording LLIN distribution and IRS in the MIS

Community mobilisation and system strengthening

Enhancing community participation

Collaboration and coordination with other health programs

The impact to date of those interventions to date is shown in Table 7 and Figure 12. (Note that the vector control interventions shown in Figure 11 are superimposed on other public health interventions, i.e. universal access to parasitological diagnosis using microscopy or RDT and the availability of highly effective treatment using ACT).

Table 7: Progressive impact of interventions by year, based on the Tafea model (2008-12)

	Pop.	Tested	ABER	Cases	TPR %	API	IRS	ITN	PHASE	SURVEILLANCE			
2008	32540	3492	11	757	21.7	23.3	—	30%	CONTROL	MMLL		PCD	
2009	32540	1809	6	278	15.4	8.5	IRS 3	30%	ACCEL	MMLL		PCD	
2010	32906	2765	8	63	[redacted]	1.9	IRS 2	>85%	ACCEL	MMLL		PCD	
2011	33269	1680	5	17	1.0	[redacted]	IRS 1	>85%	PRE-ELIM	CASE		PCD	
2012	33635	1869	6	20	1.1	0.6	—	>85%	ELIM 1	CASE		PCD+	ACD
2013	34006			4			—	>85%	ELIM 2	CASE	FOCI	PCD+	ACD

PCD = passive case detection; PCD+ = enhanced passive case detection; ACD = active case detection

Figure 12: Confirmed malaria cases (Y2 axis) and TPR and API trends (Y1 axis) in relation to pilot elimination interventions, Tafea province, 2008-12

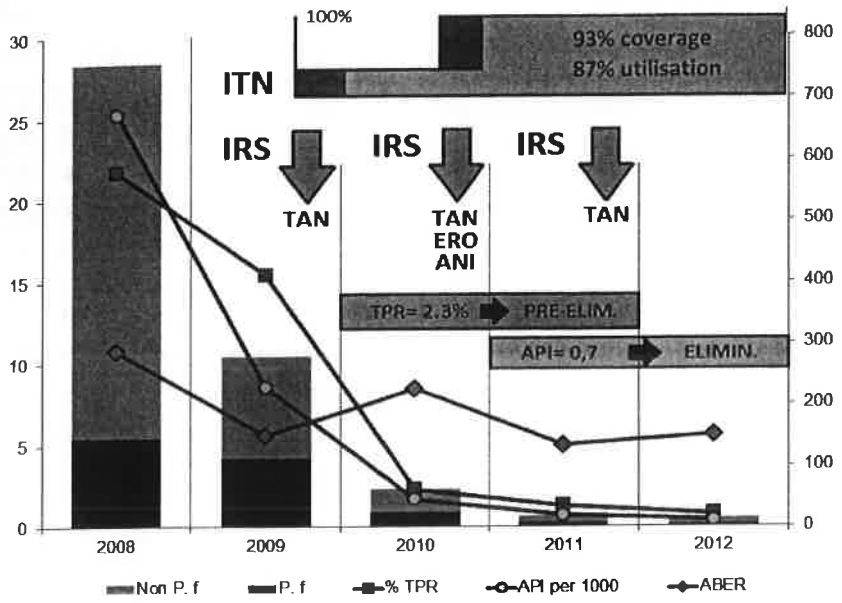


Table 7 and Figure 12 show that the number of reported cases in Tafea fell from 757 in 2008 to just four imported cases in 2013 (an additional indigenous case, reported during the strategic planning workshops in November 2013, is not included in the data). The province passed the WHO-recommended pre-elimination threshold (TPR < 5%; Figure 9) in 2010 after just one round of IRS. The elimination threshold (API < 1 per 1,000) was reached in 2011 after two rounds of IRS in all households situated within two kilometres of the sea (with a coverage of >90% of households sprayed), concurrently with the achievement of a high coverage of LLINs (93%, with 87% utilisation).

The provincial health service also maintained universal free access to diagnosis by RDT or microscopy and DOT with ACT through an expanded network of primary care facilities (including increasing the number of Aid Posts from 20 in 2010 to 31 by the end of 2012), by increasing community and school engagement, and establishing a team of 17 dedicated malaria staff (including 8 malaria elimination officers). LSM was undertaken on Tanna but not Erromango or Aniwa.

The API has continued to decline – to 0.4 per 1,000 in 2012 – and is expected to fall below 0.1 per 1,000 in 2013. There have been no reported deaths attributed to malaria since commencement of elimination-oriented activities.

These achievements can inform a progressive expansion of similar interventions to other islands, and form the basis of the proposed Strategy for 2015-20. The gradient towards higher transmission in the northern provinces represents a risk that the strategy may not be as fully effective as in Tafea (Section 3.1.1); however, early results from Torba suggest that the impact will be similar.

3.2.6 Supply chain management

The specifications for RDTs and ACT comply with WHO prequalification and evaluation guidelines; these commodities are procured through SPC- and WHO-prequalified suppliers.

Lot quality control testing is routinely performed for all arriving batches of RDTs.

Non-air-conditioned store rooms at facilities raise concerns about the validity of RDTs, ACT and other drugs in the field. There is currently no mechanism for collecting random samples of ACT or RDT from health facilities for quality testing.

All medical supplies are first stored and then distributed to provinces through the national CMS. The submission of orders may not be timely, communication between facilities, provincial pharmacies and the CMS may be inadequate, and provinces and facilities may not receive what has been ordered; on occasions, the CMS intervenes when the provincial pharmacy does not detect or respond to attempts to stockpile supplies at the facility level.

Forecasting systems for the quantification of medicine orders need to be adjusted to reflect the reduced number of cases to be treated – otherwise, oversupply and expiry of ACT will occur in many health facilities. Stock outs of RDTs are occasionally reported. Quantification of procurement is further complicated by the relatively short shelf life of both ACT and RDTs (often around two years).

3.2.7 Surveillance and information management

The Malaria Information System, which gathers and consolidates routine essential malaria surveillance and programmatic data through the MMLL, has been functioning in parallel with the HIS since 2009. At present, the surveillance and investigation of possible malaria deaths needs to be coordinated manually between the HIS and MIS.

The possibility of malaria resurgence after reaching very low transmission levels depends on several factors: human and mosquito movement due to frequent inter-island travel by air and sea through multiple entry points (importation risk) and the presence of vector mosquitoes and the degree of immunity in the human population (receptivity). Information on malaria outbreaks is currently very limited. Anecdotally, outbreaks or higher transmission levels have been reported from: Emae in 1985; Tanna in 1987 (following Cyclone Uma); Epi in 1988; Tongoa in 1990 (Kaneko 1998); Tanna, Erromango and Aniwa in 2000 and 2003 (Kaneko 2010); Gaua Island in Torba in 2010; and on Epi Island in Shefa and Malo Island and North East Santo in Sanma in 2012 (MOH 2013). However there is no written record of formal investigation and management of these events, or a clear definition of what constitutes an 'outbreak'.

3.2.8 Interaction with other health system elements

The *Strategic Vision* states a clear intention for the annual VBDCP work plan to be integrated progressively with provincial health plans, for operational planning and budgeting to be harmonised, and for health facilities to become the focal points for community level prevention (e.g. planning and management of LLIN distribution). This would free up the central VBDCP to focus on higher level activities to strengthen the implementation of the Program, e.g. operational research, QA, monitoring, surveillance and response.

In practice, the provincial malaria supervisors travel to Port Vila once or twice a year for review and planning meetings. However, the consolidated MAP is structured by programmatic area and activity – often reflecting project-based funding sources – rather than by geographic area, and implementation is centrally managed with little provincial input (MOH 2013).

Operationally, the Program has exercised some leeway to include other health programs (e.g. immunisation) in community outreach activities), and to include yaws and lymphatic filariasis surveillance activities in the malaria indicator survey. Those collaborations could be strengthened further through interventions like integrated vector management (IVM), surveillance and reporting, preventing or controlling other VBDs in Vanuatu.

The Program interacts constructively with CMS for procurement, supply chain management and logistics, and with the MOH Finance section for financial program management.

However, around 70% of malaria funding is provided from donor sources, almost 100% of commodities procurement is externally funded (and managed) and 68 of 82 positions are project-funded (although managed through GOV systems).

3.2.8 Recommendations of the 2013 MPR

The MPR made many specific recommendations in relation to individual thematic areas of the Program, plus a number of higher-order strategic directions (summarised in abbreviated form in Box 2).

Box 2: Strategic Recommendations of the Malaria Program Review, 2013

Program management

Malaria Program planning should be directed towards a comprehensive provincial planning, budgeting and expenditure reporting process and more substantive provincial input.

The VBDCP and the Malaria Steering Committee should resist taking on too many general health system strengthening tasks; it should focus primarily on its core functions – disease control and public health aspects of the Program.

Renewed donor support should gradually reduce the reliance on short term outside technical advisers, encouraging VBDCP instead to focus requests for such assistance on defined analytic tasks and to capitalise on internal resources and past capacity building activities.

Case management

In areas where quality-assured malaria microscopy is difficult to establish and sustain, RDT should be the diagnosis of choice (in both hospitals and Health Centres).

Quality assured microscopy should be maintained in hospitals for monitoring treatment response in in-patients, and in selected Health Centres.

Primaquine use and any adverse effects should be tracked and reported through the malaria line list until such time as G6PD testing and/or data on primaquine safety and efficacy from ongoing studies become available.

Vector control

Indicators of individual access to bed nets must be based on household surveys rather than estimated from distribution records. This will better inform procurement needs in future planning cycles.

Better evaluation of larval source management interventions is required before this

intervention can be replicated in other areas.

Behaviour change communication and community mobilization

As malaria cases decline, it is critical to continue to engage both the community and health workers to maintain high levels of bed net utilisation.

Monitoring and evaluation

A strengthened M&E unit within the Program is needed to undertake regular epidemiological analysis, to guide elimination strategies and to set targets and timelines.

Surveillance in support of elimination

Frequent monitoring of indicators at provincial and health zone level is vital to improve risk stratification and targeting of interventions. For monthly or quarterly reviews, the Program should concentrate on a few critical indicators (e.g. incidence and test positivity rate by species) to guide interventions and relate activities and interventions to impact.

3.3 Introduction of zonal stratification and mapping

Traditionally, other than the north-south gradient in reported incidence (Section 2.3, Figure 1 and Table 4), there have been no officially defined strata of malaria transmission risk in Vanuatu.

The only other form of operational stratification was built on the finding that mosquito breeding and malaria risk in Tafea were higher within 2 km of the coast, and this guided the geographical coverage of IRS interventions. However, this 2 km zone does not correspond to any sub-provincial administrative level for program planning.

Monthly API and TPR data by health zone are now available for 2010, 2011 and 2012; these have been used to develop zonal transmission risk stratification maps (Annex 1) which, in turn, have been used to prioritise and target malaria interventions more efficiently in support of the elimination agenda (see Section 5.1 *Thematic Area 1: Vector control*). Stratification at even lower levels, e.g. administrative villages, will eventually allow even better identification of the important foci of transmission.

4. Strategic Plan Framework

4.1 Vision

The Vision of the National Malaria Strategic Plan for 2015-20 is: [12]

A malaria-free Vanuatu by 2025-28, contributing to the good health and well-being of the population

The Vision acknowledges the likely longer term time frame necessary to achieve sustainable zero malaria transmission throughout the country, i.e. about 10 years from commencement of the new NMSP.

4.2 Mission and values

4.2.1 Mission statement

The Mission of the NMSP, which clarifies its contribution to the Vision, is:

The Malaria Program aims to progressively control and eliminate malaria in all provinces of Vanuatu. The Program works in close partnership with provincial health services and local communities to ensure that universal access to health promotion, prevention with long-lasting insecticidal bed nets, and quality-assured diagnosis and treatment is maintained. It aims to use indoor residual spraying to accelerate reduction in malaria transmission in selected areas. It seeks to strengthen and maintain excellent surveillance and apply new knowledge as it becomes available in order to achieve malaria elimination and the prevention of reintroduction.

This Mission statement describes the direct contribution of Malaria Strategy to the achievement of the Vision. Activities supported by the Program are always informed by this Mission statement, and the Program is accountable for their implementation.

4.2.2 Values

The guiding values of the Strategic Plan are:

- Country ownership and leadership through the MOH, the VBDCP, provincial health services and their partners
- Free and universal access to malaria services, increasingly integrated with community PHC
- Evidence based, ethical and technically sound interventions
- Efficiency and value for money, for both Government and donors, both in relation to malaria targets and to the overall health system
- Partnership with: other health sector programs (e.g. maternal, neonatal and child health [MNCH] and environmental health); other non-health sector ministries and organisations; academic and research institutions; private sector entities; and civil society organisations
- Increasing community responsibility and leadership for malaria control and elimination (e.g. through community leaders, zonal elimination committees, and community health and surveillance committees)
- Transparency and accountability

[12] The Vision is aligned with the *Vanuatu Health Sector Strategy 2010-2016*. Should the *Health Sector Strategy* be updated during the new NMSP, the vision may need to be updated. This will be assessed at a proposed mid-term review in early 2017.