National Strategic Plan for MALARIA ELIMINATION in Pakistan

2021-2035

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Contents

Acronyms

ABER	Annual Blood Examination Rate
ACD	Active Case Detection
ACT	Artemisinin-based Combination Therapy
AECA	Accredited External Competency Assessment
ANC	Antenatal Care
API	Annual Parasite Incidence
APvI	Annual Incidence for *P. vivax* malaria
APfI	Annual Incidence for *P. falciparum* malaria
APMEN	Asia Pacific Malaria Elimination Network
AJK	Azad Jammu & Kashmir
BCC	Behavioural Change Communication
CFR	Case Fatality Rate
CQ	Chloroquine
CME	Continuing Medical Education
DoMC	Directorate of Malaria Control
DOT	Directly Observed Treatment
DHQs	District Headquarters Hospitals
DHIS2	District Health Information System 2
DRAP	Drug Regulatory Authority of Pakistan
EMRO	WHO Regional Office for the Eastern Mediterranean
FATA	Federally Administered Tribal Areas
FGDs	Focus Group Discussions
GB	Gilgit-Baltistan
GF	Global Fund
GFATM	Global Fund to Fight AIDS, Tuberculosis & Malaria
GPs	General Practitioners
GIS	Geographical Information System
GMP	Global Malaria Programme
G6PD	Glucose-6-Phosphate Dehydrogenase
GTS	Global Technical Strategy
ICT	Islamabad Capital Territory
IDSR	Integrated Disease Surveillance Response
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
KAP	Knowledge, Attitude & Practice
KP	Khyber Pakhtunkhwa
LHWs	Lady Health Workers
LLINs	Long Lasting Insecticidal Nets
MDA	Mass Drug Administration
MNHSRC	Ministry of National Health Services, Regulation and Coordination
MPPR	Malaria Programme Performance Review
M&E	Monitoring and Evaluation
NGOs	Non-Governmental Organizations

NIMRT	National Institute of Malaria Research and Training
NSP-ME	National Strategic Plan for Malaria Elimination
PCD	Passive Case Detection
PCR	Polymerase chain reaction
PDHS	Pakistan Demographic and Health Survey
PSLM	Pakistan Social and Living Standards
PQ	Primaquine
PSPs	Provincial Strategic Plans
QA	Quality Assurance
QC	Quality Control
RDTs	Rapid Diagnostic Tests
SCM	Severe and Complicated Malaria
SPR	Slide Positivity Rate
SP	Sulfadoxine-Pyrimethamine
SOPs	Standard Operating Procedures
TESs	Therapeutic Efficacy Studies
TPR	Test Positivity Rate
TWG	Technical Working Group
UN	United Nations
UM	Uncomplicated Malaria
VCNA	Vector Control Need Assessment
WHO	World Health Organization
WMR	World Malaria Report

Acknowledgements

The *National Strategic Plan for Malaria Elimination (NSP-ME) in Pakistan 2021-2035* has been developed through an extensive consultative process with senior Department of Malaria Control (DoMC) staff at central and provincial levels, WHO and many others concerned under the overall leadership of the DoMC in close collaboration with the WHO Country Office for Pakistan starting from March 2020, culminating in the launching of the NSP-ME by the Ministry of Ministry of National Health Services, Regulation and Coordination (NHSRC) on May……., 2020.

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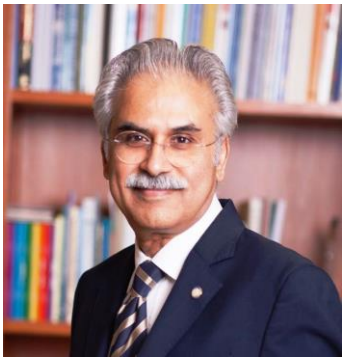
Foreword

THE PRESENTED NATIONAL STRATEGIC PLAN (NSP) FOR MALARIA ELIMINATION IN PAKISTAN (2021-2035) WILL PROVIDE A CLEAR ROADMAP FOR ELIMINATING MALARIA FROM PAKISTAN TILL 2023



Malaria is a challenging disease and its distribution in Pakistan varies largely from place to place, depending upon a variety of factors related to parasites, vectors and human populations under different geographical, ecological and socio-economic conditions. Referring to World Malaria Report (WMR, 2019), 28.9% of Pakistani population lives in areas at high risk for malaria, 69.4% at low and medium risk and the only 1.7% live in areas with no risk of malaria transmission. During 2015-2019, the improved access to and increased use of Rapid Diagnostic Tests (RDTs) have resulted in subsequent rise in the number of confirmed cases of malaria in the country reaching 412,788 in 2019. Major case load is shared by 72 high burden sharing districts/territories mainly located in Balochistan, Khyber Pakhtoonkhwa (KPK) including Tribal districts (Ex-FATA) and Sindh. Punjab, Azad Jammu and Kashmir (AJK), Islamabad Capital Territory (ICT) and Gilgit Baltistan (GB) are the least affected areas and fully qualifying for implementation of elimination strategy.

Reduction of malaria burden in the country is both a national and provincial priority. Federal and provincial governments are strongly committed to combat malaria and to achieve national targets and international obligations (SDGs) as an essential component of health agenda of the country. National Health Vision (2016-2025) of the Government of Pakistan provides a long term vision and strategy for national health policy development as priority area including health sector. Government has accorded a high priority for control of malaria along-with other 6 communicable diseases as embodied in its National Health Policy of 2001.

Over recent years Pakistan has made significant progress towards reducing malaria morbidity and mortality. This brings a sense of fulfillment and pride. To further continue this progress, we decided to develop a long term national strategy for elimination of malaria in phase-wise manner through consensus building with all stakeholders and partners. Continuation of successful public-private partnership (Malaria control Program and the Indus hospital) for malaria elimination can be effectively utilized to achieve malaria elimination goals. No doubt the declared elimination goal is big challenging task, however strong national and provincial commitment along with exemplary partnership with private sector The Indus hospital can make it possible to achieve it.

The National Strategic Plan for Malaria Elimination (NSP-ME) in Pakistan 2021-2035 has been developed through technical support of WHO and Financial support of The Global Fund (TGF). An extensive consultative process with all provinces including AJK, ICT and Gilgit Baltistan and CO-

PR for Malaria The Indus Hospital partners has been carried out under the leadership of the Secretary and the Director General, Ministry of NHSRC starting from March 2020.

The NSP-ME 2020-2035 is aligned the WHO Global Technical Strategy for Malaria (2016-2030), Global Vector Control Response (2017-2030), Eastern Mediterranean Regional Malaria Action Plan (2016-2020), and the current Strategic Plan for malaria control (2015-2020) which clearly emphasize on elimination of malaria from this region. System strengthening, capacity building, partnership building with all national and international partners and enhancing domestic resources are the key approaches of this national document.

The development of NSP-ME in Pakistan 2021-2035 is a momentous achievement of present government which clearly describe our vision and priorities for elimination of malaria. Being Special Assistant to Prime Minister (SAPM) Ministry of NHSRC, it is my privilege to launch this strategic initiative (NSP-ME 2021-2035) in Pakistan with the goal of Malaria *Free Pakistan till 2035*.

Since all provincial malaria programs, Private sector principle recipient of Global Fund grant The Indus Hospital and other partners have been extensive consulted in the development of this strategic manuscript and hence it is truly a national document. I would particularly like to appreciate Muhammad Mukhtar, Director (DoMC) for his expertise and leadership who spear headed this effort. This is not just a strategy, but it is a practical national Plan of Action (PoA) and it brings whole country on one page for elimination of malaria from Pakistan. I hope that together we all also implement with same vigor with which it has been developed.

Dr. Zafar Mirza
State Minister for NHRC/**SAPM**

Plan at a Glance

Vision

Pakistan free from malaria by 2035.

Mission

The DoMC of the Ministry of NHSRC of the Government of Pakistan aims to achieve malaria elimination by ensuring equitable and universal access to effective curative and preventive services to everyone at risk of malaria in close coordination with the efforts of all the communities, national and international non-government organizations, private sector stakeholders, United Nations agencies and financial partners.

Achieving the vision of "Pakistan free from malaria" will contribute significantly to poverty alleviation as malaria is most prevalent in the poorest segment of the population.

Goals

In line with the WHO Global Technical Strategy for Malaria 2016-2030 *(**1**)*, the goals of the National Plan for Malaria Elimination in Pakistan, 2021-2030 are as follows:

- Ultimately interrupt transmission of and eliminating indigenous malaria throughout the entire country by 2035.
- Maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-establishment of local transmission.

General Objectives

The plan has four general objectives:

- Reducing the incidence of malaria to less than 1 case per 1000 population at risk in all Provinces/Federal Territories by 2030.
- Interrupting transmission of and eliminating indigenous *P. falciparum* malaria throughout the entire country by 2030.
- Interrupting transmission of and eliminating indigenous malaria in a phased manner progressively across the country by 2035.
- Preventing the re-establishment of local malaria transmission due to importation in all areas where it has been eliminated before and beyond 2035.

Approaches

Priorities

- Flattening the epidemiological landscape by reducing transmission in high transmission areas.
- Interrupting transmission of and eliminating indigenous *P. falciparum* malaria.
- Additional country-level priorities such as measures targeting certain mobile and migrant populations, cross-border collaboration and other activities identified by local analysis.

This prioritization does not mean that efforts to eliminate malaria in low transmission areas and prevent its re-establishment should be put on hold, only that such efforts must not take precedence over addressing burden reduction.

Programme Phasing

Malaria elimination in Pakistan will be carried out in a phased manner and interim targets have been set up (1) by parasite species with a priority to be given to elimination of *P. falciparum* and (2) by geographical area with different parts of the county being at different programme phases simultaneously.

Phasing is necessary, because premature application of the elimination phase interventions would be prohibitively demanding: the malaria burden must be lowered, before it will be possible and rational to investigate and treat every case.

Milestones and Targets

By the end of 2020:

- Pakistan has developed and endorsed the NSP-ME 2021-2035, and national elimination campaign has been officially launched across the country.

By the end of 2023:

- An estimated reduction in the reported malaria incidence of 10 % at the national level compared with 2019.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2025:

- An estimated reduction in the reported malaria incidence of 30% at the national level compared with 2019.

- Transmission of malaria including *P. falciparum* malaria interrupted and zero incidence of indigenous cases of malaria including *P. falciparum* malaria attained in Provinces/Federal Territories (Punjab, Azad Jammu & Kashmir, Gilgit Baltistan and Islamabad Capital Territory) and these Provinces/Federal Territories moved from Category 2 to Category 3.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2030:

- An estimated reduction in the reported malaria incidence of 70% at the national level compared with 2019.
- *API* reached the elimination threshold in four Provinces/Federal Territories: Sindh, Balochistan, KP & Merged Areas/ex-FATA and these Provinces/Federal Territories moved from Category 1 to Category 2.
- Transmission of *P. falciparum* interrupted, and zero indigenous *P. falciparum* cases attained throughout the entire country.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2035:

- Transmission of malaria interrupted, and zero incidence of indigenous cases attained in all Provinces/Federal Territories throughout the entire country.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

It is worthwhile to note that the progress towards interrupting local transmission and eliminating malaria will be, to a large extent, conditional to how successfully technical/operational challenges are addressed within each particular Province/Federal Territory and District, taking into account universal coverage and good quality of curative/preventive measures covering everyone at risk; setting up adequate information, surveillance and monitoring & evaluation (M&E) systems; strengthening general health services; motivating and sustaining health staff concerned; and providing administrative and management provisions to govern the programme properly.

Key Interventions

The possible choices of malaria interventions (case management, disease prevention, malaria surveillance and prevention/control of malaria outbreaks) and outputs/outcomes expected for each particular Category are based on existing situation and risk factors related to malaria and the stated objectives as well.

In areas under **Category 1**, where malaria is still widespread and the primary objective is to reduce further the malaria burden, the interventions should be focused on the progressive

strengthening of capacities and capabilities of public and private health services and mobilizing community actions to provide early diagnosis and adequate treatment, to promote technically sound and sustainable preventive measures, to prevent, detect early and contain outbreaks and to assess regularly a changing malaria situation.

In areas under **Category 2**, where malaria elimination is recommended, malaria shows a focal distribution of indigenous cases and imported cases may comprise a significant proportion of all cases. In this phase, the country has to consider changing the approach to malaria surveillance to investigate each case to ascertain whether it is locally acquired or imported.

The transition from malaria elimination to prevention of malaria re-establishment is possible only when adequate and effective surveillance of the disease in the country has proved that malaria transmission has been interrupted, and that all reported cases of malaria have an imported nature. In areas under **Category 3**, particular focus should be placed on maintenance of the results achieved by deploying all efforts to detect any possible occurrence of malaria transmission, to notify as soon as possible all suspected cases and apply rapid remedial actions. Prevention of re-establishment of local transmission is a long-term policy that requires continuous investment of funds and personnel.

Strengthening the Enabling Environment

- Capacity building
- Community-based interventions
- Multi-sectoral collaboration and advocacy
- Services for mobile and migrant populations
- Cross-border and regional cooperation
- Health system strengthening
- Focused research
- Malaria in conflict areas and complex environments

Executive Summary

Over recent years Pakistan has made a significant progress in reducing malaria morbidity and mortality. Despite these recent advances, malaria remains a major and rather complicated public health issue in the country. The declared elimination goal is more distant because the rapidity in achieving this goal is influenced by the relatively high burden of malaria, insufficient development of national health systems and technical/operational constraints (see **Annexes 1-5**).

The NSP-ME 2020-2035 has been developed in line with the WHO Global Technical Strategy (GTS) for Malaria 2016-2030 *(**1**)* considering Eastern Mediterranean Regional Malaria Action Plan 2016-2020 *(**2**)* and the current 2015-2020 Strategic Plan for Malaria Control Programme *(**3**)*. In the process of its development the draft plan has been submitted by a WHO malaria consultant to WHO/Pakistan and DoMC at central level on April 12, 2020 and further discussed and refined through consultations with WHO Country Office, DoMC personnel at central and provincial levels and local experts benefiting from their inputs. The document was finally endorsed by DoMC on May ……., 2020.

The ultimate goal of the NSP-ME, 2021-2035 is to interrupt transmission of and eliminate indigenous malaria throughout the entire country by 2035; and maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-establishment of local transmission.

The proposed NSP-ME emphasized that in areas where elimination of malaria does not appear to be feasible at present, massive scaling up of existing disease management and preventive approaches and interventions, aimed at a further reduction in the burden of malaria in the short term, may form a transitional stage on the path to elimination. Wherever malaria elimination has good prospects it should be pursued with vigor towards the defined goal.

The NSP-ME highlights the necessity of a conductive policy environment and support from the highest level of state to ensure effective multi-sectoral engagement. Pakistan needs to address human resources requirements for malaria elimination at all levels, ensure effective national leadership and governance, including stakeholder coordination as well as to expand health curative and preventive services and determine appropriate community-based approaches to provide full access to effective case management and disease prevention for everyone at risk of malaria. In border areas of Pakistan and neighboring countries, malaria becomes a major problem that requires special attention because of the intense population movements within as well as across national borders.

To succeed, the special focus should be given to establishing adequate epidemiological services and information systems, with an operational research component, capable of planning, monitoring and evaluating control and elimination interventions. Once an administrative unit entered the elimination phase or even before, attention should be re-focused to ensuring that

an adequate surveillance system is fully operational and properly functional with absolutely total coverage of this administrative unit. M&E is the central component in the elimination phase, and its main requirement is to indicate exactly which administrative units have reached the elimination target at a given point in time. Indicators on impact and adequacy of surveillance are central to verification about interruption of malaria transmission, its elimination and maintenance of malaria-free status.

A successful malaria elimination campaign requires adequate planning and budgeting and should be conducted with sufficient lead time and the necessary resource mobilization. It is crucial for any country aiming for elimination to ensure that adequate financial support is available from beginning to end. A continuous flow of financial inputs from different governmental sources and partners is critical to the success of the NSP-ME in Pakistan.

NSP-ME will serve as a strategic framework and technical guide for Provinces/Federal Territories in rolling out specific interventions for burden reduction and eliminating malaria. A nation-wide parallel planning exercise is being carried out with participation of all provinces to agree jointly on their provincial strategic plans (PSPs), milestones/targets as well as specific/cross-cutting interventions, training needs and administrative/financial provisions that will be defined in detail for each province. Particular attention will be given to those provinces that are already in the elimination phase, and where it is rational and necessary to initiate surveillance and other elimination activities without any delay.

DoMC that is responsible for overall coordination and guidance of elimination activities will periodically review the programme to ensure that it remains on track, and the level of inputs required to see the desired programme impact is provided and sustained, since there is always some risk that financial provisions of the government and funding agencies could not be sufficient. A mechanism for periodic external reviews of the programme to assess the progress against milestones and targets, identify possible gaps and advise on actions to solve these problems should be built-in.

1. Background

Malaria is still a major public health problem in Pakistan. Referring to World Malaria Report (WMR) 2019 *(**4**)*, 28.9% of Pakistani population lives in areas at high risk for malaria, 69.4% at low and medium risk and the only 1.7% live in areas with no risk of malaria transmission. The actual extent of the malaria burden in Pakistan is still largely unknown. A great proportion of malaria cases are still diagnosed and treated on clinical ground. During 2015-2018, the improved access to and increased use of Rapid Diagnostic Tests (RDTs) have resulted in subsequent rise in the number of confirmed cases of malaria from all the reporting health facilities across the country reaching 374 706 in 2018. Information on deaths due to malaria is very limited, and malaria mortality is not being regularly reported. 102 malaria deaths were reported in 2018, and a total of 495 deaths were estimated by WHO to have occurred in 2018.

At present, *P. vivax* malaria is the most prevalent species accounting for 84% of all confirmed cases, with less than 15% of total cases attributed to *P. falciparum* and 1% cases due to mixed infection in the country. In 2018, *P. vivax* is a predominant species reported from all provinces/regions such as Khyber Pakhtunkhwa, Sindh, Merged Areas and Balochistan. Most of confirmed *P. falciparum* cases were registered in Sindh (49.7%) and Balochistan (35.2%). In Pakistan where malaria transmission is unstable, malaria outbreaks represent a major public health problem.

Malaria is a complex disease and its distribution in Pakistan varies largely from place to place, and it is dependent upon a variety of factors related to parasites, vectors and human populations under different geographical, ecological and socio-economic conditions. Transmission of *P. falciparum*, at the edge of its geographical range, is unstable, and can fluctuate markedly from year to year. In Pakistan, the principal and secondary malaria vectors are respectively *An. culicifacies* and *An. stephensi*. These species are widely distributed in the country and generally found throughout the year.

Over the past five years Pakistan has made some progress towards lowering the disease burden and reducing malaria incidence. It is anticipated that the stated goal of the current National Strategic Plan 2015-2020 to reduce the malaria burden by 75% will be partly achieved by 2020 considering the differences in progressing towards the goal in high-, moderate- and low-risk endemic districts of Pakistan. Over 2016-2018, *API* has decreased in Punjab, Balochistan and, to some extent, in Merged Areas, but Sindh and Khyber Pakhtunkhwa (KP) have reported an increase in the reported incidence of malaria. Some areas of the country (e.g. Punjab Province), where cases particularly *P. falciparum* dropped significantly have become eligible for malaria elimination. Similarly, Azad Jammu & Kashmir (AJK), Gilgit-Baltistan (GB) and Islamabad Capital Territory (ICT) are also the candidates for malaria elimination.

Due to funding support from Global Fund (GF) and other donors, data from 72 high-risk districts funded by GF is robust and demonstrates a substantial improvement in case diagnosis and treatment, malaria surveillance and vector control, particularly among populations at high risk of malaria reflecting a steady reduction in caseload year by year.

The Malaria Programme Performance Review (MPPR) that was conducted in November-December 2019 has created a solid ground for drawing up the next national malaria strategic plan. Under the review the national response to malaria in Pakistan has been evaluated in a comprehensive manner by national and international experts with extensive expertise in different areas of malaria control and elimination. The review evaluated the systems used to deliver interventions and identified existing gaps, and possible solutions to overcome barriers and bottlenecks for malaria control and elimination in Pakistan and a way forward to materialize the vision of malaria free Pakistan by 2035 were proposed.

Following the MPPR's recommendations, the NSP-ME 2021-2035 has been developed to provide strategic guidance and technical support for those involved in planning and implementing malaria interventions at central, provincial and district levels, and monitoring and evaluating the progress towards malaria elimination across the country. NSP-ME will also serve as a strategic framework and technical guide for provinces and districts in rolling out specific interventions for eliminating malaria.

2. The need for malaria elimination in Pakistan

Recent trends in malaria control globally, the visible impact of scaled up interventions in Pakistan and a willingness of the government and international partners to move further from malaria control to elimination combined with momentum of scientific advances (new drugs, diagnostics and vector control options), all converge to impose urgency of action to move towards malaria elimination in Pakistan. The WHO Global Technical Strategy for Malaria 2016-2030 recommended that the elimination of malaria is technically, operationally and financially feasible *(**1**)*.

An increasing political commitment on malaria control and elimination that has been mobilized in Pakistan in recent years, are being presently translated into real actions to move towards malaria elimination *(**3**)*. NSP-ME 2021-2035 will be implemented in a phased approach with elimination of *P. falciparum* attained throughout the entire country by 2030. By 2035 Pakistan will become free from malaria.

The rationale for undertaking a malaria elimination effort in Pakistan is based on the following principles:

- The demonstrated feasibility of malaria elimination in the past.
- The visible progress achieved towards addressing the malaria problem and lowering the disease burden in the recent years.
- Malaria incidence dropped to such levels in some provinces that interruption of indigenous transmission has become a feasible objective in these provinces.
- There is mutual agreement on the uppermost public health importance of *P. falciparum* malaria in terms of threat of disease burden, possible drug resistance and socio-economic losses.
- Elimination of *P. falciparum* malaria appears to be a realistic objective and should be a top programme priority.
- The government and partners reaffirmed their political and financial commitments to achieve a greater impact by eliminating malaria by 2035.
- Solid evidence accumulated over recent years in relation to proven approaches and tools for malaria control and elimination globally, regionally and in Pakistan.
- There is a need to establish an effective mechanism to ensure proper coordination of malaria elimination activities, particularly where movement across international boundaries occurs, between Pakistan and neighboring countries.

3. National Strategic Plan for Malaria Elimination (NSP-ME) in Pakistan 2021-2035

3.1. Vision

Pakistan free from malaria by 2035.

3.2. Mission

The DoMC of the Ministry of NHSRC of the Government of Pakistan aims to achieve malaria elimination by ensuring equitable and universal access to effective curative and preventive services to everyone at risk of malaria in close coordination with the efforts of the all the communities, national and international non-government organizations, private sector stakeholders, United Nations agencies and financial partners.

Achieving the vision of "Pakistan free from malaria" will contribute significantly to poverty alleviation as malaria is most prevalent in the poorest segment of the population including mobile populations and migrants.

3.3. Goals

In line with the WHO Global Technical Strategy for Malaria 2016-2030 *(**1**)*, the goals of the National Plan for Malaria Elimination in Pakistan, 2021-2035 are as follows:

- Ultimately interrupt transmission of and eliminating indigenous malaria throughout the entire country by 2035.
- Maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-establishment of local transmission.

3.4. General Objectives

The plan has four general objectives:

- Reducing the incidence of malaria to less than 1 case per 1000 population at risk in all Provinces/Federal Territories by 2030.
- Interrupting transmission of and eliminating indigenous *P. falciparum* malaria throughout the entire country by 2030.
- Interrupting transmission of and eliminating indigenous malaria in a phased manner progressively across the country by 2035.
- Preventing the re-establishment of local malaria transmission due to importation in all areas where it has been eliminated before and beyond 2035.

The above-listed objectives will be achieved through the implementation of interventions under specific objectives which are presented in Sections 3.7, 3.8 and 3.9.

Objective 1.
Reducing the incidence of malaria to less than 1 case per 1000 population at risk in all Provinces/Federal Territories by 2030.

In areas with *API* above 1 case per 1000 population at risk, massive and rapid scale-up of existing disease management and prevention interventions, aimed at achieving a significant reduction in malaria burden, should form a transitional stage on the path to elimination, reducing the risk of spread of malaria to areas approaching elimination.

Objectives 2 & 3.
Interrupting transmission of and eliminating indigenous *P. falciparum* malaria throughout the entire country by 2030.

Interrupting transmission of and eliminating indigenous malaria in a phased manner progressively across the country by 2035.

Recalling World Health Organization and international partners' commitments on malaria elimination and welcoming the progress made with malaria control in Pakistan, elimination of indigenous malaria throughout the entire country by 2035 should be the ultimate goal of the NSP-ME. The results achieved in some parts of Pakistan, where malaria transmission is limited, risk became extremely low and the incidence of malaria has been brought down to such levels that interruption of transmission becomes a feasible objective, need to be further consolidated with the goal of interrupting the transmission of local malaria across the country.

Emphasizing the uppermost public health importance of *P. falciparum* malaria in terms of threat of disease burden, possible drug resistance and socio-economic losses, there is mutual agreement that the elimination of *P. falciparum* malaria should be a top priority in Pakistan.

Objective 4. Preventing the re-establishment of local malaria transmission due to importation in all areas where it has been eliminated before and beyond 2035.

As areas achieve interruption of indigenous transmission, programmatic focus needs to shift to prevention of re-establishment of local transmission *(**5**)*. The probability of malaria becoming re-established in a malaria-free area varies with the degrees of receptivity and vulnerability of a given area. If either of these factors is zero, the probability of malaria becoming re-established is zero even if the other factor has a high value. When importation of malaria due to the arrival of refugees, migrant workers from an endemic area coincides with an increase in receptivity as a result of halting anti-malaria measures, socio-economic development of an area etc., the re-establishment of malaria transmission could take place. In the absence of appropriate action, the area is likely to become malarious again and the time is determined by the level of receptivity and vulnerability.

3.5. Approaches

3.5.1. Priorities

The proposed priorities should be as follows:

- Flattening the epidemiological landscape by reducing transmission in high transmission areas.
- Interrupting transmission of and eliminating *P. falciparum* malaria.
- Additional country-level priorities such as measures targeting certain mobile populations and migrants, vulnerable populations, cross-border collaboration and other activities identified by local analysis.

The prioritization does not mean that efforts to eliminate malaria in low transmission areas and prevent its re-establishment should be put on hold, only that such efforts must not take precedence over addressing burden reduction. Once the epidemiological landscape has been flattened, and an area has malaria incidence below 1 case per 1000 population at risk per year, then this area should be eligible for elimination phase *(**6**)*. Wherever malaria elimination has good prospects it should be pursued with vigor towards the defined goal.

Focus on high transmission areas

Despite visible progress in dealing with malaria in Pakistan, the goal of eliminating malaria in the country is a more distant possibility because the rapidity in achieving the declared goal is influenced by the relatively high burden of malaria in some provinces, insufficient development of national health systems and technical and operational constraints (resistance to antimalarial drugs, vector behaviors, accessibility of remote/border areas, uncontrolled migration etc.). In areas where elimination of malaria does not appear to be feasible at present, massive scaling up of existing disease management and preventive approaches and tools, aimed at a further reduction in the burden of malaria in a short run, may form a transitional stage on the path to elimination.

Areas of high transmission are likely to be important exporters of parasites. If a high burden area is located near a low burden area, then an early reduction of transmission in the high burden area will make it easier to achieve elimination in both areas.

Elimination of *P. falciparum* malaria

Bearing in mind the uppermost public health importance of *P. falciparum* malaria in terms of threat of disease burden, possible drug resistance and socio-economic losses, there is mutual agreement that the elimination of *P. falciparum* malaria should be a top priority in Pakistan. Even, if there were no resistance problem, this would be justified, like everywhere else, by the greater danger of this form of malaria and the greater ease with which it can be eliminated.

Based on the past experience one can expect that *P. falciparum* disappears from an area before *P. vivax* (3-5 years earlier), and *P. falciparum* elimination is usually sustainable. Current disease diagnostic, management and preventive interventions perhaps better target and have a greater impact on *P. falciparum* than on *P. vivax (**6**)*.

It is worthwhile to note that the planned interventions against *P. falciparum* in Pakistan will have impact on *P. vivax* transmission as well, because in most endemic areas of the country, both parasite species are found together, and are targeted by disease management and preventive strategies simultaneously.

3.5.2. Programme phasing

Phasing is necessary, because premature application of the elimination phase interventions would be prohibitively demanding: the malaria burden must be lowered, before it will be possible and rational to investigate and treat every case. Programme phasing on the path to malaria elimination can be summarized as follows:

- **Burden reduction phase** is aimed at bringing the malaria incidence down to less than 1 case per 1000 population at risk per year when elimination could be considered. The revision of the surveillance system and development of the elimination programme should be completed by the end of this phase before entering into elimination.
- **Elimination phase**, where surveillance becomes the core intervention and starts in an area where data from all health facilities/services show a malaria incidence of less than 1 case per 1000 population at risk per year, which is confirmed by very high and reliable case notification, mandatory reporting of each case, full participation of the public/private/community-based sectors assuming well-developed health services and a strong conviction that nothing is being missed.

Malaria elimination in Pakistan will be carried out in a phased manner and interim targets have been set up (1) by parasite species with a priority to be given to elimination of *P. falciparum* and (2) by geographical area with different parts of the county being at different programme phases simultaneously.

Phasing should be applied to large areas, where certain parts of a country may belong to the different phases. For relatively large and heterogeneous country like Pakistan, the emphasis will be given to assessing major administrative areas, typically starting from the 1st Province/Federal Territory administrative level. In Pakistan, some areas have already moved into or are about to enter the elimination phase and become eligible for elimination. If their health systems are strong enough, it will be rational to initiate surveillance and other elimination activities focusing on setting up adequate surveillance, databases and quality assurance systems, preparing and testing relevant SOPs and training different categories of health staff.

Province/Federal Territory as the unit of planning and District as the unit of implementation

Measuring *API* in the human population is considered usually a more reliable indicator of local transmission than ecological and other risk factors that pertain only to the mosquito vector(s). Based on *API* that has been used as a primary criterion for selection and other secondary criteria such as political and development priorities of the government, the degree of development of health systems and the extent of the malaria problem each Province/Federal Territory, the entire country can be sub-divided into three malaria **Categories/Strata**, namely:

- **Category 1** with Provinces/Federal Territories/Districts that are still in the burden reduction phase where *API* of 1 or above case per 1000 population at risk and elimination of malaria does not appear to be feasible at present.
- **Category 2** with Provinces/Federal Territories/Districts where a malaria incidence of less than 1 case per 1000 population at risk per year, where malaria elimination is recommended.
- **Category 3** with Provinces/Federal Territories/Districts that presently are free from malaria, where prevention of malaria re-establishment of transmission is recommended.

Some Provinces/Federal Territories are already in the elimination phase while others are still in the burden reduction phase. Provinces/Federal Territories that are presently in the elimination phase may have some districts that are still in the burden reduction phase with *API* of 1 case per 1000 population at risk or above. At the same time there are some Provinces/Federal Territories which are still in the burden reduction phase but have some Districts that are already in the elimination phase. Each Province/Federal Territory will be advised to classify their districts based on categorization (Category 1 *versus* Category 2 *versus* Category 3) to measure progress towards malaria elimination on annual basis.

3.6 Milestones and Targets

The following timetable with broad milestones and targets is proposed for implementation of the NSP-ME in Pakistan (See below **Table 1**):

By the end of 2020:

- Pakistan has developed and endorsed the NSP-ME 2021-2035, and national elimination campaign has been officially launched across the country.

By the end of 2023:

- An estimated reduction in the reported malaria incidence of 10 % at the national level compared with 2019.
- Transmission of malaria including *P. falciparum* malaria interrupted and zero incidence of indigenous cases of malaria including *P. falciparum* malaria attained in Provinces/Federal

Territories (Punjab, Azad Jammu & Kashmir, Gilgit Baltistan and Islamabad Capital Territory) and these Provinces/Federal Territories moved from Category 2 to Category 3.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2025:

- An estimated reduction in the reported malaria incidence of 30% at the national level compared with 2019.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2030:

- An estimated reduction in the reported malaria incidence of 70% at the national level compared with 2019.
- *API* reached the elimination threshold in four Provinces/Federal Territories Sindh, Balochistan, KP & Merged Areas/ex-FATA and these Provinces/Federal Territories moved from Category 1 to Category 2.
- Transmission of *P. falciparum* interrupted, and zero indigenous *P. falciparum* cases attained throughout the entire country.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2035:

- Transmission of malaria interrupted, and zero incidence of indigenous cases attained in all Provinces/Federal Territories throughout the entire country.
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

It is worthwhile to note that the progress towards interrupting local transmission and eliminating malaria will be, to a large extent, conditional to how successfully technical/operational challenges are addressed within each particular Province/Federal Territory and District, taking into account reaching universal coverage and good quality of curative/preventive measures covering everyone at risk; setting up adequate information, surveillance and M&E systems; strengthening general health services; motivating and sustaining health staff concerned; and providing administrative and management provisions to govern the programme properly.

Table 1. Actual/Projected Phase Status on the path to eliminate malaria by Province/Federal Territory, 2019-2035

Year Provinces	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Punjab												
Balochistan												

Sindh												
KP												
Merged Areas												
AKJ												
GB												
ICT												

Year **Provinces**	2031	2032	2033	2034	2035
Punjab					
Balochistan					
Sindh					
KP					
Merged Areas					
AKJ					
GB					
ICT					

Burden Reduction Phase (**Category 1**)
Elimination Phase (**Category 2**)
Prevention of Re-establishment Phase (**Category 3**)

3.7 Key Interventions

The key interventions including case management, disease prevention, malaria surveillance and prevention/control of malaria epidemics along with cross-cutting interventions (see Section 3.9) listed below are aimed at guiding country-level actions to reduce the disease burden and finally eliminate malaria in the Pakistan's context.

Based on the latest available malaria data, all districts in Pakistan were sub-divided and classified by DoMC into three **Strata** (see **Annex 6**):

- **Stratum I** comprised high-risk malaria districts with *API* above 5.
- **Stratum II** comprised moderate-risk malaria districts with *API* between 1 and 5
- **Stratum III** comprised low-risk malaria districts with *API* below 1.

Districts under **Strata I & II** fall under **Category 1** (Burden Reduction Phase) and those within the **Stratum III** correspond to **Category 2** (Elimination Phase) and **Category 3** (Prevention of Re-establishment Phase). The above-mentioned operational stratification is a practical tool aimed at the planning and deployment of tailored interventions to meet the differences in risk of malaria transmission across the country, in order to achieve the maximum impact.

3.7.1. Case management

Malaria case management, consisting of early diagnosis and prompt effective treatment, remains a vital component of malaria control and elimination strategies *(**7**)*.

Recommended policies and practices

Table 2 below lists the main differences between case management policies and practices in areas under Categories 1 (Burden Reduction Phase), 2 (Elimination Phase) & 3 (Prevention of Re-Establishment Phase).

Table 2. Case management policies and practices recommended for different Categories

Categories	**Burden Reduction Phase (Category 1)**	**Elimination Phase (Category 2)**	**Prevention of Re-Establishment Phase (Category 3)**
Purpose	Early diagnosis and effective treatment of all symptomatic infections to reduce morbidity and mortality and transmission as well	Early detection and management of all infections including asymptomatic, to prevent onward transmission	Early diagnosis and treatment of imported malaria, and prevention of introduced and indigenous cases
Diagnosis policy	All suspected cases should be examined by RDT or microscopy	All suspected cases must be examined by RDT or microscopy All positive cases confirmed by RDT should be re-confirmed by microscopy Mandatory reporting and notification on each confirmed case within 24 hours	Adequate case notification system is established and fully functional
Treatment policy	*Pf*: ACT as defined by national treatment policy and as long as efficacy is confirmed by TES; single dose of PQ is recommended in areas that are about to move to elimination *Pv*: CQ + PQ as defined by national treatment policy and as long as efficacy is confirmed by TES, otherwise ACT Mixed infections: as recommended by current treatment policy	*Pf*: ACT as defined by national treatment policy and a single dose PQ is mandatory *Pv*: CQ + PQ as defined by national treatment policy, and administration of PQ is preferably with testing for G6PD deficiency	Cases should be treated in line with national treatment policy DOT approach can be considered for treatment of imported cases Awareness on drug resistance patters within and outside the country, to formulate preventive guidelines for evidence-based pre-travel health advice

Service delivery	By all public health services, private medical practitioners, not-for-profit sectors (NGOs), informal private sector and community-based services	Largely, universal coverage has been achieved in this stage Public health sector must play a major role and supervise other sectors involved Over-the counter-sale of antimalarial drugs prohibited Service provision by other sectors, e.g. military, police, corporate sector etc. should follow national norms and is monitored	Public and private health services involved
Quality assurance of diagnostics, antimalarial medicine and case management services	Yes	Yes	-
Monitoring of antimalarial therapeutic efficacy	Monitoring of suspected resistance and therapeutic efficacy studies (TES)	Monitoring of suspected resistance and therapeutic efficacy studies (TES)	-

Universal coverage with case management

In Pakistan the public health sector is still under-resourced, facing human resource and supply chain challenges, and its service network is not sufficiently dense in some areas. The public sector invests in provision of diagnostics and medicines and communication, training and monitoring. The informal private sector including drug vendors is still a major source of irrational treatment and substandard medicines. Malaria staff along with provincial/district health departments should identify private health providers/facilities in violation of this statute and, where possible, should assist qualified providers become licensed to provide diagnosis and treatment according to national guidelines. The country needs to develop an appropriate strategy for involvement and supervision of the different kinds of private providers.

Private sector involvement in the case management as per the national treatment guidelines will be scaled up. Innovative approaches of sharing updated medical information, e.g. via continuing medical education (CME) and credit hours for malaria treatment, reminders via mobile applications and incentives for data reporting will be promoted. Appropriate clinical support tools (job aids, treatment algorithm etc.) and supervision/monitoring systems (SOPs, checklist etc.) for the private health sector need to be developed and rolled-out. Community-based services are usually the best solution for remote areas.

The policy of testing all clinically suspected malaria cases attended/admitted in the public and private health facilities with RDT or microscopy before anti-malarial treatment is administered will be enforced in all districts. RDTs will be rapidly scaled up to all BHUs and private clinics/General Practitioners (GPs) in collaboration with partners concerned across the country. Implementation of high standard of malaria case management will be supervised by District Health Officers (DHOs) and their malaria staff. Malaria diagnostic and treatment services should be free of cost in all public sector health facilities. To ensure quality diagnosis and effective treatment in the reach of all at risk, the addition of malaria diagnostic and curative services to community-based management of pneumonia and diarrhea of children by trained LHWs will be considered. In burden-reduction areas, the annual blood examination rate (ABER) for populations at risk should be kept at level of 10% or higher.

In the elimination phase, the roles and responsibilities for each channel (public, private and community-based health sectors) will be defined, considering that public health sector must play a major role and supervise all other sectors involved, to ensure optimal case management and surveillance with a total coverage of all active foci. The principle of total coverage of all active foci will be applied to case management. Blood samples will be taken for parasitological examination by microscopy or Rapid Diagnostic Tests (RDTs) from all febrile patients including those with history of fever in the past weeks and clinically suspected asymptomatic infections by passive and active case detection (PCD/ACD). Active screening for malaria cases will be actively advocated for focus investigation. ACD will be particularly enhanced in active foci of malaria that show signs of refractoriness. The norms may be less rigid in foci that have demonstrated a good response to the applied measures. Along with PCD every attempt will be taken to screen mobile and migrant populations (MMPs) and ethnic groups by ACD in remote and border areas. It is well known that malaria tends to take refuge in such places and populations, as they are often neglected and not adequately covered by the health services. A good rapport has to be established with the military and police medical services, and the same applies to jails and other institutions across the country.

In settings eligible for elimination, it is recommended that RDTs and blood slides should be taken simultaneously from suspected cases. Blood slides will be promptly dispatched to a nearest laboratory for rapid examination. It is recommended that all the positive cases confirmed by RDTs should be cross-checked by quality-assured microscopy available at district and higher levels. RDTs are usually used in situations where microscopy is not available, particularly at the peripheral level in high-risk MMPs without access to adequate laboratory facilities and in the private sector as well. National standard operating procedures (SOPs) on PCD and ACD and the role of RDTs, microscopy and PCR-based diagnostics at different levels in the control and elimination phases will be revised/developed. Regular RDT-based malaria screening for pregnant women will be introduced through ANC services in high-transmission areas. In areas eligible for elimination, ABER for populations at risk in active and non-active residual foci should be maintained at level of at least 5%.

Treatment of malaria should be based on the national treatment policy *(**8**)* and WHO guidelines *(**7**)*:

- A safe low dose of primaquine recommended by WHO is mandatory and should be ensured in the treatment of all confirmed cases of *P. falciparum* to eliminate gametocytes and reduce mosquito-borne transmission.
- The radical treatment of uncomplicated *P. vivax* malaria includes a combination of chloroquine (CQ) for 3 days and PQ for 14 days to ensure elimination of hypnozoites, which cause relapses. Radical treatment for *vivax* malaria with primaquine for 14 days should be actively promoted with close follow-up and supported by adequate supply of primaquine to all health facilities responsible for its diagnosis and treatment. A mechanism for promoting adherence to the 14-day primaquine treatment regimen and monitoring safety will be established based on the findings of the G6PD deficiency prevalence in various ethnic groups. Health personnel and community-based health staff will be actively involved in diagnosis and supervision of treatment of *P. vivax* cases in the elimination phase. This is important since some patients do not feel that they need to take PQ any longer after having apparently been cured and PQ may harm them - by causing hemolysis in G6PD deficient patients. Whereas such haemolysis is self-limiting if the drug has been stopped, it may be dangerous if PQ is continued. The screening for G6PD deficiency (even if the level of G6PD deficiency is low) is recommended prior to PQ administration, and it can be rolled out gradually in the country. The directly observed/supervised treatment (DOT) of *P. vivax* cases with PQ should be always considered, particularly in the elimination phase, when the number of cases becomes low.
- Following the ban on oral artemisinin monotherapies, similar measures should be ensured to remove marketing authorization for SP, still in use in the private sector to treat fever suspected as malaria. The production and use of injectable artesunate and artemether will be limited to hospitals designated for the management of severe and complicated malaria.

Hospitalization of malaria patients should be mandatory in relation to severe and complicated (SCM) cases. Uncomplicated malaria cases usually do not need to be hospitalized. SCM cases will be properly managed at the peripheral public health centres and be referred without delay to the hospital facility. All health facilities responsible for SCM management will be supported by adequate parasitological diagnosis and supply of medicines and items required for SCM management on 24/7 basis. Adequate surveillance mechanism on SCM and associated deaths from all hospitals will be set up. Sentinel sites for surveillance of SCM management can be set up in some hospitals

After thorough need assessment at the central, provincial and district levels, a comprehensive training plan (refresher, pre-service and in-service training) for strengthening case management capacity will be developed, including teaching methods for effective systems for dissemination of knowledge with colleagues. All service providers authorized to diagnose malaria will be properly trained. National and provincial malaria programmes will standardize training curriculum for CME with some credit hours and ensure consistent knowledge and skills related

to malaria diagnosis among the entire healthcare workforce concerned. The programme staff on a regular basis will carry out regular support and supervision visits to monitor the quality of laboratory services at all public facilities. Training and re-training of all laboratory technicians will be continued, and all laboratories will participate in quality assurance and control procedures. Cascade laboratory training, supervision and monitoring will be strengthened. Deployment of laboratory technicians in all relevant vacant positions is desperately needed. The programme staff will target all service providers from public and private and community-based health sectors who are involved in malaria treatment for training on case management, which can be combined with training on diagnosis and surveillance. Ad hoc training will be provided if there are changes to national treatment guidelines. The programme staff on a regular basis will carry out regular support and supervision visits to monitor the quality of treatment services at all public, private and community-based facilities and services. In the elimination phase, all private sector care providers certified for malaria diagnosis must refer all confirmed malaria cases to public health providers and facilities for treatment. Among other service providers (military, police etc.), stakeholders will be designated to carry out the monitoring visits.

Quality assurance and control

Quality assurance of diagnostics, treatment and patient care is important in the burden reduction and elimination phases *(**9,10**)*. The only difference is that quality assurance (QA) of microscopy has a higher priority in the elimination phase. For case management, it is critical to ensure quality of both microscopy and RDTs as well as the quality of available and to be supplied malaria commodities through adequate registration, good procurement practices and regular quality monitoring at all levels. The ban on import, manufacture, export, registration, distribution and sale of artemisinin monotherapy will be reinforced through communication with importers, manufacturers, exporters, distributors, pharmacies and drug sellers through DRAP. National guidelines on QA and quality control (QC) *(**11**)* along with SOPs for laboratory diagnosis of malaria will be developed/updated and disseminated to all service providers. Health staff at central, provincial and district laboratories will be trained on QA/QC. For QC, performance of work of laboratory technicians will be accessed by reference laboratories usually at provincial and central levels. In the elimination phase, all positive blood slides and at least 10% randomly selected negative ones will be cross-checked by reference laboratories. A slide bank kept preferably at the National Reference Laboratory will be used to support QA/QC and training on malaria diagnosis. Reference laboratories at central and provincial levels will participate in Accredited External Competency Assessment (AECA), supported by WHO. Supervision is the key to QA of patient care and should be applied at all levels with clear protocols and monitoring systems. Parasitological diagnosis and treatment of malaria must be restricted only to those providers and facilities that participate in the national malaria QA programme. Provincial and district reference laboratories for QA/QC of microscopy and RDT, SOPs for microscopy and RDTs will be strengthened.

Monitoring of resistance to antimalarials

Monitoring of antimalarial therapeutic efficacy and carrying out relevant studies (TES) at sentinel sites throughout the country will be continued in collaboration with WHO to keep relevant maps updated and revise national treatment policy accordingly.

3.7.2. Disease prevention

Long-lasting insecticide nets (LLINs) have a potential for reducing transmission, where their universal coverage, efficacy and health impact have ascertained or is anticipated. The protective effect of LLINs could be influenced by behavioral characteristics of the vector(s) involved, i.e. their feeding habits and preferences for feeding on humans or animals as well as human sleeping patterns and variations in the net use *(**12**)*. Indoor Residual Spraying (IRS), which does operate both through repelling mosquitoes from entering houses and by killing female mosquitoes who are resting inside houses after having taken a blood meal can be a right choice for areas where nets are not accepted and/or highly affected by malaria (especially *P. falciparum*) and/or epidemic-prone situations; when a high percentage of the structures in an operational area have adequate spray-able surfaces and can be well sprayed; local malaria vectors are endophilic and susceptible to the insecticide in the use, and good public acceptance *(**13**)*.

Recommended policies and practices

Table 3 below lists the main differences between disease preventive policies and practices in areas under Categories 1 (Burden Reduction Phase), 2 (Elimination Phase) & 3 (Prevention of Re-Establishment Phase).

Table 3. Disease preventive policies and practices recommended for different Categories

Categories	**Burden Reduction Phase (Category 1)**	**Elimination Phase (Category 2)**	**Prevention of Re-Establishment Phase (Category 3)**
Purpose	To reduce transmission intensity	To reduce onward transmission from existing cases	To reduce onward transmission from imported cases
Stratification of malaria situation	Definition of major eco-epidemiological types with selection of appropriate vector control options for different malaria strata based on local epidemiology	Foci-based stratification with categorization of different foci of malaria	Stratification based on levels of receptivity and vulnerability
Vector control policy	Transmission reduction through universal population coverage and usage of LLINs, IRS and personal protective measures Environmental management and larval control wherever feasible Sustainable and cost-effective vector control based on IVM is	Geographical reconnaissance Vector control, on a strict total coverage of all active foci of malaria, with a view to interrupting transmission as soon as	In areas of high vulnerability and receptivity, it may be necessary to reduce receptivity using appropriate vector control measures

	recommended	possible all over the target area	
Entomological surveillance	Yes	Yes	As a part of vigilance, particularly in areas with high receptivity and vulnerability
Monitoring and management of insecticide resistance	Yes	Yes	-
Epidemic preparedness and response	To be established in epidemic-prone areas with focus on populations at risk	The system must be fully functional throughout the areas eligible for elimination	As a part of a malaria alert and response system, particularly in areas with high receptivity and vulnerability
Research, technology, monitoring and evaluation	To introduce a GIS-based database on malaria vectors To consider operational research to guide vector control by consideration of technical and operational feasibility, effectiveness and sustainability	A central repository of information related to entomological monitoring and applied vector control interventions established and fully functional	-

It is logical to assume that a combination of different vector control options may compensate for deficiencies of each individual method. The integrated vector control approach suiting country's conditions, responding to local needs and being cost-effective should be actively promoted to bring malaria transmission down as soon as possible. The application of vector control measures and their combinations should be always guided by consideration of their technical feasibility, operational applicability, cost-effectiveness and sustainability. Quality control and assurance procedures for vector control interventions (LLINs & IRS) are required to be implemented *(**14**)*.

LLINs

Achieving and maintaining universal coverage with LLINs to ensure that each household has sufficient nets (the target coverage rate for large sized LLINs is 1.8 people per net in line with WHO standards) and every inhabitant at risk sleeps under a LLIN every night is critical to reduce malaria transmission, particularly in high-risk areas. The national LLINs distribution policy is aimed at universal coverage for the entire population at risk of malaria in high-risk rural districts of the **Stratum I** (*API* above 5) and **Stratum II** (*API* between 1 and 5) and included 'mass' and 'continuous' distribution for pregnant women. But so far this is being implemented only in selected GF supported districts (11) of Balochistan, Sindh, Khyber Pakhtunkhwa and Tribal Districts and there is no replacement policy of LLINs. The priority will be given to achieve and maintain universal coverage with LLINs through a combination of 'mass' and 'continuous' distributions via antenatal care (ANC) clinics with involvement of Lady Health Workers in all districts of the **Stratum I** focusing on replacement campaigns where LLINs distribution was done in 2018 onwards and then to the remaining districts of this **Stratum**. LLINs will be distributed further at no cost to reach gradually universal coverage of all rural populations at high risk in

Strata I and **II**, and distribution will be based on outcomes of stratification of transmission intensity. By doing so, the programme will increasingly focus on maximizing cost-effectiveness and sustainability.

Distribution of LLINs will be coupled with locally appropriate and gender sensitive Information, Education & Communication (IEC)/Behavior, Change & Communication (BCC) to ensure community participation and correct LLIN usage. Distribution campaigns, particularly in areas reporting low LLINs ownership will be carried out based on their actual utilization and needs and led by trained health staff and community health workers at district level. Continuous distribution of LLINs will be provided through the community-based network in order to address any LLIN attrition in-between mass distributions. Additional LLINs will be given to pregnant women in communities targeted for mass LLIN distribution through ANC services maximizing LLIN coverage for infant. Military/police service personnel based in or operating in malaria risk areas will be protected by distributing LLINS. In the event of disaster and outbreak situations, LLINs will be provided to anyone who has not already been covered. LLINs ownership and utilization will be permanently monitored and evaluated following distribution campaigns.

IRS

Over the course of the 2021-2023 years, IRS will be continued only in epidemic-prone areas across the **Strata I & II** to prevent and respond to malaria outbreaks. It is expected that by 2023-2024 depending upon the availability of financial domestic resources and the provincial capacity to conduct a large-scale campaign, IRS will be expanded to all districts of the **Strata I & II** to reduce further the intensity of and finally interrupt indigenous transmission of malaria throughout the country by 2035.

In accordance with the national policy the choice of insecticide will consider safety, efficacy, cost, availability and susceptibility of vectors. To be effective IRS requires careful planning, well-organized operations with skilled technical staff, strong supervision and community mobilization to achieve the high level of IRS coverage (more than 80%) to maximize impact of this operation. The well-defined SOP will be developed for IRS planning, implementation, and monitoring. Pyrethroids will not be used for IRS in areas where LLINs are being deployed and 3rd generation insecticide will be used for insecticide resistance management.

In areas eligible for malaria elimination based on a detailed assessment of the local epidemiological situation, IRS along with other preventive measures will be recommended on a strict coverage of all active foci of malaria, with a view to interrupting indigenous transmission as soon as possible all over the target area, where case and foci investigations are in place, and entomological evidence and other factors indicate that interruption of transmission can be expected.

In addition to IRS and other measures, mass drug administration (MDA), which consists of administering a full therapeutic course of antimalarial medicine (irrespective of the presence of

symptoms or infection) to a defined population living in a defined geographical area (except for those for whom the medicine is contraindicated) at approximately the same time and often repeated at intervals (***15***) could be considered in areas/situations eligible for elimination of *P. falciparum* malaria, when (1) persistent active foci of malaria continue to exist in areas where its transmission has been interrupted elsewhere, or (2) a small-scale outbreak is reported in a malaria-free area or (3) IRS and/or other vector control measures have reduced substantially intensity of transmission but cannot fully interrupt it. There are, however, numerous difficulties connected with the use of focal MDA. It is therefore not a procedure that should be adopted without very careful consideration.

Larval control and environmental management

Larval control is realistic only in restricted areas, where a high proportion of breeding sites are well defined, accessible and of a manageable size. Larval source management can be recommended as a supplementary intervention *(**16**)* in areas where it technically feasible and operationally applicable, and if it involves regular treatment of all breeding sites and careful inspection at frequent intervals.

Environmental management, which deserves to be used more often by communities for collective protection from malaria vectors can be classified into (1) environmental modification that includes drainage, filling, land leveling etc.; (2) environmental manipulation that includes water salinity changes, stream flushing, regulation of the water level in reservoirs, vegetation removal, shading and exposure to sunlight etc., and (3) modification/manipulation of human habitation/behavior that includes the position of settlements away from vector sources etc. High costs and the length of time required for completion are the main disadvantages of environmental management operations; however, small-scale operations are feasible and can be applied in combination with other vector control options. In active foci where entomological surveillance is carried out, the impact of potential environmental management interventions should be assessed and policy guidance for deployment of these techniques should be developed. A strong multi- and inter-sectoral collaboration is required for deployment of environmental management at local level. Malaria programme and health staff will work with local communities to engage them in environmental management activities.

Entomological surveillance

National and provincial malaria programmes will build capacity necessary for entomological surveillance, and SOPs related to entomological monitoring and surveillance will be developed. Entomological surveillance should include identification of vector species, monitoring vector behaviors and bionomics, mapping species distribution and density, identification of host preference, seasonal fluctuation of species, and assessment of an area’s receptivity. Entomological surveillance will be also carried out in epidemic-prone areas based on set outbreak thresholds. A routine vector survey will be an important part of the malaria focus investigation to determine transmission patterns in areas eligible for malaria elimination. An assessment of each outbreak situation will include an entomological survey.

Insecticide resistance

Insecticide resistance is one of the greatest threats to any concerted or prolonged attempt at malaria transmission control, whether the goal is intensified control or elimination. Particular attention will be paid to monitoring and management of insecticide resistance *(**17**)*. All existing and possible breeding sites of *Anopheles* mosquitoes will be properly mapped in relation to active foci of malaria, particularly in areas eligible for elimination. To maximize the impact of vector control interventions, currently used group of insecticides (pyrethroids) will be rotated with the available next generation of insecticide for IRS. Also, standard LLINs will be rotated/replaced with new generation nets. Routine insecticide resistance monitoring will be conducted each year.

Integrated Vector Management

A VCNA will be conducted following WHO guidelines at provincial and district levels. Vector maps need to be updated with information on vector species, distribution, breeding sites, resting and biting habits and insecticide susceptibility. National Integrated Vector Management (IVM) plan and insecticide resistance management plan has been developed/updated and will be implemented based on the VCNA findings *(**18**)*. An IVM steering committee formed of national and provincial high-level health officials and other sectors will be in place to oversee and for decision making for vector control activities.

Capacity building

National program in consultation with provinces will develop a comprehensive plan of action for capacity building of malaria staff involved in vector surveillance and control at provincial and district levels. Various training and refresher training courses for the entomology and integrated vector control staff will be conducted. Malaria entomological and health staff will be trained on IRS to support its application and monitor quality of IRS operations. Capacity building on mass campaign for distribution of LLINs will also be required.

Operational research

Priority operational research in vector control will be identified, and relevant studies including Knowledge, Attitude & Practice (KAP) studies and Focus Group Discussions (FGDs) on barriers for LLIN ownership/utilization as well as KAP studies on malaria prevention measures will be conducted to generate enough scientific evidence on vector control.

Procurement policy

The current policy for procuring only WHO listed insecticides from recommended source will be strictly followed. The drafted SOPs for public health pesticides (PHPs) will be finalized and implemented immediately through consensus of all stakeholders and partners. This system should be part of the vector control unit. All vector control products must be registered in the country as part of quality control mechanism.

3.7.3. Malaria surveillance and M&E

The design of the malaria surveillance system depends on the level of malaria transmission, the implementing strategy and its goal and the resources available to conduct surveillance *(**19**)*. In the burden reduction phase, where there are still many cases of malaria and is not possible to investigate and react to each confirmed case individually - the programme goal is to reduce the disease burden. Malaria surveillance is based on aggregate numbers, and indicators such as mortality/morbidity rates, incidence of severe/complicated cases, annual parasite incidence (*API*) etc. are calculated to measure the impact of programme interventions. In the elimination phase, as a transmission is progressively reduced, it becomes increasingly possible and necessary to track and respond to each individual case. In the phase of prevention of re-establishment of local transmission, a priority should be given to the immediate notification of imported cases and the occurrence of possible introduced as a result of onward transmission from imported cases and indigenous cases *(**5**)*.

Recommended policies and practices

Table 4 below lists the main differences between disease preventive policies and practices in areas under Categories 1 (Burden Reduction Phase), 2 (Elimination Phase) & 3 (Prevention of Re-Establishment Phase).

Table 4. Malaria surveillance policies and practices recommended for different Categories

Categories	**Burden Reduction Phase (Category 1)**	**Elimination Phase (Category 2)**	**Prevention of Re-Establishment Phase (Category 3)**
Purpose	To allow targeting interventions, detecting potential outbreaks and tracking progress	To discover any evidence of the continuation or resumption transmission, detect local and imported cases as early as possible, investigate and classify each case and focus of malaria, provide a rapid and adequate response and monitor progress towards malaria elimination	To prevent introduced cases and indigenous cases secondary to introduced ones
Epidemiological evaluation	Reduction of the malaria burden in terms of prevalence, incidence and mortality	Proven disappearance of locally acquired cases	Reduction onward transmission from imported cases Prevention of introduced and indigenous cases secondary to introduced ones
Data reporting, recording and indicators used	Private sector is requested to report cases Aggregate numbers of out-and in-patients,	Malaria must be a notifiable disease Private sector, military medical services and others must report every case by law	Malaria is a notifiable disease must report every case by law

	uncomplicated malaria, severe malaria and deaths due to malaria Indicators (API, SPR, TPR, ABER) are reported	Reported number of acquired locally and imported cases Reported number of active, non-active residual and potential foci of malaria	
Detection methods	PCD health facility-based and through community-based services as well as other health volunteers at worksites ACD by health staff and mobile teams is recommended for remote villages, border areas and development projects Blood screening and treatment of positive cases at crossing border and transit points, and new settlements as well Confirmatory TES	The same as in the Burden Reduction Phase with special attention to ACD ACD to fill gaps in PCD to detect all infections including asymptomatic in areas eligible for elimination and populations at risk where the number of cases became low All cases and foci of malaria in this phase must be fully investigated Confirmatory TES	In principle, PCD However, under exceptional circumstances, especially where importation of malaria is intense and when introduced and indigenous cases reported, ACD is recommended Screening of returnees/migrants from endemic areas can be recommended
Case and foci identification, investigation and classification	No	Yes	Yes
Technology, monitoring and evaluation	Consolidating the use of new tools such as web-based data transmission, volunteer reporting via SMS and introducing case-based malaria surveillance	Adequate case- and foci-based malaria surveillance fully functional across the entire territory of a country National/provincial computerized malaria elimination database/registers established National malaria elimination monitoring committee set up	Adequate case-based malaria surveillance fully functional across the entire country
Integration with other health programmes	Often as an integrated public health programme usually with a centralized management component	Usually as a special programme with a highly specific and time-limited objective	Usually as an integrated public health programme

Surveillance system and mechanisms

The malaria surveillance system has improved in recent years, particularly in the GF supported districts, however there is still no adequate system to capture the full burden of malaria in the

country over space and time. The system is missing cases from a large proportion of the private sector as well as other key facilities such as tertiary hospitals which may diagnose and treat many cases. Routine malaria surveillance will be strengthened across the country to ensure complete and timely reporting from all health sectors including the public facilities and private sector, health volunteers, military/police health services, and other parties concerned.

In order to improve malaria surveillance system in Pakistan, enhanced and adequate malaria surveillance will be supported throughout the country and not just for 72 districts supported by the GF to ensure a standardized approach to surveillance in terms of variables collected, indicators monitored and monitoring and evaluation processes for good nationwide data quality. A universal and adequate surveillance system using DHIS2 on malaria will be set up in all provinces and districts to ensure uniformity of data collection and analysis across the country. A comprehensive national malaria database needs to be developed to collate malaria information from different sources and systems, in order to reduce discrepancies in data received from different systems.

The Geographical Information System (GIS)-based mapping will be introduced to trace evolution of the malaria problem and identify most affected areas, where targeted and site-specific malaria control and elimination measures to be applied. District-wise malaria profiling, stratification and maps based on *API* and *TPR* will be annually updated to guide the planning process moving towards malaria elimination in a phased manner.

Surveillance approaches in the elimination phase

The elimination phase is defined by the application of malaria surveillance according to specific and rigorous standards *(**19,20**)*. Malaria surveillance in the elimination phase is aimed at (1) immediate detection of and mandatory notification on all malaria infections, whether symptomatic or not within 24 hours, and ensure that they are early and properly treated in order to prevent generating secondary cases; and (2) investigation of each malaria case to determine whether it was locally acquired or imported, ideally within 24 hours.

Once a local case of malaria has been detected and notified, a focus investigation will be carried out by malaria staff within 72 hours (3 days) to describe the locality where malaria occurred for determining the underlying cases of ongoing transmission, and rapid measures should be applied in a given focus as early as possible to interrupt transmission and prevent its further spread.

In the elimination phase, each malaria symptomatic and asymptomatic infection and focus, where this case reported has to be targeted for action. Surveillance activities will be enhanced so that every focus (village, or sub-village or working site) where there are indigenous cases of malaria (*P. vivax* presents surveillance difficulties because of relapses related to hypnozoites that cannot be detected) is targeted to intensified surveillance. The enhanced surveillance can distinguish between locally transmitted and imported malaria in locations with highly mobile populations to guide the choice of interventions.

Capacity building

The transition from the burden reduction to elimination will require revision of guidelines, training and supervision related to surveillance. In the elimination phase, the national operational manual along with respective SOPs on malaria surveillance will be developed including detailed description of tasks and responsibilities for the malaria programme and other health staff at all levels and updated as necessary. To ensure adherence to standard surveillance procedures and practices in line with national guidelines and SOPs, malaria programme staff will lead trainings on surveillance for all categories of health staff concerned and other partners involved. Such trainings can be integrated into other malaria trainings if possible. Intensive trainings on malaria surveillance for various categories of health staff need to be undertaken at provincial and district levels.

3.7.4. Prevention and control of malaria outbreaks

Epidemic-prone situations in Pakistan can be identified during the process of stratification of the malaria problem into discrete populations and areas with sporadic/seasonal outbreaks of various magnitudes at various points in time and based on data from health and non-health sectors. As a result of further analysis, it is possible to define major precipitating factors which cause epidemics so that in the future they can be monitored for epidemic prediction purposes.

To ensure accurate forecasting and adequate response to malaria outbreaks, risk factors will be identified and the system for their monitoring will be established and be properly functional at district level. An outbreak monitoring system will constitute a part of the national malaria epidemiological surveillance system. Its primary task is to identify early signs of an impending epidemic related either to a particular area or to a population group. The recognition of early alarm signals depends upon the adequacy of the variables chosen. Selection of the set of variables and the range of their numerical values is determined by type of area in regard to level of malaria prevalence and incidence, existing health service infrastructure, time lag in communication, etc.

It is equally important to determine at what level and who has or should have the capacity to judge the abnormality of the situation, decide on the epidemiological diagnosis and to have the authority to initiate epidemic containment measures. While various levels of peripheral health services as well as health volunteers will be encouraged to report early any unusual rise in numbers of malaria cases and associated mortality, it is also important that there is adequate expertise to be capable of sorting out the information from the periphery and distinguish between true and false alarm signals at the intermediate level (e.g., district).

A systematic approach for regular coordination and information sharing with the Integrated Disease Surveillance Response (IDSR) unit at the provincial and district levels will be designed and implemented. Timely alert generation and outbreak detection need to be ensured. Capacities at district level will be enhanced through intensive training and follow-up. The programme

capacity to assess the abnormality of the malaria situation and to apply rapid containment measures will be strengthened at provincial and district levels.

Control of a malaria outbreak involves measures aimed at (1) minimizing clinical consequences; (2) containing transmission, if possible, in the affected area; (3) preventing further spread of the epidemic; and (4) improving emergency preparedness in order to prevent future epidemics. The first two objectives require the application, as soon as possible, of effective containment measures, while the last two involve assessment of risk and the application of preventive measures.

In pursuance of the first objective, one has to ensure the quality of medical care in the diagnosis and treatment of malaria, particularly severe and complicated cases. It also implies the provision of adequate stocks of effective antimalarials and other items required for management of the disease. Containment of the outbreak requires some form of transmission control, which should be rapidly introduced unless the epidemic has exhausted itself by the time the health services have recognized it. It is therefore necessary to assess which interventions could and should be implemented for this purpose. The containment of an epidemic requires the implementation of emergency measures (including focal MDA) to all the people considered to be at risk reduce quickly the parasite reservoir in the affected population.

The prevention of outbreaks by planned interventions will be one of the major tasks of DoMC at all levels. It is expected that emergency situations within epidemic-prone areas or population groups in the country are likely occur. Prevention of the further spread of the outbreak and its recurrence in subsequent years requires the application of sustainable methods of vector control. IRS, if feasible, continues to be the most easily applicable transmission control measure. IRS, to be fully effective, the total coverage of houses sprayed within the affected area should be ensured based on adequate provision of insecticides, spraying equipment, transport and deployment of vector control programme staff. In epidemic-prone areas, where LLINs and other insecticide-impregnated materials are already widely used, this approach may be the most effective way of controlling transmission and preventing its spread to new areas or its renewal in subsequent years.

Emergency preparedness for malaria outbreaks should be part of the general organization of emergency health services, which in turn should be an integral part of the national health system. Preparedness for malaria outbreaks will be based on an understanding of the epidemiology of malaria and of the epidemic risk factors. The more complete that understanding and the more developed the information system and the monitoring of risk factors, the higher is the level of preparedness, the more accurate the forecasting and the more adequate the response. Malaria preparedness will include the identification of resources (appropriate manpower, supplies, equipment and logistical arrangements including administrative and technical procedures,

responsibilities of health and other sectors) and the required mechanisms for their rapid mobilization.

Malaria preparedness will be strengthened by identifying the resources (appropriate response teams, supplies, equipment) and the required mechanisms and logistical arrangements for their rapid mobilization and deployment at provincial and lower levels. Application of sustainable vector control methods will be considered to prevent outbreaks and their possible spread to new areas or renewal in subsequent years. The existing national epidemic preparedness and response guidelines will be available at the provincial and district level across the entire country.

3.8. Specific objectives, interventions and outputs/outcomes expected by Category

The possible choices of malaria interventions and outputs/outcomes expected for each Category are based on existing situation and risk factors related to malaria, and the stated objectives as well.

3.8.1. Category 1 (Burden Reduction Phase)

In areas under **Category 1** comprising all districts of **Strata I & II**, where malaria is still widespread and the primary objective is to reduce further the malaria burden, the interventions should be focused on the progressive strengthening of capacities and capabilities of public and private health services and mobilizing community actions to provide early diagnosis and adequate treatment, to promote technically sound and sustainable preventive measures, to prevent, detect early and contain outbreaks and to assess regularly a changing malaria situation. The specific objectives, interventions and outputs/outcomes expected for Category 1 (Burden Reduction Phase) are detailed in **Table 5**.

Table 5. Specific objectives, interventions and outputs/outcomes expected in Burden Reduction Phase

Specific Objectives	Key Interventions and Outputs/Outcomes expected
1. Strengthening malaria programme management, to ensure that it is operating optimally at all levels of the health system. **2.** Providing prompt and reliable diagnosis and treatment in public and private health facilities and at community level as well. **3.** Delivering preventive measures appropriate to local transmission patterns and population characteristics, to achieve the visible impact on malaria transmission, incidence and prevalence. **4.** Strengthening disease and entomological surveillance, to efficiently gather, use and disseminate data. **5.** Improving rapid response capability to cope with emergency situations including malaria epidemics.	**1.** Districts stratified based on risk of malaria transmission followed by implementation of tailored interventions. **2.** Districts with scaled up system for case detection and management, aimed at reaching every inhabitant of a malaria-affected area. **3.** Districts with universal coverage with LLINs and/or IRS along with supplementary vector control measures reached all at-risk populations guided by consideration of technical and operational feasibility, effectiveness and sustainability and based on Integrated Vector Management. **4.** Districts with adequate epidemiological services and information systems and operational research

6. Ensuring delivery of an appropriate package of interventions to hard-to-reach at-risk population groups and communities. **7.** Rapidly rolling out newly tools and interventions, where locally appropriate, to accelerate progress towards elimination. **8.** Initiating programme re-orientation towards malaria elimination when appropriate.	component, capable of planning, monitoring and evaluating anti-malaria interventions established. **5.** Districts with a properly functioning system for entomological surveillance established with sufficient human and infrastructural capacity. **6.** Districts with an adequate mechanism for epidemic preparedness and response set up and maintained. **7.** Districts with special interventions for high risk groups such as tribal populations and populations residing in conflict affected or hard-to-reach areas applied. **8.** Districts with a properly functioning mechanism for timely referral and management of severe and complicated cases of malaria at all levels established to reduce malaria-related mortality. **9.** Districts with a robust supply chain management system established.

3.8.2. Category 2 (Elimination Phase)

In areas under **Category 2** comprising some districts of **Stratum III**, where malaria elimination is recommended, malaria shows a focal distribution of indigenous cases and imported cases may comprise a significant proportion of all cases. In this phase, the province has to consider changing the approach to malaria surveillance and investigate each case to ascertain whether it is locally acquired or imported. The specific objectives, interventions and outputs/outcomes expected for Category 2 (Elimination Phase) are detailed in **Table 6**.

Table 6. Specific objectives, interventions and outputs/outcomes expected in Elimination Phase

Specific Objectives	Key Interventions and Outputs/Outcomes expected
1. Strengthening institutional capacities of DoMC and general health services at all levels as well as enhancing capacity for decision-making related to malaria elimination and prevention of re-establishment. **2.** Establishing and maintaining an adequate system of early detection, prompt diagnosis and effective treatment of malaria cases and their subsequent clinical and epidemiological monitoring across the entire country. **3.** Strengthening diagnostic services providing quality assured parasitological diagnosis of malaria in the public and private sectors throughout the country, including the most remote and poorly accessible areas. **4.** Ensuring effective treatment and use of a low dose primaquine for *P. falciparum* malaria, to reduce rapidly its transmission. **5.** Ensuring universal coverage of at-risk populations with LLINs and IRS as well as supplementary vector control measures including entomological surveillance.	**1.** Districts eligible for malaria elimination stratified based on the GIS mapping to categorize and monitor the functional status of each malaria focus, especially *P. falciparum*. **2.** Districts with public and private health service staff reoriented towards malaria elimination and relevant trainings for different categories of health staff conducted. **3.** Districts with mandatory and timely notification and reporting of each case of malaria carried out by all public and private health care providers. **4.** Districts where each case of malaria promptly diagnosed by quality assured RDT and/or microscopy and treated according to national policy, including those from the private sector. **5.** National- and provincial-level reference laboratories established, focusing primary on developing guidelines/protocols for diagnostic policy, coordinating the referral of samples from district laboratories and providing confirmatory testing, and overseeing internal and external quality assurance.

6. Applying IRS as a core intervention in high risk areas to prevent malaria outbreaks and reduce the intensity of *P. falciparum* transmission with the aim of interrupting its indigenous transmission. **7.** Reinforcing and sustaining a high-quality system of malaria surveillance covering all areas of the country. **8.** Ensuring early and mandatory reporting of and notification on each case of malaria identified within public and private health care sectors to a specialized malaria institution. **9.** Establishing an appropriate system to ensure prompt and thorough epidemiological investigation of each case and focus of malaria to be included into relevant national registers. **10.** Stratifying each district in low-risk areas based on the GIS mapping to categorize and monitor the functional status of each malaria focus, especially *P. falciparum*, in order to guide properly malaria elimination effort at district and lower levels. **11.** Maintaining adequate capacities for early recognition, rapid response to and prevention of malaria outbreaks/epidemics.	**6.** Districts with a high-quality system of disease surveillance covering all areas set up. **7.** Districts where every case and focus of malaria thoroughly investigated and classified. **8.** Districts with a total strict coverage of all active foci of malaria by effective LLINs and/or IRS and supplementary vector control measures achieved, with a view of interrupting transmission as soon as possible within a given focus. **9.** Districts where vector control operations based on results of entomological assessment of a given focus (as a part of epidemiological investigation of the focus). **10.** Districts with an adequate system for early recognition and rapid response to malaria outbreaks established and fully operational. **11.** Districts where effective screening, management and prevention of malaria among mobile and migrant populations implemented. **12.** Districts where registers of cases and foci of malaria set up and regularly updated. **13.** A national malaria elimination database established and regularly updated. **14.** An independent national malaria elimination monitoring/advisory committee established to provide an external view on progress towards elimination.

In provinces/districts eligible for malaria elimination:

- The status of malaria as a notifiable disease will be established/strengthened by law enforcement and be mandatory, and appropriate system for case and focus notification, investigation, classification, reporting and response will be established across the whole province once considered eligible for malaria elimination.
- National malaria information system and its reporting mechanism and data will be revised to adapt to the new elimination realities. The national and provincial programs need to develop a mechanism to streamline case-based surveillance system removing duplicate systems and discrepancies in data collection.
- Strong advocacy and technical assistance are required to re-orient and strengthen malaria surveillance system and its reporting mechanisms to enable individual case investigations and reporting as required for malaria elimination.
- Adequate case- and foci-based surveillance will be established in order to mark the limits of locations with different types of foci of malaria, namely active, non-active residual and cleared foci (see **Table 7**).
- Each district (with primary focus on the Province of Punjab and other territories eligible for elimination) will be stratified based on the GIS mapping to categorize and monitor the functional status of malaria foci, in order to guide properly malaria elimination efforts in a given focus (see **Table 8**).

Table 7. Types of malaria foci based on evidence of transmission and presence of cases

Type	Evidence of transmission	Presence of cases
Active focus	A focus with local transmission	Yes, locally acquired cases – indigenous and/or introduced cases reported
Non-active residual focus	A focus with no local transmission that has been interrupted recently (1-3 years ago)	Yes, but only imported or induced or relapsing cases may occur
Cleared focus	A focus with no local transmission for more than 3 years and which is no longer considered as non-active residual focus	Yes, but only imported or induced or relapsing cases may occur

Table 8. Types of malaria foci with operational criteria and recommended minimum standards of response

Type	Operational criteria	Recommended minimum standards of response
Active focus	Locally acquired case(s) - indigenous and/or introduced have been detected within the current transmission season/ calendar year	All feasible measures including detailed investigation of each case and focus of malaria to interrupt local transmission as soon as possible should be applied
Non-active residual focus	• The last locally acquired case(s) – indigenous and/or introduced have been detected in the previous transmission season/calendar year or up to 3 years earlier • Only imported or induced or relapsing/old cases may occur	• PCD is accessible to the entire population at risk and supported by supervision • ACD is conducted regularly and covers the entire population at risk • Epidemiological investigation and classification of every case reported • Diagnosis by quality-assured microscopy and RDTs or even PCR-based techniques • Early/adequate/radical treatment of all cases • Continuous use of LLINs. • Entomological surveillance. • Health education • Measures applied in a non-active residual focus may be less comprehensive than in an active focus, but standards of quality and coverage should be the same
Cleared focus	• A focus with absence of locally acquired case(s) for more than 3 years • Only imported, induced or relapsing/old cases may occur in current transmission season/calendar year	• Vigilance measures by general health services. • PCD, and ACD if cases reported • Entomological surveillance is recommended • In case of high degree of receptivity and vulnerability vector control measures can be recommended • Health education

3.8.3. Category 3 (Prevention of Re-Establishment Phase)

The transition from malaria elimination to prevention of malaria re-establishment is possible only when adequate and effective surveillance of the disease in the country has proved that malaria transmission has been interrupted, and that all reported cases of malaria have an imported nature. In areas under **Category 3** comprising some districts of **Stratum III**, focus should be

placed on maintenance of the results achieved by deploying all efforts to detect any possible occurrence of malaria transmission, notifying as soon as possible all suspected cases and applying rapid remedial actions.

The combined effect of receptivity and vulnerability, and thus the risk of re-establishment of local transmission in a country, depends on numerous ecological, climatic, socio-demographic, epidemiological, entomological and other factors. Results of the risk assessment will form the basis for the development of a national plan to prevent malaria re-establishment in the country.

In areas where both indicators are low, the focus will be on early detection of malaria cases by general health care staff who need to be vigilant for the disease and the possible malaria re-introduction (occurrence of introduced case(s) secondary from imported) and the re-establishment of local transmission. It can often be ensured by timely detection, reporting and epidemiological investigation of all cases of malaria, together with immediate and effective health care interventions.

If the threat of the possible re-establishment of malaria transmission is considerable, the measures described above will be supplemented by active case detection, especially when importation is intensive into areas with high receptivity. In areas of high vulnerability and receptivity, it might be worthwhile to consider implementing appropriate malaria vector control measures, to reduce receptivity. In addition, the vulnerability of an area may be reduced by ensuring easy access to malaria diagnosis and treatment for the entire population, including migrants and refugees. In some areas, especially those with a high influx of immigrants from malaria-endemic countries, screening high-risk populations for malaria infection can be recommended.

The specific objectives, interventions and outputs/outcomes expected for Category 3 (Prevention of Re-Establishment Phase) are detailed in **Table 9**.

Table 9. Specific objectives, interventions and outputs/outcomes expected in Prevention of Re-Establishment Phase

Specific Objectives	Key Interventions and Outputs/Outcomes expected
1. Establishing an early warning system to monitor malaria risk factors in terms of vulnerability and receptivity in order to predict and prevent re-establishment of local transmission. **2.** Maintaining a reliable disease and entomological surveillance system with full coverage of malaria risk areas. **3.** Sustaining adequate epidemiological and entomological capabilities with an effective operational research component, to determine risk and underlying causes of possible transmission resumption.	**1.** Districts where surveillance activities during the phase of prevention of re-establishment kept at a high standard (but can be difficult because vigilance needs to be maintained when indigenous cases are absent and the risk of re-establishment of local transmission malaria may be low). **2.** Districts where all confirmed malaria cases identified by public and private health care institutions mandatory notified and reported to a designated provincial/national public health institution/agency responsible for the prevention of malaria in the country.

4. Ensuring easy access to reliable malaria diagnosis, and effective and radical treatment for every individual. **5.** Maintaining an appropriate epidemic preparedness and alert system.	**3.** Districts where every case of malaria promptly diagnosed and effectively treated by public health care providers. **4.** National policies and recommendations for malaria treatment updated periodically. **5.** Districts where an epidemiological investigation of both the case and probable focus conducted in a timely and mandatory manner. **6.** Districts where the register of malaria cases maintained, and all cases reported in the register. **7.** Districts where immigrants from malaria-endemic countries provided at points of entry with visual materials on malaria, including information about what to do in case of suspected malaria. **8.** Districts where awareness of people travelling to malaria-endemic countries raised about means of malaria prevention and where every year the medical care services are provided with updated WHO information about the situation on drug-resistant malaria in different geographic areas and countries of the world, as well as with recommendations about treatments and antimalarial drugs containing the schemes and doses to be used. **9.** Districts with an adequate level of competence in malaria diagnosis of health staff sustained. **10.** Districts with vector control to reduce receptivity applied, particularly for outbreak containment and in some special situations and/or border areas. **11.** Districts where choice of vector control measures based on local environmental and epidemiological conditions, and implementation coordinated with other sectors and local authorities. **12.** Districts where entomological surveillance continued to record any major changes in entomological parameters with focus on: (1) estimating the abundance of larvae and adult mosquitoes; (2) monitoring resistance to insecticides; and (3) meteorological monitoring. **13.** Districts with adequate outbreak preparedness with sufficient manpower, supplies and equipment maintained.

Prevention of re-establishment of local transmission is a long-term policy that requires continuous investment of funds and personnel. In the phase of maintaining the malaria-free status, countries are requested to continue reporting to the relevant WHO Regional Office on the annual basis on the maintenance of their malaria-free status.

3.9. Strengthening the enabling environment

Cross-cutting interventions common to all Categories are presented below.

3.9.1. Capacity building

A considerable effort will be taken to increase human resources and train, motivate and sustain health staff including the programme personnel at all levels until malaria eliminated across the entire country. Special attention will be paid to the training of professional and managerial staff of the DoMC and public health services in malaria elimination. Adequate training will be provided to meet the progressive needs on malaria elimination for new staff, and regular refresher courses for all staff in service at all levels. To address these needs, a creative and innovative approach to capacity development will be promoted at national and provincial levels. Training programmes will be supported and coordinated to:

- Make the inventory of various categories of health staff needed and relevant posts to be filled, and on this basis to decide on the number and categories of relevant personnel to be trained or re-trained.
- Establish or maintain a group of trainers with the necessary malaria expertise to assist in organization of training activities in relation to malaria elimination at national and provincial levels.
- Develop/revise national guidelines and instruction materials including for CME to address malaria elimination issues.
- Improve knowledge and enhance skills of different categories of the public and specialized health personnel involved in malaria elimination with particular attention to malaria surveillance. Although such trainings can take place in the country, some senior staff may require additional training abroad, and this may apply not only to DoMC personnel but also to selected staff of the general health services from central and provincial levels.
- Ensure that training programmes and their contents are constantly adapted to and appropriate for the existing elimination strategy. Trainings will be "task-oriented" and "problem-solving", and basic training is supplemented by regular supervision and refresher training courses. It is essential to remember that although the training must be appropriate to the functions to be assumed by trainee, it should be broad enough to enable the trainee to adjust to all possible situations.
- Develop a systematic and objective assessment of performance of the training and proper feedback for purposes of its improvement.
- Ensure that the training increases the motivation of health staff to maintain their skills and competence and remain in service.
- Secure adequate financial support for capacity building.

There is a desperate need for strengthening the entomological component of the national malaria programme. Since vector control is an essential tool to reduce and halt transmission of malaria, it is highly advisable that special training courses will be organized for existing and new entomological staff, and entomologists will play a greater role in the decision on malaria elimination and prevention of its re-establishment of malaria.

The capacities of the National Institute of Malaria Research and Training (NIMRT) that is designated to enhance institutional capacities of the DoMC and general health staff will be strengthened to meet the growing training and research needs on malaria and other vector-borne diseases in Pakistan. In the recently approved 5-Year Plan of Action (PoA 2020-2024), the Ministry of NHSRC has agreed to hand over the institute to the DoMC to act as the National Reference Laboratory on QA/QC malaria diagnosis and treatment and Reference Insectary on entomological surveillance and research. The institute has a comprehensive networking with leading research institutions at national and provincial levels and will be supported by WHO and other international partners. Provincial reference laboratories and insectaries will relate to the institute.

3.9.2. Community-based interventions

The success of the malaria elimination programme will depend not only on the scope and quality of the various activities implemented, but also to a great extent on cooperation of the community in a broad sense: from a community member to different institutions, both governmental and private. Therefore, publicity and transparency of the programme are of great importance. Community involvement is key in any attempt to eliminate malaria. It is envisaged that the community will be involved in the mobilization of local resources and implementation of community-based interventions.

It is critical to understand how a community perceived malaria and what kind of preventive practices are currently in place at community level. Health staff and health volunteers deployed at the grassroots level are the first contact points to educate and raise awareness of communities on malaria signs/symptoms and cure and preventive practices. There is a need for development national and provincial strategies on engagement and empowerment of communities and their linkages with local health staff and partnership with private sector to ensure the sustainability of malaria control, elimination and preventive activities.

In the context of the national plan for malaria elimination, DoMC should map all the current IEC/BCC strategies and revise them, if necessary, to align with existing strategies on case management, disease prevention and surveillance for malaria elimination. Specifically, strategies on community mobilization will be incorporated with an overall aim to deliver quality malaria-related information on treatment and prevention at the community level.

To promote behavior, change related to health seeking and personal protection, DoMC will develop and disseminate IEC-related materials/messages to the public, and a multi-media strategy to deploy messages via radio and television broadly utilized. The messages will target the most at-risk and underserved populations. Different IEC/BCC materials/messages will be harmonized across different ethnic minorities and MMPs. To improve coordination, DoMC may

convene an annual meeting to share with all partners involved the progress on IEC/BCC activities, identify best practices and challenges in implementation, update key messages and develop new IEC/BCC materials/messages in the context of malaria elimination. DoMC will consider including key IEC/BCC messages into training modules and learning materials to be used for training purpose of public health staff, private health providers and community health workers.

DoMC along with general health staff and community health workers will work with community/religious leaders to mobilize communities and increase awareness about malaria prevention at provincial level. Community sensitization and training workshops will be organized by involving important community actors including community healthcare workers, private sectors providers, police/military, religious leaders, village chiefs, village health support groups, teachers and other stakeholders to strengthen the linkages between the key actors and quality malaria service providers.

DoMC will conduct knowledge, attitudes, practices, and beliefs (KAPB) surveys to evaluate the impact of IEC/BCC strategies and to assess compatibility of the practices, customs and beliefs of various social groups and minorities with existing prevention approaches. Based on results, IEC/BCC strategies and related materials will be updated at provincial level.

3.9.3. Collaboration and advocacy

Additional resources for malaria control and elimination remain severely constrained. The social, economic and environmental problems posed by malaria exceed the jurisdiction and capabilities of the Ministry of NHSRC. There is obviously a need for improved multi-and inter-sectoral collaboration, as well as for planning and information sharing, to ensure that additional funds are earmarked for malaria control and elimination.

Multi- and inter-sectoral collaboration is a key factor for success for the shift from malaria control to elimination. Despite, lack of adequate funding, irresponsibility, poor infrastructure and lack of skilled staff that are usually the key challenges in inter-sectoral collaboration, however, there are opportunities to strengthen inter-sectoral collaboration because already some kind of collaboration for malaria control does exist in Pakistan.

Since the Ministry of NHSRC is not always powerful enough to motivate other ministries or the corporate sector for collaboration, to be effective, multi- and inter-sectoral action has to be supported by high-level political leaders. Existing collaborative mechanisms within and between the formal and informal sectors, and channels of communication among policy-makers, local administration, public health personnel and partners will be further strengthened to promote information sharing and joint planning for malaria elimination as well as to ensure that additional funds are earmarked for malaria elimination. There should be an effective mechanism to ensure collaboration between relevant governmental sectors, other agencies and partners at various

levels. The following mechanisms can be considered to fully capitalize on the potential of multi- and inter-sectoral approach to malaria elimination:

Joint appraisal and consensus building

A lot of the information is available in different databases and from different sources, and the required data could be easily extracted from those sources. However, there will be a need for rapid appraisal to map the key determinants for malaria, identifying the common interests of different sectors, the expected impact etc. The collection of the information would provide a first opportunity for inter-sectoral dialogue.

Policy formulation and implementation

It includes staff of the different sectors involved in policy formulation, delivering the multiple intervention packages and assessing the inter-linkages and potential synergies of the different sectors.

Joint evaluation and learning

Malaria is complex, and so is effective inter-sectoral action on malaria. There is a need for regular evaluation and continuous learning, addressing not only 'if an action takes place,' but also "why the action works or why it does not".

Monitoring and accountability

It includes monitoring on malaria and sectoral outcomes, and it is important to hold sectors 'accountable' by measuring impact and providing feedback.

The health sector will work jointly with other departments such as planning, land development, trade and industry, environment, water and irrigation, infrastructure, work and transport, food and agriculture, education, security, culture and community development, especially at peripheral levels. Each sector should review its current activities to identify those that could be modified or added to have a malaria-reducing effect as well as its potential and role in addressing those determinants of malaria where concerted efforts by multiple sectors are required. Each sector will have some comparative advantages with respect to malaria elimination that can be released with no or limited additional costs. Functioning coordination mechanism on malaria between the national and provincial malaria control programs, various programs within in health sector and other governmental departments, such as Agriculture, Sanitation, Education, Public Health Engineering, Housing and Environment will be established for joint planning and implementation.

Partners including governmental sectors, national and international non-governmental organizations, the private sector, media, bilateral donors, multilateral agencies and funding institutions based on their mandates will be harnessed for achievement of the malaria elimination goal. The adequate communication/advocacy strategy will be developed to involve everyone

concerned in malaria elimination. To be most successful, the government must play a leadership role in coordinating and organizing malaria elimination activities in the country, and in engaging their populations in national and local efforts. The government will work together with all existing and potential partners that operate in Pakistan and may consider appointing a focal person to coordinate all partners and harmonize their activities under the endorsed NSP-ME. National, province and district administrations will be also engaged, and steering committees at different levels could be an option to oversee the inter-sectoral work directed at malaria elimination. Review meetings will be periodically conducted to present achievements/problems/constraints and indicate future plans to enhance the existing collaboration, and relevant meeting reports have to be produced and widely disseminated among all parties concerned. DoMC will collaborate with partners to upgrade existing facilities for malaria elimination training to improve their quality and performance as well as to establish and strengthen partnerships with centers of excellence in order to ensure delivery of high-quality malaria services.

To advocate for the elimination agenda, DoMC will conduct sensitization meetings for policy makers, members of parliament, and community leaders on malaria elimination, and engage private sector partners and business leaders to support malaria elimination activities across the country. DoMC will also carry out advocacy events such as commemorating World Malaria Day, and utilize other events, including music concerts, educational seminars, radio/television shows, religious ceremonies, in cooperation with other central government agencies including Ministries of Tourism, Education, Interior and Religion to advocate for widespread support for malaria elimination.

3.9.4. Services for mobile and migrant populations

Mobile and migrant population (MMPs) that move either within Pakistan or between neighboring countries and national security forces posted along borders, are among the highest risk groups for malaria infection. Unfortunately, given the difficulty in reaching and tracking these populations/groups, there is usually poor surveillance of malaria in these groups. Ongoing challenges include characterizing and defining MMPs, developing an intervention and surveillance strategy, adapted to the country's conditions, responding to the local needs, and aimed at better targeting these hard-to reach populations by technically sound and sustainable measures within the country.

Analysis will be carried out on a regular basis within the country to identify the main MMP groups and their areas to be targeted for interventions. The mapping exercises and available outcomes of operational research among these populations will be utilized to update approaches to address MMPs for malaria elimination. National/provincial focal points can be appointed by DoMC to coordinate activities directed towards MMPs. DoMC will collaborate with other sectors, such as Ministry of Foreign Affairs and the Department of Immigration, the Department of Tourism, Department of Forestry, province/district administration and partners' organizations involved to appropriately target these populations at risk.

Cross-border activities should take into consideration specific interventions for MMPs. IEC/BCC activities will be considered for minorities, tribal populations and at the working sites of large-scale deployment of mobile population groups. Military and policy personnel deployed inside and travelling outside the country, considered as the most easily accessible MMP group will be targeted for engagement. Industries supporting employment of MMPs, forestry, farming, construction, and tourism in at-risk areas will be engaged in malaria elimination and prevention.

To address MMPs' malaria-related issues, the following approaches and measures can be recommended:

- Mapping formal and informal work sites, refugees and hard-to-reach populations.
- Intensifying case detection among refugees, in hard-to-reach vulnerable populations and at development sites to provide adequate health care services.
- Setting up appropriate malaria screening points along international borders.
- Developing treatment and prevention guidelines for MMPs.
- Conducting IRS in outbreak-prone areas.
- Providing LLINs, repellents and education materials on malaria prevention to refugees, policy and soldiers.
- Advocating for collaboration with immigration officers, police, key decision-makers and employers of migrants by explaining the cost-benefit of adequate MMP interventions.
- Promoting IEC, BCC and community mobilization skills tailored to MMPs.
- Updating and standardizing monitoring and evaluation tools to incorporate MMP indicators and improving monitoring of MMP interventions.

It is critical to differentiate between different types of MMPs, based on their key characteristics and risks that would help to determine the most effective strategies to target and reach these vulnerable populations with the most appropriate interventions. Thus, the better understanding of various MMP groups and the situations, which place them at risk of malaria is required, in order to develop targeted behavior change and outreach interventions for MMPs. There is an urgent need to develop appropriate and accessible malaria services for MMPs in different settings. In addition, in the context of universal coverage and access to basic health services, these remote and often marginalized populations (socially, economically or geographically) should be able to have an easy access to adequate and affordable health care.

3.9.5. Cross-border and regional cooperation

Neighboring countries may share many commonalities in relation to eco-epidemiological malaria settings and malaria-related problems encountered, and therefore a closer collaboration should be promoted for solving these problems, particularly in the context of malaria elimination. With support from WHO, the three bordering countries have launched an initiative called Pakistan,

Iran and Afghanistan Malaria Network "the PIAM NET" but practical follow up is inadequate in border districts and provinces.

Malaria in border areas of neighboring countries may become a major problem that requires special attention because of the intense population movements within as well as across national borders. The movements may be illegal; even if they are not, they may be difficult to track. Furthermore, communication is constrained by different languages. Malaria transmission patterns are often affected by ecological complexity and may be very intense to focus. For obvious reasons, border areas are often the most remote and neglected, and there is little information and control over what happens across the border. If there are malaria control or elimination activities on both sides of borders, their policies, strategies and approaches may be different. Realizing that a substantial number of cases are border malaria, there is a great need for DoMC to focus their activities on vulnerable, often underserved, groups of migrating populations in border areas. However, there are many constraints such as administrative hurdles, political sensitivities in dealing with the most concerned areas, and the remoteness and inaccessibility of most of the problem zones.

In the context of malaria elimination, particular emphasis will be given to situations, where there is a risk of spread of malaria between neighboring countries, and all necessary steps will be taken to assist in solving common malaria problems in border areas. The existing mechanisms and approaches being applied will be reviewed and ways for their improvements will be recommended. Particular emphasis will be placed on assessment of current situations and identification of problems encountered, regular and timely information exchange, notification on unusual malaria situations as well as development and implementation of joint plans of action for harmonization of malaria elimination activities in border areas.

Establishment of a functional mechanism for coordination of malaria elimination activities with neighboring countries, particularly where movements across national boundaries occurs will be facilitated by WHO. WHO along with other partners will be actively involved in providing strategic guidance, technical support, mediating exchange of relevant information and coordinating malaria control and elimination activities in border areas. Collaboration and coordination with Iran and Afghanistan through joint planning and information sharing through WHO will be enhanced. Cross-border meetings of existing PIAM NET will be regularly organized at sub-regional level.

Efforts will be made for a new joint statement to be signed by the Ministries of Health of three countries and partners concerned. Joint statements on cross-border coordination between Pakistan and neighboring countries with the designation of focal country's point and establishment of an inter-country working group, composed of national counterparts, WHO staff and partners to assist in planning, implementing and evaluating elimination activities in border areas can be considered.

3.9.6. Health system strengthening

In order to facilitate an elimination effort in Pakistan, the health system in the country will be further strengthened in terms of human resources, financing, information systems and governance. Due to the need for strong malaria surveillance with total coverage of all geographical areas of the country and high quality of operations, human resources must be increased at all levels. Some general public health staff should be devoted to malaria and have sufficient time for surveillance and response operations. Respective health personnel will be trained accordingly. In the elimination phase, enforcing the mandatory notification of malaria will be a major challenge in Pakistan where many fever patients seek care in the informal private sector. Financial allocations need to be maintained, despite low burden of malaria in some areas. Launching a malaria elimination plan increases the need for leadership and management, and operations have to be managed with rigor and flexibility, supported by robust monitoring and quality control.

3.9.7. Focused research

The objectives of the research should be closely tied to the particular situation and problems identified within a particular country and intervention strategies being applied. Such research should be relevant to existing control or elimination strategy, addressing not only the efficacy/effectiveness of specific interventions but also social, economic, cultural and behavioral factors that may affect programme activities. Regional oversight of research activities at national level is needed to minimize unnecessary duplication and to take full advantage of any opportunities for collaborative research, innovation and synergy.

Operational research will be conducted in collaboration with research institutions to assess the effectiveness of intervention measures and to identify the gaps in malaria control and elimination. Malaria Indicator Survey will be conducted every three to four years to assess and evaluate the coverage, outcome and impact of malaria control interventions. A coordination mechanism will be established for regular interaction with Pakistan Bureau of Statistics for inclusion of malaria indicators in the PDHS and PSLM surveys.

Some priority research areas - including (1) what are the optimal vector control measures for elimination, especially in the high risk areas and situations; (2) what are the optimal interventions for identifying and providing services in support of malaria elimination among MMPs; (3) what are effective and feasible strategies for ensuring quality case reporting and management in the private sector; and (4) how community engagement in malaria elimination can be improved - can be considered for accelerating transition towards malaria elimination in Pakistan.

3.9.8. Malaria in conflict areas and complex environments

A violent conflict may cause population displacement and destruction of infrastructure, as well as the breakdown of health services, including routine disease control programs, which can lead to outbreaks. Additionally, the lack of clean water supplies, poor sanitation and waste management, overcrowding and poor shelter can increase the risk of communicable diseases including malaria. The increase in malaria morbidity and mortality due to conflicts and in refugees and displaced populations have been well documented in conflict areas. In conflicts or in complex emergencies/environments, factors that may contribute to the increase in malaria morbidity and mortality include the breakdown of general health and specialized malaria services, movement of people from low to high transmission areas, and environmental deterioration encouraging vector breeding.

Malaria outbreaks during the crisis can be prevented by early application of effective malaria interventions through early detection, adequate diagnosis and appropriate treatment, focal IRS, MDA, massive LLINs distribution among populations at risk and health promotion information campaigns. Prioritizing LLINs distribution to pregnant women and young children during the crisis in high-transmission areas can be appropriate given that child mortality due to communicable diseases including malaria are often raised in conflict settings.

It is important that the crisis response should be collaboratively and rapidly organized by the Ministry of NHSRC, UN Agencies and the NGO community, and effectively coordinated by the Ministry of NHSRC of the Government of Pakistan. The intervention response must be planned in advance, and adequate resources and expertise should be made available to assure the proper containment of possible outbreaks. Research should be advocated to improve malaria control in both normal and emergency circumstances in areas in which displaced populations are present.

4. Measuring Progress and Impact

The following principles should be taken into account:

- In the burden reduction phase, the main focus should be given to establishing adequate epidemiological services and information systems, with an operational research component, capable of planning, monitoring and evaluating control interventions.
- Once an administrative unit entered the elimination phase or even before, the attention should be re-focused to ensuring that adequate surveillance system is fully operational and properly functional with absolutely total coverage of this administrative unit.
- M&E is the central component in the elimination phase. Operationally, the main information requirement is to indicate exactly which administrative units have reached the elimination target at a given point in time;
- Different set of outcomes and impact indicators are required depending on the stage on the continuum to malaria elimination.
- Indicators on impact and adequacy of surveillance are central to verification about interruption of malaria transmission, its elimination and maintenance of malaria-free status.

At present, M&E is a fundamental component of the Strategic Plan for Malaria Control Programme 2015-2020 *(**3**)*. Through M&E, programme impact, outcome, output and input indicators are measured to provide the basis for accountability and informed decision making at both programme and policy level.

In order to improve malaria surveillance system in Pakistan, enhanced malaria surveillance will be supported throughout the country and not just for 72 districts to ensure a standardized approach to surveillance in terms of variables collected, indicators monitored and monitoring and evaluation processes for good nationwide data quality. A universal and adequate surveillance system using DHIS2 on malaria will be set up in all provinces and districts to ensure uniformity of data collection and analysis across the country. A comprehensive national malaria database will be developed to collate malaria information from different sources and systems, in order to reduce discrepancies in data received from different systems. National and provincial programs monitoring capacity will be strengthened by establishing a M&E unit with qualified staff to better coordinate and implement surveillance and M&E activities. Appropriate resources are needed for dissemination and uptake of M&E guidelines.

Implementation of the NSP-ME in Pakistan, 2021-2035 will be evaluated at regular intervals for compliance with targets and objectives to be achieved. Parameters will be established to monitor and evaluate all programme areas with focus on:

- monitoring the operational aspects of the programme and measuring outcome indicators to ensure that the activities are yielding desired results and moving the programme towards achieving its targets and objectives.
- monitoring changes in impact indicators resulting from the activities implemented.
- appropriately interpreting results and making revisions in policies or strategies, when needed, to help ensure progress.
- documenting progress towards malaria elimination. Information on coverage and quality of interventions with mapping out foci of malaria is particularly important.

In the burden reduction and elimination phases, progress will be monitored through a minimal set of impact and outcome indicators, which should be routinely tracked by DoMC. A recommended core set of indicators to measure the progress towards interrupting transmission of indigenous malaria is listed in **Annexes 7 & 8**. Province-wise baseline and targets of key interventions under relevant PSPs are shown in **Annex 9**.

In local populations receiving LLINs and/or IRS along with other supplementary vector control measures, one can expect a decrease in the incidence of malaria infection and disease (including uncomplicated (UM) and severe/complicated (SCM) malaria and deaths associated with malaria). From improved coverage, rapidity and effectiveness of the treatment of UM, one can expect a decrease in (1) the incidence of SCM and malaria deaths (*but perhaps an initial increased in the reported incidence of UM, SCM and malaria deaths*), (2) in the ratio of SCM to UM and (3) in the ratio of malaria deaths to UM. From improved management of SCM before and after hospitalization, a decrease in the case fatality rate (CFR) of SCM can be expected.

A malaria elimination database will be established when a decision has been made to go for elimination. Ideally, management and maintenance of the malaria elimination database should be the responsibility of a national committee that is independent of the malaria programme. This database will serve as the national repository of all information related to malaria elimination. Since an annual malaria surveillance report as good epidemiological practice provides a synthesis of all available information on malaria and its elimination and is required for the future verification/certification process of malaria elimination such reports will be prepared, especially at provincial level.

Adequate provisions will be made for monitoring and evaluating the progress towards malaria elimination and for effective vigilance activities after the attainment of malaria-free status. Regular assessments preferably every two to three years by an independent team of experts will form an essential element of the programme.

5. Cost of Implementing the Plan

Successful malaria elimination campaign requires adequate planning and budgeting, and campaign should be conducted with sufficient lead time and the necessary resource mobilization. It is crucial for any country aiming for elimination to ensure that adequate financial support is available from beginning to end. Sat May 2015, the GTS for Malaria 2016-2030 was adopted by the World Health Assembly. The cost of implementing the GTS was estimated at about US$ 101.8 billion over 15 years. By 2025, the annual investment is estimated at US$ 7.7 billion, and by 2030, US$ 8.7 billion would be required per year. A further estimated US$ 673 million is also needed each year to fund malaria research and development *(**1**)*.

It is expected that implementing the NSP-ME 2021-2035 would bring substantial benefits in terms of saving lives and averting the socio-economic losses provoked by the disease than the total cost and investments made to execute this elimination plan. A continuous flow of financial inputs from different governmental sources and partners is critical to the success of the malaria elimination plan in Pakistan. There is some risk that the funding agencies would not be able to provide and/or sustain the level of inputs to see a visible programme impact: delays in disbursements can rapidly lead to malaria resurgences.

Pakistan is eligible for the GF funding, but the level of counterpart financing has to increase. By launching the national malaria elimination programme, the government should consider it as a high financial priority in its development plans or normal budgetary allocations. Once the country becomes malaria-free, the costs shift towards general health services, and greater flexibility is needed, as the epidemiology changes. With such changes, government funding is likely to be more efficient. Therefore, national commitment, so crucial for the achievement and maintenance of elimination, will be gauged by the extent to which domestic investments are increased, and this becomes important in leveraging donor support.

Based on a cost estimate for implementing the GTS 2016-2030 at the global level, and bearing in mind that the country in 2019 accounted for about 25% of all reported cases in the EMR *(**4**)*, it is expected that the estimated cost of dealing with malaria in Pakistan would amount to more than USD 690 million in total that is necessary for the full-scale programme implementation over next 5 years (see **Table 10**). The cost of eliminating malaria in eligible areas (Punjab, AJK, GB and ICT) as shown in **Table 11** is expected to be close to USD 145 million during 2021-2025. The programme's budget should be sufficient and realistic, including adequate reserve provisions to meet possible problems that are liable to occur during its implementation, and the source(s) of funds will be clearly indicated.

Table 10. Estimated cost of the NSP by Provinces/Federal Territories, Pakistan 2021-2025

Item	**Punjab + AJK + GB +**	**Sindh**	**Balochistan**	**KP + Merged**	**Total Cost** (USD)	**% of Total**

	ICT			Areas		Cost
Vector Control						
LLINs	0	89,750,002		109,927,547	240,051,760	34.8
IRS	14,123,416	34,230,370		41,843,267	112,750,386	16.3
LSM	855,000	360,000	495,000	570,000	2,280,000	0.3
Disease Management						
Diagnosis	6,915,854	4,439,611	1,392,838	4,076,792	16,825,097	2.4
Antimalarial drugs	8,466,799	1,076,510	2,790,223	1,601,438	13,934,951	2.0
Laboratory Reagents	1,312,000	646,000	324,000	590,000	2,872,000	0.4
Laboratory Equipment	47,610	94,530	0	253,000	395,840	0.1
Capacity Building						
Training	42,322,632	18,141,954	11,011,766	18,724,445	90,210,798	13.1
Community-Based Interventions						
IEC materials	222,739	180,228	926,939	335,527	1,665,434	0.2
BCC	0	8,574,146	17,441,723	19,977,200	45,993,070	6.7
M&E						
M&E	2,652,028	7,472,275	8,229,554	2,307,944	20,661,801	3.0
Programme Implementation						
Human resources	31,571,246	13,902,488	22,637,710	19,896,693	88,008,138	12.7
Infrastructure development	8,437,796	1,173,240	1,053,003	1,191,802	11,855,097	1.7
Warehouse	0	0	6,241,166	0	6,241,166	0.9
Programme Management (PM) & Assistance						
Technical assistance	944,149	440,150	440,150	874,968	2,699,418	0.4
PM (3%)	6,315,017	5,414,445	4,077,348	18,882,161	34,688,972	5.0
Total Cost (USD)	124,196,270	185,895,953	139,988,968	241,053,486	691,134,678	100
% of Total Cost	18.0	27.0	20.0	35.0	100	

Table 11. Estimated cost of the NSP for malaria elimination in Punjab, AJK, GB and ICT, Pakistan 2021-2025

Item	Punjab	AJK	GB	ICT	Total Cost (USD)	% of Total Cost
Vector Control						
LLINs	0	0	0	0	0	0
IRS	11,340,627	1,099,376	1,683,413	0	14,123,416	11.4
LSM	540,000	150,000	150,000	15,000	855,000	0.7
Disease Management						
Diagnosis	6,535,662	281,590	98,603	0	6,915,855	5.6
Antimalarial drugs	8,466,779	0	0	0	8,466,779	6.8

Laboratory Reagents	1,048,000	152,000	92,000	20,000	1,312,000	1.0
Laboratory Equipment	0	32,430	15,180	0	47,610	0.05
Capacity Building						
Training	35,614,984	4,036,552	2,557,077	124,020	42,332,633	34.1
Community-Based Interventions						
IEC materials	164,426	31,067	26,236	1,011	222,740	0.15
BCC	0	0	0	0	0	0
M&E						
M&E	1,344,411	531,527	531,527	244,564	2,652,028	2.1
Programme Implementation						
Human resources	17,315,118	6,051,671	6,051,671	2,152,786	31,571,247	25.4
Infrastructure development	6,194,832	1,169,184	987,798	91,576	8,436,996	6.7
Programme Management (PM) & Assistance						
Technical assistance	355,204	196,315	196,315	196,315	944,149	0.8
PM (3%)	5,446,181	411,951	371,695	85,190	6,315,017	5.2
Total Cost (USD)	94,366,230	14,143,664	12,761,514	2,924,862	124,196,270	100
% of Total Cost	76.0	11.4	10.3	2.3	100	

Between 2025 and 2035 it is anticipated that the cost of case management, disease prevention and cross-cutting interventions would be somewhat less because of a progressive decline in the number of malaria cases across the country. However, the cost of surveillance activities that is a core function of elimination programme will be gradually increased and should be kept at a sufficient level until the national elimination goal is achieved.

Sufficient financial provisions will be made for monitoring and evaluating the progress made towards malaria elimination by 2035 to ensure the set milestones/targets and stated objectives/goals are met. During the elimination phase, financial allocations will be maintained, despite a low burden. Adequate financial resources will be also available for effective vigilance activities after attainment of malaria-free status because adequative surveillance to prevent the re-establishment of local transmission can be relatively costly in Pakistan assuming a high degree of vulnerability and receptivity.

6. Governance and coordination

Political commitments and partnership action

Pakistan by endorsing the GTS for malaria 2016-2030 *(**1**)* has managed to get its country-level partnership action on malaria off the ground and, as a result, the burden of malaria has been gradually reducing. Pakistan has recently become a member of APMEN (Asia Pacific Malaria Elimination Network). However, malaria control and elimination efforts in Pakistan are still not sufficiently backed by political support at national and provincial levels resulting in gradual weakening of the anti-malaria programmes.

To be successful in attaining the stated elimination goal, the government and partners should re-affirm their political and financial commitments to take all possible efforts aimed at further reducing malaria-specific morbidity and mortality in areas where elimination is not feasible at present and interrupting transmission of malaria in Provinces/Federal Territories that are already or will become eligible for malaria elimination in Pakistan.

Programme management and administration

There should be a clear understanding of the commitments to be faced until malaria elimination is achieved. The national and provincial governments should recognize the full implications of the elimination programme and what it calls for in terms, not only of human, material and financial resources, but also of administration, organization and management. A national strategic plan for malaria elimination based on phased approach will be set clearly out and agreed upon by all those involved at provincial, national and international levels.

The existing anti-malaria programmes at the national and provincial levels will be strengthened through a very strong coordinating mechanism under the stewardship of DoMC at the national level to lead and steer the malaria control and elimination efforts in the country with the support of provinces and partners. The formulation, authority, organization and responsibility of the DoMC will be specified, and the administrative policy will be clearly defined as well. The existing high-level national steering committee will be restructured and nominated as the National Taskforce for Malaria Elimination and made functional as per growing need of the programme. Similar high-level steering body/task force will be constituted at provincial level to mobilize resources and track progress towards the target of malaria free Pakistan.

Adequate legislative and administrative provisions to govern DoMC will be officially approved to cover the programme's requirements, including the right of entry by malaria staff to houses with the purpose of investigation, mandatory notification and reporting of malaria cases etc. Regulation and engagement of the private sector as a major elimination challenge in Pakistan will be properly addressed. A considerable effort will be taken to fill vacant positions, increase human resources and train, motivate and sustain health staff at all levels until malaria elimination across the entire country is achieved.

The malaria programmes at the provincial level will be revised with the establishment of a specialized malaria unit staffed by a core group of technical personnel dedicated to malaria within the provincial health departments with clear terms of reference for coordinating, planning, implementation, quality control, and monitoring and evaluation of the programme. This unit will also be adequately resourced to support capacity building and surveillance within districts. Each district will have a focal person for malaria (a district malaria officer) who has clear terms of reference and reporting lines to the core malaria team at the Provincial level and operates through the integrated health system at district level, which will be adequately staffed.

7. The way forward

The proposed NSP-ME will provide strategic guidance and technical support for those involved in planning and implementing the programme aimed at burden reduction and elimination and monitoring and evaluating the progress towards malaria elimination in the country. NSP-ME will serve as a strategic framework and technical guide for provinces in rolling out specific interventions for eliminating malaria.

After launching of the NSP-ME 2021-2035, orientation workshops will be carried out at provincial level to launch PSPs and make them operational in reaching milestones and targets defined for each province. Particular attention will be given to those provinces that are already in the elimination phase, and where it is rational and necessary to initiate surveillance and other elimination activities without any delay. A substantial effort will be considered to increase human capacity for malaria elimination and train, motivate and sustain health staff of different categories and community health workers, with special focus on areas eligible for elimination.

Since surveillance and M&E will be a key component of measuring the progress towards elimination, national reporting and information systems for disease surveillance and health management will be strengthened at central, provincial and district levels by the validation/assessment of existing systems at all levels.

The DoMC with its Technical Working Group that is responsible for overall coordination and guidance of elimination activities will periodically review the programme to ensure that it remains on track, and the level of inputs required to see the desired programme impact is provided and sustained, since there is always some risk that financial provisions of the government and funding agencies could not be sufficient.

By implementing the NSP-ME 2021-2035 and creating greater awareness of malaria elimination effort in Pakistan, international partners such as WHO, APMEN, Global Fund and other donors can be requested to provide the necessary technical support and additional resources for malaria elimination.

A mechanism for periodic external reviews of the programme to assess the progress against milestones and targets, identify possible gaps and advise on actions to solve these problems will be built in.

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Annexes

Annex 1. Country profile

The United Nations (UN) estimates the population of Pakistan to be about 219 million[1]. During 1950–2011, Pakistan's urban population expanded over seven-fold, while the total population increased by over fourfold. About two-thirds (63.7%) of the population is rural. Approximately 23% of the population lives below the international poverty line of US$1.25 a day. Provisional results of Pakistan's 2017 national census estimate the country's total population to be 207 774 000. Pakistan population is equivalent to 2.65% of the total world population. Pakistan ranks number 6 in the list of countries by population. The population density in Pakistan is 244 per km^2. The total land area is 881 913 km^2. Key demographic indicators are shown in **Table 1**.

Table 1. Key demographic Indicators by Provinces/Region, Pakistan

Indicators	National	Balochistan	KP	Merged Areas (ex-FATA)	Sindh	Punjab
Total population (million)	207774000	12344508	40525047	5001676	47886051	110012442
Population density (per km^2)	244	36	350	117	340	536
Geographic Area (km^2)	881913	347190	101741	27220	140914	205344
Average Household size	6.4 persons	7.9 persons	7.2 persons	9.0 persons	6.1 persons	6.1 persons

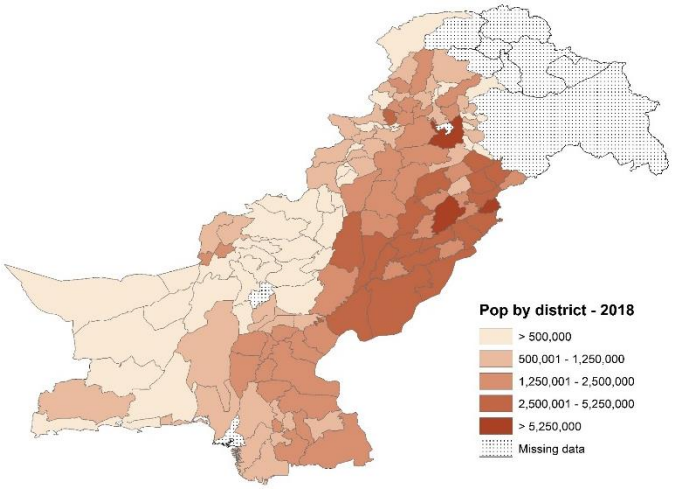
In 2014, the urban areas of Pakistan were estimated to be home to at 37% of the total population[2]. In Pakistan, urban areas are defined as places with municipal corporation, town committee or cantonment. The 15 most populated urban areas, ranked according to population include Karachi (1), Lahore (2), Faisalabad (3), Rawalpindi (4), Multan (5), Hyderabad (6), Gujranwala (7), Peshawar (8), Quetta (9), Muzaffarabad (10), Kotli (11), Islamabad (12), Bahawalpur (13), Sargodha (14) and Sialkot (15). The population by districts is shown on **Figure 1**.

Pakistan is classified as a lower middle-income country by the World Bank with Gross National Income per capita of USD 1,590 in 2018 and ranked 146 out of 187 countries in the 2013 United Nations Development Programme Human Development Index.

[1] Based on Worldometer elaboration of the latest United Nations data. Accessed 24th February 2020 at https://www.Worldometers.info

[2] United Nations (2014). World Urbanization Prospects: The 2014 Revision, Highlights. Accessed 18th Nov 2016 at https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf

Figure 1. District-wise population data, Pakistan, 2018



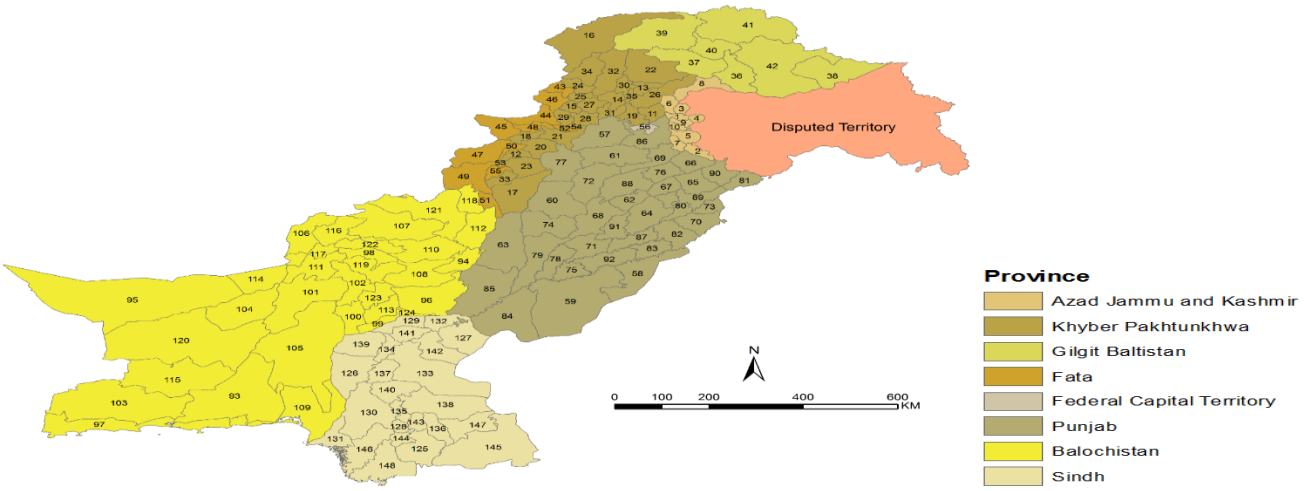
Pakistan is a federal parliamentary republic consisting of four provinces – KP, Punjab, Sindh and Balochistan; one capital territory - ICT; and three federal territory – Merged Areas/ex-FATA, AJK and GB. The country is subdivided further into divisions and then districts (3rd level administration). Divisions were abolished in 2000. 154 Districts, which are further subdivided into 581/or 596 Tehsils[3]. A level below the Tehsil is the Union Council (5th level administrative unit), which is an elected local government body made up of 21 councillors, headed by a Nazim. A village/Union council usually comprises a large village and surrounding areas, often including nearby small villages. The term *Union or Village Council* is also used for localities that are part of cities (see **Figure 2**).

The Kashmir territory has been a disputed territory between Pakistan and India since the British relinquished control of the Indian sub-continent in the 1940s. The area is a heavily militarised covering at a 724 km. long line of control between the two countries and is classified as one of the world's most worrisome disputed territories[4]. Another major territorial dispute pitting Pakistan and the Afghanistan is the Durand Line, a notorious 2,430 Kilometre-borderline that the two countries share[5].

Several districts/agencies in Balochistan and Merged Areas/ex-FATA have borders with neighboring countries, Afghanistan and Iran. Movement of people across borders is common for economic reasons. Thousands of Afghani people move daily into Pakistan via Torkham in Khyber, Ghulam Khan in NWA, Nawa pass in Mohmand & Azam Warsak in SWA. Huge numbers also cross the border from Parachinar in Kurram Agency, similarly Chaman border. According to the NMS 2015-2020, there are no guidelines in place to address the issue of imported malaria cases through cross border movement.

[3] Pakistan Bureau of Statistics (2014). List of Districts, Tehsils/Talukas. Accessed on October 10, 2016 at [http://www.pbs.gov.pk/sites/default/files/LIST%20OF%20DISTRICTS%20%26%20TEHSILS.pdf].
[4] Metrocosm (2015). Every Disputed Territory in the World. Accessed 18th Nov 2016 at http://metrocosm.com/disputed-territories-map.html
[5] Omrani B (2016). The Durand Line : History and Problems of the Afghan-Pakistan Border. *Asian Affairs* **40**: 177–195

Figure 2. Administrative sub-division of Pakistan



Annex 2. Epidemiology of malaria

Population at risk

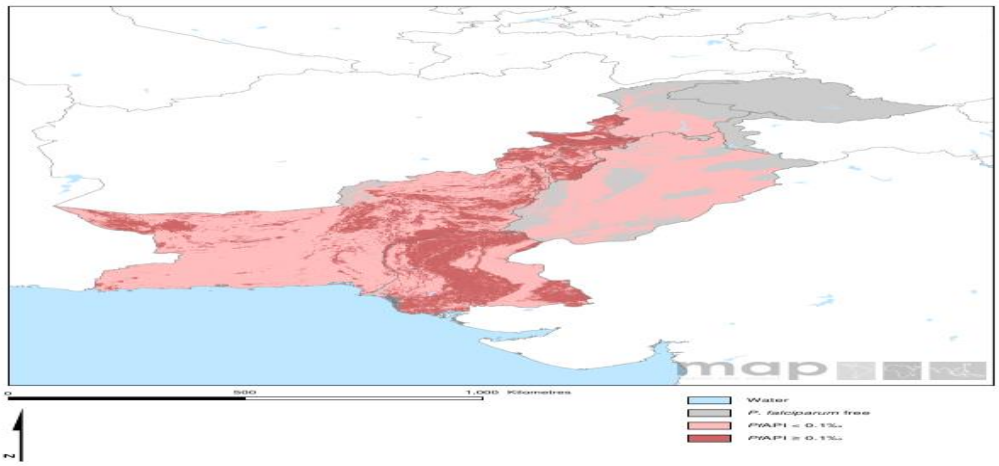
Malaria is still a major public health problem in Pakistan. With more than one million estimated and almost 375 000 confirmed cases reported in 2018, Pakistan has been grouped with Afghanistan, Somalia, Sudan and Yemen accounting for more than 95% of the total regional malaria burden[6][7]. Referring to WMR 2018, 28.9% of Pakistani population lives in areas at high risk for malaria, 69.4% at low and medium risk and the only 1.7% live in areas with no risk of malaria transmission[8].

Geographical distribution

The natural extent of malaria transmission in Pakistan is limited by the combination of high altitude with low temperatures and aridity which affect both development of the malaria mosquitos and parasites. Malaria occurs at altitudes below 2000 meters above sea, and most prevalent in river valleys, irrigation channels and rice-growing fields across the country. At present, *P. vivax* malaria is the most prevalent species accounting for 84% of all confirmed cases, with less than 15% of total cases attributed to *P. falciparum* and 1% cases due to mixed infection in the country. Transmission of *P. falciparum*, at the edge of its geographical range, is unstable, and can fluctuate markedly from year to year. The *P. falciparum* map from the Malaria Atlas Project Predictions 2015[9] is shown in **Figure 3**.

[6] Pakistan Malaria Annual Report, DoMC Pakistan 2019.
[7] WHO EMRO Malaria Report 2019.
[8] World Malaria Report, Global Malaria Programme WHO, Geneva 2019.
[9] Malaria Atlas Project (2013). http://www.map.ox.ac.uk

Figure 3. Predictions for distribution of *P. falciparum* malaria and its *API*, Pakistan 2015



In Pakistan, there are two main transmission seasons determined by rainfall and temperature. The highest transmission season comes soon after the monsoon rains from August to December when vectors take advantage of the abundant stagnant pools and clogged water drains to breed in large numbers, increasing their vectorial capacity[10]. The second transmission season is around April-May and is usually due to relapse resulting from transmission in the previous year[11].

Malaria vectors

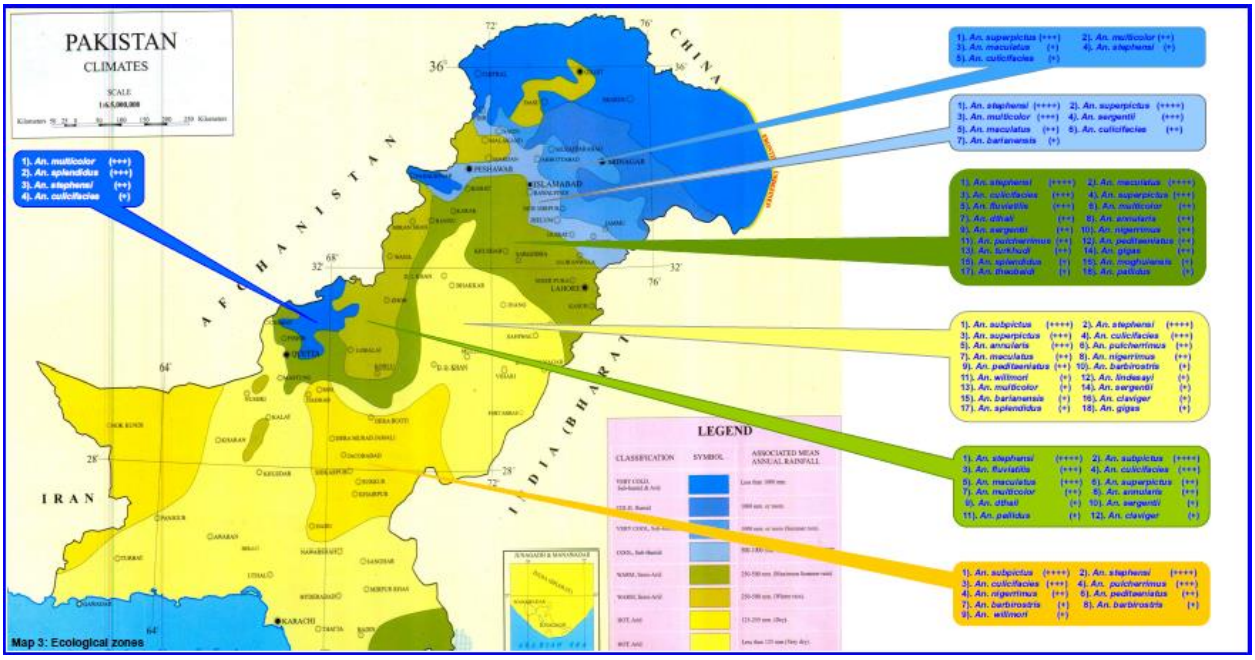
In Pakistan, the principal and secondary malaria vectors are respectively *An. culicifacies* and *An. stephensi*. These species are widely distributed in the country and generally found throughout the year. *An. stephensi* is considered an urban malaria vector while *An. culicifacies* is more dominant in the rural areas. *An. culicifacies* complex is composed of five chromosomal forms, denoted as species A, B, C, D and E distributed across Southeast Asia[12]. In Pakistan, only species A & B are found[13]. In terms of vectorial capacity, species A has been shown to be a better malaria vector whereas species B is a poor or non-vector of malaria[14]. *An. stephensi* is in the same subgenus as *An. gambiae*, the primary malaria vector in Africa; two races of *An. stephensi* exist based on differences in egg dimensions and the number of ridges on the eggs: *An. stephensi stephensi sensu stricto*, the type form, is a competent malaria vector that takes place in urban areas, and *An. stephensi mysorensis*, the variety form, exists

[10] Mukhtar M. Guidelines for anti-vector interventions for monsoon season (2009), DoMC Pakistan, Ministry of Health, Pakistan, pp 14.
[11] Strategic Plan Malaria Control Programme (2015-2020), DoMC Pakistan, 2014.
[12] Manguin S, Garros C, Dusfour I, Harbach RE, Coosemans M (2008). Bionomics, taxonomy, and distribution of the major malaria vector taxa of Anopheles subgenus Cellia in Southeast Asia: an updated review. Infection, Genetics & Evolution, 8: 489-503.
[13] Mahmood F, Sakai RK, Akhtar K (1984). Vector incrimination studies and observations on species A and B of the taxon Anopheles culicifacies in Pakistan. Transactions of the Royal Society of Tropical Medicine & Hygiene, 78: 607-616.
[14] Subbarao SK, Vasantha K, Raghavendra K, Sharma VP, Sharma GK (1988). Anopheles culicifacies: sibling species composition and its relationship to malaria incidence. Journal of the American Mosquito Control Association, 4: 29-33.

in rural areas and exhibits considerable zoophilic behaviour, making it a poor malaria vector (see **Figure 4**).

Both *An. culicifacies* and *An. stephensi* ss are mostly zoophilic, rest indoors especially during daytime and breed in clean water, although there is evidence that suggests *An. stephensi* can breed in almost any type of water collection, including highly polluted wastewater and underground water reservoirs[15][16]. Their breeding sites include agricultural drains, small irrigation channels, temporary pools, pits, puddles and paddy fields. Other two species namely *An. fluviatilis* and *An. annularis* have been identified from Merged Areas/ex-FATA and Balochistan provinces and are considered as secondary vectors[17].

Figure 4. Distribution of malaria vectors, Pakistan (developed by Muhammed Mukhtar in 2012)



[15] Mujahid AA, Mallick GH, Shah IH, Bahar R, Campbell CC, Grenier R, Simeonov LA (1976). Report of Malaria External Review Team, December 1-20, 1975, Islamabad, Pakistan. Unpublished document, PD-ABL.393, MAL 126, 95511, Pp. 24 & annexes.

[16] Mukhtar M. Guidelines for anti-vector interventions for monsoon season (2009). DoMC, Ministry of Health, Pakistan: pp. 14.

[17] Mukhtar M. Guidelines for anti-vector interventions for monsoon season (2009). DoMC, Ministry of Health, Pakistan: pp. 14.

Despite being probably the most abundant mosquito species in almost all provinces of Pakistan[18], *An. subpictus* is yet to be incriminated as a malaria vector in Pakistan[19]. A more recent study found *An. subpictus* negative for the presence of human Plasmodium sporozoites but concluded that "further study is required with even large sample size before declaring that *An. subpictus* is not a vector of *Plasmodium* in Pakistan" [20]. It however plays a significant role in the neighboring countries Afghanistan and India[21]. Hammad and colleagues[22] seem to recognize *An. subpictus* as a major vector alongside *An. culicifacies*. *An. splendidus* has been found infected in Khyber Pakhtunkhwa province, although it's not clear if it is considered as an incidental vector in the region. *An. superpictus* was also found infected, and in fact considered as a major vector in Quetta, Baluchistan in a study conducted in 1935[23]. *An. pulcherrimus* has also yet to be incriminated in transmission albeit being also an abundant mosquito species in Pakistan[24].

Annex 3. Recent trends and current situation

The actual extent of the malaria burden in Pakistan is still unknown. According to the WHO estimates the number of malaria cases is likely 705 532 (545 000 – 987 000)[25] in 2018. A great proportion of malaria cases are still diagnosed and treated on clinical ground. During 2015-2018, the improved access to public and private health sector facilities and increased use of RDTs have resulted in better reporting on confirmed malaria across the country (especially from the 72 GF-supported districts) reaching 374 706 in 2018 (see **Figures 5 & 6**).

[18] Naeem H, Ashraf K, Rashid MI, ur-Rehman H, Oneeb M, Akbar H (2014). Insecticide resistance status of Anopheles subpictus from District Kasur, Punjab, Pakistan. Science International (Lahore), 26: 1205-1208.

[19] Herrel N, Amerasinghe FP, Ensink J, Mukhtar M, van der Hoek W, Konradsen F (2001). Breeding of Anopheles mosquitoes in irrigated areas of South Punjab, Pakistan. Medical & Veterinary Entomology, 15: 236-248.

[20] Kausar S, Ashraf K, Aftab, Akber H (2014). Vectorial role of Anopheles subpictus by using Polymerase Chain Reaction. Thesis submitted to the Department of Parasitology, University of Veterinary & Animal Sciences, Lahore-Pakistan, published 2014. Abstract available at http://opac.uvas.edu.pk/cgi-bin/koha/opac-detail.pl?biblionumber=3518&shelfbrowse_itemnumber=4527#shelfbrowser.

[21] Chatterjee S & Chandra G (2000). Role of Anopheles subpictus as a primary vector of malaria in an area in India. Japanese Journal of Tropical Medicine & Hygiene, 28: 177-181.

[22] Hammad M, Ahmed N, Khan IA, Shah B, Kan A, Ali M, Rasheed MT, Junaid K, Adnan M, Zaki AB, Ahmed S (2015). Studies on the efficacy of selected insecticides against Anopheles mosquitoes of village Goth Bhoorji (Sindh) Pakistan. Journal of Entomology & Zoology Studies, **3**: 169-173.

[23] Mulligan HW & Baily JD (1936). Malaria in Quetta, Baluchistan. Records of the Malaria Survey of India, 6: 289-385.

[24] Parvez SD, Shah IH, Rai MA (1987). Malaria in Model Town, Lahore. Pakistan Journal of Health, 24: 44-47.

[25] World Malaria Report, Global Malaria Programme, WHO Geneva 2019

Figure 5. Number of blood slides and RDTs taken to examine for malaria in 2013-2018, Pakistan

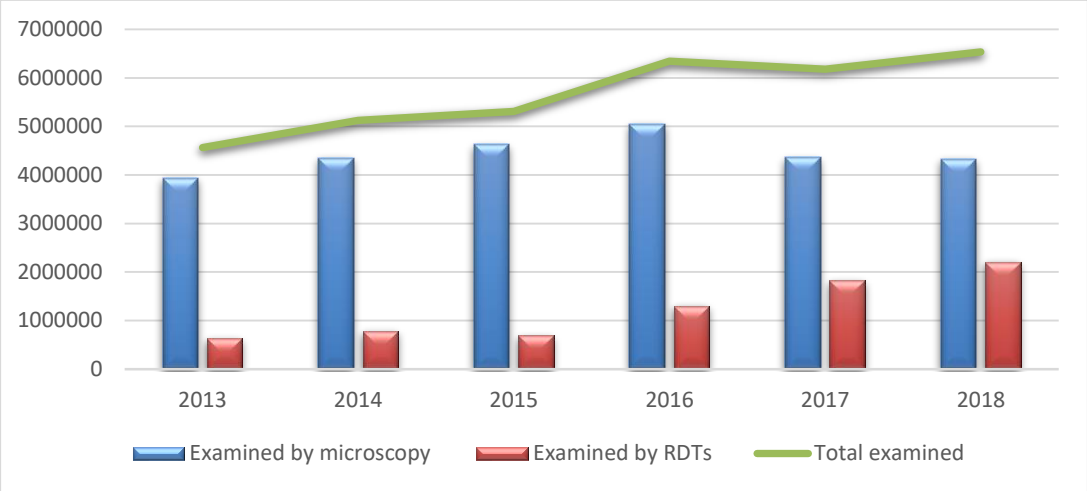
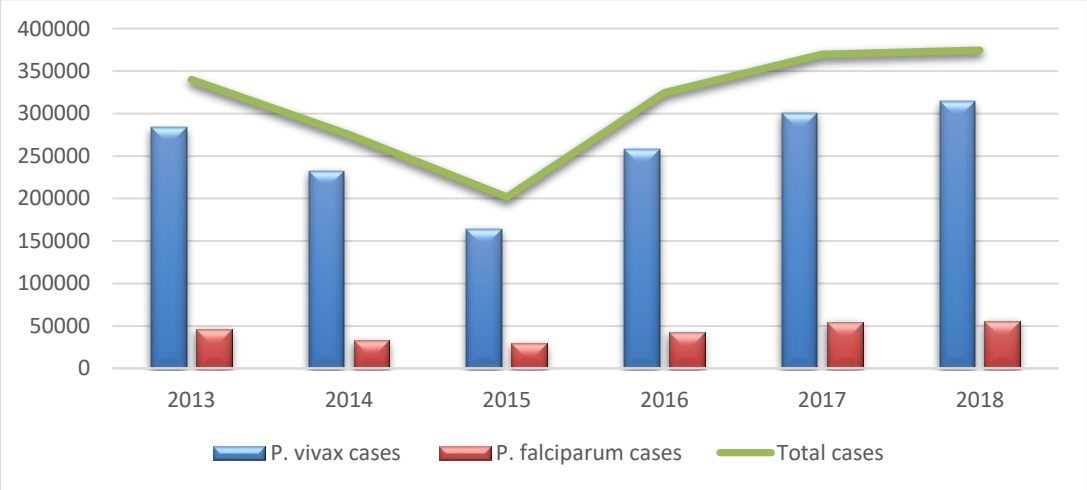


Figure 6. Number of positive malaria tests confirmed by microscopy & RDTs in 2013-2018, Pakistan



Over 2013-2018 *API* as an impact indicator to measure the progress towards malaria control has decreased from 2013 to 2015 but showed an upward trend during 2016-2017 and remaining without a major change in 2018 (with the same trends for *P. vivax* and *P. falciparum* malaria). Test Positivity Rate (*TPR*) as an indicator of diagnostic surveillance and transmission intensity has shown the same trend. Annual Blood Examination Rate (*ABER*) as a proxy indication of access to case detection showing the surveillance coverage of populations at risk of malaria has not significantly changed and remained at level of 3.0% (see **Figures 7 & 8**).

Figure 7. Trends in the reported *API, TPR and ABER* over 2013-2018, Pakistan

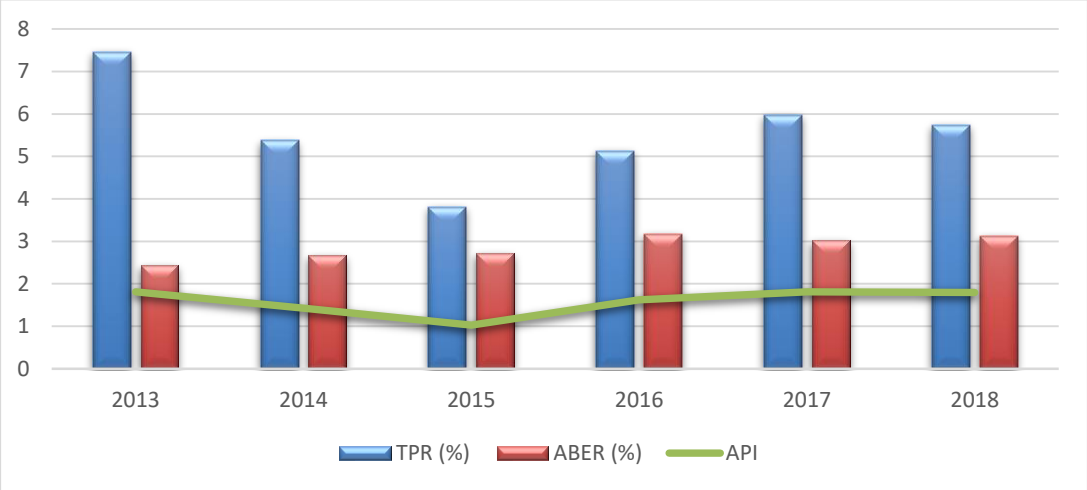
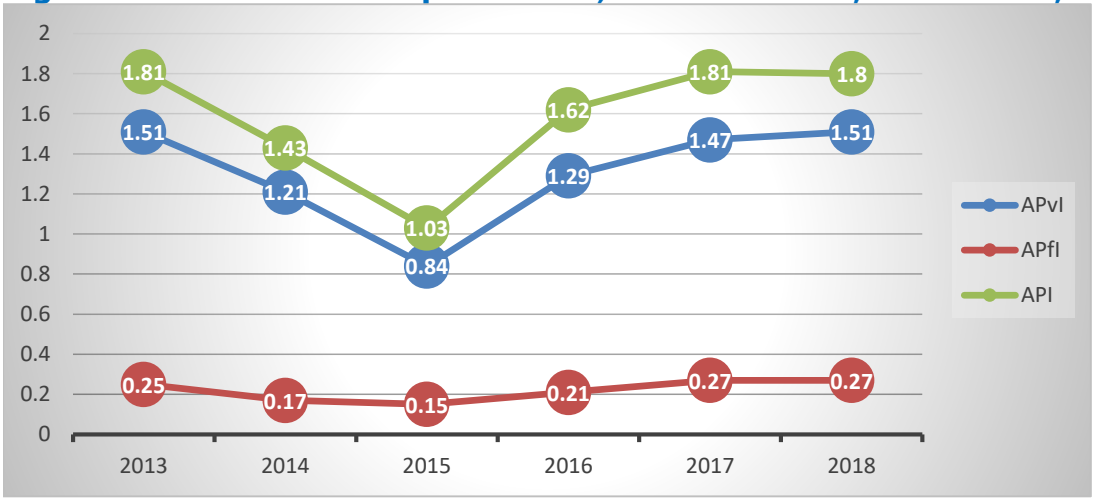


Figure 8. Trends in the reported *API, APvI and APfI*, 2013-2018, Pakistan



Over the past years there has been some increase in the number of confirmed malaria cases across the country. This could be attributed to the enhanced coverage of diagnostic services within the public and private health sectors (especially in the 72 GF-supported districts) leading to an increase in blood examination for malaria (especially by RDTs) among clinically-suspected cases and, as a result, the rise in confirmed cases of malaria. The malaria burden seems much larger than reported because most patients utilize private health services and malaria data is not collected from all the public health care facilities, especially in provinces/districts that are not supported by GF.

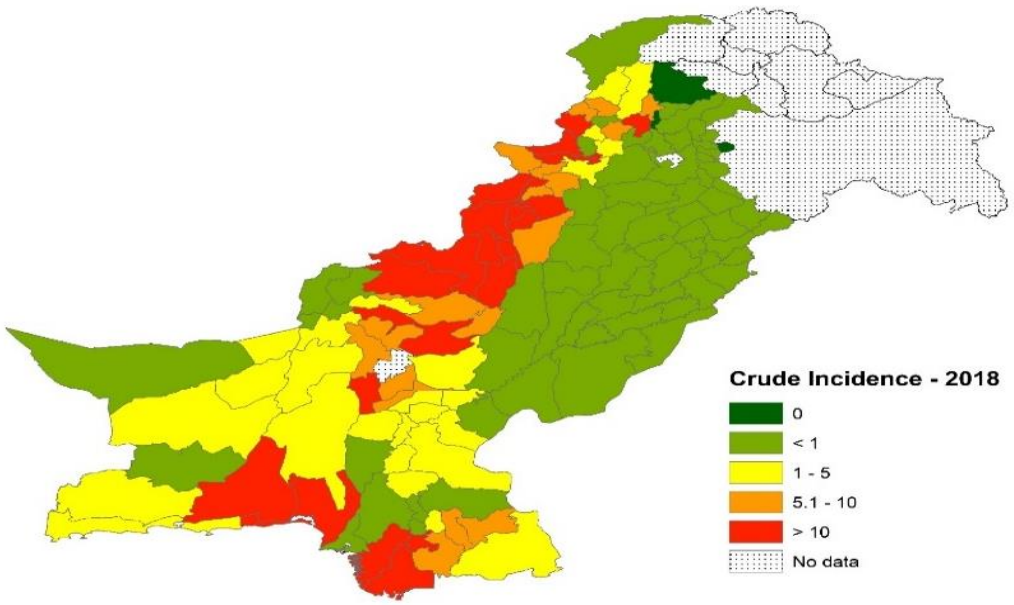
In 2018, the reported *API* for the entire country was 1.73 per 1000 people at risk (see **Table 2**). There was a high variation of *API* and *TPR* within provinces in 2018 (see **Figure 9**).

Table 2. Malaria data, Pakistan 2018

Province	Population	Total examined by Microscopy and RDTs	Number of total positive cases	Number and % of P. falciparum	Number and % of P. vivax	Number and % of mixed infections	*API*	*ABER (%)*	*TPR (%)*
Punjab	112379419	2430367	1875 (100%)	253 (13.5%)	1606 (85.7%)	16 (0.8%)	0.02	2.2	0.08
Sindh	49046230	1778174	129085 (100%)	27627 (21.4%)	100010 (77.5%)	1448 (1.1%)	2.6	3.6	7.3
KP	31418783	1036281	115995 (100%)	3183 (2.7%)	112407 (96.9%)	405 (0.4%)	3.7	3.3	11.2
Merged Areas	5120663	471190	65853 (100%)	5010 (7.6%)	60258 (91.5%)	585 (0.9%)	12.9	9.2	14.0
Balochistan	15096464	745629	61510 (100%)	19564 (31.8%)	40102 (65.2%)	1844 (3.0%)	4.1	4.9	8.3
AJK	4045366	71542	192 (100%)	2 (1.0%)	189 (98.4%)	1 (0.6%)	0.05	1.8	0.3
Pakistan	**217106925***	**6533183**	**374510**	**55639**	**314572**	**4299**	**1.73***	**3.0***	**5.73**

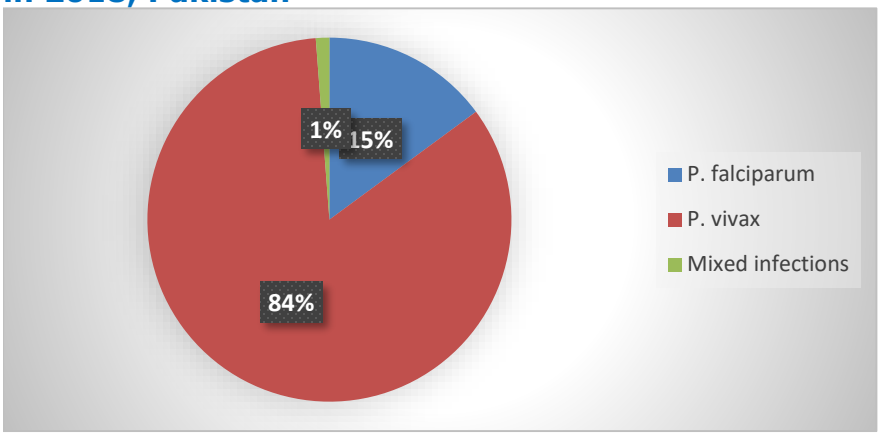
Note: **API & ABER* calculated based on the total country's population

Figure 9. *API* by districts in Pakistan, 2018



Majority of the cases were *P. vivax* followed by *P. falciparum* and then mixed infections (see **Figure 10**). *P. vivax* was a predominant species with the *P. vivax/P. falciparum* ratio between 65.2% and 98.4% reported from all provinces/regions in 2018. Sindh (34.5%), Khyber Pakhtunkhwa (31.0%), Tribal Districts (17.6%) and Balochistan (16.4%) account for 99.5% of all *P. vivax* cases reported in the countr. Most of confirmed *P. falciparum* cases were registered in Sindh (49.7%) and Balochistan (35.2%), reflecting a focal distribution of the *P. falciparum* malaria in Pakistan.

Figure 10. Proportion of *P. vivax*, *P. falciparum* and mixed malaria infections in 2018, Pakistan



In 2018 the average *ABER* was 3.0%, with the lowest (3.5%) in Punjab and highest (9.2%) in Merged Areas/ex-FATA. Average *TPR* was 5.7% varying between 0.05% in Punjab to 11.2% in KP (see **Figure 11)**. In several districts *TPR* increased between 2016 and 2017 but starting from 2018 the rate has been declining. This trend could be explained by the continuous expansion of and better access to malaria diagnostic facilities, especially RDTs which initially allowed the detection of more cases and further led to screening of lower risk populations that became less infected as a result of improved diagnostic surveillance including early diagnosis and prompt treatment.

Figure 11. *TPR* by district, Pakistan 2018

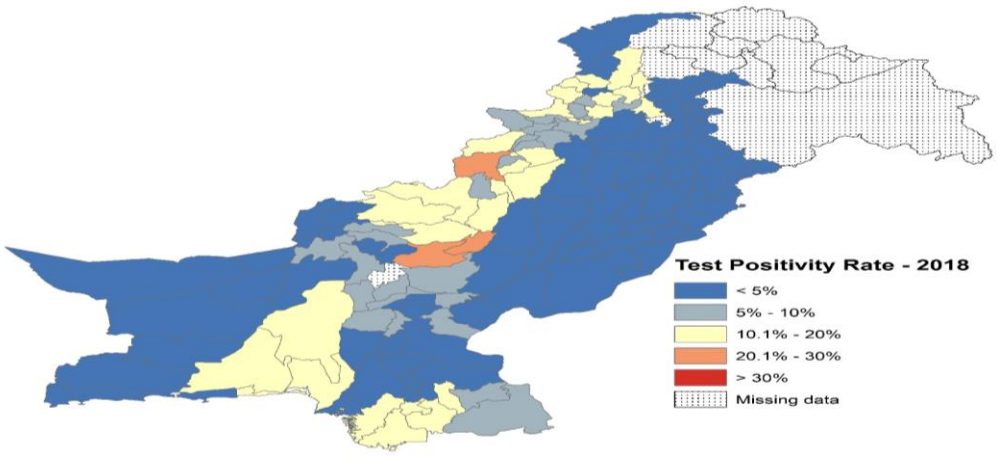
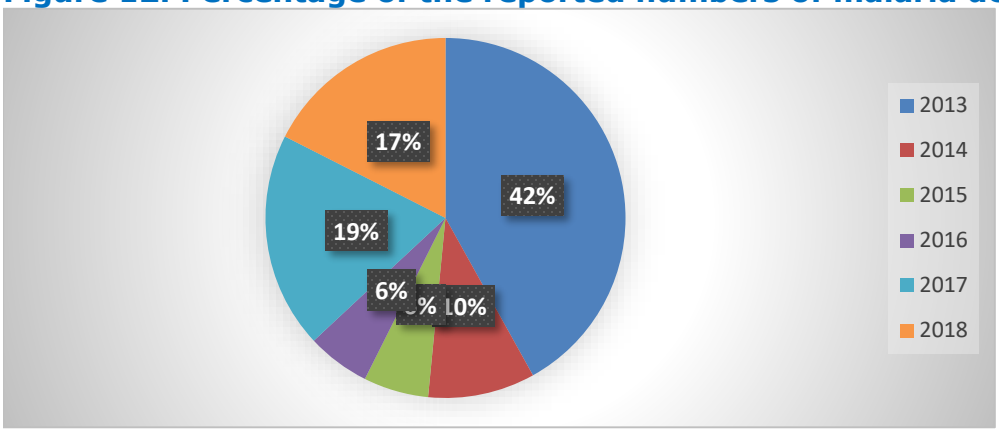


Figure 12 shows the number of deaths due to malaria reported in Pakistan during 2013-2018. 582 deaths associated with malaria were reported between 2013 and 2018. However, information on malaria deaths is very limited. Malaria mortality is not being regularly reported, and data from tertiary care health facilities are not reported in the national health information system. No special surveys on malaria mortality have been conducted apart from the malaria indicator survey 2014 which reports mortality on the basis of verbal autopsy in 32 high-risk districts. Over all 42 deaths were recalled by

the head of households as a result of verbal autopsy. A total of 495 deaths (120 – 880) were estimated by WHO to have occurred in 2018[26].

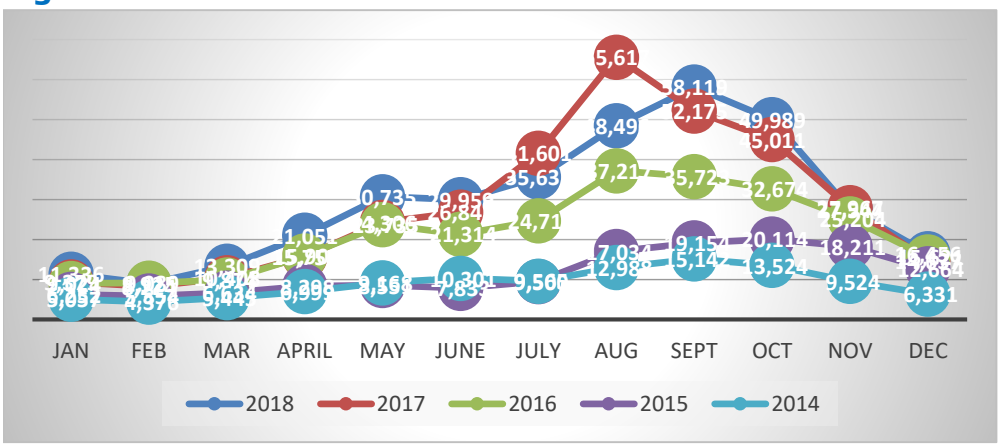
Figure 12. Percentage of the reported numbers of malaria deaths in 2013-2018, Pakistan



In Pakistan where malaria transmission is unstable, malaria outbreaks represent a major public health problem. During the last years several outbreaks of malaria including explosive ones due to *P. falciparum* malaria occurred annually in the country resulting in the sudden increase of the number of reported suspected and confirmed cases of malaria.

Age- and gender-specific morbidity data which is available for 2018 only from 72 high-risk districts have indicated that males (57%) and females (43%) are almost equally affected and the age-group >5 years (83%) were most affected by malaria. A total of 8.4% of the reported confirmed malaria cases in 2018 were found in pregnant women. In recent years the seasonal distribution of malaria was almost the same with most cases reported from August to October (see **Figure 13**).

Figure 13. Seasonal distribution of malaria cases in 2014-2018, Pakistan

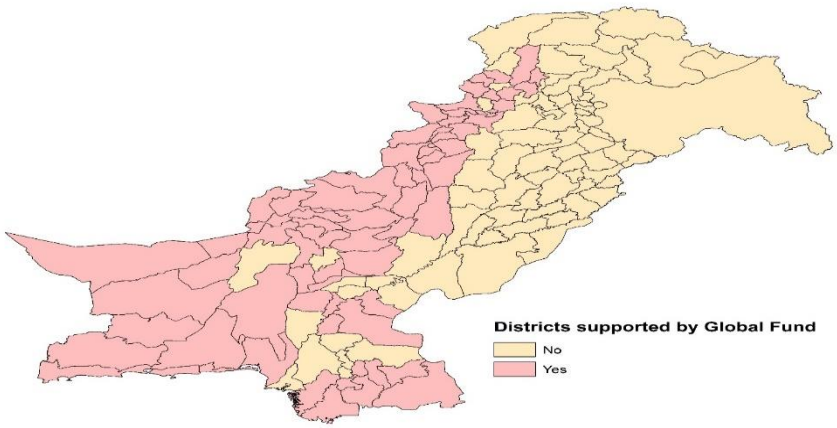


[26] World Malaria Report, Global Malaria Programme WHO, Geneva 2019

Malaria situation in the GF supported districts

In 2018 56.1 million people residing in the 72 GF-supported districts (see **Figure 14**) were covered by 3818 public and private malaria diagnostic facilities, where either microscopy or RDTs were available.

Figure 14. Districts supported by the GF, Pakistan



A total of 351551 malaria cases (accounting for 94% of all cases reported in the country) were confirmed from the GF-supported 72 districts in 2018. This was an increase as compared to 344043 cases reported in 2017, with 293 244 of *P. vivax* cases (83.4%) followed by 54014 of *P. falciparum* cases (15%) and 4293 of mixed cases (1%). Provincial breakdown indicates that most cases (84002 or 32%) were reported from Merged Areas/ex-FATA followed by KP (75653 or 29%), Balochistan (66032 or 26%) and Sindh (34413 or 13%). Highest *API* was reported in Tribal Districts, followed by KP, Sindh, Balochistan and one district of Punjab (DG Khan). Average *ABER* and *TPR* were 6.0% and 10.4%, respectively (see **Table 3**).

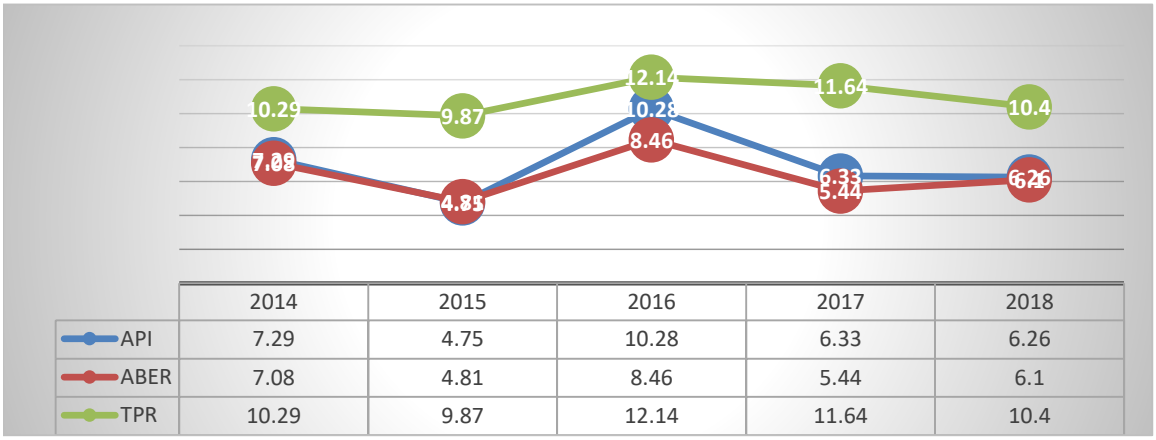
Table 3. Malaria data from 72 GF-supported districts, 2018

Province	Population	Number of cases				Malaria indicators					
		Positive	*P.f*	*P.v*	Mix.	*TPR (%)*	*API*	*ABER (%)*	*P.v (%)*	*P.f (%)*	Mix. (%)
KP	17705434	106950	2822	103742	386	11.6	6.3	5.4	97.0	2.6	0.36
Merged Areas/ ex-FATA	5120663	65853	5010	60258	585	14.0	12.9	9.2	91.5	7.6	0.89
Sindh	18108423	111920	26402	84070	1448	9.5	6.2	6.5	75.1	23.6	1.29
Baluchistan	12240271	66170	19554	44757	1859	8.3	5	6	67.6	29.6	2.81
Punjab (DG Khan)	2957793	658	226	417	15	2.5	0.2	0.9	63.4	34.3	2.28
TOTAL	**56132548**	**351551**	**54014**	**293244**	**4293**	**10.4**	**6.3**	**6.0**	**83.4**	**15.4**	**1.22**

Figure 15 shows that *API* has decreased from 7.3 to 4.8 over 2014-2015 but significantly increased in 2016 reaching 10.3 which was almost double as compared to the previous year. Between 2017 and 2018 *API* declined and remained slightly above 6.0%. The increase in *API* could be attributed to

increased coverage of the case management services (adding new districts: 43 districts in 2016 to 72 districts in 2017). TPR and ABER have showed almost the same trend over 2014-2018.

Figure 15. Trends in reported *API, TPR* and *ABER* in 72 GF-supported districts, 2014-2018



	2014	2015	2016	2017	2018
API	7.29	4.75	10.28	6.33	6.26
ABER	7.08	4.81	8.46	5.44	6.1
TPR	10.29	9.87	12.14	11.64	10.4

There has been an increase in the utilization of RDT tests and a drop in microscopic examination in the GF supported districts. Almost all malaria diagnosis carried out in non-GF supported districts was by means of microscopy (see **Figure 16**). Since the burden of malaria was larger in the GF-supported districts, *TPR* was higher there (see **Figure 17**).

Figure 16. Number of suspected malaria patients tested by RDTs and microscopy in the GF-supported and non-supported districts, Pakistan, 2013-2018

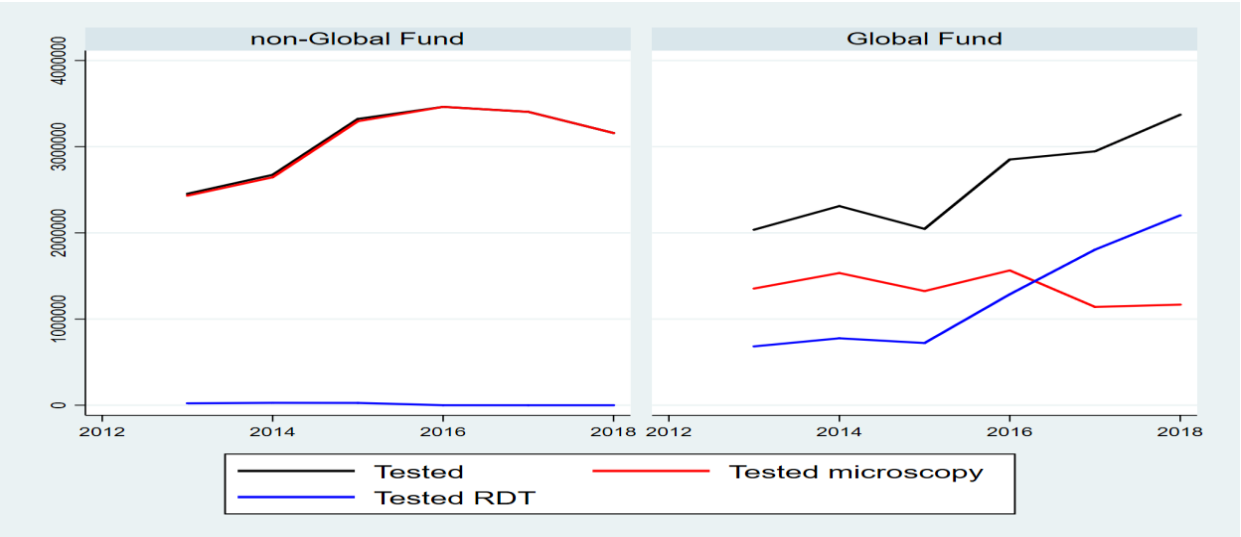
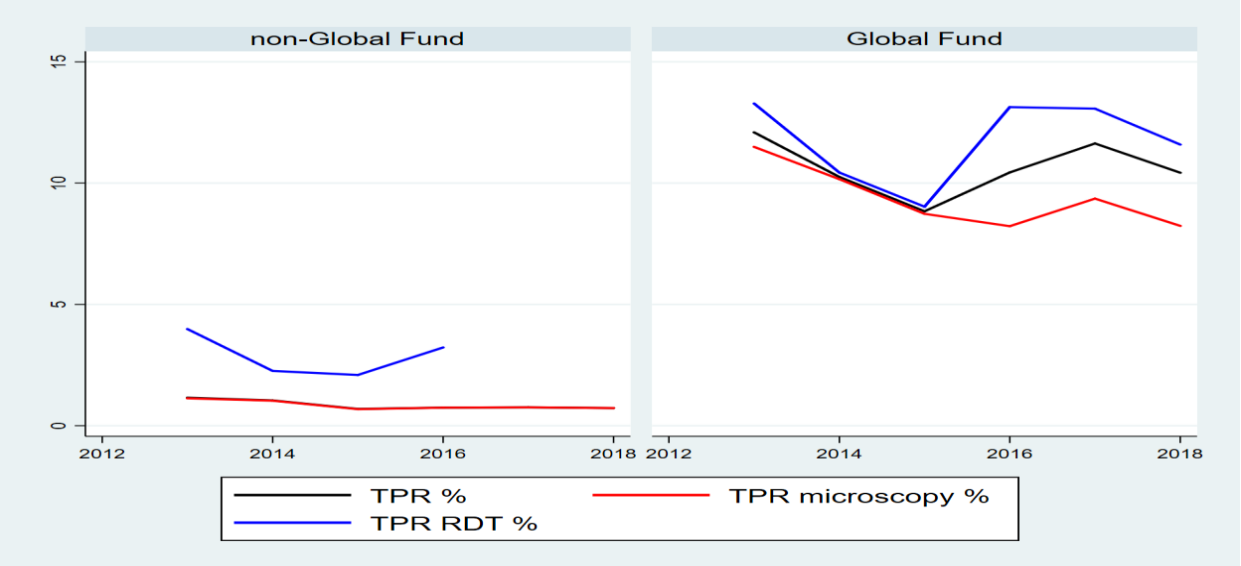


Figure 17. Percentage of *TPR* by RDTs and microscopy in the GF-supported and non-supported districts, Pakistan, 2013-2018



A significant rise in the number of confirmed malaria cases was reported from private health sector facilities, with almost 50% increase in cases between 2016 and 2018 (see **Figure 18**).

Figure 18. Number of malaria cases detected by public and private health sector facilities, 2016-2018

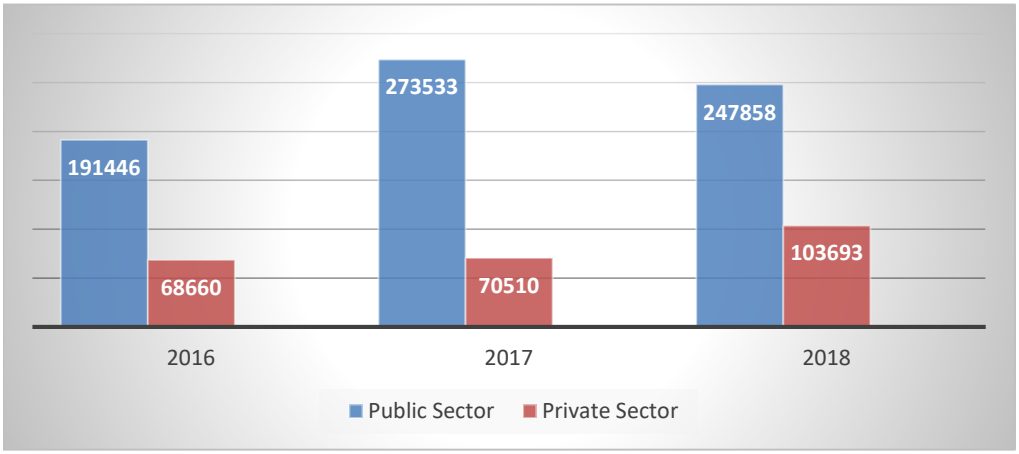
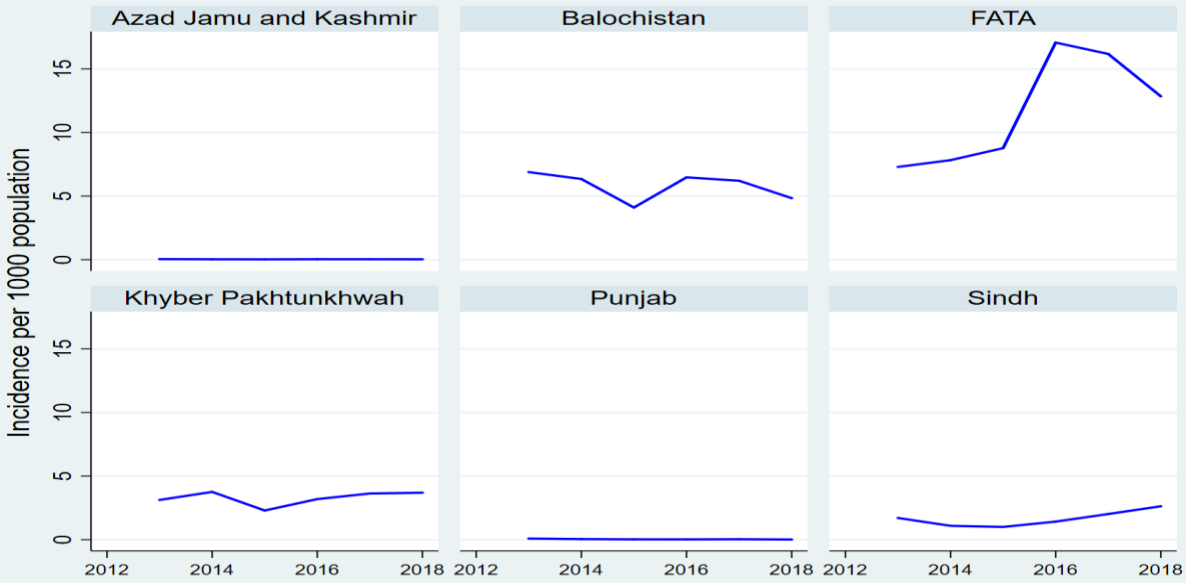


Figure 19 shows the *API* trends in different provinces which were supported by the GF during 2013-2018. There has been no change in the reported *API* in Punjab over time. However, a slight increase in Sindh and KP (2015-2018) and an initial increase (2015-2016) following a reduction (2016-2018) in the reported *API* has been observed in Balochistan and Tribal Districts where highest malaria incidence was reported.

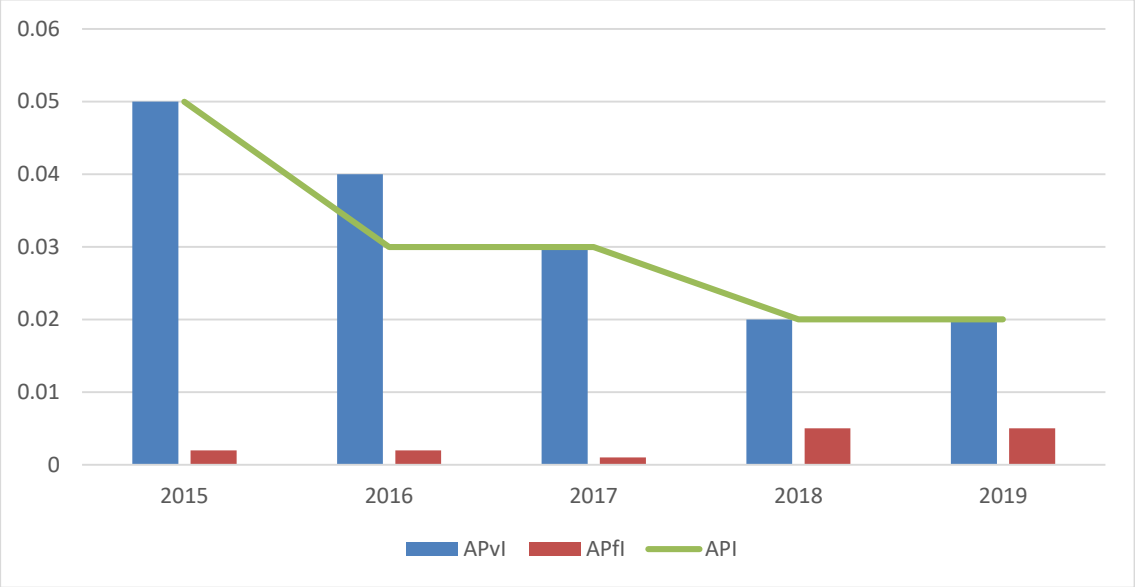
Figure 19. *API* rates in different provinces supported by the GF, Pakistan 2013-2018



Progress towards malaria elimination

Over the past five years Pakistan has made some progress towards lowering the disease burden and reducing malaria incidence. Some areas of the country (e.g. Punjab Province), where cases of particularly *P. falciparum* dropped significantly have become eligible for malaria elimination (see **Figure 20**). Similarly, AJK, GB and ICT are also candidates for malaria elimination. At the stage where the number of confirmed malaria cases becomes low, as observed in the Province of Punjab and obviously in some other provinces/districts, the use of conventional malariometric indicators like *API* becomes meaningless, and the main question is then to ascertain whether indigenous malaria transmission is still taking place in a given area. At this stage all the cases that are reported should be subject to epidemiological investigation. The result of the investigation is an epidemiological diagnosis of each malaria case in terms of its place, time and source. The presence of particular categories of cases is the basis for classification of malaria focus. Since the focus as a minimum entity is the object of malaria action, this concept is critical for those programmes that aim at interruption of local transmission of malaria. The identification and monitoring of the functional status of malaria foci is a cornerstone for success towards malaria elimination. This procedure is not mandatory in areas where the interruption of malaria transmission is not envisaged.

Figure 20. *API, APfI & APvI*, Punjab, 2015-2019



Annex 4. Malaria Strategic Plan, Pakistan 2015-2020

Goal

By 2020, reduce the malaria burden by 75% in high and moderate endemic districts/agencies and eliminate malaria in low endemic districts of Pakistan.

Objectives

- To achieve <5 API in high endemic areas of province of Balochistan, Sindh, KP and Merged Areas/ex-FATA region by 2020
- To achieve <1% API within moderate endemic districts of Balochistan, Sindh, KP and Punjab by 2020
- To achieve Zero API within low endemic districts of Sindh, KP and Punjab by 2020

Specific objectives

- To ensure and sustain the provision of quality assured early diagnosis and prompt treatment services to >80% at risk population by 2020.
- To ensure and sustain coverage of multiple prevention interventions (IRS, LLINs & and other innovative tools and technologies) to 100% in the target high risk population as per national guidelines and coverage in foci in moderate and low risk districts by 2020.
- To increase community awareness up to 80% on the benefits of early diagnosis and prompt treatment and malaria prevention measures using health promotion, advocacy and BCC intervention by 2020.

- To enhance technical and managerial capacity in planning, implementation, management and MEAL (Monitoring, Evaluation, Accountability and Learning) of malaria prevention and control intervention by 2016.
- To ensure availability of quality assured strategic information (epidemiological, entomological and operational) for informed decision making and; functional, passive and active case based weekly surveillance system in all low risk districts by 2017.
- To ensure provision of malaria prevention, treatment and control services in humanitarian crises, emergencies and cross-border situation.

Outcomes

- At least 80% of those suffering from uncomplicated & complicated malaria start getting standardized and free of cost anti-malarial treatment.
- 100% of health facilities with no reported stock-outs of nationally recommended antimalarial drugs during the past three months.
- At least 80% of the private care providers involved in malaria case management have started reporting confirmed malaria cases.
- All the suspected malaria cases visiting public sector facilities get their blood examined with microscopy or RDT (ABER >10%).
- More than 80% of households in high risk of malaria get at least one LLINs.
- At least 80% of households in high risk of malaria get sprayed with IRS annually.
- At least 80% of people in high malaria endemic districts know the cause, symptoms, and preventive measures for malaria.

Impact

- Bring down annual incidence of malaria to less than 1 case per 1000 population in 10 districts by 2020.
- Bring down annual incidence of malaria to less than 5 cases per 1000 population in 66 districts/agencies by 2020.
- At least 50% reduction in mortality due to malaria by the year 2020, taking 2013 as baseline.
- Bring down annual incidence of malaria to Zero per 1000 population in 47 districts by 2020.

Annex 5. Key achievements and challenges in malaria control and elimination

The below-listed observations have been made during the MPPR conducted in the end of 2019 in Pakistan and reflected in the final MMPR report[27].

Programme management

It is anticipated that the stated goal of the current National Strategic Plan (NSP) to reduce the malaria burden by 75% will be partly achieved by 2020 considering the differences in progressing towards the goal in high-, moderate- and low-risk endemic districts of Pakistan.

[27] Unpublished final MPPR report, DoMC, Pakistan 2020

There is no high-level decision-making body on Malaria at national and provincial levels. There are no dedicated malaria control personnel at provincial and district levels, who could co-ordinate and supervise activities within the integrated system and monitor malaria outcomes. There are insufficient budgetary allocations for malaria control and elimination from the government. Malaria control in high-risk malaria districts is heavily dependent on international funding provided by the Global Fund (GF). GF support in the country has been seen as a dichotomy of the interventions in different malaria epidemiological setting resulting in inequitable coverage of interventions across the country. Furthermore, in the GF support resulted in a parallel system of malaria surveillance and control interventions in the grant intervention districts.

The new National Strategic Framework for Malaria, 2021-2030 along with relevant Strategic Plans for each province should be developed based on outcomes of the MPPR conducted in the end of 2019. The government along with partners concerned should be determined to provide necessary support to the new strategy in the course of its implementation and should accord it as a high financial priority in its health and socio-economic development plans.

The design of multiple interventions supported by GF should be reviewed in light of the outcomes of the MPPR, considering the need for strengthening of malaria vector-borne diseases control programmes and general health services and their coordination, in particular surveillance and supply management systems. In addition to extending enhanced surveillance to all malaria endemic districts irrespective of risk of malaria, the GF should continue strengthening capacity in specific service deliveries and involve local NGOs in activities in which they have comparative advantage, such as engagement of private sector, deployment of LLINs, BCC and community mobilization.

Case management

In recent years, the coverage and quality of case management has greatly improved in Pakistan as a result of strengthening public health services, expanding community-based services and engaging with the private sector for delivery of malaria curative services as well as providing adequate diagnostics and medicine, particularly at the periphery. Substantial effort has been taken to enhance quality assurance of diagnostics, antimalarial medicines and case management services.

Currently malaria diagnosis in Pakistan is based on microscopy and RDTs. However, treatment of patients on clinical ground, irrational use of anti-malarial drugs without parasitological confirmation in the private sector and self-medication are still very common. As a result, access to prompt diagnosis and effective treatment of malaria remains inadequate and delays in treatment results in malaria morbidity and persistent transmission.

Coverage of diagnostic services in the public sector has expanded in recent years in the GF supported districts but diagnostic services remain poorly accessed by the population, particularly in districts not supported by the GF and lack rigorous quality control. Microscopy and RDT testing are not available in

the peripheral public health facilities, nor in hospitals after 2 PM and during weekends resulting in one of the reasons of malaria treatment based on clinical diagnosis alone.

Quality of parasitological diagnosis by microscopy remains uncertain. The policies on Quality Assurance (QA)/Quality Control (QC) of malaria microscopy are not always implemented and need reorganization of provincial reference laboratories for QA/QC. A system for RDT quality assurance is not yet in place. There is shortage of dedicated laboratory technicians and microscopists compared with the existing needs, and limited opportunities for refresher training as well as problems in replacing defective microscopes and diagnostic supplies, particularly in moderate- and low-risk areas. There is a lack of qualified and skilled laboratory technicians to serve as trainers in training workshops.

Malaria treatment in the public sector is provided free of charge. For testing and treatment communities are accessing Basic Health Units (BHUs) to seek malaria treatment and at some instances, LHWs are also referring malaria suspects to the nearest BHUs and provide malaria education to families, but access to BHUs and coverage is uneven. The number of trainings on case management conducted in high-risk districts with support from the GF achieved >95% of target, but the proportion of physicians updated on the 2017 national treatment guidelines remains very low as there are no mechanisms for knowledge dissemination by trained clinicians. Only a limited number of staff from tertiary care hospitals are trained on national guidelines for the management of severe and complicated malaria and does not report on hospital admissions and deaths due to malaria. Radical treatment with primaquine for vivax malaria for 14 days is often not prescribed by clinicians. Tests for Glucose-6-Phosphate Dehydrogenase (G6PD) deficiency screening are not available and a single low dose primaquine for falciparum malaria is not prescribed by clinicians in spite it does not require G6PD testing.

The private sector is a major provider of malaria treatment for the majority of the population and remains highly unregulated. There is non-compliance with national malaria treatment guidelines, and the majority of cases are treated only on the basis of clinical diagnosis. Injection Chloroquine (CQ) although banned are still available in the market and inappropriately used to treat malaria in the private sector. Sulfadoxine-pyrimethamine is also given in the private sector for the treatment of malaria. Except for relatively few private clinics in GF supported districts, the great majority of private clinicians do not report patients which have been treated for malaria.

Disease prevention

There are two principal vector control measures such as LLINs and, to much lesser extent, IRS that are currently part of the national malaria control strategy in Pakistan. The national vector control policy includes IRS for outbreak/epidemic situations and LLINs in high-risk districts. The national LLINs distribution policy focuses on universal coverage for the entire population at risk of malaria in high-risk rural districts and included 'mass distribution' and continuous distribution for the pregnant women, but this is being implemented only in few selected GF supported districts and there is no replacement policy of LLINs. To achieve universal coverage with LLINs in the target high-risk districts, DoMC and the Indus Hospital (TIH) have successfully completed mass distribution campaign in 11 districts of Balochistan, Sindh, Khyber Pakhtunkhwa (KP) and Merged Areas/ex-FATA in 2018, funded by the GF (2.5 million

LLINs protecting around 6.25 million population).

The existing capacities for vector control at the national and provincial levels are limited. DoMC at national level is not directly involved in any IRS operations or distribution of LLINs, and these activities are carried out by the provinces. The deficiency of entomology and vector control staff and skilled technicians is acute and is directly affecting program performance. The entomologists are not provided with relevant equipment or logistic support to conduct vector surveillance and implement high quality vector control. Training on vector control and entomological surveillance is largely inadequate.

Pakistan has recently developed and endorsed Integrated Vector Management (IVM) guidelines to guide the implementation of vector-borne diseases control. The Ministry of NHSRC has yet to perform a Vector Control Needs Assessment (VCNA) for IVM as a basis for developing an IVM strategic plan. A national Steering Committee to oversee of conducting the VCNA for development of IVM strategy is also yet to be constituted. Once the strategic plan is finalized the implementation modalities can be defined.

Until recently, the programmes have been procuring the insecticides from the Public Sector Development Program (PSDP) budget at the local market which are not complying with WHO quality specifications. The current policy is that products should be procured from WHO pre-qualified sources which is not being always followed. Programme has Standard Operating Procedures (SOPs) for management of Public Health Pesticides (PHPs) which include the procurement, transportation, storage and disposal in the drafted form which needs to be finalized urgently through consensus of all stakeholders and partners. WHO recommended practices for public health pesticides storage and disposal are not strictly followed.

No routine vector surveillance is being currently done. This has resulted in a lack of updated information on vector bionomics. There are no updated vector maps with information on vector species, distribution, breeding sites, resting and biting habits and insecticide susceptibility. There is no regular mechanism for insecticide resistance monitoring (IRM). The available data (2017) revealed possible resistance to pyrethroids, organochlorines, organophosphates in *An. culicifacies* and *An. stephensi.* suggest the rotation of carbamate group with pyrethroids and/or switch to New Generation Insecticides or LLINs as IRM strategy.

There is no collaboration on entomological surveillance and research between the DOMC and other relevant departments of the government and research institutions and universities at the national level. There was no community-based survey to assess utilization of LLINs, despite this was planned. A proper functioning system to periodically observe "wear and tear" of the distributed LLINs is not in place.

Malaria surveillance

Malaria control and elimination is not adequately data-driven and evidence-based because of a poor disease surveillance system in its coverage and quality, particularly in non-GF supported districts of Pakistan. Malaria is a reportable disease but not a notifiable disease. Malaria data on total examined

by microscopy or RDT and positive cases specified by parasite species are collected, processed and analyzed usually on monthly basis. A tiny proportion of presumed cases (case suspected of being malaria that is not confirmed by a diagnostic test[28]) is also reported. Information on severe and complicated (SCM) cases and deaths due to malaria among hospital admissions is not collected. There is no comprehensive malaria database to collate malaria information from different sources and systems. Surveillance system mainly covers public health sector with very limited information from private sector. Since cases are not reported from most of the private sector and tertiary level hospitals the actual burden of malaria cannot be properly estimated.

Multiple (new and old) malaria surveillance and information systems i.e Malaria Information System (MIS) (G30 Form), DHIS and DHIS2 (FM 1-4 Forms) are in place simultaneously in the country and they are not unified or coordinated. The new DHIS2 surveillance tools developed (FM1-4 Forms) are being currently used for reporting from 72 districts supported by the GF, whereas in the non-GF supported districts data are being collected on MIS (G30 Form) developed during the eradication era, with different sets of malaria data being collected. The DHIS system is present in all districts and systematically reports lower malaria cases, compared to the DHIS2 system.

The existence of these three systems has led to fragmented malaria data collection and surveillance. No single national database exists and no organization or individual in the country has a national overview, on a routine basis, of all relevant key epidemiological indicators. The current situation prevents effective monitoring and data use for programmatic action. Furthermore, the lack of standardized approach across the country has led to differences across the provinces in terms of guidance documentation on recording and reporting and data validation, case definitions, variables collected, indicators and monitoring and evaluation processes, all of which affect the accuracy of reporting and data quality.

Prevention and control of malaria outbreaks

Outbreaks of malaria of varying magnitudes continue to occur on the fringes of endemic areas in Pakistan. The appearance and explosive development of outbreaks indicates the failure on the part of national health services to forecast and prevent this kind of events. The genesis and mechanisms of malaria outbreaks in Pakistan are complex and depend on both qualitative and quantitative relationships between the human host, the parasite and its vector as well as on the biological, physical, political and economic characteristics of the environment. One of the major features of malaria ecosystems in Pakistan is instability of various degrees and periodic and sporadic outbursts of the transmission leading to excessive morbidity associated, at times, with mortality.

The adequate system for epidemic forecasting, preparedness and response is lacking and most outbreaks of malaria are not detected, reported and dealt with. Absence of an early warning system for outbreak prevention and detection remains a big challenge. The defined standard criteria for early detection and confirmation of malaria outbreaks/epidemics are currently missing.

[28] WHO Malaria Terminology, GMP WHO HQ, Geneva, 2016, updated 2019

Monitoring and evaluation

There is limited capacity to coordinate and implement M&E activities in malaria control programs at the national and provincial levels. M&E guidelines and tools are not always available at provincial and district levels. A structured mechanism to monitor the GF funded activities does exist in GF supported districts but still there are some gaps. Minimal or no M&E activities are implemented in districts not supported by the GF.

The DoMC does not have M & E officer, but the Common Management Unit established in January 2018 with support from GF Grant provides M&E support to the Directorate. There is a qualified M&E Manager at the national level supported by a Data analyst/IT in charge and a data officer. Similarly, the private sector PR (TIH) also has a M& E manager supported by MIS and M&E coordinators.

Roles and responsibilities for the M&E Unit have been clearly spelled out in the updated M&E manual. At the provincial levels (KPK, Sindh and Baluchistan) Provincial Management Units have been established each having a trained M&E coordinator and is equipped to carry out the assigned tasks. At the district level District Management Units have been established in each district with M&E officers in place, but in some districts, there are no M&E staff. Structured M&E guidelines and SOPs have been updated by the programme in 2017.

The national monitoring and evaluation plan 2015-2020 was developed in 2016. The plan spells out the key functions and actions of the malaria M&E system in accordance with the National Malaria Strategic Plan 2015-2020. The plan builds upon systems and structures already in place. The systems in place include the routine service data collection, periodic population-based surveys, such as drug monitoring survey, sentinel sites, and special operational research activities. In line with the national strategic plan 2015-2020, the DoMC has clearly described the impact and outcome indicator measurement framework in the revised M&E plan.

The goal is to strengthen system/structures that would provide timely and reliable information on the performance of malaria programme and effectiveness of intervention strategies to guide program decision-making for malaria control in Pakistan. The objectives include (1) to attain timely and complete monthly malaria morbidity and mortality; (2) to receive reports from at least 90% health facilities using MIS; (3) to cover 75% of country by entomological surveillance; (4) to develop Semi Annual and Annual Reports at National and regional levels; and (5) to generate timely, complete and accurate epidemiological population baseline data for pre-elimination.

The M&E Plan commits to ensure availability of data recording registers and surveillance forms at health facility level onwards, for smooth malaria reporting. In addition, since the web-based MIS is fully functional, the districts have been equipped with computer and internet connections for smooth data entry and timely web hosting of data and reports. The disease specific data generated by the malaria information system is consolidated and periodically shared with the ministry of National Health Services, Regulations and Coordination. In addition, the data is also shared with various stake holders on quarterly/annual basis.

Annex 6. Malariological stratification, Pakistan 2018-2019

Malaria is a complex disease and its distribution in Pakistan varies largely from place to place, and it is dependent upon a variety of factors related to parasites, vectors and human populations under different geographical, ecological and socio-economic conditions. Using of the 2018 available data on annual parasite incidence (*API*), all districts in Pakistan were classified into four main strata with very high (districts with *API* above 10.1), high (districts with *API* between 5.1 and 10.0), medium (districts with *API* between 1 and 5), and low (districts with *API* below 1) risk of malaria transmission (see **Figure 21**). The maximum adjusted incidence value observed between 2018 and 2019 was used to categorize districts outside of Punjab (incidence data for 2018 was used for Punjab) into four categories (see **Figure 22**).

Figure 21. District-wise malaria strata, Pakistan 2018

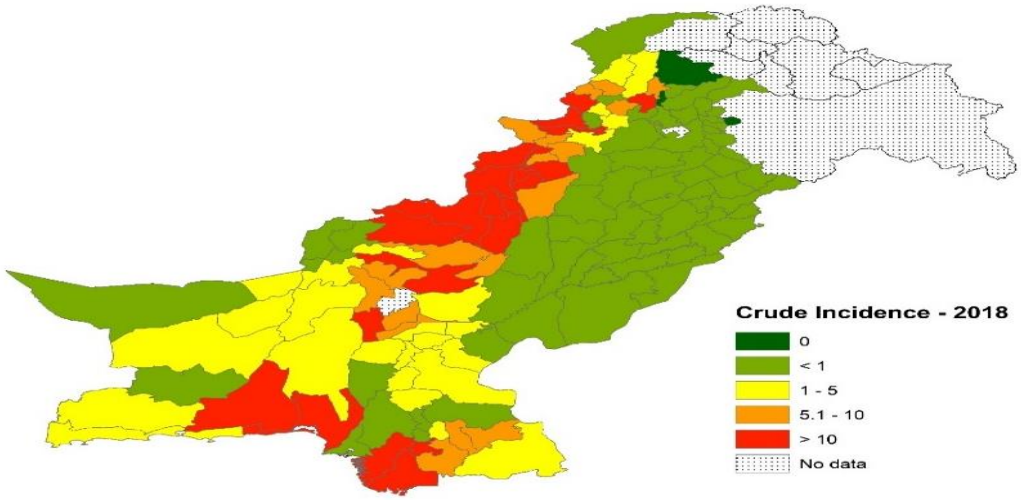
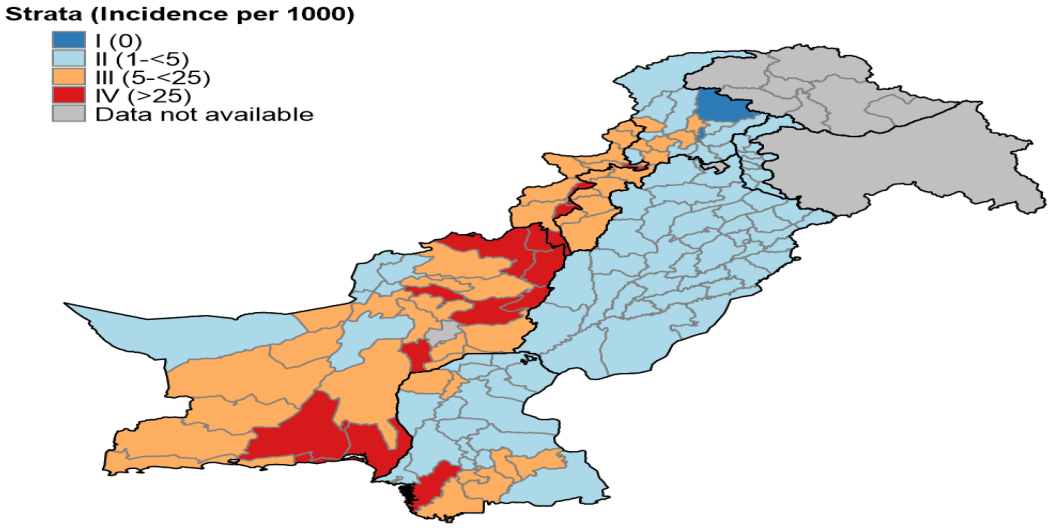


Figure 22. District-wise malaria strata based on adjusted incidence value observed in 2018-2019, Pakistan



The reported number of malaria cases and proportion of *P. falciparum* cases by district during 2018-2019 are shown in **Figures 23-24** below.

Figure 23. Number of reported cases of malaria by districts, Pakistan 2019

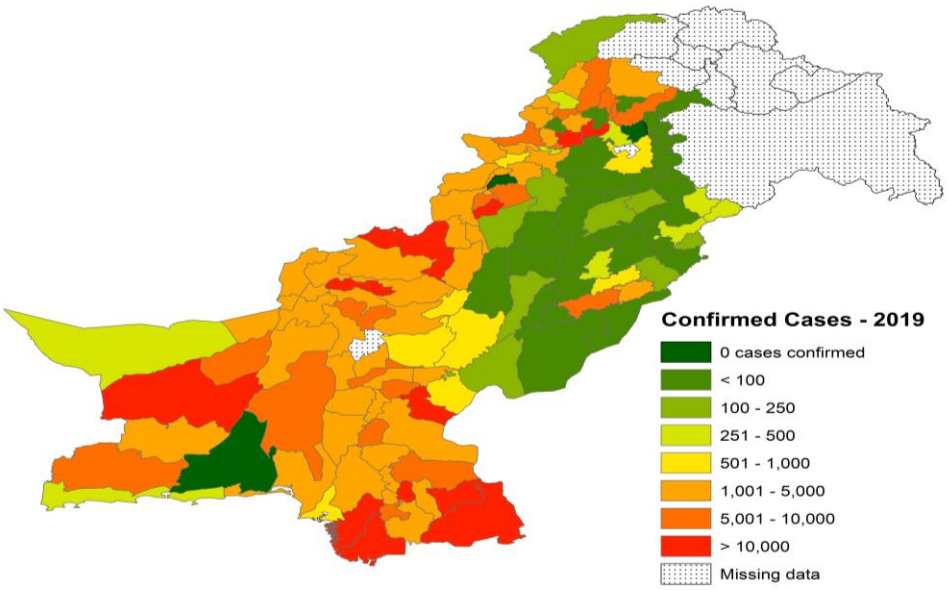
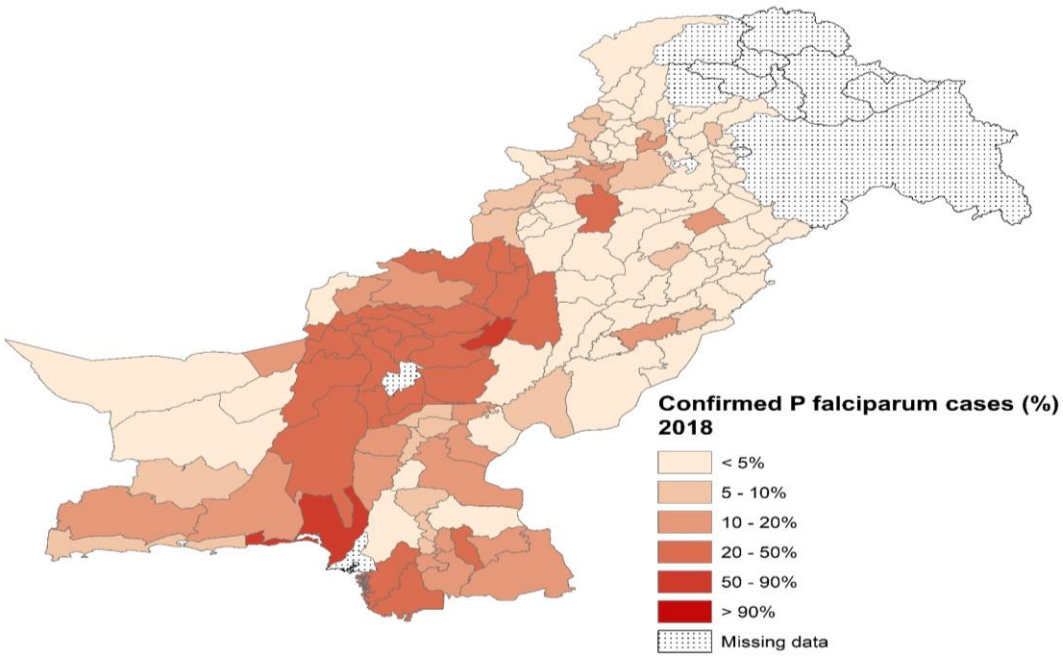


Figure 24. Proportion of *P. falciparum* malaria by district, Pakistan 2018



Annex 7. Proposed surveillance indicators in the burden reduction phase

Indicator	Definition	Purpose
Impact Indicators		
Annual Parasite Incidence (API)	Number of confirmed malaria cases per 1000 people at risk per year	To measure trends in malaria morbidity and identify/compare areas with ongoing transmission of malaria
Annual P. falciparum Parasite Incidence (APfPI)	Number of confirmed *P. falciparum* malaria cases per 1000 people at risk per year	To measure trends in *P. falciparum* malaria morbidity and identify/compare areas with ongoing transmission of *P. falciparum* malaria
Annual P. falciparum Parasite Incidence (APvPI)	Number of confirmed *P. vivax* malaria cases per 1000 people at risk per year	To measure trends in *P. vivax* malaria morbidity and identify/compare areas with ongoing transmission of *P. vivax* malaria
Malaria mortality	Number of confirmed malaria deaths x 100000/Total population at risk	To monitor the impact of programme interventions on the number of deaths due to malaria
Percentage of all deaths to malaria deaths.	Number of malaria deaths confirmed x 100/All deaths reported per year	To reflect the proportion of malaria deaths over time in a population.
Percentage of malaria cases disaggregated by parasite species	Number of confirmed malaria cases by species x 100/Total number of confirmed malaria cases	To reflect the proportion of cases due to various species and provide information on the likelihood of observing severe cases
Malaria Test Positivity Rate (TPR) by RDT and/or microscopy	Number of confirmed malaria cases x 100/Total number of patients receiving a parasitological test	To reflect trends in malaria morbidity and identify areas with the most intense malaria transmission.
Outcomes/Outputs indicators: quality and coverage of case management, disease prevalence and malaria surveillance		
Percentage of suspected malaria cases that have had a diagnostic test.	Number of patients received a parasitological test x 100/Total number of suspected cases of malaria.	To reflect the extent to which a malaria programme is able to achieve the goal when all suspected cases received a diagnostic test.
Percentage of patients with UM and SCM receiving treatment according to national policy.	Number of patients with UM+SCM received treatment according to national policy x 100/Total number of malaria patients treated per year.	To reflect the extent of malaria treatments according to national policy.
Percentage of malaria cases detected by private health care institutions	Number of malaria cases detected within private health sector x 100/Total number of malaria cases detected	To reflect the extent to which private health sector providers involved in detection of malaria
Proportion of health facilities with no reported stock out of the recommended drugs lasting more than a week at any time during the past 3 months.	Number of health facilities with no reported stock out of the recommended drugs x 100/Total number of health facilities.	To reflect the extent of health facilities sufficiently supplied with recommended drugs.

Percentage of households with at least one insecticide treated net.	Number of households with at least one insecticide treated net x 100/Total number of households.	To reflect the availability of insecticide treated nets in a population.
Proportion of people who slept under an insecticide-treated net in the previous night.	Number of people who slept under an insecticide-treated net the previous night x 100/Total number of people.	To reflect the usage of insecticide-treated nets in the previous night in a population.
Proportion of children under five years old who slept under an insecticide-treated net in the previous night.	Number of children under five years old that slept under an insecticide-treated net the previous night x 100/Total number of children under five.	To reflect the usage of insecticide-treated nets in the previous night among children under five years old.
Proportion of pregnant women who slept under an insecticide-treated net in the previous night.	Number of pregnant women that slept under an insecticide-treated net the previous night x 100/Total number of pregnant women.	To reflect the usage of insecticide-treated nets in the previous night among pregnant women.
Proportion of people who are aware about malaria and preventive measure.	Number of people with sufficient knowledge on malaria and its prevention x 100/Total number of people.	To reflect the education level of population on malaria and its prevention.
Case Fatality Rate (*CFR*).	Number of malaria deaths confirmed x 100/Total number of SCM.	To measure effectiveness of SCM management in a health facility.
Percentage of rapid response teams sufficiently equipped and supplied.	Number of rapid response teams sufficiently equipped and supplied x 100/Total number of rapid response teams.	To reflect the extent to which the capacity for emergency/epidemic preparedness and response adequate in a province.
Percentage of entomological staff trained last year.	Number of entomological staff trained x 100/Total number of entomological staff.	To reflect the extent to which the entomological service staff trained
Annual blood examination rate (*ABER*).	Number of patients receiving a parasitological test x 100/Total population at risk of malaria.	To reflect the extent of diagnostic testing in a population.
Completeness of health facility reporting malaria data.	Number of health facilities reported malaria data x 100/Total number of health facilities.	To measure the completeness of malaria reporting in a district/province.

Annex 8. A recommended set of proposed indicators in the elimination phase

Indicator	Target or Norm	Purpose
Impact Indicators		
Number of confirmed malaria cases disaggregated by classification status (indigenous *versus* introduced *versus* imported *versus* induced *versus* relapsing) per administrative unit per year		To measure the progress towards malaria elimination
Number of foci by classification status (active *versus* non-active residual *versus* cleared) per administrative unit per year		To measure the progress towards malaria elimination
Outcomes/Outputs indicators: quality, coverage, timeliness and completeness of surveillance		
% of foci fully investigated and classified with the "malaria foci investigation form"	100%	
% of confirmed cases that are fully investigated and classified with the "malaria case investigation form"	100%	
% of people examined for malaria by microscopy and/or RDTs per year (Annual Blood Examination Rate/ABER): • For units where active and non-active residual foci reported, the indicative target should be well above 5% of the population at risk, and • For units where only cleared foci reported but conditions for malaria transmission exist the indicative target should be between 1% and 3% of the population at risk	100%	to measure the level of diagnostic surveillance activity/ABER per administrative unit
% of health facilities/services within public/private/ community-based sectors that actively and fully participate in the malaria diagnostic quality assurance programme with: • 10% negative randomly selected cases and 100% positive cases confirmed by microscopy and completed the blinded proficiency panel in the reference laboratories each year, and • 100% positive cases confirmed by RDTs cross-checked by quality-assured microscopy or even by PCR-based diagnostics in the reference laboratories each year	100%	To measure quality of malaria diagnostic services provided per administrative unit
% of health facilities/services within public/private/ community-based sectors where first contact with health staff/VHVs done within 24 hours from first symptoms (e.g., onset of fever)	100%	to measure timeliness of care-seeking per administrative unit
% of health facilities/services within public/private/ community-based sectors where blood slide/RDT examined and result received on the same day (24 hours)	100%	to measure timeliness of parasitological diagnosis per administrative unit
% of health facilities/services within public/private/ community-based sectors where reporting of and notification on positive diagnosis to the malaria programme done on the same day (24 hours)	100%	to measure timeliness of reporting/notification per administrative unit
% of health facilities/services within public/private/community-based sectors that report completely and timely on the number of patients examined by microscopy and/or RDTs and positive for malaria to national malaria programme	100%	to measure completeness of reporting per administrative unit

Annex 9. Province-wise baseline and targets of key interventions under PSPs, Pakistan 2018-2025

Table 9.1:- Case Management- Malaria Screening (Baseline and Projection)

Province	Stratum	District	Blood Examination Projection					
			Base Line 2018	2021	2022	2023	2024	2025
Pakistan		**143**	**6,533,183**	13,552,461	16,314,847	22,739,182	29,447,939	30,123,874
Punjab	Stratum III	36	2430367	4796673.035	7352154.508	11269344.37	15354641.88	15691033.83
Sindh	Stratum I	8	1778174	849809	869614	1112355	1365948	1397802
	Stratum II	8		1471831	1506786	1928242	2368915	2425284
	Stratum III	4		1755302	1765748	2220543	2681050	2697825
	Total	**20**		**4076941**	**4142147**	**5261141**	**6415913**	**6520912**
Khyber PakhtoonKhwa	Stratum I	13	1036281	1337281	1376777	1771824	2189045	2253790
	Stratum II	13		1124010	1159126	1494248	1849300	1907358
	Stratum III	5		280069	286166	365507	448187	457988
	Total	**31**		**2741360**	**2822069**	**3631579**	**4486531**	**4619137**
Balochistan	Stratum I	26	745,629	697978	718510	924632	1142383	1176274
	Stratum II	7		442547	463383	606583	762382	798608
	Stratum III	0		0	0	0	0	0
	Total	**33**		**1140525**	**1181892**	**1531215**	**1904765**	**1974882**
Merged Districts (E	Stratum I	13	471190	441127	452210	579504	712977	731045
AJK	Stratum III	10	71542	355834	364374	466399	573111	586866

Table 9.2:- Case Management- Malaria Patients Treatment (Baseline and Projection)

Province	Stratum	District	Malaria Cases Projection					
			Base Line 2018	2021	2022	2023	2024	2025
Pakistan		**143**	**374513**	**448372**	**481877**	**405099**	**324493**	**335249**
Punjab	Stratum III	36	1875	2054	2166	1901	1731	1329
Sindh	Stratum I	8	129085	114992	123356	103347	82308	85487
	Stratum II	8		38190	40988	34357	27378	28251
	Stratum III	4		7711	8038	6978	6282	4773
	Total	**20**		**160893**	**172382**	**144682**	**115969**	**118510**
Khyber PakhtoonKhwa	Stratum I	13	115995	84057	90709	76450	61252	63999
	Stratum II	13		6931	7496	6332	5085	5288
	Stratum III	5		599	628	549	497	380
	Total	**31**		**91586**	**98833**	**83331**	**66834**	**69667**
Balochistan	Stratum I	26	61510	138940	149368	125425	100131	104257
	Stratum II	7		4281	4657	3957	3197	3345
	Stratum III	0						
	Total	**33**		**143221**	**154025**	**129382**	**103328**	**107602**
Merged Districts (Ex-	Stratum I	13	65853	50402	54245	45603	36451	38001
AJK	Stratum III	10	195	215.33	226.98	199.22	181.34	139.27

Table 9.3:- Disease Prevention- Mass distribution of LLINs (Baseline and Projection)

Province	Stratum	District	Baseline 2018	LLIN Mass Campaign				
				2018 Replacement in 2021	2019 Replacement in 2022	2020 Replacement in 2023	2021 St-II Replacement in 2024	2022 St-II Replacement in 2025
Pakistan		143	2,508,216	35529943	36578299	37665626	38793915	39965300
Punjab	Stratum III	36	0	0	0	0	0	0
Sindh	Stratum I	8	1,286,196	4327010	4424470	4524175	4626176	4730527
	Stratum II	8		7258501	7425397	7596302	7771316	7950540
	Stratum III	4		0	0	0	0	0
	Total	20		14070284	14420527	14780938	15151881	15533735
Khyber PakhtoonKhwa	Stratum I	13	537,562	8039632	8287257	8542655	8806074	9077772
	Stratum II	13		1843737	1896910	1951642	2007979	2065970
	Stratum III	5		0	0	0	0	0
	Total	31		15460320	15914942	16383676	16866980	17365328
Balochistan	Stratum I	26	285,242	101422	102858	104313	105789	107286
	Stratum II	7		112018	114045	116109	118211	120351
	Stratum III	0		89328	91749	94235	96789	99412
	Total	33		5897917	6139972	6396698	6669265	6958951
Merged Districts (Ex-FATA)	Stratum I	13	399,216	101422	102858	104313	105789	107286
AJK	Stratum III	10		0	0	0	0	0

Table 9.4:- Disease Prevention - Continues distribution of LLINs through ANC clinics (Baseline and Projection)

Province	Stratum	District	Baseline 2018	Continuous (PL)				
				2021	2022	2023	2024	2025
Pakistan		143	360999	369931	380822	392120	91244	95165
Punjab	Stratum III	36	19300	0	0	0	0	0
Sindh	Stratum I	8	107703	58274	59587	60930	62303	63709
	Stratum II	8		97755	100002	102304	104661	107075
	Stratum III	4		0	0	0	0	0
	Total	20		156029	159589	163234	0	0
Khyber PakhtoonKhwa	Stratum I	13	140523	108275	111609	115049	118597	122256
	Stratum II	13		24831	25547	26284	27043	27824
	Stratum III	5		0	0	0	0	0
	Total	31		133105	137156	141333	0	0
Balochistan	Stratum I	26	62490	1366	1385	1405	1425	1445
	Stratum II	7		1509	1536	1564	1592	1621
	Stratum III	0		1203	1236	1269	1304	1339
	Total	33		79431	82691	86148	89819	93720
Merged Districts (Ex-FATA)	Stratum I	13	30983	1366	1385	1405	1425	1445
AJK	Stratum III	10		0	0	0	0	0

Table 9.5:- Disease Prevention –Advocacy (Baseline and Projection)

Province	Stratum	District	Advocacy				
				Male Advocate @10/HF	Male Advocacy Sessions @10P	Female Advocate @10/HF	Female Advocacy Sessions@10P
Pakistan		**143**		54140	5414	54140	5414
Punjab	Stratum III	**36**		**18965**	**1896.5**	**18965**	**1896.5**
Sindh	Stratum I	8		3480	348	3480	348
	Stratum II	8		6805	680.5	6805	680.5
	Stratum III	4		1685	168.5	1685	168.5
	Total	**20**		**11970**	**1197**	**11970**	**1197**
Khyber PakhtoonKhwa	Stratum I	13		3550	355	3550	355
	Stratum II	13		695	69.5	695	69.5
	Stratum III	5		3320	332	3320	332
	Total	**31**		**7565**	**756.5**	**7565**	**756.5**
Balochistan	Stratum I	26		5645	564.5	5645	564.5
	Stratum II	7		1625	162.5	1625	162.5
	Stratum III	0		0	0	0	0
	Total	**33**		**7270**	**727**	**7270**	**727**
Merged Areas (Ex-	Stratum I	13		5430	543	5430	543
AJK	Stratum III	10		2940	294	2940	294

Table 9.6:- Disease Prevention – Awareness (Baseline and Projection)

Province	Stratum	District	Awareness			
			Benificieries Reached by Male Advocate @300B/A	Male Advocacy Sessions@20P	Benificieries Reached by Female Advocate @200B/A	Female Advocacy Sessions @20P
Pakistan		**143**	1082800	54140	1082800	54140
Punjab	Stratum III	**36**	**379300**	**18965**	**379300**	**18965**
Sindh	Stratum I	8	69600	3480	69600	3480
	Stratum II	8	136100	6805	136100	6805
	Stratum III	4	33700	1685	33700	1685
	Total	**20**	**239400**	**11970**	**239400**	**11970**
Khyber PakhtoonKhwa	Stratum I	13	71000	3550	71000	3550
	Stratum II	13	13900	695	13900	695
	Stratum III	5	66400	3320	66400	3320
	Total	**31**	**151300**	**7565**	**151300**	**7565**
Balochistan	Stratum I	26	112900	5645	112900	5645
	Stratum II	7	32500	1625	32500	1625
	Stratum III	0	0	0	0	0
	Total	**33**	**145400**	**7270**	**145400**	**7270**
Merged Areas (Ex-FA	Stratum I	13	108600	5430	108600	5430
AJK	Stratum III	10	58800	2940	58800	2940

Table 9.7:- Malaria Surveillance, M&E and Focused research – Number of health facilities involved in Malaria.

Province	Stratum	District	Total Health Facilities							
			Hospitals	RHCs	BHUs	MCH	CDs	Sub Health Centers	Total Pub	Total Pvt
Pakistan		**143**	**608**	**707**	**5,118**	**777**	**3,329**	**289**	**10,828**	**5,640**
Punjab	Stratum III	36	210	314	2,500	240	505	24	3,793	1,440
Sindh	Stratum I	8	31	39	233	20	373	-	696	320
	Stratum II	8	46	74	427	60	750	4	1,361	480
	Stratum III	4	51	17	131	38	100	-	337	160
	Total	**20**	**128**	**130**	**791**	**118**	**1,223**	**4**	**2,394**	**960**
Khyber PakhtoonKhwa	Stratum I	13	72	48	361	22	193	14	710	520
	Stratum II	13	14	12	76	4	33	-	139	80
	Stratum III	5	50	51	332	7	214	10	664	400
	Total	**31**	**136**	**111**	**769**	**33**	**440**	**24**	**1,513**	**1,000**
Balochistan	Stratum I	26	50	71	495	60	453	-	1,129	1,040
	Stratum II	7	16	25	159	30	95	-	325	280
	Stratum III	0	-	-	-	-	-	-	-	-
	Total	**33**	**66**	**96**	**654**	**90**	**548**	**-**	**1,454**	**1,320**
Merged Areas (Ex-FA	Stratum I	13	39	9	176	95	530	237	1,086	520
AJK	Stratum III	10	29	47	228	201	83	-	588	400

Table 9.8:- Malaria Surveillance, M&E and Focused research – Review Meetings

Province	Stratum	District	Yearly Meetings Numbers (2021-2025)				
			MCW Quarterly Review meeting @30P/Meeting	Pub Facility staff Monthly Review meeting@30P/Meeting	Pvt Facility staff Monthly Review meeting @20P/Meeting	Provincial Bi-Annual Review Meeting	NationalReview Meeting
Pakistan		**143**	12935.79399	4331.2	3384	12.4	1
Punjab	Stratum III	**36**	**6535.248451**	**1517.2**	**864**	**2**	**0**
Sindh	Stratum I	8	579.7424701	278.4	192	2.4	0
	Stratum II	8	1004.452524	544.4	288	0	0
	Stratum III	4	1177.165377	134.8	96	0	0
	Total	**20**	**2761.360371**	**957.6**	**576**	**2.4**	**0**
Khyber PakhtoonKhwa	Stratum I	13	1052.817038	284	312	0	0
	Stratum II	13	272.4896394	55.6	48	0	0
	Stratum III	5	815.5530276	265.6	240	2	0
	Total	**31**	**2140.859705**	**605.2**	**600**	**2**	**0**
Balochistan	Stratum I	26	658.6092598	451.6	624	2	0
	Stratum II	7	424.7673784	130	168	0	0
	Stratum III	0	0	0	0	0	0
	Total	**33**	**1083.376638**	**581.6**	**792**	**2**	**0**
Merged Areas (Ex-FA	Stratum I	13	414.9488237	434.4	312	2	0
AJK	Stratum III	10	0	235.2	240	2	0

Table 9.9:- Malaria Surveillance, M&E and Focused research – Monitoring Visits

Province	Stratum	District	Yearly Visit Numbers (2021-2025)		
			National<-> Province	Province <-> District	District to Facility
Pakistan		**143**	3	4	5
Punjab	Stratum III	**36**	**10**	**144**	**20932**
Sindh	Stratum I	8	18	96	4064
	Stratum II	8	0	0	7364
	Stratum III	4	0	0	1988
	Total	**20**	**18**	**96**	**13416**
Khyber PakhtoonKhwa	Stratum I	13	0	0	4920
	Stratum II	13	0	0	876
	Stratum III	5	18	100	4256
	Total	**31**	**18**	**100**	**10052**
Balochistan	Stratum I	26	18	132	8676
	Stratum II	7	0	0	2420
	Stratum III	0	0	0	0
	Total	**33**	**18**	**132**	**11096**
Merged Areas (Ex-FA	Stratum I	13	9	52	6424
AJK	Stratum III	10	9	40	3952

Table 9.10:- Capacity Development – Diagnosis (Microscopy and RDTs)

Province	Stratum	District	Diagnostic Training Participants 2021			Diagnostic Training Participants 2024		
			Basic Microscopy Training	RDT Pub	RTD- Pvt	Refresher Microscopy Training	RDT Pub	RTD- Pvt
Pakistan		143	2,630	9,091	3,940	3,945	9,091	3,940
Punjab	Stratum III	36	1,048	3,214	1,425	1,572	3,214	1,425
Sindh	Stratum I	8	140	304	200	210	304	200
	Stratum II	8	240	986	405	360	986	405
	Stratum III	4	136	269	160	204	269	160
	Total	20	516	2,394	960	774	2,394	960
Khyber PakhtoonKhwa	Stratum I	13	240	117	325	360	117	325
	Stratum II	13	52	55	65	78	55	65
	Stratum III	5	202	563	400	303	563	400
	Total	31	494	735	790	741	735	790
Balochistan	Stratum I	26	242	302	658	363	302	658
	Stratum II	7	82	133	205	123	133	205
	Stratum III	0	-	-	-	-	-	-
	Total	33	324	1,454	40	486	1,454	40
Merged Districts (Ex-FATA)	Stratum I	13	96	735	325	144	735	325
AJK	Stratum III	10	152	559	400	228	559	400

Table 9.11:- Capacity Development – Uncomplicated Malaria Case Management

Province	Stratum	District	TOT (MCM)	MCM (UC) Participants					
			2,021	2019-20 HCP Pub Tained	2019-20 HCP Pvt Tained	2021 Target Pub	2021 Target Pvt	2024 Target Pvt	2024 Target Pvt
Pakistan		143	564	658	104	24,836	4,124	4,360	25,915
Punjab	Stratum III	36	144	77	12	9,341	1,428	1,440	9,353
Sindh	Stratum I	8	96	335	66	571	254	320	1,480
	Stratum II	8	-	210	26	2,579	454	480	2,605
	Stratum III	4	-	-	-	1,391	160	160	1,391
	Total	20	96	545	92	4,541	868	960	5,476
Khyber PakhtoonKhwa	Stratum I	13	-	559	119	2,199	401	520	2,318
	Stratum II	13	-	89	13	452	67	80	465
	Stratum III	5	100	-	-	1,869	400	400	1,869
	Total	31	100	-	-	4,520	868	1,000	4,652
Balochistan	Stratum I	26	132	362	46	2,388	994	1,040	2,434
	Stratum II	7	-	17	10	744	270	280	754
	Stratum III	0	-	-	-	-	-	-	-
	Total	33	132	-	-	3,188	40	40	3,188
Merged Districts (Ex-FATA)	Stratum I	13	52	36	-	1,872	520	520	1,872
AJK	Stratum III	10	40	-	-	1,374	400	400	1,374

Table 9.12:- Capacity Development – Complicated Malaria Case Management

Province	Stratum	District	MCM (Com) Participants					
			2019-20 HCP Pub Tained	2019-20 HCP Pvt Tained	2021 Target Pub	2021 Target Pvt	2024 Target Pvt	2024 Target Pvt
Pakistan		143	73	-	16,402	5,640	5,640	16,402
Punjab	Stratum III	36	14	-	6,084	1,440	1,440	6,084
Sindh	Stratum I	8	34	-	854	320	320	854
	Stratum II	8	25	-	1,364	480	480	1,364
	Stratum III	4	-	-	1,122	160	160	1,122
	Total	20	59	-	3,340	960	960	3,340
Khyber PakhtoonKhwa	Stratum I	13	242	-	1,728	520	520	1,728
	Stratum II	13	14	-	352	80	80	352
	Stratum III	5	7	-	1,306	400	400	1,306
	Total	31	-	-	3,386	1,000	1,000	3,386
Balochistan	Stratum I	26	139	-	1,426	1,040	1,040	1,426
	Stratum II	7	19	-	470	280	280	470
	Stratum III	0	-	-	-	-	-	-
	Total	33	-	-	1,896	1,320	1,320	1,896
Merged Districts (Ex-FATA)	Stratum I	13	-	-	834	520	520	834
AJK	Stratum III	10	-	-	862	400	400	862

Table 9.13:- Capacity Development – Surveillance and outbreak preparedness

Province	Stratum	District	Surveillance and OBR Participants						
			TOT Surveillance & OBR	2019-20 HCP Pub Tained	2019-20 HCP Pvt Tained	2021 Target Pub	2021 Target Pvt	2024 Target Pvt	2024 Target Pvt
Pakistan		143	564	986	360	9,842	5,280	5,640	10,828
Punjab	Stratum III	36	144	-	-	3,793	1,440	1,440	3,793
Sindh	Stratum I	8	96	-	-	696	320	320	696
	Stratum II	8	-	-	-	1,361	480	480	1,361
	Stratum III	4	-	-	-	337	160	160	337
	Total	20	96	-	-	2,394	960	960	2,394
Khyber PakhtoonKhwa	Stratum I	13	-	628	195	82	325	520	710
	Stratum II	13	-	63	15	76	65	80	139
	Stratum III	5	100	-	-	664	400	400	664
	Total	31	100	691	210	822	790	1,000	1,513
Balochistan	Stratum I	26	132	251	145	878	895	1,040	1,129
	Stratum II	7	-	44	5	281	275	280	325
	Stratum III	0	-	-	-	-	-	-	-
	Total	33	132	295	150	1,159	1,170	1,320	1,454
Merged Districts (Ex-FATA)	Stratum I	13	52	-	-	1,086	520	520	1,086
AJK	Stratum III	10	40	-	-	588	400	400	588

Table 9.14:- Capacity Development – Community workers Training

Province	Stratum	District	Malaria Community Works Training Participants			
			TOT Provincial	TOT District	2021 Target	2024 Target
Pakistan		143	564	2,086	97,069	97,069
Punjab	Stratum III	36	144	836	49,014	49,014
Sindh	Stratum I	8	96	161	2,174	2,174
	Stratum II	8	-	312	7,533	7,533
	Stratum III	4	-	62	8,829	8,829
	Total	20	96	535	18,536	18,536
Khyber PakhtoonKhwa	Stratum I	13	-	152	7,896	7,896
	Stratum II	13	-	30	2,044	2,044
	Stratum III	5	100	150	6,117	6,117
	Total	31	100	332	16,056	16,056
Balochistan	Stratum I	26	132	258	4,940	4,940
	Stratum II	7	-	70	3,186	3,186
	Stratum III	0	-	-	-	-
	Total	33	132	328	8,125	8,125
Merged Districts (Ex-FATA)	Stratum I	13	52	55	3,112	3,112
AJK	Stratum III	10	40	-	2,225	2,225

Table 9.15:- Capacity Development – DHIS and Quality Assurance

Province	Stratum	District	DHIS-2 2021/22 Target	Diagnostic QA training at Provincial Level for District staff
Pakistan		143	564	282
Punjab	Stratum III	36	144	72
Sindh	Stratum I	8	96	48
	Stratum II	8	-	-
	Stratum III	4	-	-
	Total	20	96	48
Khyber PakhtoonKhwa	Stratum I	13	-	-
	Stratum II	13	-	-
	Stratum III	5	100	50
	Total	31	100	50
Balochistan	Stratum I	26	132	66
	Stratum II	7	-	-
	Stratum III	0	-	-
	Total	33	132	66
Merged Districts (Ex-FATA)	Stratum I	13	52	26
AJK	Stratum III	10	40	20