

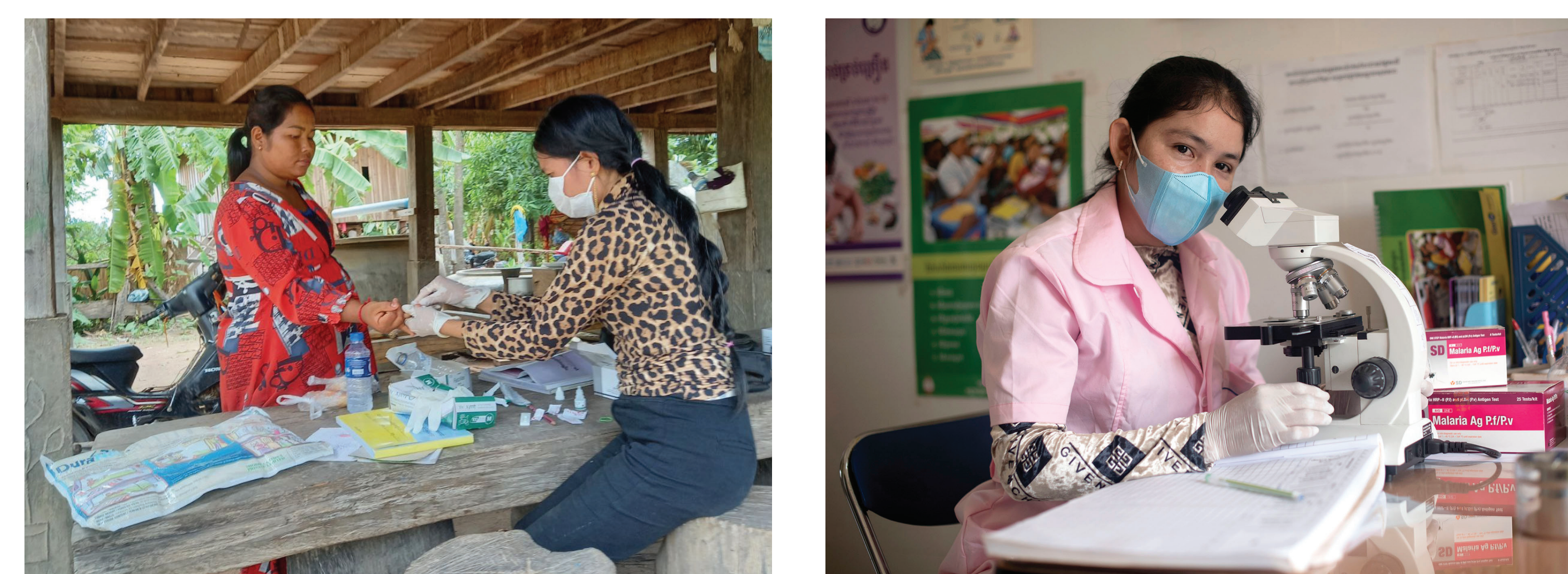
DETECTION OF PLASMODIUM MALARIAE AND PLASMODIUM KNOWLESI THROUGH IMPROVEMENTS IN MICROSCOPY SERVICES IN CAMBODIA

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Introduction

The United States Agency for International Development (USAID)/President’s Malaria Initiative (PMI) funded Cambodia Malaria Elimination Project 2 (CMEP2) has been operating in 14 operational health districts (ODs) of six provinces in Cambodia, namely Battambang, Pailin, Pursat, Kampong, Kep and Koh Kong with a total population of 2,350,598 in coordination with the National Center for Parasitology, Entomology and Malaria Control (CNM). Malaria diagnosis is one of the crucial components in malaria elimination, and the primary method of malaria diagnosis in Cambodia is Rapid Diagnostic Tests (RDTs). Currently, RDTs only detect *Plasmodium falciparum* (Pf) and *Plasmodium vivax* (Pv), where *Plasmodium malariae* (Pm) and *Plasmodium knowlesi* (Pk) are detected through research studies using molecular diagnostic tools. Training and support for microscopy diagnosis has taken place in the six provinces under CMEP2, managed by CNM with support from USAID/PMI, CMEP2 (and prior project CMEP) and the World Health Organization. Support includes training courses on microscopy diagnosis and national competency assessments for malaria microscopists to ensure quality diagnosis at points of care. If patients test negative by RDT but malaria symptoms continue, then a blood smear is taken for microscopy. If the blood smear is positive for Pm/Pk, a blood smear and dried blood spot are taken for confirmation at CNM through both microscopy and polymerase chain reaction (PCR).



(L) VMW performs RDT testing; (R) HF staff performs microscopy

Aim and Method

Aim: Malaria case detection with all feasible diagnostic methods

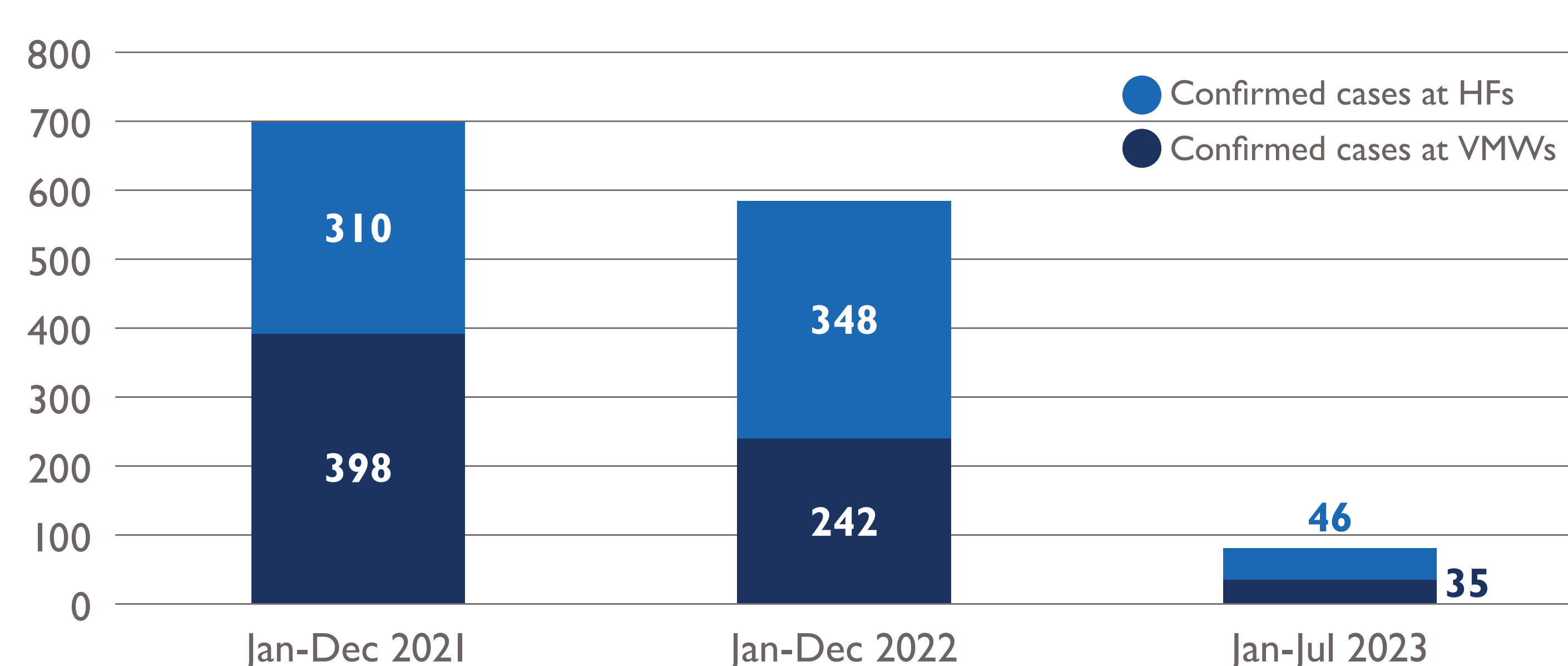
Method: Routine malaria diagnostic services in malaria case management

Tables and Figures

CONFIRMED CASES BY SPECIES AT HFs (JAN 2021–JUL 2023)

	Pv	Pm + Pf	Pm	Pk	Pf
Jan-Dec 2021	296	0	1	1	12
Jan-Dec 2022	223	1	47	8	69
Jan-Jul 2023	39	0	4	2	1

CONFIRMED CASES BY POINTS OF CARE

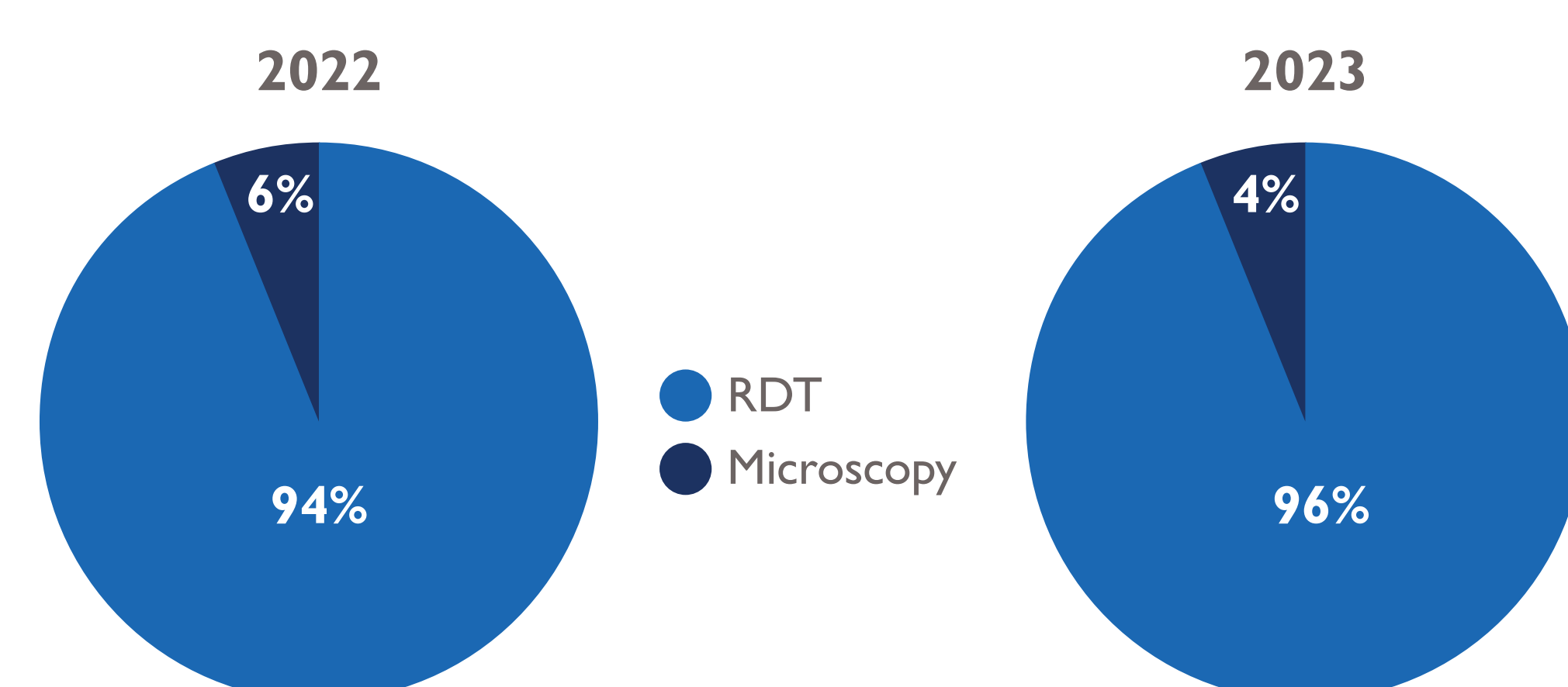


Results/Discussion/Conclusion

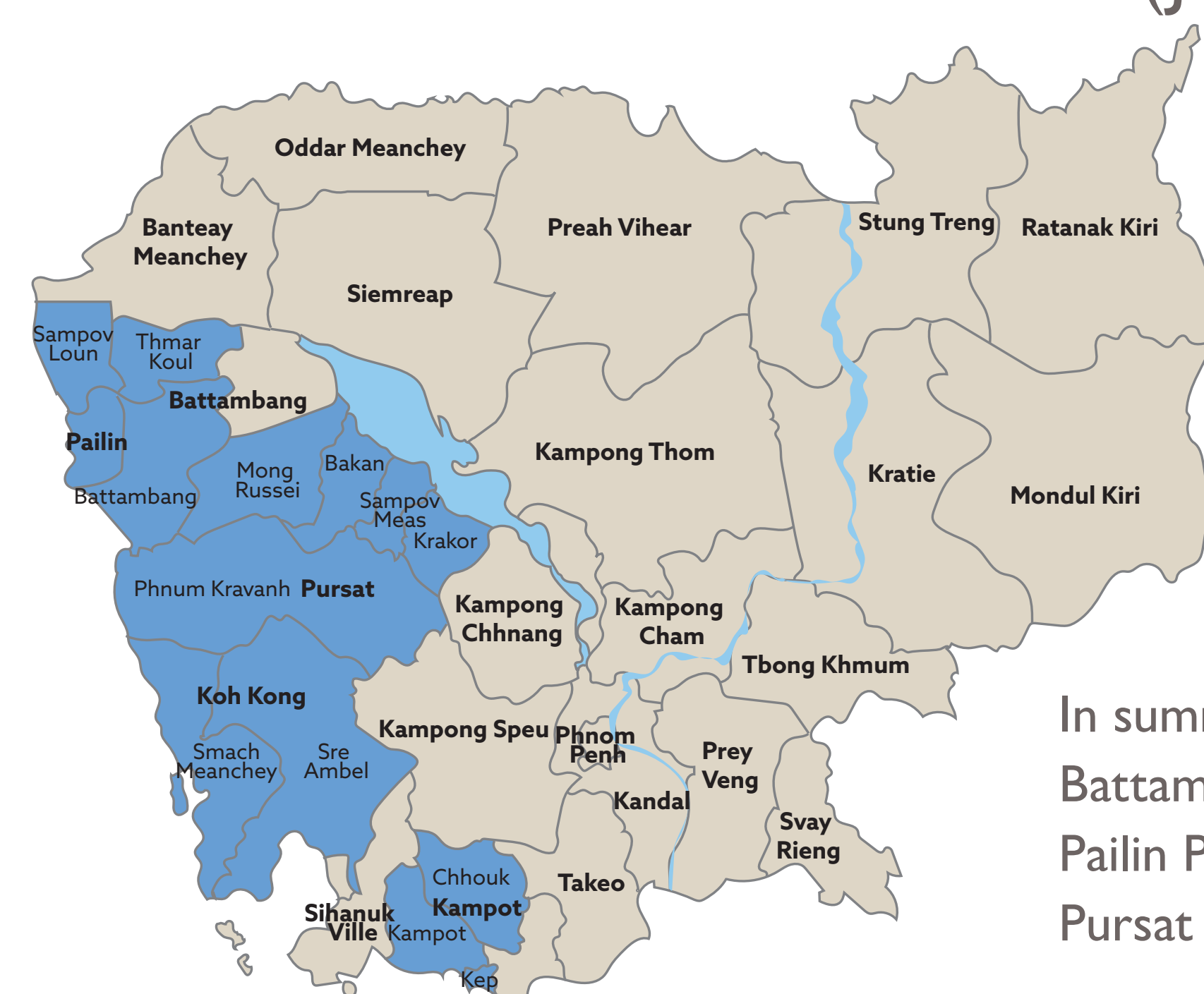
Malaria diagnosis is part of malaria case management at all service delivery points (or points of care), including public health facilities (HFs) and community health volunteers. HF staff and village/mobile malaria workers (VMWs/MMWs) are trained to perform malaria diagnosis primarily using RDTs which can rapidly confirm results as positive or negative. In addition, HF staff at referral hospitals are trained on microscopy diagnosis so that they can perform initial diagnosis and/or reconfirmation/cross-check with result provided by the RDT.

Currently, the malaria RDTs being supplied in Cambodia are “Malaria Ag Pf/Pv” which specifically detect only Pf, Pv or Mixed Pf and Pv but not other species. Applying microscopy examination on suspected malaria cases, self-referred or referred from VMWs to HF or referred between HFs provides the possibility to detect non-Pf/Pv species (mainly Pm and Pk species) in different areas under the six CMEP2 provinces.

RDT VS. MICROSCOPY TEST AT HEALTH FACILITIES



PM AND PK CASES BY PROVINCE (JAN 2021–JUL 2023)



In summary:
 Battambang Province: 2 Pm and 3 Pk
 Pailin Province: 0 Pm and 2 Pk
 Pursat Province: 51 Pm and 6 Pk

Microscopy confirmation from CNM has been regularly supportive to the HF results, and CNM PCR helps further differentiate species between Pm and Pk while HF capacity on these parasite morphologies are still challenging.

The results suggest there is likely ongoing Pm/Pk transmission that is undetected in areas without microscopy services in Cambodia. HFs predominately use RDTs as microscopy services at HFs remain limited. Updates to the suspected case definition may be needed to ensure all Pm/Pk infected patients are specifically indicated and tested.

As Cambodia aims for the elimination of all human malaria species by 2025, introducing and sustaining quality microscopy will be essential to detect all forms of malaria species.

In addition, referral mechanisms should be improved to ensure all negative RDT among suspected cases are cross-checked by microscopy. Pan RDTs should be an option to cover all tested cases in all service delivery points, at least at selected areas where Pm/Pk being notified.

RDTs are limited in malaria species detection

Ongoing Pm/Pk transmission goes undetected

Limited microscopy services at health facilities



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