

A series of case studies examining global health product innovations and R&D investment landscapes

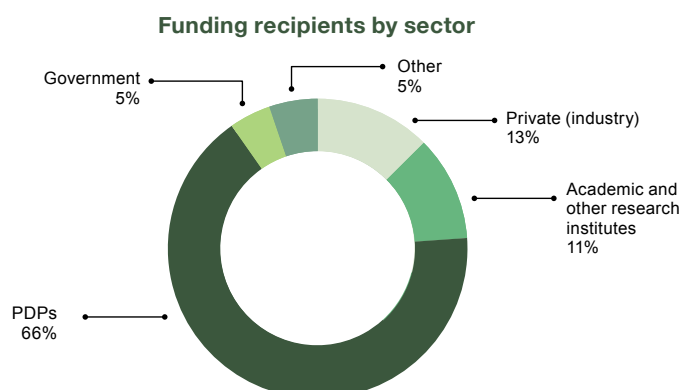
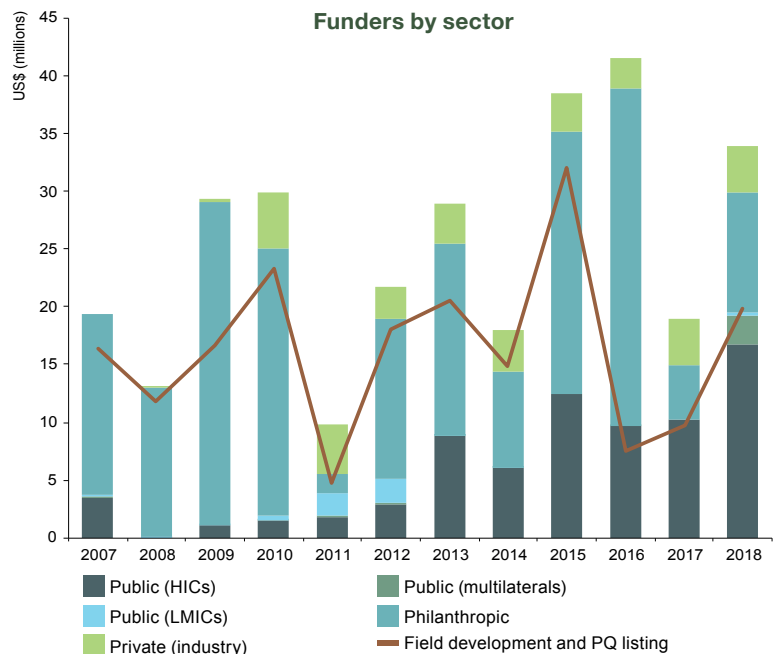
NEXT-GENERATION CHEMICAL VECTOR CONTROL: ESSENTIAL TOOLS IN THE BATTLE AGAINST MALARIA

Malaria control interventions prevented some 693 million cases between 2001-2015 in Africa with insecticide-treated nets (ITNs) preventing over two-thirds. Yet, malaria continues to threaten the world's poorest and most vulnerable. An estimated 228 million malaria cases occurred in 2018, causing 405,000 deaths. More than 90% of cases occurred in Africa. Current malaria control tools, including vector control products (VCPs) like ITNs, are not enough to end malaria. Growing mosquito resistance to pyrethroids – until recently the only insecticide class used in ITNs – represents the biggest threat to progress against malaria, and demonstrates a clear need for new tools.

To build on 20 years of progress against malaria, new VCPs such as next-generation, dual ITNs are required. One of the key organisations supporting chemical VCP development (among a number of other VCP technologies) is the Innovative Vector Control Consortium (IVCC), a not-for-profit product development partnership (PDP) which serves to engage and bring together industry, public and academic partners to develop new VCP candidates. Policy Cures Research (PCR) has been tracking global investment in chemical and biological VCP R&D since 2007. The funding trends and product landscape signal promising advancement of essential new tools for wider application in vector control programming.

Malaria chemical VCP R&D funding, 2007-18¹

- Global funding for **malaria chemical VCP R&D totalled \$304m** between 2007 and 2018.
- Annual investment fluctuated between \$10m-\$40m, mainly driven by philanthropic investment.
- Funding **overwhelmingly focused on field development**, accounting for 60% of all chemical VCP R&D funding, with 11% going to primary and secondary screening and optimisation while 24% was unspecified.
- Funding for field development spiked in 2015, reflecting a large and final disbursement (\$22m) to IVCC of a multi-year grant from the Gates Foundation.
- Chemical VCP funding has historically been dominated by the philanthropic sector, and specifically the **Gates Foundation, which contributed just under two-thirds of all global funding for this area since 2007.**
- This 2017-2018 surge in public sector funding was driven by a large core funding contribution from UK DFID to IVCC.
- PDPs and private industry play critical roles in the development of chemical VCPs to prevent malaria, accounting for 79% of all funding received since 2007.²
- **Two-thirds of all funding between 2007 and 2018 went to PDPs, and 13% to industry** (85% of which was internal industry investment), followed by academic institutions (11%, just over half of which came from public funders).



¹ Source: Policy Cures Research, G-FINDER Survey, 2007-2018

² Funding provided to IVCC is disbursed onwards to product development companies and academic institutions to carry out R&D activities. Onward funding from IVCC is not captured in this breakdown.

Product case study – Interceptor G2

Currently, the WHO recommends pyrethroid-treated ITNs in malaria control programmes. A number of dual insecticide ITNs (i.e. those containing pyrethroid plus insect growth regulators, piperonyl butoxide (PBO), or chlorfenapyr (Interceptor G2)), now have a WHO prequalification listing.

Some have also received conditional endorsement from WHO, but they have not yet been evaluated for their epidemiological impact and thus are not yet recommended for use in WHO policy. They are currently under review by the WHO Vector Control Advisory Group (VCAG). As of January 2020, there are 19 ITNs prequalified by WHO, see *text box*.

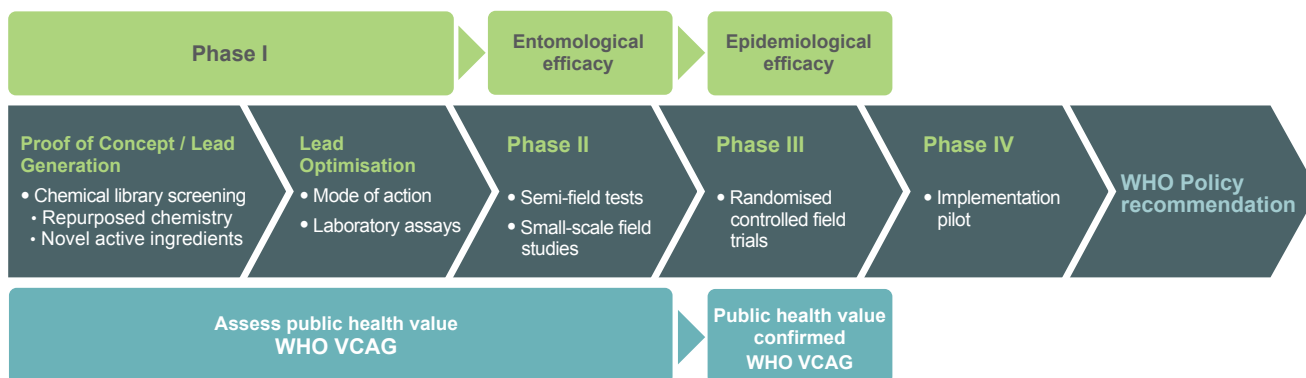
Interceptor G2, developed by BASF in partnership with IVCC, is a next-generation ITN and the first dual active ingredient LLIN (long-lasting insecticidal net) designed to overcome growing pyrethroid resistance. Interceptor G2 joined the revised listing of WHO prequalified ITNs in 2018. In large-scale hut trials, Interceptor G2 significantly outperformed standard nets by approximately four times - causing 81% mosquito mortality as compared to around 20% shown by pyrethroid-only nets. More importantly, Interceptor G2 effectively controlled highly pyrethroid-resistant mosquito populations.

IVCC and partners are currently undertaking public health value trials (including cost) in five African countries to build the necessary evidence to receive full WHO endorsement and inclusion in new policy recommendations on the use of next-generation ITNs. In parallel with the pilots, to accelerate access to Interceptor G2, the Gates Foundation has signed an agreement with BASF for the provision of 35 million nets over the next four years at an affordable price.

WHO Prequalified ITNs

- 12 – Pyrethroid-only
- 5 – Pyrethroid-PBO based
- 1 – Pyrethroid plus insect growth regulator
- 1 – Pyrethroid-chlorfenapyr net (Interceptor G2)

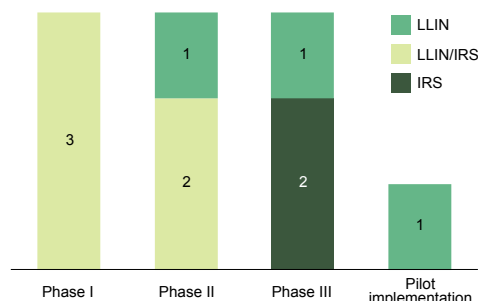
Chemical VCP product development phases



New malaria chemical VCPs critical to ending malaria

Dual insecticides nets such as the Interceptor G2 are essential for ITNs to remain a useful tool for malaria control, and any new insecticides developed will need to be used in combination and/or on a rotation basis to ensure mosquitoes do not develop resistance to them.

Currently, there are at least five novel insecticides in early-stage development with the potential to be used in either bed nets or for indoor residual spraying (IRS). The remaining pipeline includes three next-generation ITNs – two dual insecticide nets and one completely non-pyrethroid based – and two novel IRS formulations.



On average, \$25m annually was invested in developing insecticides/ITNs in the last 12 years. Maintaining at least this level of funding will be essential to sustain the further development of the existing pipeline. However, 2020 is a particularly critical juncture for reviewing progress of the Global Technical Strategy for Malaria 2016-2030 and for analysing the future funding landscape for VCPs. PCR will continue to track the funding trends in this essential area of R&D and work with partners to update our understanding of the current and anticipated investment gaps.