

THE NUMBERS GAME

Nature Outlook maps the challenges in tackling the malaria epidemic. By Priya Shetty.

MAPPING MALARIA

Malaria is still one of the 'big three' diseases, along with HIV and tuberculosis, affecting the developing world. While it has been eliminated in many regions, it remains a scourge of poorer countries, especially those in sub-Saharan Africa, where *Plasmodium falciparum* is the leading cause of malaria. Elsewhere in the world, malaria is caused by a mix of *P. falciparum* and *P. vivax*, as well as a few less common sub-species.



S14 | NATURE | VOL 484 | 26 APRIL 2012

ട്റ് 3.0

2.0

1.0

0

US\$1.7

billion

2009

2010

US\$1.7

billion

US\$2

billion

2011

2021

2031

2041

VULNERABLE GROUPS

Children: Most malaria deaths happen in children under 5 years old because their immune systems are not developed enough to fend off the parasite's attack.



Pregnant women: A pregnant woman is 4-times more likely to get malaria, and twice as likely to die from it, than another adult. This is because her immune system is partially suppressed during pregnancy. Malaria in pregnancy has dangerous consequences for the baby too.



People living with HIV: HIV infection weakens the immune system, making people more vulnerable to malaria. Malaria infection causes HIV viral loads to shoot up, which could increase its transmission. The diseases are linked in other ways too – the *DARC* gene that protects against vivax malaria might increase susceptibility to HIV.

TIMELINE OF RESISTANCE

Malaria has defeated many drugs in the past, often less than a decade after they were introduced.





DANGER ZONE: Drug Resistance Thailand, Cambodia

Artemisinin-combination therapies (ACTs) were the great hope of malaria control, as the parasite has steadily become resistant to older drugs. Just a couple of years after ACTs were introduced to this part of Southeast Asia in 2005, drug resistance emerged. Why this area is such a hotspot for drug resistance is not entirely clear, there seems to be many factors: counterfeit medicines are rife, drugs are available too easily over the counter, and the drugs are sold on their own rather than in combination (which makes it easier for the parasite to develop resistance).

LOFTY AMBITIONS

MYANMAR

WHO: 788 Lancet: 21,995

INDIA

WHO: 1,023

Lancet: 46,970

In 2007, Bill Gates's rallying call for eradication took some malaria experts by surprise. New drugs and insecticide-treated bed nets were helping control the spread of the infection, yet the world was some way off beating the parasite for good. Opinion is divided, especially as many of the goals set by the WHO so far haven't been achieved.

TARGET BY 2010: TARGET BY 2015: Drugs distributed Bed nets needed **Diagnostic tests** Reduction in death rate Number of Reduction in deaths cases .5 BI Achieved 25% (from 26.6 Achieved Achieved Achieved Can these targets be achieved? to 19.8 deaths per 100,000) 100 million 66 million 16 million