**Differential effects of case management and test-and-treat on infectiousness**

#### Additional Material to:

#### Resurgence of malaria infection after mass treatment: a simulation study

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Define *κ* as the infectiousness of the human population over some arbitrary time-interval, (possibly measured by the proportion of mosquitoes that become infected at each feed). This can be analysed as two components:

$κ=λw\_{1}κ\_{1}+pw\_{2}κ\_{2}$

where the first component, $λw\_{1}κ\_{1}$, is the contribution of new infections arising during the interval (proportional to $λ$, the force of infection) and $pw\_{2}κ\_{2}$ is the contribution of the standing crop of pre-existing infections (proportional to $p$, the prevalence).$ κ\_{1}$ and $κ\_{2}$ thus represent the different average infectiousness of the different categories of infection while $w\_{1}$ and $w\_{2}$ are constant scale-factors.

Clinical malaria disproportionately occurs during the initial period of an infection. Treatment of some proportion, $ε\_{1}$, of clinical malaria cases thus reduces the first component, and hence the overall infectiousness to:

$κ\_{CM}=λ\left(1-ε\_{1}\right)w\_{1}κ\_{1}+pw\_{2}κ\_{2}$

and the proportion by which the overall infectiousness is reduced is:

 $1-\frac{κ\_{CM}}{κ}=\frac{λε\_{1}w\_{1}κ\_{1}}{λw\_{1}κ\_{1}+pw\_{2}κ\_{2}}$

which is a decreasing function of *p.*

Conversely, test-and-treat applied to some proportion, $ε\_{2}$, of the infected population reduces the second component, and hence the overall infectiousness to:

$κ\_{TT}=λw\_{1}κ\_{1}+\left(1-ε\_{2}\right)pw\_{2}κ\_{2}$

and the proportion by which the overall infectiousness is reduced to:

 $1-\frac{κ\_{TT}}{κ}=\frac{pε\_{2}w\_{2}κ\_{2}}{λw\_{1}κ\_{1}+pw\_{2}κ\_{2}}$

which is an increasing function of *p.*

This analysis assumes that the proportions, $ε\_{1}$ and $ε\_{2}$ are independent of prevalence.