### Additional File 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time spent host seeking pre-bite</td>
<td>$s$</td>
</tr>
<tr>
<td>Time spent resting and seeking an ovipositing site post-bite</td>
<td>$f$</td>
</tr>
<tr>
<td>Feeding-related mortality pre-bite</td>
<td>$a$</td>
</tr>
<tr>
<td>Feeding-related mortality post-bite</td>
<td>$b$</td>
</tr>
<tr>
<td>Oviposition-related mortality</td>
<td>$c$</td>
</tr>
<tr>
<td>Probability that infected mosquito will feed (and lay) in pre-infectious cycle</td>
<td>$M$</td>
</tr>
<tr>
<td>Probability of survival during the time between blood feeds</td>
<td>$W$</td>
</tr>
<tr>
<td>Probability of surviving one feeding and one ovipositing event</td>
<td>$\lambda$</td>
</tr>
<tr>
<td>Number of feeding cycles between infection and infectiousness</td>
<td>$n$</td>
</tr>
<tr>
<td>Number of bites taken per feeding attempt for infectious mosquitoes</td>
<td>$A$</td>
</tr>
<tr>
<td>Probability of surviving single bite</td>
<td>$k$</td>
</tr>
<tr>
<td>Average lifetime number of infectious bites given per infected mosquito</td>
<td>$B$</td>
</tr>
<tr>
<td>Average lifetime infectious bites with no behavioural alteration</td>
<td>$B_0$</td>
</tr>
<tr>
<td>Number of infectious bites with behavioral alteration as proportion of that without</td>
<td>$F$</td>
</tr>
</tbody>
</table>

\[
k = (1 - a)(1 - b)
\]

\[
\lambda = (1 - c)k
\]

\[
W = (1 - s)(1 - f)(1 - c)
\]

Probability that a newly infected mosquito survives from the bite in which it acquires *Plasmodium* infection to first post-infection feeding attempt

\[
= (1 - b)(1 - s)(1 - f)(1 - c) = (1 - b)W
\]

Probability of surviving from one bite to the next

\[
= (1 - a)(1 - b)(1 - s)(1 - f)(1 - c)
\]

Probability of surviving period of one feeding cycle if does not feed or lay

\[
= (1 - s)(1 - f)
\]

Probability of surviving period equivalent to one post-infection, pre-infectious feeding cycle

\[
= (1 - s)(1 - f)(M(1 - a)(1 - b)(1 - c) + (1 - M)) = (1 - s)(1 - f)(M\lambda + 1 - M)
\]

\[
= (1 - s)(1 - f)(1 + M(\lambda - 1))
\]

Average number of bites per feeding attempt for mosquito which survives to give one bite and attempts $A$ bites

\[
= 1 + (1 - b)(1 - a) + ((1 - b)(1 - a))^2 + ((1 - b)(1 - a))^3 \ldots ((1 - b)(1 - a))^{d-1}
\]
Using the standard sum for a finite series this can be simplified to

\[
\frac{1 - ((1 - b)(1 - a))^d}{1 - (1 - b)(1 - a)} = \frac{1 - k^d}{1 - k}
\]

The average number of post-infectious feeding attempts, each comprising \(A\) attempted bites, from a mosquito which survives to give a first infectious bite

\[
= 1 + \binom{(1 - b)(1 - a)}{-d-1} (1 - b)(1 - s)(1 - f)(1 - c)(1 - a) + \binom{(1 - s)(1 - f)(1 - c)((1 - a)(1 - b))^d}{2}
\]

\[
+ \binom{(1 - s)(1 - f)(1 - c)((1 - a)(1 - b))^d}{3} \ldots + \binom{(1 - s)(1 - f)(1 - c)((1 - a)(1 - b))^d}{n}
\]

\[
= 1 + Wk^d + \left(Wk^d\right)^2 + \left(Wk^d\right)^3 \ldots \left(Wk^d\right)^n
\]

Using the standard sum of an infinite series, this can be simplified to

\[
\frac{1}{1 - Wk^d}
\]

Average lifetime number of infectious bites per infected mosquito

= probability survives to end of feeding cycle in which infected
\x 
× probability survives \(n\) infected feeding cycles
\x 
× probability survives from end of pre-infectious feeding cycles to give first infectious bite
\x 
× average number of feeding attempts per mosquito which survives to give first infectious bite
\x 
× average number of infectious bites per feeding attempt

\[
\text{probability survives to end of feeding cycle in which infected} = (1 - b)W
\]

\[
\text{probability survives } n \text{ infected feeding cycles} = \left(1 - s\right)\left(1 - f\right)\left(1 + M\left(\lambda - 1\right)\right)^n
\]

\[
\text{probability survives from end of last pre-infectious feeding cycle to give first infectious bite} = (1 - a)
\]

\[
\text{average number of feeding attempts per mosquito which survives to give first infectious bite} = \frac{1}{1 - Wk^d}
\]

\[
\text{average number of infectious bites per feeding attempt} = \frac{1 - k^d}{1 - k}
\]

So, \(B\), the average lifetime number of infectious bites per infected mosquito
\[ B = Wk \left( (1-s)(1-f)(1+M(\lambda-1)) \right)^n \frac{1-k^A}{(1-k)(1-Wk^A)} \]

\[ B_0, \text{ the average lifetime number of infectious bites per infected mosquito in the absence of behavioural modification} = \]

\[ = (1-b)W \left( (1-s)(1-f)(1+1(\lambda-1)) \right)^n (1-a) \frac{1-k^i}{1-Wk^i} \frac{1-k^i}{1-k} \]

\[ B_o = Wk \left( (1-s)(1-f)\lambda \right)^n \frac{1-k}{(1-k)(1-Wk)} \]

So the number of infectious bites per infected mosquito with behavioral manipulation, as a proportion of that without manipulation is given by

\[ F = \frac{Wk \left( (1-s)(1-f)(1+M(\lambda-1)) \right)^n \frac{1-k^A}{(1-k)(1-Wk^A)}}{Wk \left( (1-s)(1-f)\lambda \right)^n \frac{1-k}{(1-k)(1-Wk)}} \]

\[ F = \frac{(1+M(\lambda-1))^n (1-Wk)(1-k^A)}{\lambda^n (1-Wk^A)(1-k)} \]