

The role of indirect protection in the assessment of dengue vaccination impact

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ABSTRACT

Dengue is a vector-borne viral disease, endemic in 128 countries, where approximately 4 billion people currently live. To date, no specific treatment for dengue exists. It has been estimated that, annually, dengue represents 400 million infections and a global burden of 9 billion US dollars, worldwide. In December 2015, the first vaccine against dengue (Dengvaxia®) was approved in 3 highly endemic countries (Mexico, The Philippines and Brazil). This new vaccine provides an opportunity to significantly reduce dengue burden but raises the question of the definition of the most appropriate vaccination program for each endemic country or region. The impact of such programs is expected to result from a combination of direct protection conferred to vaccinated individuals (reduction of the risk to develop disease when bitten by an infectious mosquito) and indirect protection (reduction for the entire population of the risk of being exposed through a reduction in the number of individuals likely to transmit the virus to mosquitoes).

The extent of indirect protection critically depends not only on the number of vaccinated individuals in the population but also on the ability of vaccination to reduce infections. Moreover, dengue infections may be either symptomatic or silent and it has been previously proposed that both forms contribute differently to the transmission of the disease [1].

Here we have used a serotype-specific dengue transmission model [2]

to study the respective contribution of direct and indirect protection to the overall reduction of dengue burden associated to different vaccination strategies. These results indicate variation in the contribution of indirect protection to the overall vaccination impact according to the epidemiological setting, the time horizon or the vaccination strategy considered. The contribution of indirect protection is nevertheless always significant if a large vaccination program is implemented.

References

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