Dengue serotypes: a network model for competition and coexistence in Rio de Janeiro

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In the last decades, we have observed the alternating appearance of four serotypes of Dengue circulating in Rio de Janeiro. The more severe type of dengue is the hemorrhagic fever, and having antibodies to dengue virus from an earlier infection is a risk factor for the hemorrhagic fever. Then it is important to have a model taking into account the coexistence of these serotypes, allowing us to study a possible enhancement/diminishment of one disease due to the presence of another disease/serotype. By considering spatial aspects of the city, we work with a network model where nodes represent the neighborhoods, while the links between them are determined by distance. We explore the SIS and SIR models running on each of the nodes infected by serotypes 1,2,3 and 4 of Dengue, in order to determine the epidemic limit, the force of infection, and then predict, on the basis of reporting data, the predominant serotype for each year.

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