

MODELLING TUBERCULOSIS TRANSMISSION: THE ROLE OF HETEROGENEITY IN SUSCEPTIBILITY TO INFECTION

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ABSTRACT

Heterogeneity in susceptibility is inherent to infectious disease transmission in nature. Here, we explore the consequences of host heterogeneity in the susceptibility to infection, first for general epidemiological models with partial immunity and then for two specific models of tuberculosis (TB).

Infection generates a selection mechanism whereby fit individuals remain susceptible for longer and frail individuals are transferred faster to the recovered compartment. As a result, rates of reinfection are higher when measured at the population level even though they might be lower at the individual level [1]. We show that this mechanism may explain high rates of tuberculosis reinfection observed in epidemiological studies [2]. To do that, we compare it to an alternative model, for which increased individual risk of reinfection is assumed, and conclude that proposed mechanism is better supported by the fittings to the data from 14 countries. Finally, a TB model is adjusted to a Portuguese data-set [3] and the total burden of TB is estimated. Inclusion of heterogeneity in the model leads to lower estimates of infection prevalence and to a different infection profile of the population.

References

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