

THE EFFECT OF MIGRATION ON TUBERCULOSIS EPIDEMIC

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ABSTRACT

We propose a new tuberculosis (TB) mathematical model, with 25 state-space variables where 15 are evolution disease states (EDSs), which takes into account the flux of populations between a country of origin (A) and a community (G) plus the rest of the population (C) of a host country (P). Contrary to some beliefs, related to the fact that agglomerations of individuals increase proportionally to the disease spread, analysis of the model shows that the existence of communities are simultaneously benefic for the TB control from a global and regional viewpoint. We prove the existence of an optimal ratio for the distribution of individuals in C versus G, which minimizes the reproduction number R_0 . A sensitivity analysis is derived and we show that the TB transmission rate β does not act linearly on R_0 , as it is common in compartment models where system feedback or group interactions do not occur. Further, we find the most important parameters for the increase of each EDS. The model and techniques proposed are applied to a case-study with concrete parameters, which model the situation of Angola (A) and Portugal (P), in order to show its relevance and meaningfulness.