LEPRASIM, an Agent-Based Model to simulate leprosy in Indonesia

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Despite continuous efforts, leprosy persists locally in endemic areas including Indonesia. A cost effective method to interrupt leprosy transmission is needed to eradicate the disease completely. Agent-based Simulation models can provide a better insight in the spatio-temporal diffusion patterns of a disease, but can also be used to investigate different intervention strategies.

We developed an agent-based model (LEPRASIM) to test a number of possible future long-term prevention strategies on their effectiveness. The model is applied to a case study on a group of five islands in the Flores Sea, Indonesia. Empirical data on leprosy incidence and prevalence are available for these islands as a result of a chemoprophylaxis intervention study during the period 2000-2010. The long-term effectiveness (2000-2025) of a set of eight leprosy prevention strategies, aimed at different contact groups of symptomatic patients is measured.

Tests on long-term leprosy prevention strategy for the contact groups of leprosy patients using rifampicin prophylaxis revealed that the effectiveness depends on the prevalence rate. At low prevalence rate an approach aimed at household and neighbour contacts proofed to be the most effective. At high prevalence rates a blanket approach, followed by a targeted approach aimed at both household and neighbour contacts of infected individuals is the most effective option.

In this study we show how Agent-based Simulation can be an effective tool for testing long term intervention strategies. The major advantage of the agent-based approach is that social contacts can be modelled directly and that the model is spatial, taking into account the distribution of people over the different islands. Although the model was developed for a specific case study, it is adjustable for other areas, including new types of social contacts and prevention strategies.