



# **Ascaris: The Neglected Parasite: Chapter 7. Ascaris lumbricoides: New Epidemiological Insights and Mathematical Approaches**

*Martin Walker, Andrew Hall, María-Gloria Basáñez*

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In the context of the current unprecedented momentum and commitment to control neglected tropical diseases, and the increased advocacy of anthelmintic mass drug administration (MDA), there are renewed calls for research and development into the epidemiology and population biology of helminthic parasites to be embedded at the core of intervention strategies. This review of the epidemiology of *Ascaris lumbricoides* – one of the three neglected soil-transmitted helminth infections of greatest public health importance – includes discussion on diagnostic methods and their limitations; patterns of transmission within communities, including heterogeneities in infection and reinfection following curative treatment; the geographical distribution of infection, and the role of environmental, climatic and socio-economic co-variables. Special emphasis is placed on the mathematical approaches that underpin contemporary parasite epidemiology. In particular, statistical models – for analyzing highly variable, overdispersed, zero-inflated and hierarchically or spatially structured data – and dynamic models of infection and transmission. Deterministic, stochastic and hybrid dynamic models are discussed in the context of their application in elucidating the interplay between the parasite frequency distribution and density-dependent population processes; the dynamics of reinfection following curative treatment; the sustainability of parasite populations at low densities; theoretical threshold densities (transmission breakpoints) for elimination; and the potential spread of anthelmintic resistance. The review highlights the public health relevance of mathematical models and analytical methods, and concludes by focusing on recent insights into the epidemiology of *A. lumbricoides* which are particularly germane to the effective implementation of MDA-based control.

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