PREFACE

Backcalculation is a methodology to reconstruct the past Human Immunodeficiency Virus (HIV) infection rates from Acquired Immune Deficiency Syndrome (AIDS) incidence data and incubation distribution. An important public health problem is how many individuals are infected with HIV. Most of the national surveillance data systems record only AIDS cases and not HIV infected cases. This work attempts to study the size of the HIV infection estimates under various parametric model assumptions using backcalculation methodology and applies these models to estimate the infection levels using surveillance data at national and regional level.

Various alternative choices for the two major components of backcalculation methodology namely incubation period distributions and infection densities are analysed in detail. The uncertainties of the backcalculation estimates are quantified by real and simulated data sets.

The thesis contains five chapters. Chapter I reviews the magnitude of HIV/AIDS epidemic and the current trend of the epidemic and related concepts. Various incubation period distributions that are applied in the context of HIV/AIDS modeling are presented in Chapter II. Some new models for incubation period are also proposed. The statistical aspects of backcalculation methodology are presented in Chapter III and methods of
estimation of parameters are also explained in detail. Infection densities and uncertainties of backcalculation estimates are also presented in this chapter. Chapter IV deals with simulation studies, which aims to quantify the uncertainties of backcalculation estimates due to alternative incubation period distributions and infection densities. Chapter V contains the estimated minimum size of the HIV/AIDS epidemic in India and Tamilnadu. Short-term projection of HIV/AIDS in India and Tamilnadu is presented under various model assumptions and results are compared with other projections. The thesis concludes with a summary of findings and a list of topics for further research.