The Use of Mathematical Models to Evaluate Tuberculosis Control Interventions

Lin, Hsien-Ho
National Taiwan University

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National Taiwan University   Hsien-Ho Lin

概 要

Tuberculosis (TB) remains a major infectious disease in the world, with estimated eight million incident cases every year. In the past few decades, dynamic transmission models of infectious diseases have been used increasingly to inform policy making in TB control. In this talk I will give some examples on the application of infectious disease models in TB control.

1. New TB diagnostics. In the past few years, a number of new diagnostic tools and strategies have been endorsed by WHO, including the automated machine Xpert MTB/RIF. At the same time, decision makers in national TB programs are faced with the challenge of choosing the appropriate diagnostic option that is most suitable for the country-specific epidemiologic situation and available resources. We developed an integrated modeling approach to assess the impact of a new diagnostic tool at the patient level, health system level, and the population level. Using the integrated model, we collaborated with the Tanzania National Tuberculosis Program to evaluate the potential impacts of several diagnostic options that are being considered by the program.

2. **Evaluate national TB control policy.** In China, the challenge of TB control is to maintain the decline of TB while dealing with the high prevalence of MDR-TB. The TB program needs to decide on whether to invest on the expensive MDR-TB diagnosis and treatment at the national level. At the same time, the task of TB control was complicated by the ongoing shift in treatment from TB dispensaries (using directly-observed therapy, short-course [DOTS] treatment) to designated hospitals. Our modeling analysis of different TB control measures in China suggested that maintaining and strengthening DOTS would have the greatest impact on both drug susceptible TB and MDR-TB. We also found that the ongoing shift in treatment from TB dispensaries to designated hospitals could have a negative impact on TB control if the hospitals cannot maintain a high cure rate as in the dispensaries.

Hsien-Ho Lin, M.D., M.P.H., Sc.D.

Institute of Epidemiology and Preventive Medicine
College of Public Health, National Taiwan University
No. 17, Xu-Zhou Rd., Taipei 100, Taiwan
Phone No.: 02-33668023
Fax No.: 02-33668023
E-mail: hsienho@ntu.edu.tw

Education

1994-2001	M.D., National Taiwan University, Taiwan
2002-2003	M.P.H., International Health, Harvard University, U.S.A.
2005-2009	Sc.D., Epidemiology, Harvard University, U.S.A.

Professional Appointments

2001-2005	Resident, Mennonite Christian Hospital, Taiwan
2009-2009	Postdoctoral Fellow, Brigham and Women's Hospital, U.S.A.
2010	Attending Physician, Mennonite Christian Hospital, Taiwan
2010~	Assistant Professor, Institute of Epidemiology and Preventive Medicine, National Taiwan University, Taiwan

Research Interests

Dr. Lin's research interest involves using epidemiological studies to assist control and prevention of tuberculosis. He has used epidemic models to assess the potential impact of tuberculosis interventions that are being considered by policy makers, including new diagnostics (e.g., LED microscopy, Gene Xpert MTB/RIF) in developing countries and tuberculosis control programs in China and Taiwan. He has been studying risk factors of tuberculosis, including active smoking and passive smoking, indoor and ambient air pollution, alcohol use, and diabetes, using population-based cohort studies and meta-analysis. Building on evidence from these epidemiological studies and epidemic theory of infectious diseases, he is investigating population-level impact of changing risk factors on future tuberculosis epidemiology, the interaction between chronic disease epidemiology and tuberculosis epidemiology, and methodological issues when conducting such studies.