

Summary of each section of

*“PERSISTENT HIGH INCIDENCE OF TUBERCULOSIS AMONG IMMIGRANTS IN A LOW-INCIDENCE COUNTRY: IMPACT OF IMMIGRANTS WITH EARLY OR LATE LATENCY”*

## 1. Introduction

- > Characteristics of Tuberculosis(TB).
- > Overview of TB situation over the globe.
- > The development or organization of the paper.

## 2. Model formulation

- > Setup of the ODE systems
- > Define parameters and variables

## 3. Model Analysis

- > Assume there is an equilibrium, then there exists a solution for the equilibrium.
- > Prove that there exists an equilibrium of the system by setting up the Lyapunov function  $V(x)$  and proving the  $V'(x) < 0$ . Note Lyapunov [Pronounce: lee 'ap uh nahf]

## 4. Numerical Simulation

- > Plug in the initial data of X, E, L, T (from the 2001 Census of Canada), and others into the system. Note that most of the values of the parameters can be found in this section.

- > Simulate different scenario of  $q_1$ ,  $q_2$  and  $\beta$  with figures

- > 1.  $q_1 > 0$  and  $q_2 = 0$ :

In this scenario, an increase of  $q_1$  will sharply increase the TB incidence rate within a short period of time. TB incidence is very sensitive to the percentage of new immigrants with early-stage LTBI,  $q_1$ .

- > 2.  $q_1 = 0$  and  $q_2 > 0$ :

In this scenario, the TB incidence rate increases slowly by increasing  $q_2$  during a relatively long period. This illustrates that new immigrants with late latent TB alone, though in a large proportion, can not sustain a high TB incidence level in the foreign-born population.

- > 3.  $q_1 > 0$  and  $q_2 > 0$

Illustrates the relationship of TB incidence rate with varying  $q_1$  and  $q_2$  at the endemic equilibrium.

- > Note that: The scenario of  $q_1=q_2=0$  is done by other research.

- > Effects of annual new immigrant level

- > Fix  $q_1 = 3\%$ ,  $q_2 = 37\%$ .

Simulate the change of the TB incidence by varying the annual level of new immigrants ( $\pi$ )

- > Effect of the transmission coefficient

- > Simulate the change of the TB incidence by varying the transmission coefficient  $\beta$ .

## 5. Summary

- > Recap the organization of the paper.
- > Conclude that new immigrants in the early latent stage ( $q_1$ ) have a much more significant impact than those in the late latent stage ( $q_2$ ) on the TB incidence of the foreign-born population in an immigration country.
- => It is of high priority to identify and treat new immigrants with early-stage LTBI.
- > Expectation on the direction of future research.