

AMSC/MATH 420, Spring 2014

Second Project on Modeling Epidemics: Time-Varying Interventions

Oral presentation due Friday May 2

Written presentation due Monday May 12

Description common to all teams. This project will use an SIR-like model with the affected population divided into a low-risk group and a high-risk group. Parameters that quantify the rates of disease transmission within and between groups will be estimated from the AIDS diagnosis data at <http://wonder.cdc.gov/aids-v2002.html>; the metropolitan areas to use will be chosen after the project team is formed. On the other hand, we will regard parameters that quantify rates of removal from the susceptible and infectious population to be under our control, subject to a budget that represents resources spent by a public health organization on interventions such as awareness campaigns and disease testing programs. The budget constraint will be a maximum value for a “cost function” that expresses how much resources are required to achieve given values of the removal parameters. The central mathematical problem will be to develop a method to determine removal parameters, constrained by the budget, that minimize the number of people who contract the disease. Another goal will be to see if the optimal removal parameters can be reasonably approximated by a linear (or other simple) function of the transmission parameters and cost function parameters.

Team specialization. This team will consider intervention strategies that can use different removal parameters at different times. Should resources be spent as soon as they are available or is there an advantage to saving them for use at a later time? With this question in mind, the team will choose a family of intervention strategies that allow the removal parameters to change over time, and determine and analyze optimal intervention strategies for this family.