Avdelningen för Medicinsk Biostatistik och Epidemiologi

Computer aided infectious disease epidemiology – Bridging to public health

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ABSTRACT

This thesis explores the junctions of mathematical and computer modeling of infectious disease epidemics, the basis of such research and the communication of results. With increasing frequency we turn to computers and software for any type of research problem encountered. Computer modeling is a blessing with many hidden trapdoors. Skipping mathematical modeling, resorting to code immediately, is ill advised. Validity, uncertainty, bugs and old mathematical truths must all be taken under careful consideration. The same duality is present in the communication of the results from computer models to the public, to decision makers and to peers.

These topics are discussed in the context of four contributing papers.

The first paper describes a computer model of an infectious disease epidemic in Sweden. Using Swedish travel data we were able to demonstrate a way of successfully restricting travel to delay the spread of disease.

The second paper discusses a known fallacy common to many epidemic models, often overlooked when mathematical models are simulated on computers. It is demonstrated that it must be considered also with more complex models. The model in Paper I is used to exemplify the problem.

The third study takes the parsimonial considerations of the first two papers to another level, proposing static models for use in epidemic modeling. Understanding, an eluding - especially in computer models - but essential component in all models, is benefited.

The fourth study explores the epidemiology of sexual networks. Using survey datasets we show that with high probability, the sexually active population is largely connected, in a so called giant component, rendering the Swedish population an ideal isotope for sexually transmitted pathogens.

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