Office of Epidemiology, City of Akron Health Department

Report on Colloquium by Dr. Margo Erme, March 16th, 2006, Kent State University.

report written by Mienie de Kock, KSU

Margo Erme, the disease control medical officer of the Akron Health Department presented in a colloquium at Kent State University and discussed the methods used to try to detect disease outbreaks on a local level, their limitations and the need for better mathematical models to improve disease and outbreak surveillance.

It is the job of the Office of Epidemiology to monitor and log outbreaks of diseases in Akron and across Summit County in which it lies and to report results to the Ohio Department of Health and to prescribe disease control measures when appropriate. This includes preparedness plans in the event of bio-terrorism. Bio-terrorism concerns attract the majority of funds. The office also provides educational programs and materials for the local health care professionals and for the public.

The main duty of the office is to maintain the surveillance of communicable diseases that are required to be reported by Ohio state law. This is accomplished by gathering data from a large number of sources. These sources include hospitals, doctors' offices, schools, pharmacies and other retail outlets. One particularly interesting source of data is Pittsburgh State University, which operates a program called RODS (Real Online Disease Surveillance). It operates by automatically gathering the data and displaying it online. For example, RODS delivers data concerning chief complaints of patients entering the emergency room (see attachment page 3). The complaints vary from general malaise to specific ailments (like a rash or neurological or respiratory complaint). Another example is the sale of pharmaceuticals. This includes the sales of thermometers, over-the-counter flu medications, anti-diarrhea medicine and pediatric medicine. In order to give a more accurate reflection of real illness, both "unpromoted" and "all sales" are shown.

The problem is that the surveillance of communicable diseases on a local level is an imprecise and time-dependent event. Waiting for the confirmation of a disease by laboratory testing can take days and this delay can be problematic if a disease outbreak is suspected. Another problem is the very nature of the data itself. It is often very rough and carries little specific information. A large number of school absentees may indicate there is an illness in the population, but it says nothing of what it is. Clinical diagnoses are only slightly more helpful. A doctor very frequently sees a patient, observes flu-like symptoms, says it looks like the flu and orders treatment for the afflicted patient. Very rarely are laboratory tests ordered. It simply is not worth the cost of the tests to get information that would not change the treatment plan. Another problem is that not all of the pertinent sources for data in the county are connected. In particular, only a few of the many hospitals in Akron are connected. So the data collected might not be representative of the total population. Also, the reporting is voluntary (see attachment page 1 and 2). The privacy and confidentiality of the patient is also a problem.

The needed research includes the determination of the proportion of signals that are true events. It is important to narrow down on false alarms, even though a false alarm is preferred over a missed truth. Improving the ways the data is transformed for analysis and refining the analytic methods to improve pattern recognition and integration of multiple streams of data is essential. It would be ideal to have a time frame for when the peak of an outbreak may occur after it has been detected. They have noticed that the peak of the flu season always comes between four and twelve weeks after the first laboratory confirmation. It should be determined whether this estimate can be improved upon and whether estimates can be found for other diseases.

One final problem facing the epidemiologists is the issue of scope. The epidemiologists' techniques work well in a relatively small region with a high population (like Summit County), but they do not extend well to larger regions (such as states the size of Ohio). One possible reason for this is rural counties with small populations. They offer very limited data and not much can be said of it.

Attached is a copy of the hand-out Margo Erme distributed during her talk. It summarizes all the important and pertinent points.

[Comments, by Bernard Beauzamy

In 2005, SCM had a contract with the French Ministry of Defense : what mathematical models are relevant in epidemiology ? In October 2005, I could meet in Akron with Dr. Virginia L. Abell, Dr. Marguerite A. Erme, Dr. Amy Lee, and what they told me was extremely helpful for our study. Therefore, I am quite happy that Margo accepted to give a talk at the colloquium we organize in Kent, because what she says is absolutely central to the Robust Mathematical Modeling program.

Our study found that two types of mathematical models exist in epidemiology :

- Statistical models : from data gathered at various places, decision is taken, usually on the basis of thresholds.

- Comprehensive models : one tries to understand how the disease propagates ; this is usually described by means of differential equations.

Academic research is extremely active for models of the second type (and many journals do exist), but such models are never used in practice, because they are too complicated and the necessary data do not exist at all.

In practice, all models that are really used are of the first type. This is the case in Akron, and also in France with a net called "sentinel", which detects and predicts the presence of flu. This net was established long ago, and seems to work well, even on larger regions (the net works for France as a whole).

Margo's talk indicates very well what directions we should take. We should not try to build more elaborate models, but find a more efficient way to use the data that epidemiologists already collect. Perhaps, as Per Enflo proposed a while ago, a good idea might be to use different thresholds at different times, for instance to take a decision based upon data collected at one week distance.

I'll try to see if, in France, some research programs can be built upon these lines. I'll keep everyone informed.]