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Game to teach infectious diseases modelling

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In the June 2010 issue of the SACEMA Quarterly, Steve Bellan reported on the 2009 and 2010 Clinics on the Meaningful Modelling of Epidemiological Data (MMED) that were given at the African Institute for Mathematical Sciences (1). This clinic continues to be given annually and in April 2012 an article has been published in PLOS Biology on a teaching tool, in the form of a game, that is used during the clinics (2).

Modern infectious disease epidemiology builds on two independently developed fields: classical epidemiology and dynamical epidemiology. Over the past decade, integration of the two fields has increased in research practice, but training options within the fields remain distinct with few opportunities for integration in the classroom. The annual MMED Clinic has begun to address this gap. MMED offers participants exposure to a broad range of concepts and techniques from both epidemiological traditions. During MMED 2010 a pedagogical approach (in the form of a game) that bridges the traditional distinction between classical and dynamical epidemiology was developed which can be used at multiple educational levels, from high school to graduate level courses. The approach is hands-on, consisting of a real-time simulation of a stochastic outbreak of Muizenberg Mathematical Fever (MMF) in course participants, including realistic data reporting, followed by a variety of mathematical and statistical analyses, stemming from both epidemiological traditions. During the exercise, dynamical epidemiologists developed empirical skills such as study design and learned concepts of bias while classical epidemiologists were trained in systems thinking and began to understand epidemics as dynamic nonlinear processes.

This is how the stimulation works:. Participants in the workshop are "infected" by fellow attendees whom they interact with. Like a real disease, people are more likely to infect individuals that they know and spend more time with. When people receive their diagnosis, they go to a website that gives them more information. On the site, a random number generator determines whether they'll have symptoms and how many others they'll infect. The students are also told to inform the instructors of their infection. But only some are also instructed to report to a “health clinic”—one of the instructors. The result of the game is two data sets: The instructors have the omniscient data set that records every infected person, which would never exist in the case of a real disease outbreak. There's also a more realistic data set consisting of cases reported to the health clinic. When MMF has run its course through the workshop, the mathematicians work with the data set from the health clinic to make predictions about how MMF spreads, what influences its severity, and why the outbreak burns out. They can see how far off their predictions are from reality by checking against the omniscient data set. The instructors can create different versions of MMF with different modes of transmission - environmental versus person-to-person, for example - or different rates of infectiousness.

MMF is the brainchild of Steve Bellan, ecologist at the University of California, Berkeley, who specializes in the epidemiology of wildlife diseases like anthrax (see the article on anthrax surveillance in Namibia in the SACEMA Quarterly of March 2011) (3), and Juliet Pulliam of the University of Florida, Gainesville. They believe this type of integrated educational tool will prove extremely valuable in the training of future infectious disease epidemiologists. "The feedback we've gotten from those who have gone through this has been very positive," Bellan says.

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