

Nicolas Bacaër

Title: The basic reproduction number of epidemics in periodic or random environments

Session: Epidemiology

Abstract:

The basic reproduction number, noted R_0 , is a concept that is often used in epidemiology. Originally developed by Lotka in a demographic context, it was popularized in epidemiology by Anderson & May. In simple models, it is the average number of secondary cases due to one primary case at the beginning of an epidemic. An epidemic occurs when R_0 is bigger than 1.

For more complex models, the definition of R_0 requires a little attention in order to keep $R_0=1$ as the epidemic threshold. In constant environments, R_0 is often the spectral radius of a "next-generation matrix".

However many infectious diseases, in particular air-borne and vector-borne diseases, are very much influenced by seasonality. We shall explain how the definition of R_0 was adapted to time-periodic environments a few years ago and how classical results concerning R_0 are modified in this case.

Finally we shall explain how the definition of R_0 was recently adapted to random environments.

References:

[1] N. Bacaër, E. Ait Dads: On the biological interpretation of a definition for the parameter R_0 in periodic population models. *J Math Biol* 65 (2012) 601-621.

[2] N. Bacaër, M. Khaladi: On the basic reproduction number in a random environment. *J Math Biol*, doi:10.1007/s00285-012-0611-0