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On continuously structured epidemic and ecological models

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The basic reproduction number $\mathcal{R}_0$ is defined, in an epidemic model, as the expected number of new infections produced by an infected individual in a fully susceptible population. In an ecological model, the basic reproduction number $\mathcal{R}_0$ is defined as the expected number of offspring that an individual has thoughout its life. It is generally calculated as the spectral radius of the so-called *next-generation operator*. However, when considering continuously structured populations defined in a Banach lattice X with concentrated states at birth it is not possible to define the next-generation operator in X. We will present an approach to compute $\mathcal{R}_0$ of such models as the limit of the basic reproduction number of a sequence of models for which $\mathcal{R}_0$ can be computed as the spectral radius of the next-generation operator. We will present some examples, in particular an epidemic model with asymptomatic transmission for which we will also discuss the final infection size.