Methodological approaches for the estimation of reproduction numbers (R0,Re,Rt) of COVID-19. Systematical review

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Reproductive numbers have become a popular summary statistic used by policymakers to assess the state of an epidemic such as the COVID-19 epidemic and the efficacy of interventions. There are different terms, definitions, and methodologies for the estimation of this indicator. Here, we made a systematic review of reproduction numbers types and methods for their calculations during the COVID-19 pandemic. We conducted a systematic review according to PRISMA 2020. We looked in MEDLINE (PubMed) and Scopus on May 1st of 2021. For each paper, we extracted information about reproductive number terms, definitions, methodology used for their estimation, methodological advantages and disadvantages, factors affecting their estimation, and applications. We reviewed 100 papers. We identified that the majority of these studies estimated at least one of the two classic reproductive numbers: basic and effective reproductive numbers. We found that most methodologies are based on compartmental models of the epidemic, Renewal equation, Lotka-Euler equation, and Maximum likelihood models. Some new proposals or improvements to previous methods were also reported. We also found that there are biological, environmental, social, and administrative factors that affect the reproductive number estimations. Though there are different terms for the reproductive number all of them refer to the basic or effective reproductive number. However, the methodology used to estimate the number is more important than the term because the specific number being estimated depends on the assumptions of the methodology used.

COVID-19; Basic reproductive number; Communicable Disease Control; statistical models