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Super-spreading events initiated the exponential growth phase of COVID-19 with R0 higher than initially estimated

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The basic reproduction number R_0 of the coronavirus disease 2019 has been often estimated to range between 2 and 4. We used a SEIR model that properly accounts for the distribution of the latent period and, based on empirical estimates of the doubling time in the near-exponential phases of epidemic progression in China, Italy, Spain, France, United Kingdom, Germany, Switzerland, and New York State, we estimated that R_0 lies in the range 4.7–11.4. We explained this discrepancy by performing stochastic simulations of model dynamics in a population with a small proportion of super-spreaders. The simulations revealed two-phase dynamics, in which an initial phase of relatively slow epidemic progression diverts to a faster phase upon appearance of infectious super-spreaders. Early estimates obtained for this initial phase may suggest lower R_0 .

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