Use of probability distributions and mathematical models in the understanding of the spreading of SARS-CoV-2 inside schools

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The opening of the schools during the pandemicl of SARS-CoV-2 was a question of debate in Spain at the begining of the curs 2020-2021 after a long time of closing. The same question appeared around the world and very differnt meassures were employed for the different countries, while Sweden left open the schools with very minor restrictions, Peru closed all the type of schools during the next two years.

Before the beginning of the course and to consider the possible dynamics we ellaborate scenarios and performed numerical simulations to calibrate the different measures considered for the begining of the curs. We found that some of the measures like for example the reduction of the class rate would produce marginal effects whoile other measures like the length of quarentine has larger effects [1].

During the reopening of the schools in Catalonia, there was a control of the cases in the schools and the formation of stable convivence groups permited the study of the propagation of the infection when an index case entered in the group. We had accessed to the individual anonimized data to perform such study and we analyzed the resulting propagation rates inside of the bubble groups.

The resulting dynamics were interpreted in colaboration with pediatric epidemiologists to quantify the spreading of SARS-CoV-2 inside the scholar groups [2]. We have fitted a negative binomial distribution to the children infected by a index case inside the bublbe groups, and characterize the average number of infected children per index case for the different school levels see Fig.1.

The low rate of progation found in our analysis agrees with other similar results in the analysis of scholar propoagation and with the fact that the capacity of infection from children to adult is smaller than the capacity of infection

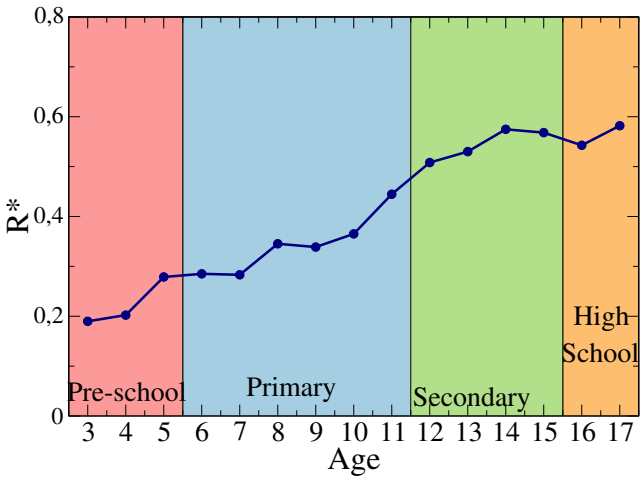

Fig. 1. Dependence of the average number of infected children on the age of the bubble group in the school.

[1] S. Alonso, et al. *Individual prevention and containment measures in schools in Catalonia, Spain, and impact of this strategy on community transmission of SARS-CoV-2 after school reopening* to be published in PLoS one (2022)

[2] S. Alonso, et al. *Age-dependency of the propagation rate of coronavirus disease 2019 inside school bubble groups in Catalonia, Spain*. The Pediatric infectious disease journal, **40**, 955 (2021).