

PARENTAL VACCINATION TO ACCELERATE THE PROGRESS TOWARDS MEASLES ELIMINATION IN ITALY

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High-income countries are experiencing measles reemergence as the result of suboptimal vaccine uptake and marked immunity gaps among adults. In 2017, the Italian Government introduced mandatory vaccination at school entry for ten infectious diseases, including measles. However, sustainable and effective vaccination strategies targeting adults are still lacking.

We propose a vaccination strategy to be introduced on top of the current policy, which consists of offering vaccination to the parents of all of the children who receive any measles vaccine dose. The “current” and the “parental” immunization strategies are simulated through a model of household demography informed with detailed socio-demographic data. The effectiveness of each vaccination program is evaluated in terms of its impact on the overall and age-specific susceptibility to infection of the Italian population, on the effective reproduction number over the period 2017-2045, and on the amount of time required to achieve measles elimination.

We show that the current policy would reduce measles susceptibility in the age segments of the population characterized by higher contact rates, resulting in a remarkable decrease in the infection transmission potential and making measles elimination a realistic target (Figure 1). However, if only 50% of unvaccinated children are vaccinated at school entry, disease elimination would probably be achieved only after 2045. Offering vaccination to the parents of children who receive a measles vaccine dose could progressively reduce

by 17-35% the immunity gaps among individuals who are between 18 and 45 years of age in 2018 and would increase the probability of measles elimination before 2045 from 12.0% (estimated in the absence of this additional policy) to 78.9-96.5% (Figure 1).

Although the proposed policy can reach only a fraction of susceptible adults, that is those with children in the measles-vaccination age group, the obtained results suggest that this strategy may be both feasible and effective. In particular, a key advantage of this policy is that it does not require targeted activities to recruit parents, thus resulting in a relatively simple implementation protocol.

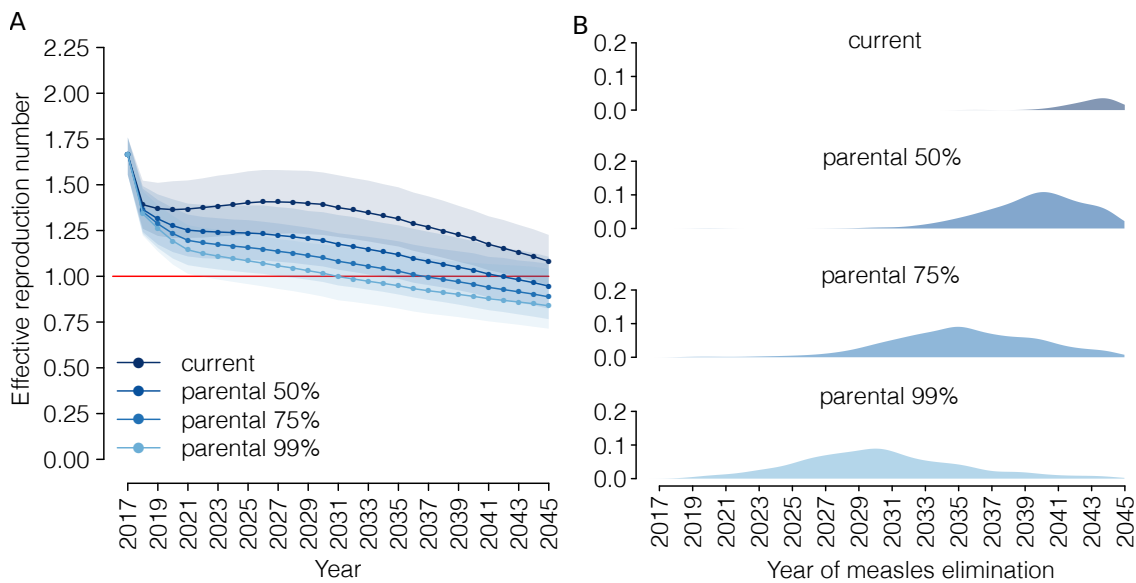


Figure 1: Progress towards measles elimination. (A) Mean effective reproduction number over time, as estimated by the model under the “current” vaccination program (50% coverage) and under different coverage scenarios for the “parental” vaccination program. Shaded areas represent the 95% CI associated with model estimates. The red line represents the measles elimination threshold; elimination is achieved when the effective reproductive number is smaller than 1. **(B)** Probability associated with different time at measles elimination, as obtained by 1000 model realizations under the “current” vaccination program (50% coverage) and under different coverage scenarios for the “parental” vaccination program.