

## Quantifying the next generation matrix of rubella in real time.

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[Background] While the vaccination coverage among children has been maintained greater than 95% for decades, Japan experienced an epidemic of rubella from 2012-13, revealing that adult male who missed a chance of vaccination remained susceptible and constituted the majority of cases. Here we reconstruct the next generation matrix that depends on age and sex so that catch-up campaign can be conceived. [Methods] Multivariate renewal process model was employed, and the next generation matrix was assumed as given by the product of relative susceptibility by age and gender and the social contact rate. The proposed model was applied to approximately linear growth phase. [Results] Estimating the relative susceptibility from the notification data, the effective reproduction number was estimated at on the order of 1.5. Subsequently, effective reproduction number by additional vaccinations that depend on age and sex was explored.  $R < 1$  was attained optimally by focusing on adult male aged from 30-59. [Conclusions] Catch-up campaign was successfully planned in real time. Effective reproduction number could inflate the required vaccination dose, and thus, valid real time estimation was deemed as critical.

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\*Mini-Symposium: Quantification of the epidemiological magnitude of infectious disease epidemics