When to stop Herpes Zoster vaccination?

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"Herpes Zoster vaccination in the context of demographic changes - A modelling study"

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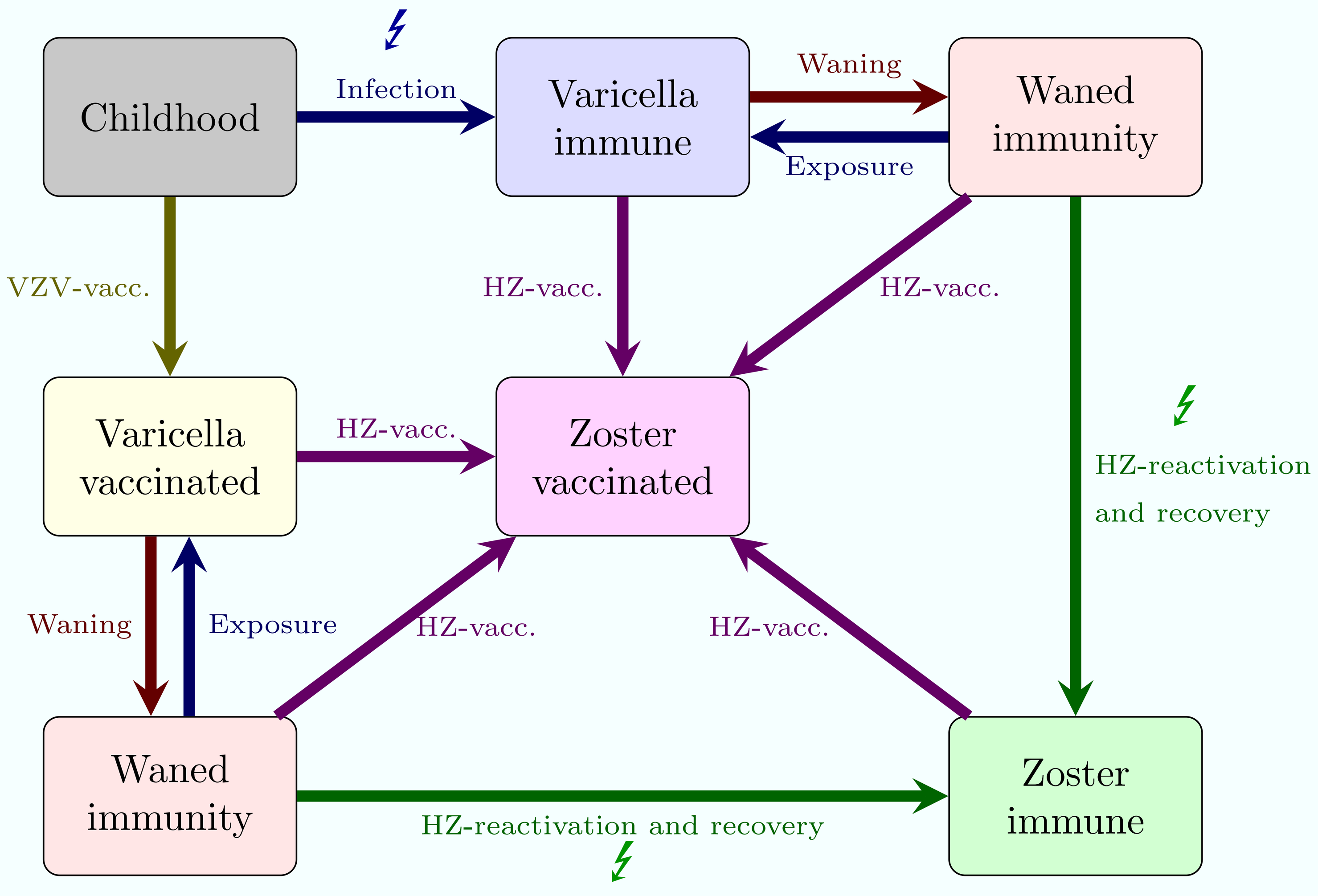
Background

- Childhood **infection with Varicella Zoster Virus (VZV)** causes chickenpox, with later **exposure** boosting immunity.
- After **immunity waning**, dormant VZV-virus may **reactivate** causing *Herpes Zoster (HZ)*.
- **VZV-vaccination** protects against VZV, but may also **wane** and **reactivate** as HZ.
- **HZ-vaccination** reduces HZ risk for both non-VZV-vaccinated and VZV-vaccinated individuals.
- **Demographic considerations** suggests that benefits of **HZ-vaccination** disappears as non-VZV-vaccinated population dwindles.
- It is unclear how long population-wide **HZ-vaccination** is beneficial.



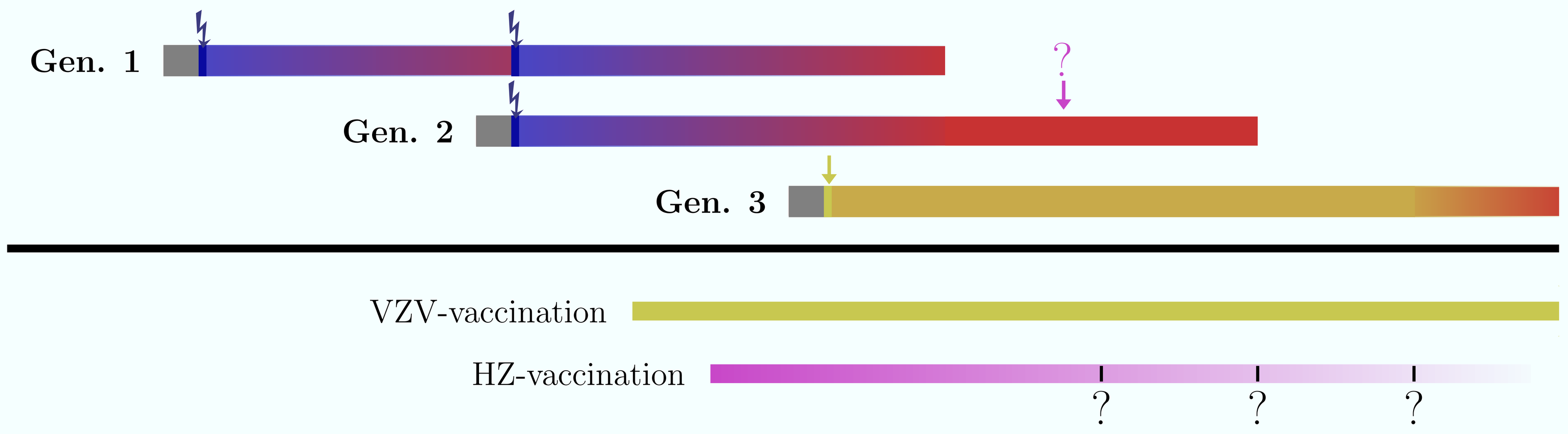
Demographic considerations

Three different life-courses can be exemplified by three generations:

Gen. 1: **Exposed** to VZV in childhood and **boosted immunity** during parenthood

Gen. 2: **Exposed** to VZV during childhood, but not again later.

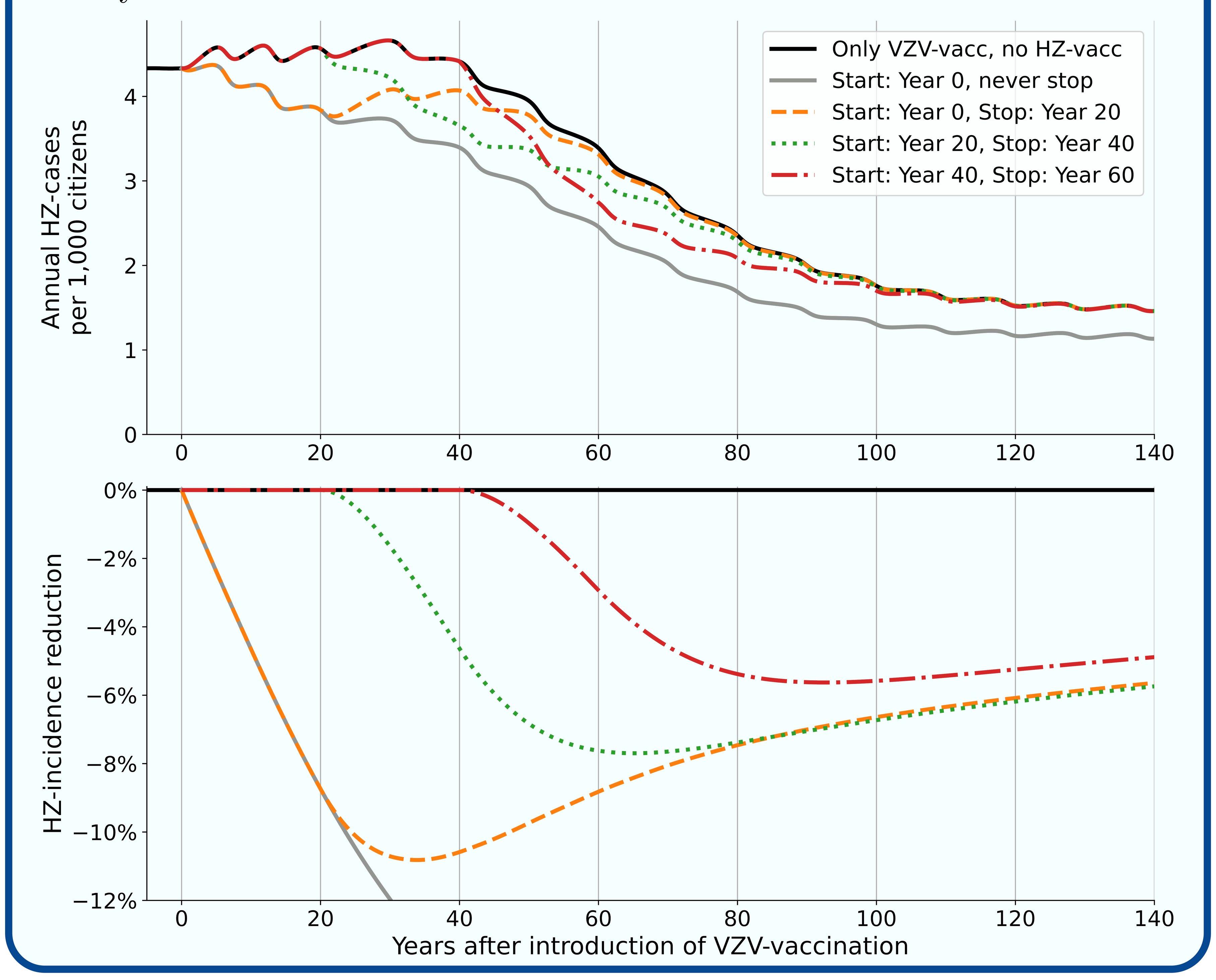
Gen. 3: **VZV-vaccinated** in childhood.



Lack of boosting suggests that Gen. 2 has high risk of HZ. However, **HZ-vaccination** of Gen. 3 is most likely unnecessary, as **VZV-vaccination** provides better HZ-protection than **VZV-infection**.

Examples of simulation time-series

Three examples of 20 years of **HZ-vaccination** are shown, starting 0, 20 or 40 years after the introduction of **VZV-vaccination**.



Infectious Disease Modelling

Based on previous modelling work (see references), we implement a model as a system of ordinary differential equations, allowing for both mathematical analysis and *simulations*.

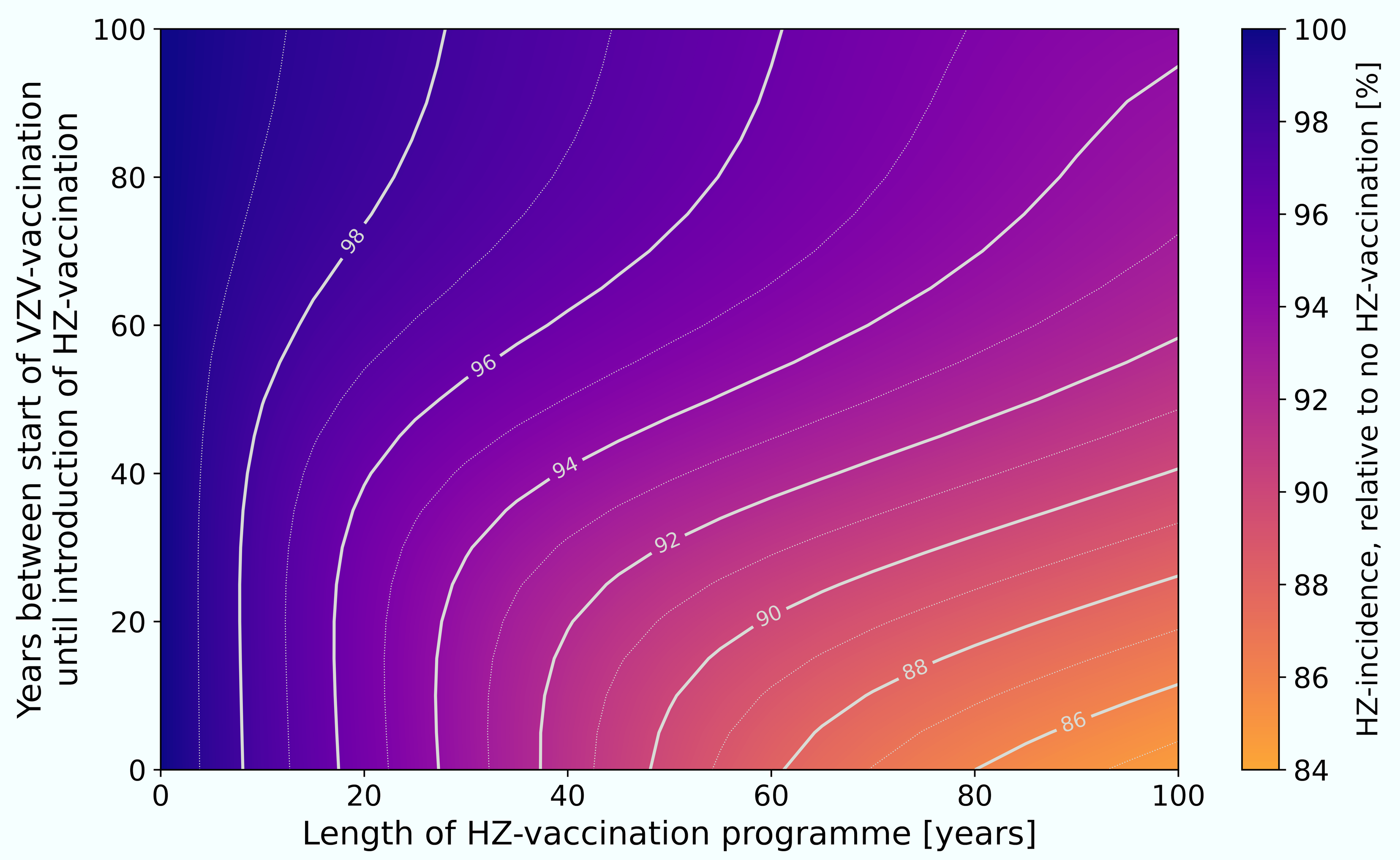
Accounting for both demographics and epidemiology simultanously, we simulate *different scenarios* of age-specific vaccination-rates and timing.

Results: **VZV-vaccination** always reduces VZV-incidence significantly but temporarily increases HZ-incidence.

We simulated different **HZ-vaccination** programmes:

X How long to maintain **HZ-vaccination** before discontinuing?

Y Years from **VZV-vaccination** introduction to **HZ-vaccination**.



HZ-vaccination of the older population reduces HZ-incidence, but the benefit per year of vaccination diminishes over time. Delayed start of **HZ-vaccination** causes it to diminish earlier. This changing benefit per year may affect a cost-benefit analysis of **HZ-vaccination**-programmes.

References

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- Horn et al., (2016). "*Current and future effects of varicella and herpes zoster vaccination in Germany - Insights from a mathematical model in a country with universal varicella vaccination.*" Human Vaccines & Immunotherapeutics, 1-11. DOI: 10.1080/21645515.2015.1135279
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