"Intra-Seasonal Waning" as Methodological Artifact

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> 3. What if the vaccine is not leaky?

Vaccine models

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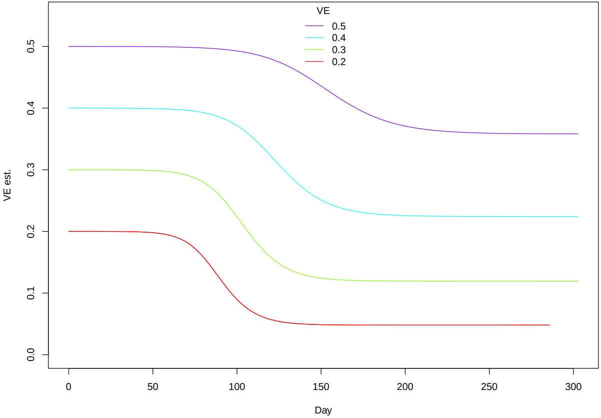
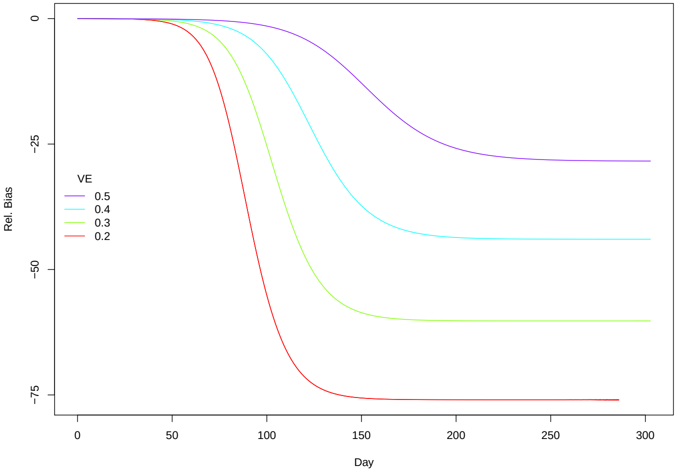
2.
   - Simulation of seasonal influenza epidemics using a stochastic SIR model, keeping track of time since vaccination
   - Implement ”all-or-none” with two viruses: A certain proportion of the population
   - Use Ray’s analytic approach (only vaccinees, conditional logistic regression)

First scenario: "Leaky" vaccine

Vaccination coverage: 0.47, constant; $R_0 = 1.6$; $\delta = 0.25$

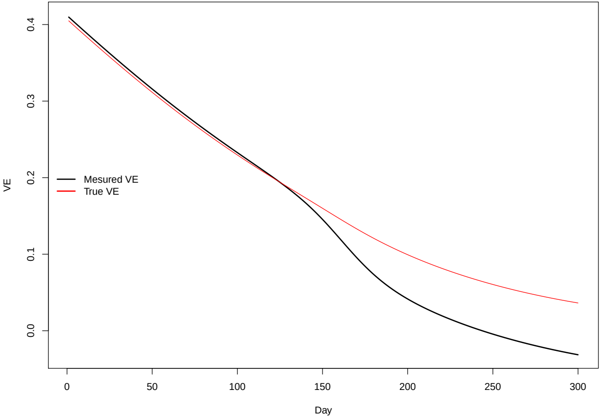


Rel. Bias

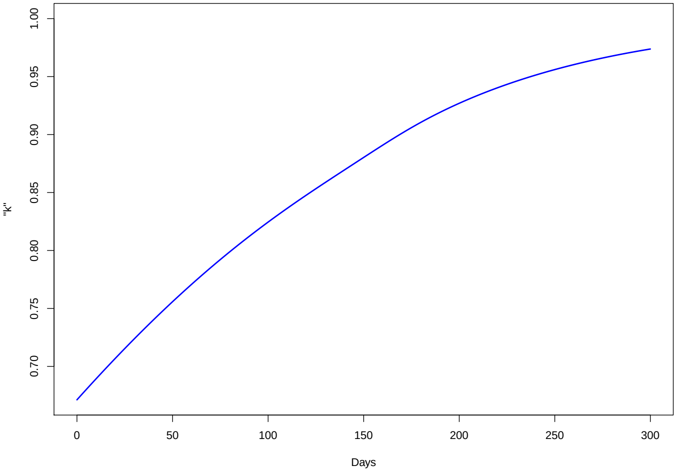


Second scenario: 2 viruses, “all-or-none”

Vaccination coverage: 0.3; $R_0 = 1.25, 1.75;;\ \delta = 0.33$



Time-dependent "k"



- Stochastic simulation with time-since vaccination (TSV)
- Normally-dist. vaccination uptake (cumm. 0.47), starting 100 days before transmission, continuing until 200 days after seeding; $R_0 = 1.8, 1.7$; Proportion of population susceptible (after vacc.) to virus 1, 2, neither or both: $0.2, 0.4, 0.3, 0.1$
- All infections used as cases, control-case ratio 1:3
- Conditional logistic regression, with time since vaccination: < 60, $61 - 120$,$121 - 180$,> 181 days; conditioning on day of enrollment

Variable	OR
TSV 1	Ref.
TSV 2	3.62
TSV 3	2.13
TSV 4	5.92