STATS 700-002 Class 3.
The Volz Coalescent

Edward Ionides and Aaron King

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▶ A time-varying population can be approximated as piecewise constant. Volz et al. (volz09) noticed that this can be inappropriate for fast-changing populations and derived an alternative approach.

Cluster size distributions

▶ Why are (Volz et al., 2009) so interested in cluster size distribution?

The ancestor function

▶ $A(t, T)$ is defined as the "fraction of the population at t with sampled progeny extant at T.

Does "population" here mean "host population, N" or "population of infected hosts, $\mathcal{I}$"?

Intuition

▶ From the introduction, "Coalescent rates are low near peak prevalence, but higher when there is a large ratio of incidence to prevalence."

How is this evident?

Likelihood

▶ Equation (12) is written in terms of $A(t, T)$, which is a property of the model not of the data.

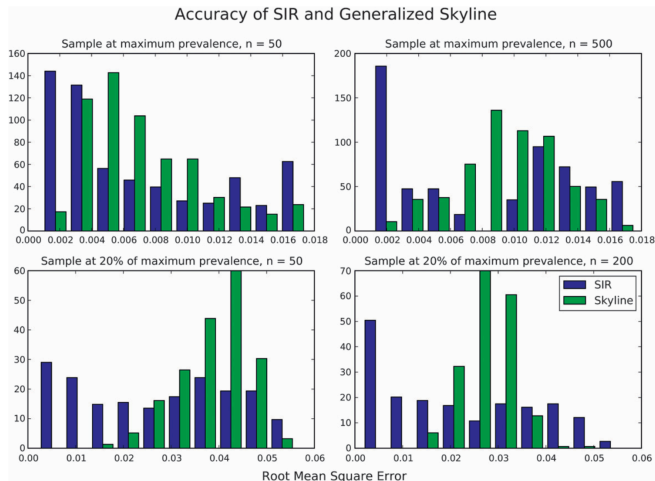How can this be considered a likelihood?

Comparison with the skyline plot

FIGURE 3.—Root mean square error of SIR and generalized skyline estimates of epidemic prevalence. Data are based on 300 simulated epidemics ($R_0 = 2$). RMSE is averaged over 100 time points.

References I

Volz, E. M., Kosakovsky Pond, S. L., Ward, M. J., Leigh Brown,
A. J., and Frost, S. D. W. (2009). Phylodynamics of infectious
disease epidemics. *Genetics*, 183(4):1421–1430.