

## Supporting Information

### File S6. Sampling more individuals on simulations

In Figure S5 we re-arrange our results on simulations shown in Figures 5–7 to compare our estimations when increasing the number of samples. We find that increasing  $n$  does not necessarily improve estimation from 1000 local genealogies.

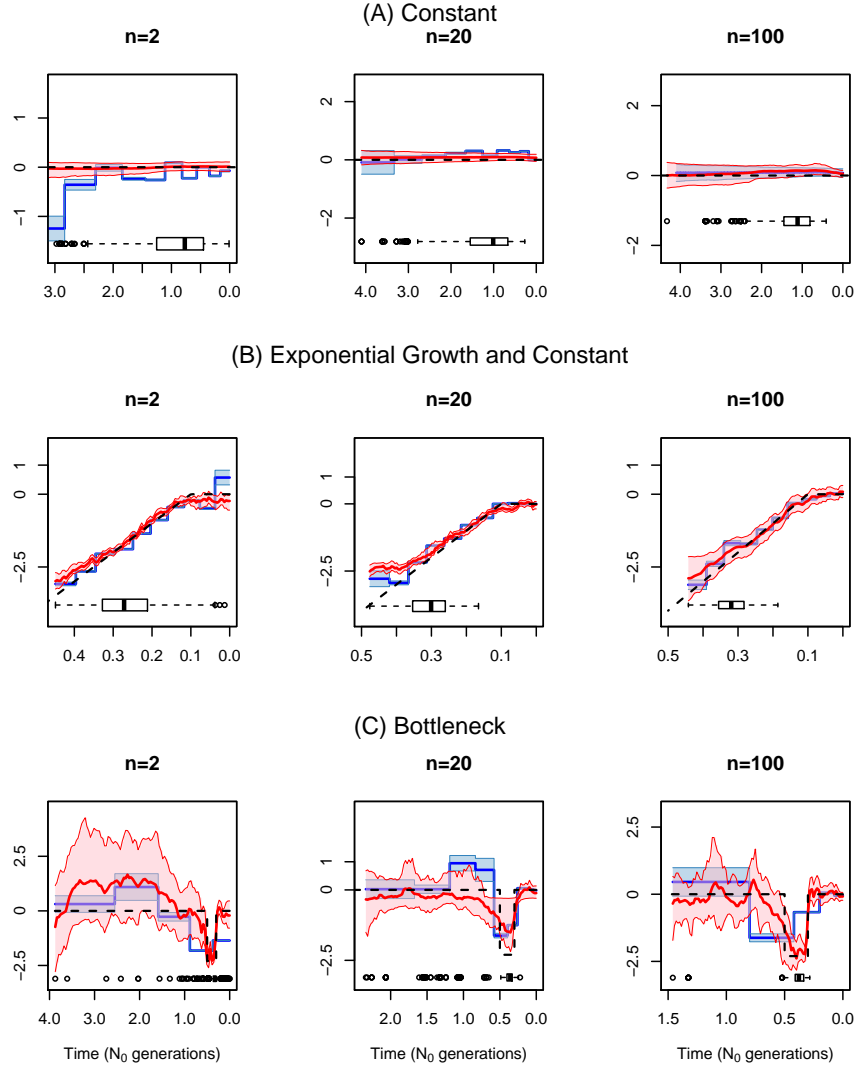


Figure S5: **Comparison of population size trajectories  $N(t)$  inferred varying the number of samples from 1000 simulated local genealogies** (A) Simulated data under constant population size, (B) exponential and constant trajectory, and (C) a bottleneck. We rearrange the plots displayed in Figures 5–7 corresponding to 1000 simulated genealogies. Red curves and pink areas correspond to our Bayesian GP estimates and blue curves and areas correspond to the EM estimates.