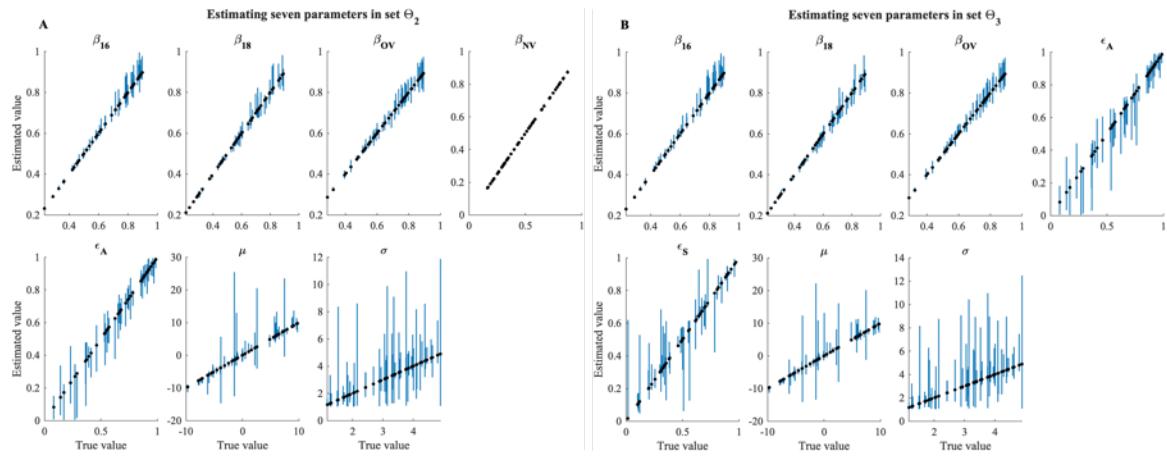


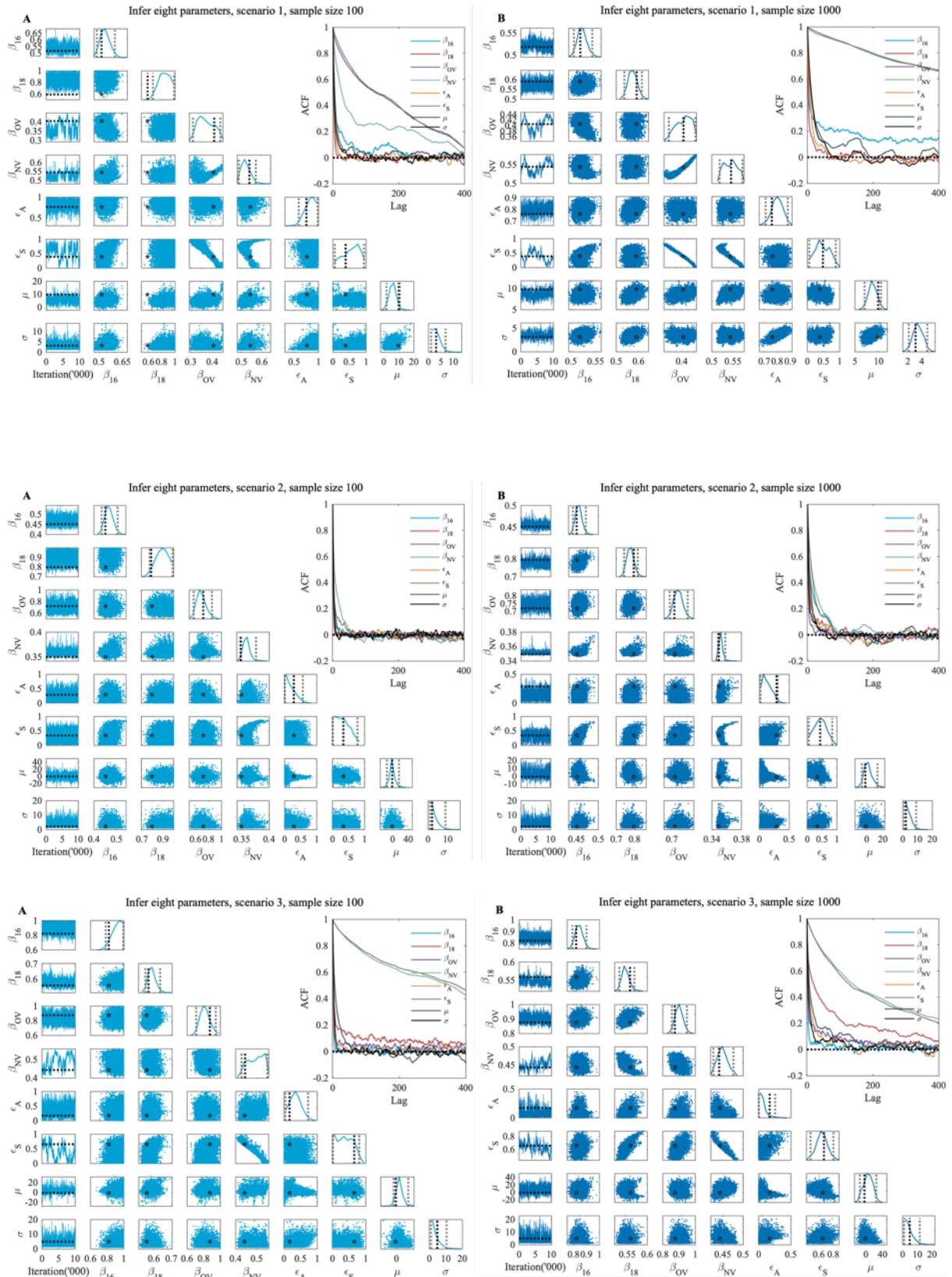
Appendix 2 – Results of the parameter estimation

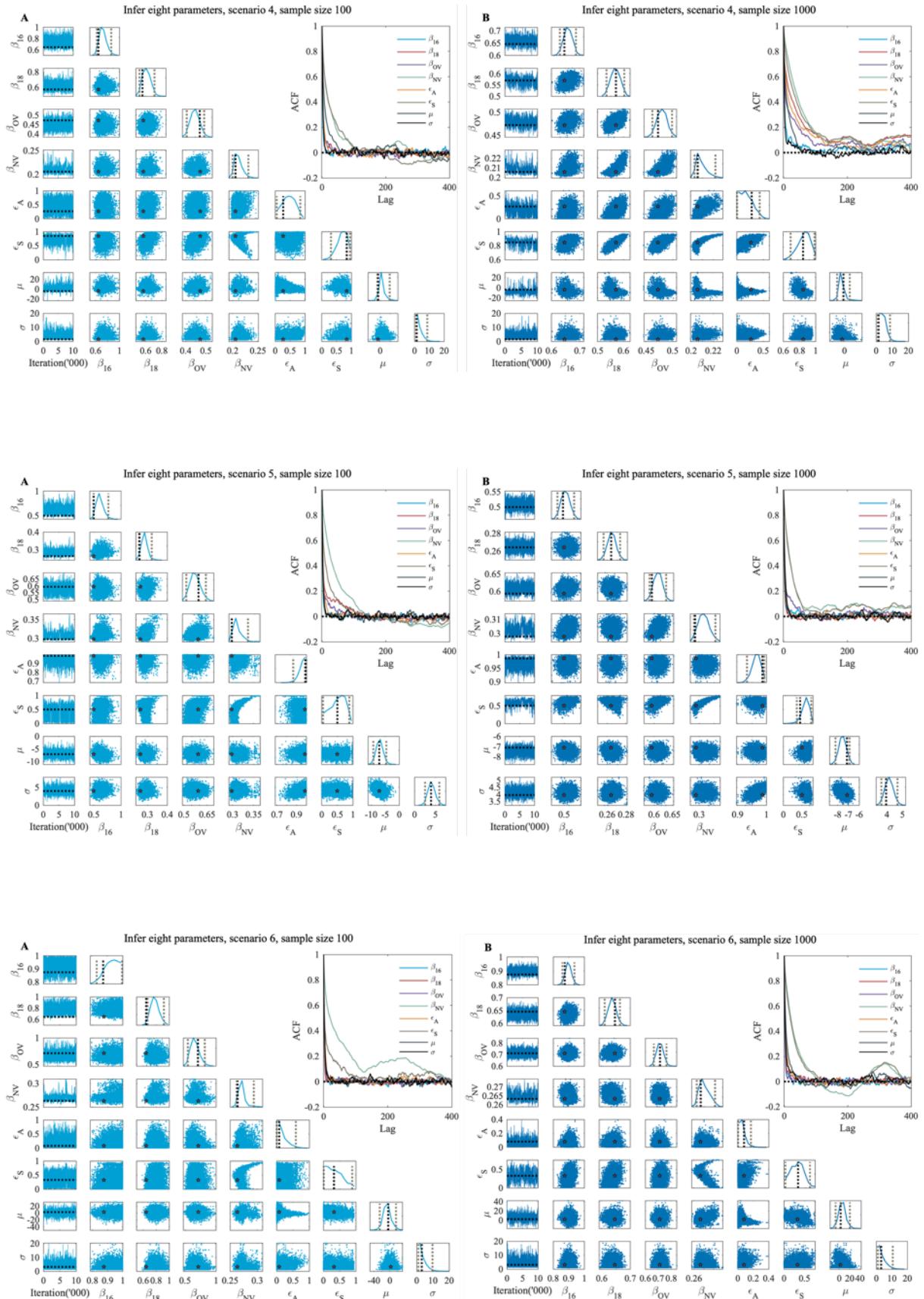
B.1 MCMC results of inferring seven parameters in set Θ_2 ($\Theta_2 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \beta_{NV}, \epsilon_A, \mu, \sigma\}$) and set Θ_3 ($\Theta_3 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \epsilon_A, \epsilon_S, \mu, \sigma\}$) with data from 1000 women in each of the 1-year age group. The true values of the parameters are on the x-axis, and the estimated values are on the y-axis. The bar in blue indicates 95% CrI. The block dots in the bar represent the true parameter values. (A) MCMC result of inferring seven parameters in set Θ_2 with data from 1000 women in each of the 1-year age group. (B) MCMC result of inferring seven parameters in set Θ_3 with data from 1000 women in each of the 1-year age group.

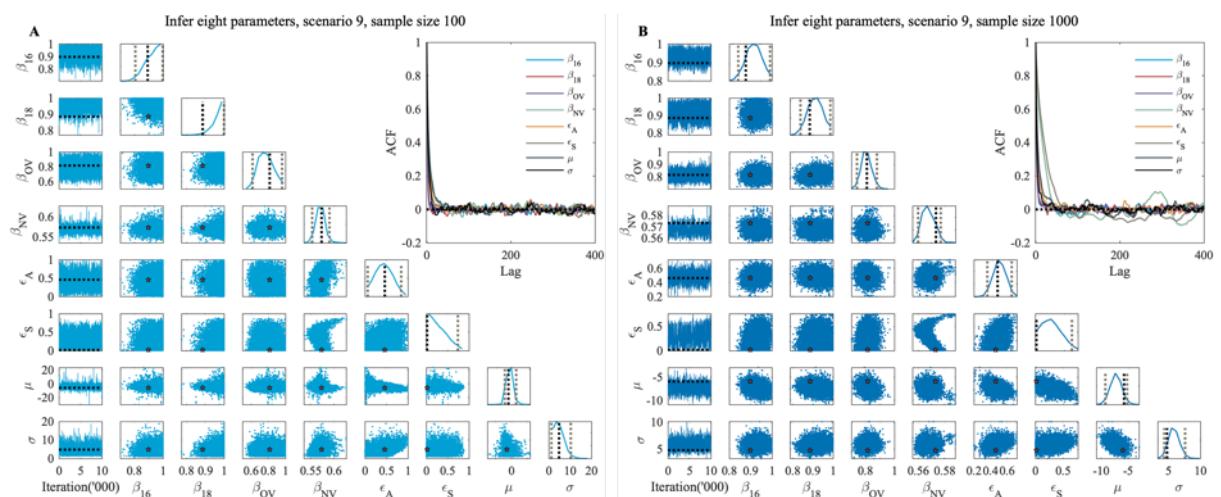
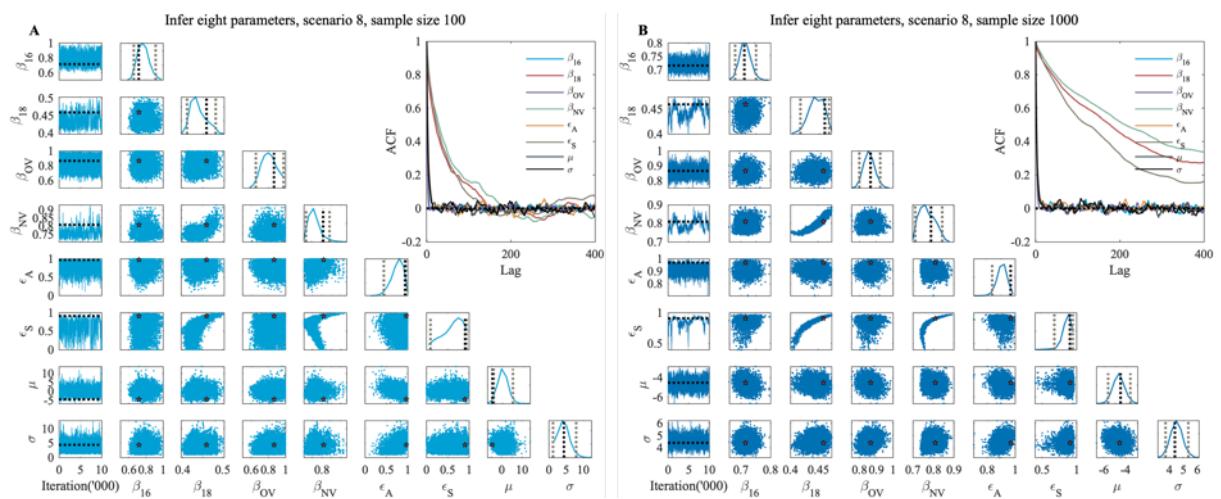
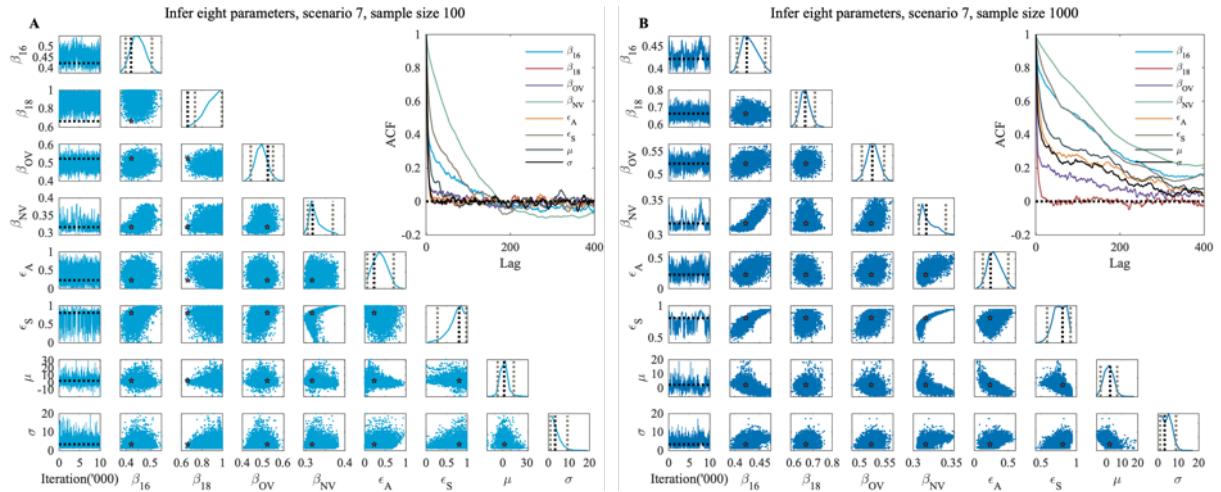


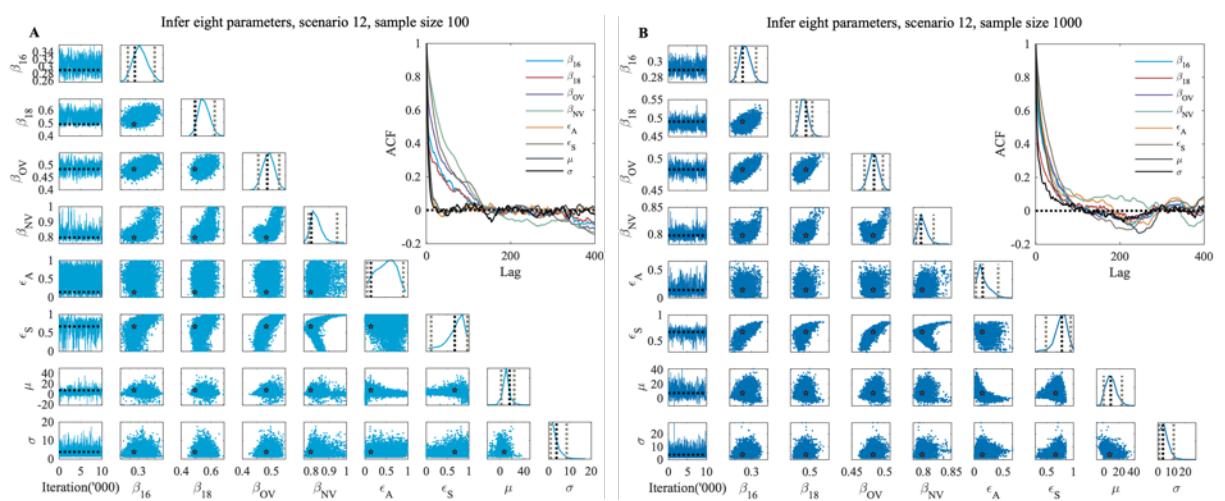
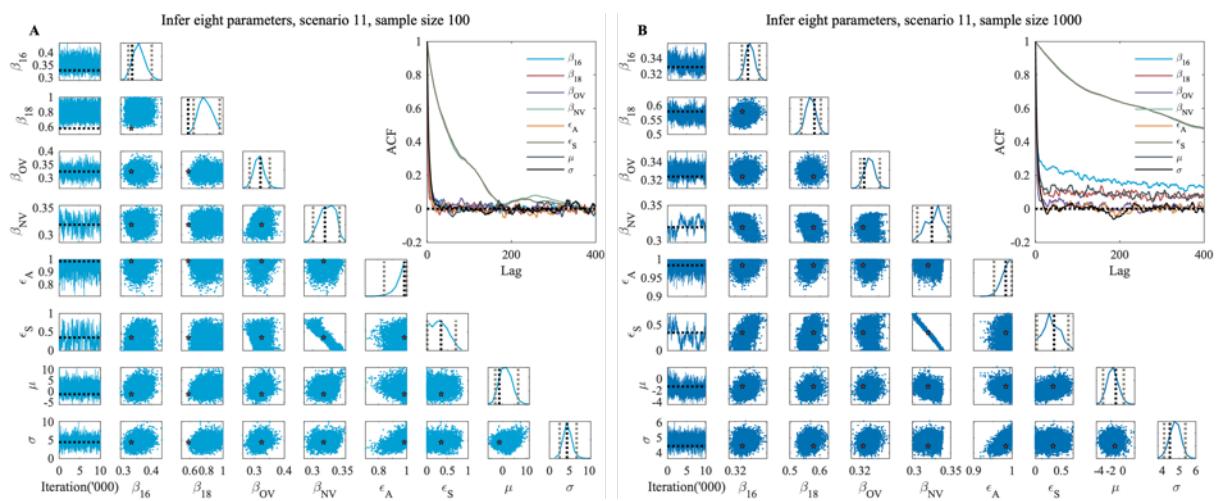
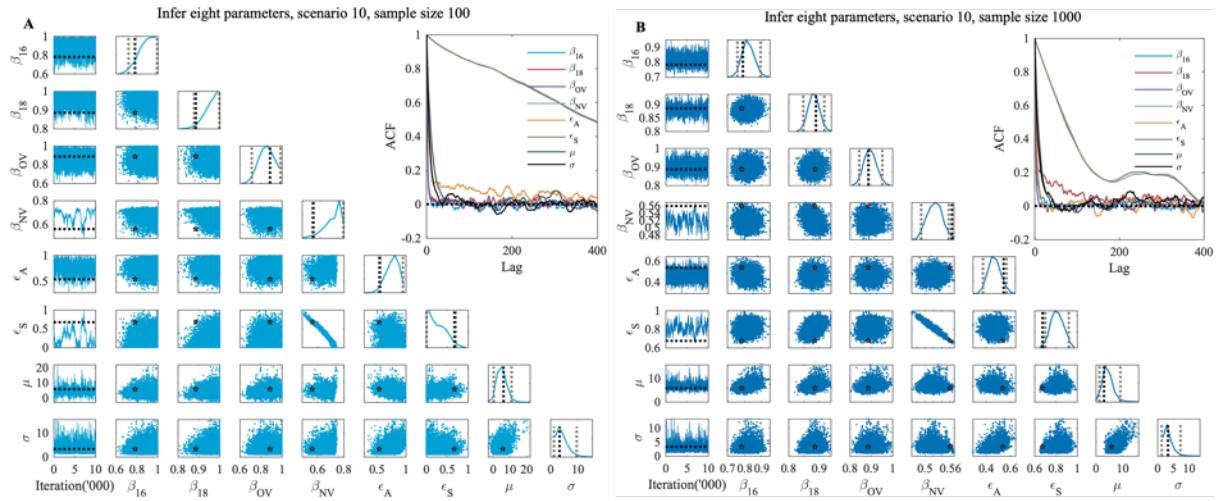
B.2 MCMC result of inferring eight parameters in set Θ_1 ($\Theta_1 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \beta_{NV}, \epsilon_A, \epsilon_S, \mu, \sigma\}$) using sample size is 100 and 1000 women in each of the 1-year age group under 50 scenarios.

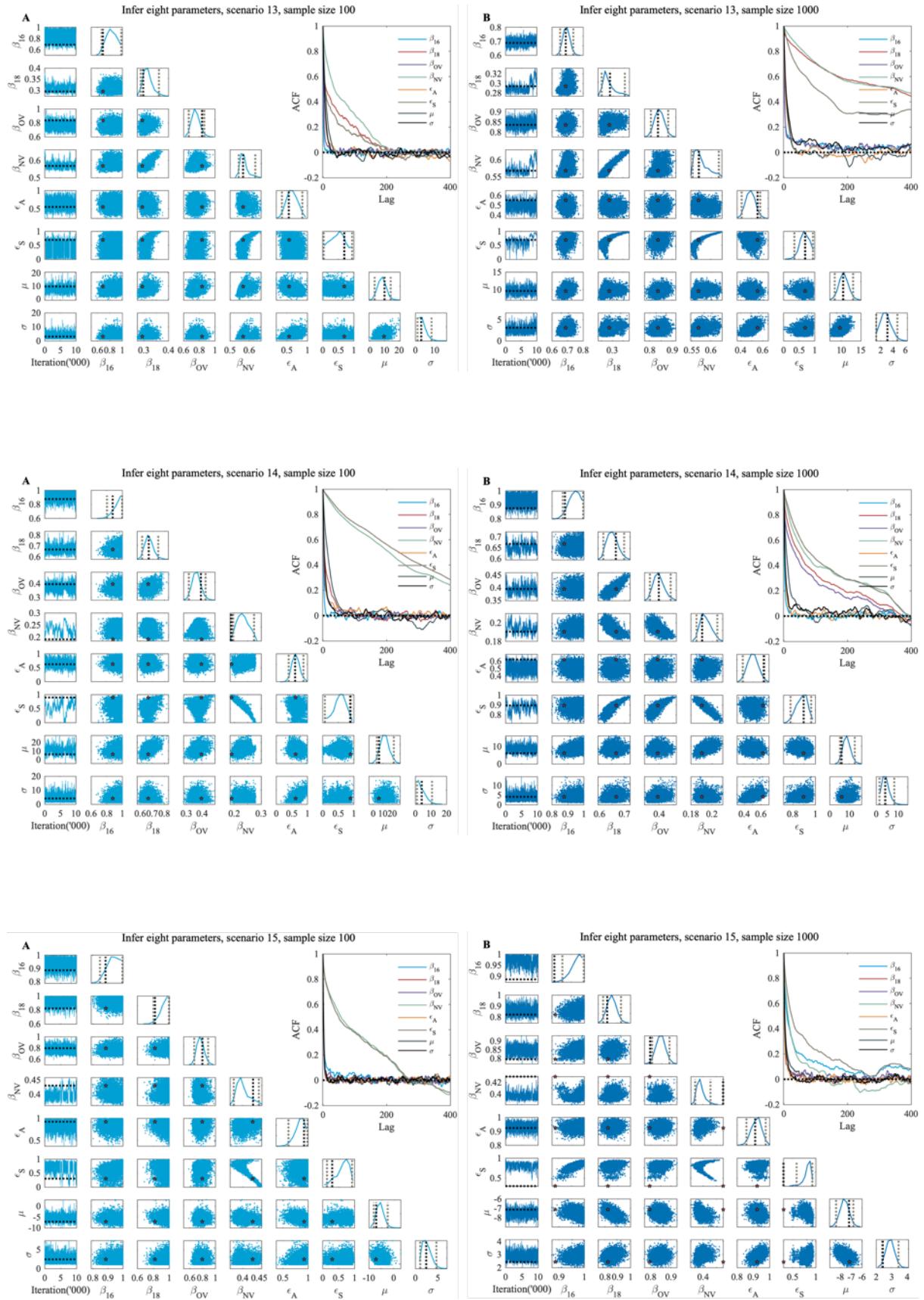
The first column shows the MCMC trace plots. The left triangular matrix shows the posterior distribution of parameters and bivariate distributions of parameter pairs estimated from MCMC. The solid black lines and the stars represent true values. The black dashed line represents 95% CrI. The upper right figure shows the autocorrelation. (A) MCMC result of inferring eight parameters in set Θ_1 with data from 100 women in each of the 1-year age group. (B) MCMC result of inferring eight parameters in set Θ_1 with data from 1,000 women in each of the 1-year age group.

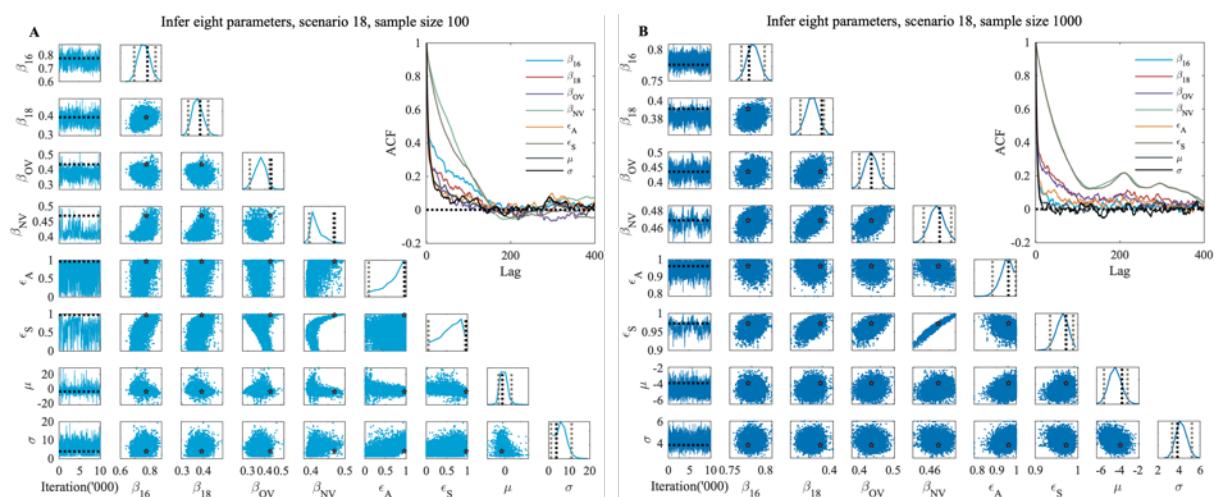
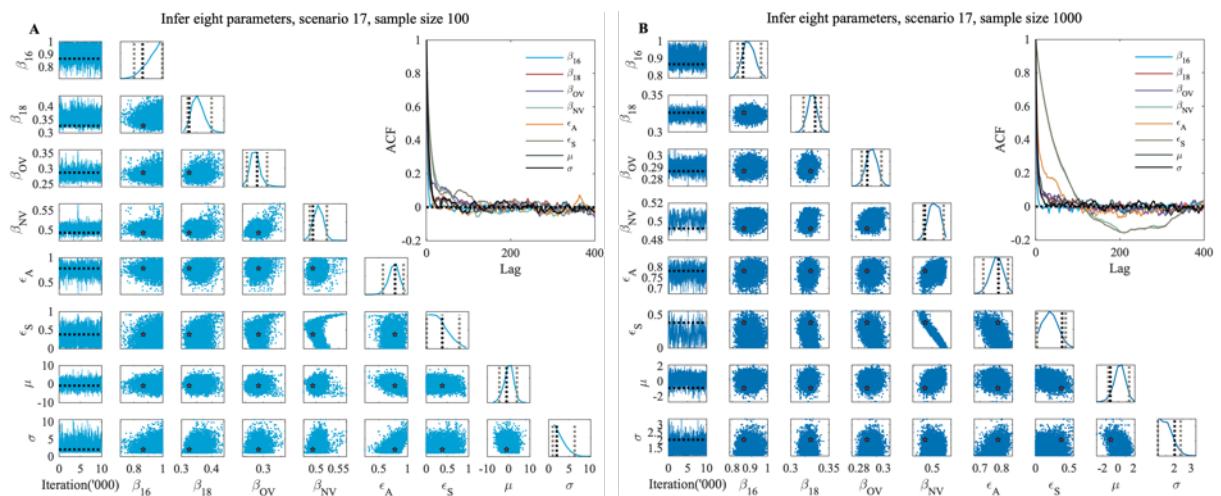
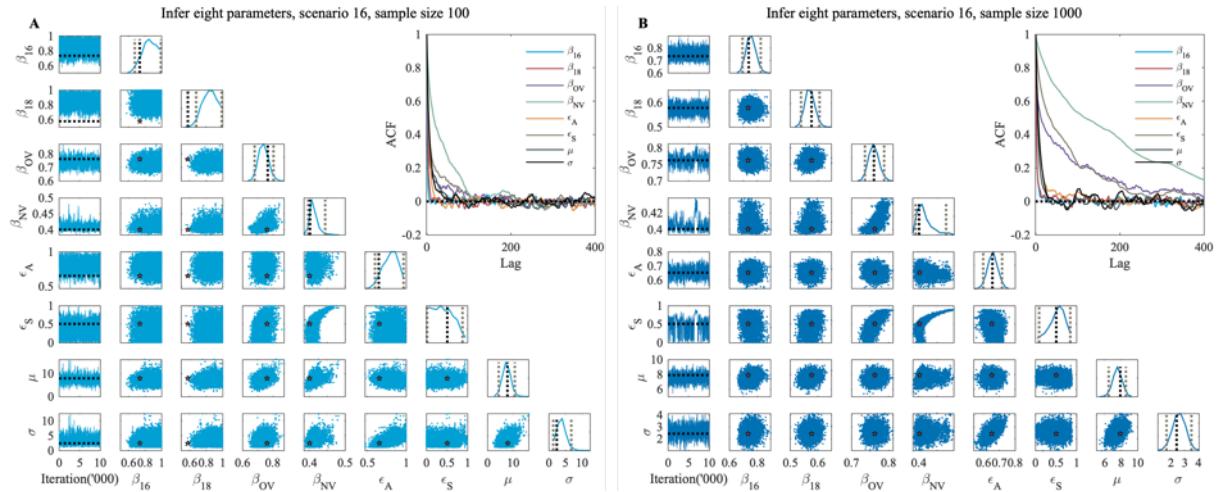


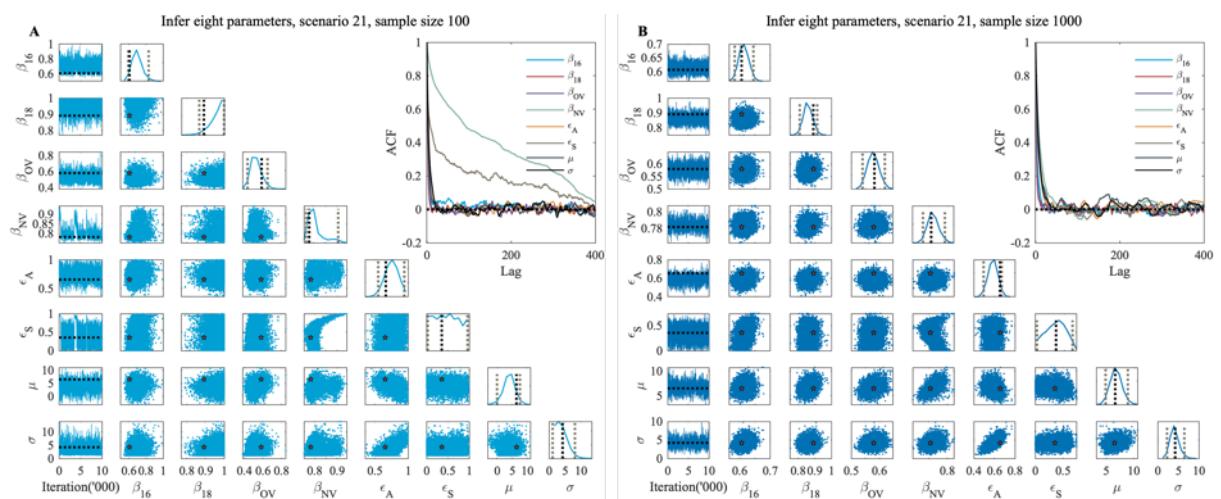
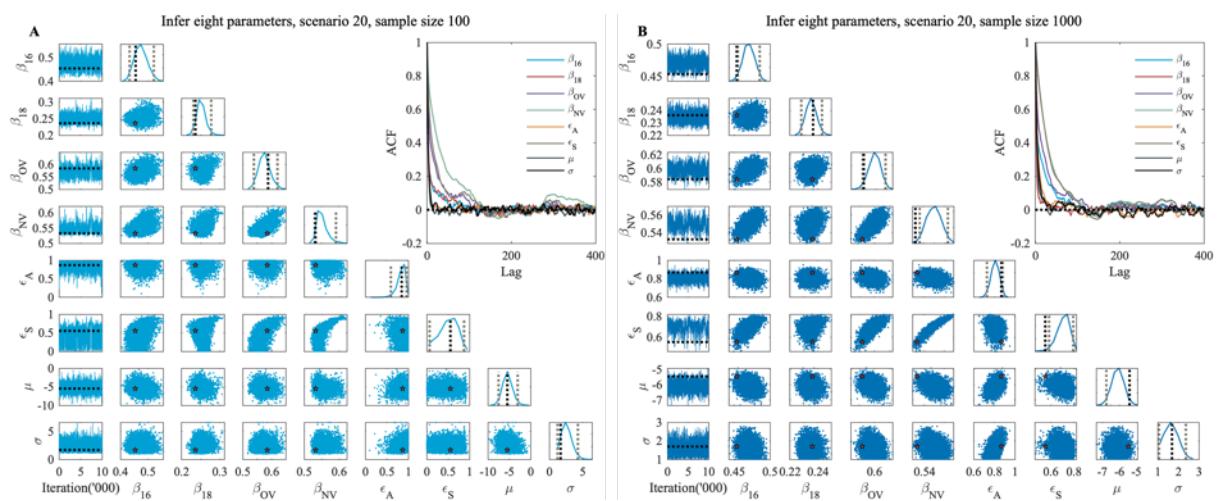
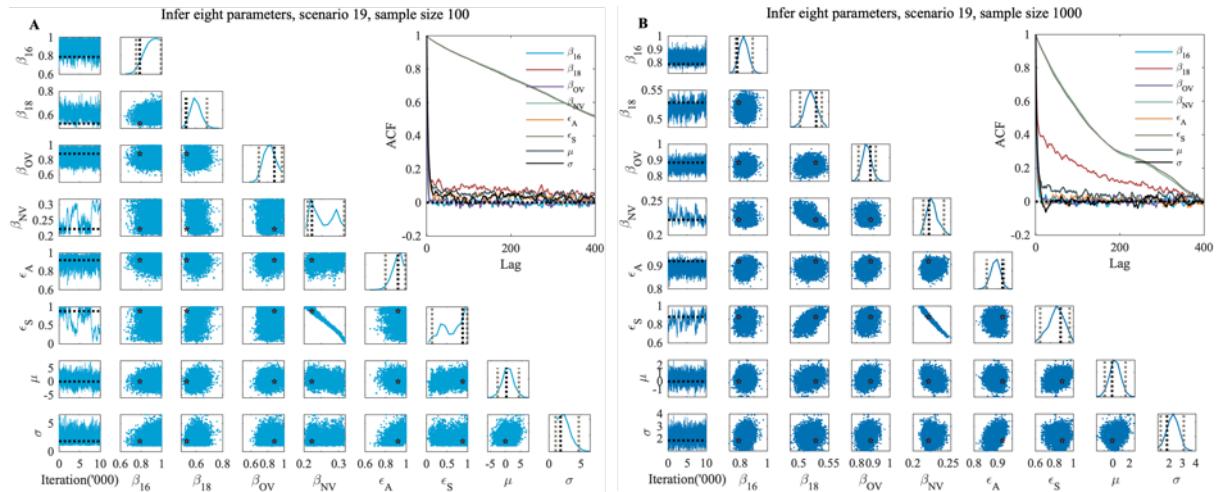


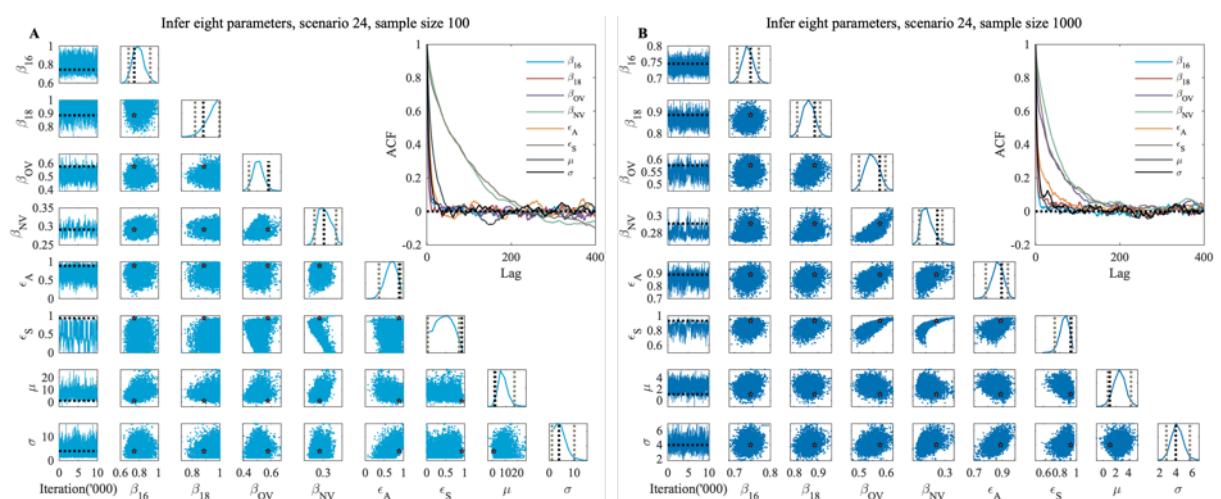
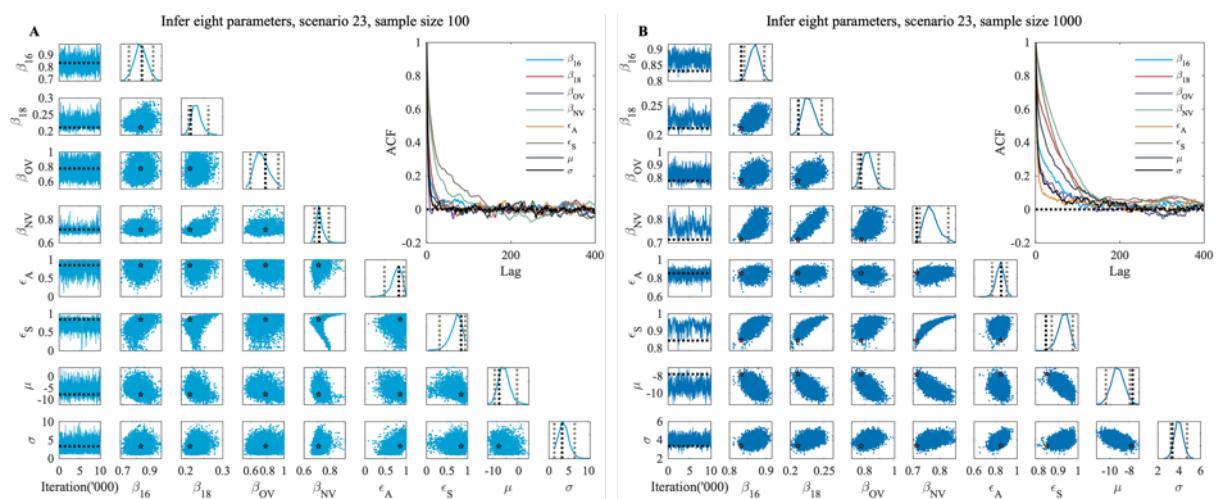
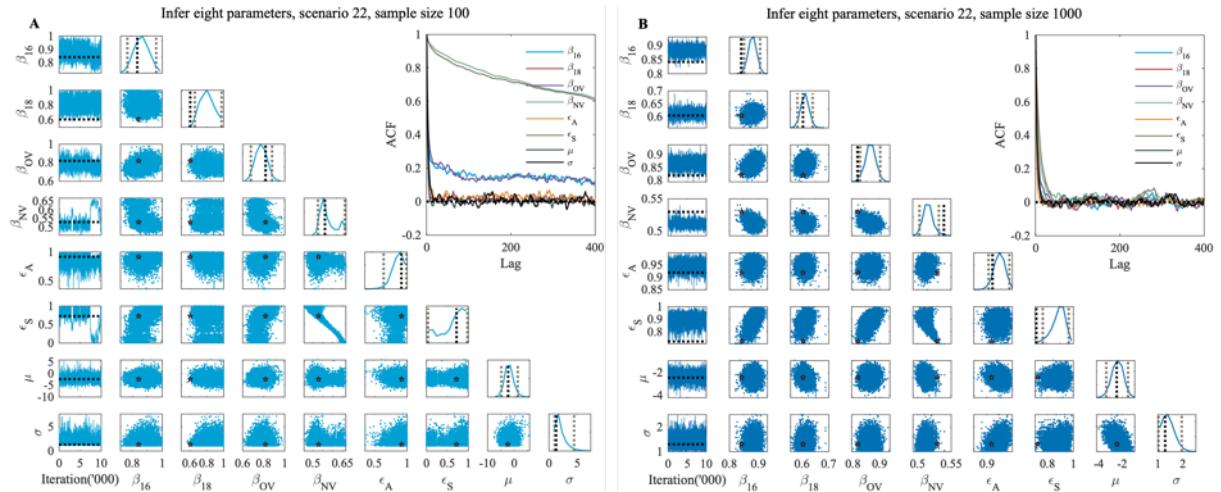


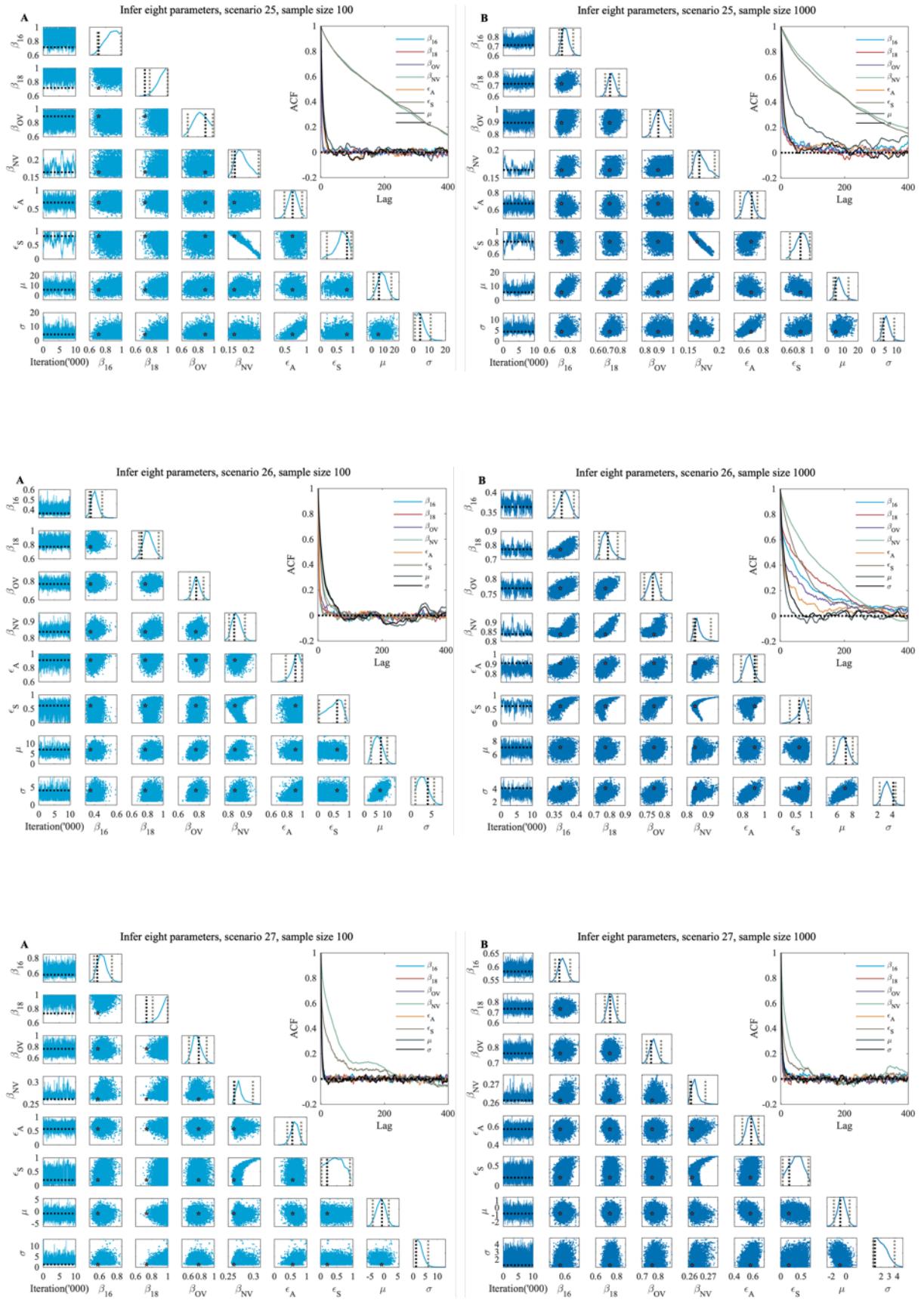


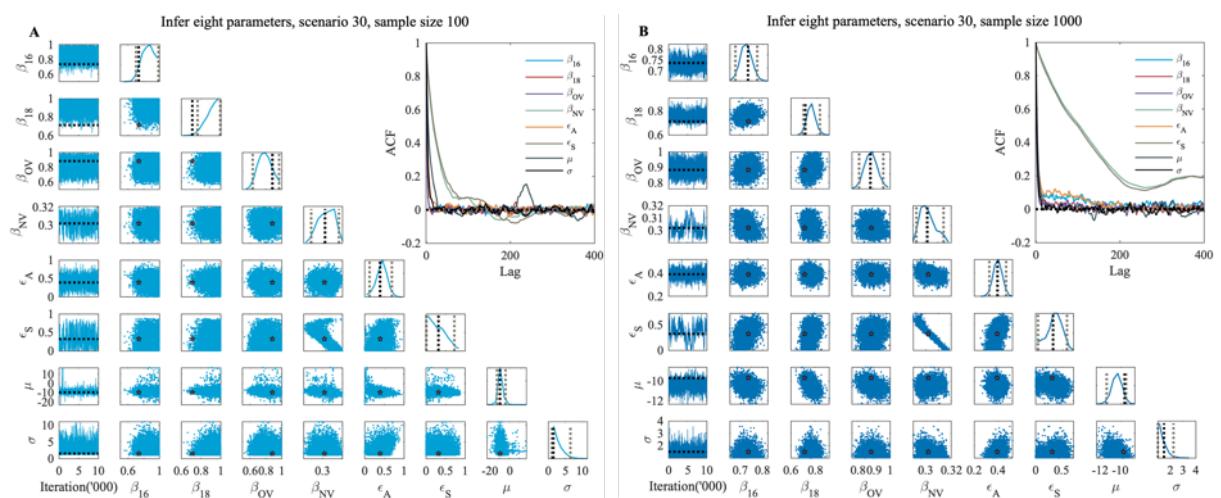
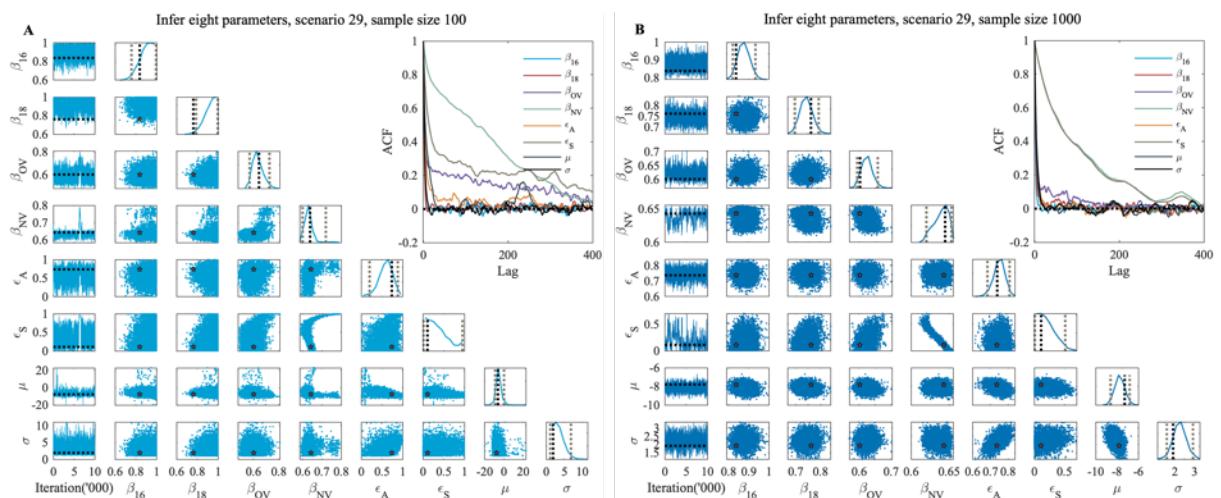
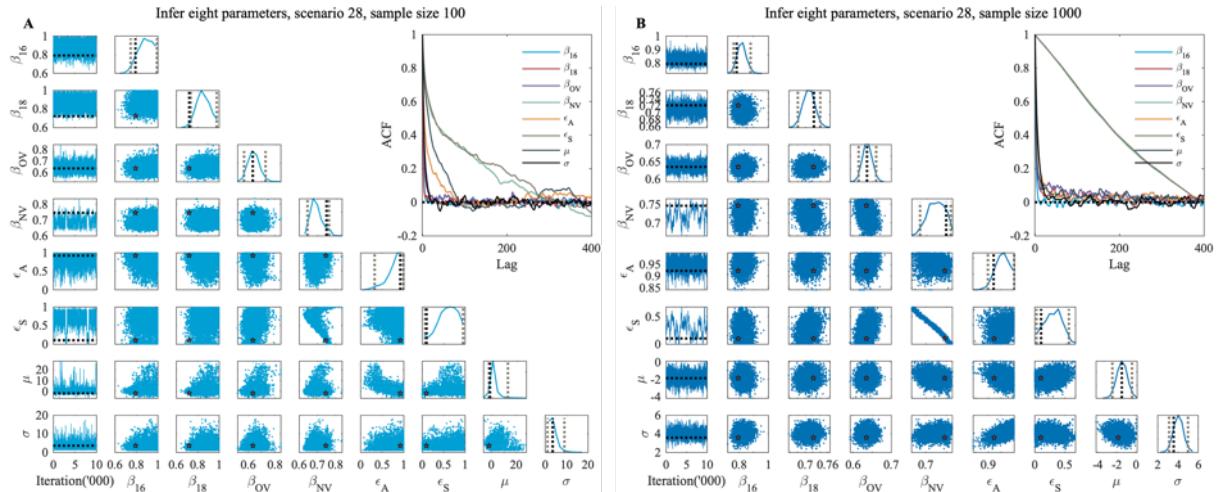




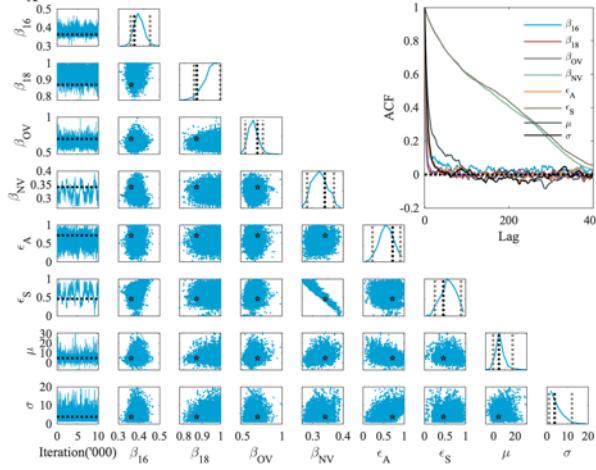




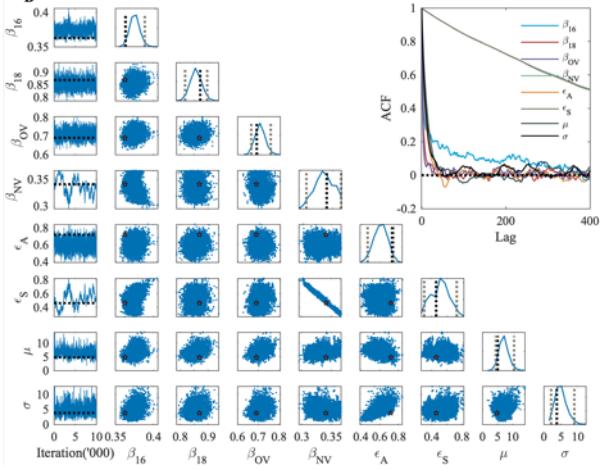




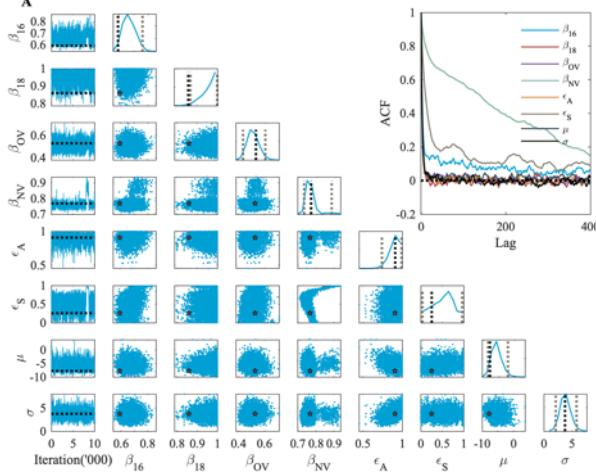
Infer eight parameters, scenario 31, sample size 100



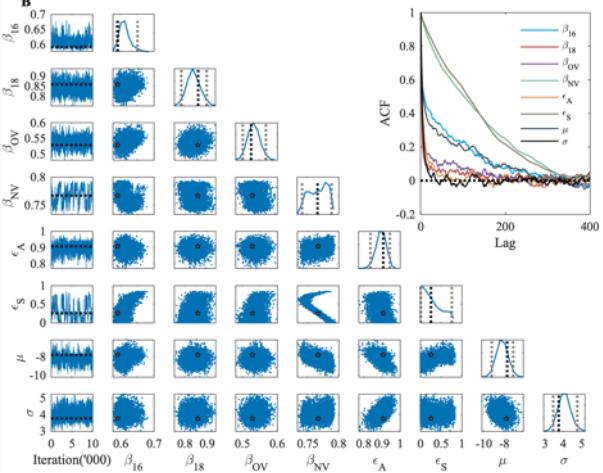
Infer eight parameters, scenario 31, sample size 1000



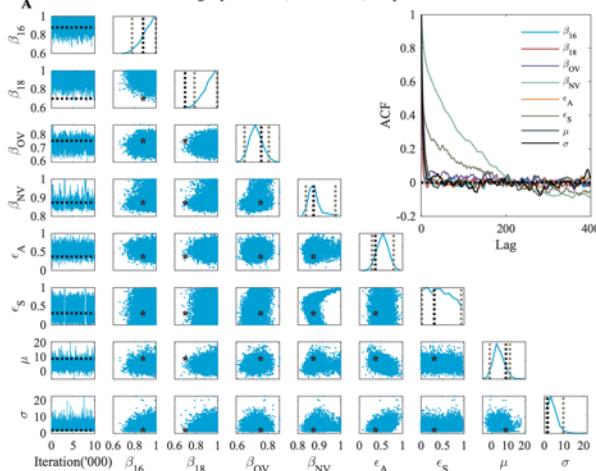
Infer eight parameters, scenario 32, sample size 100



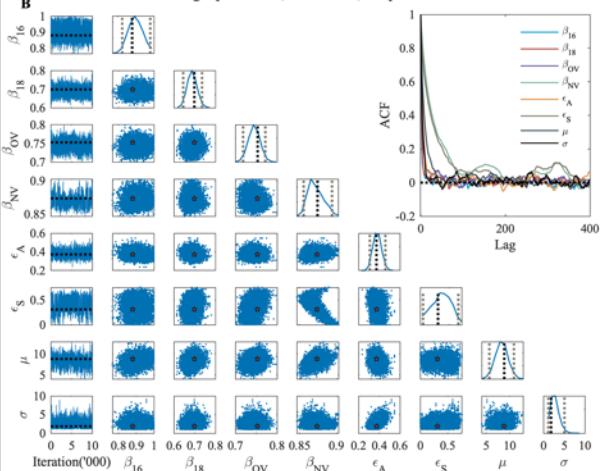
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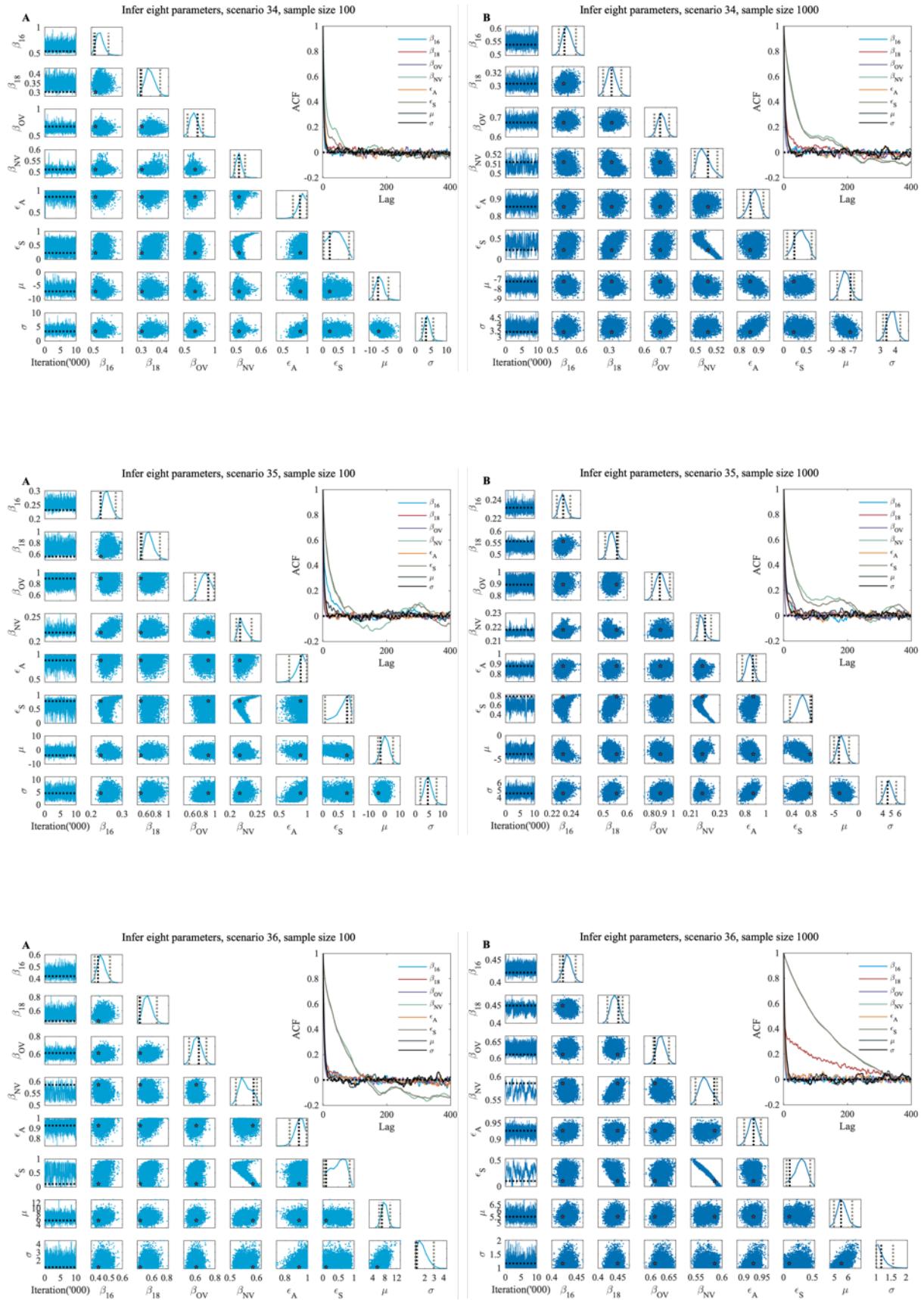


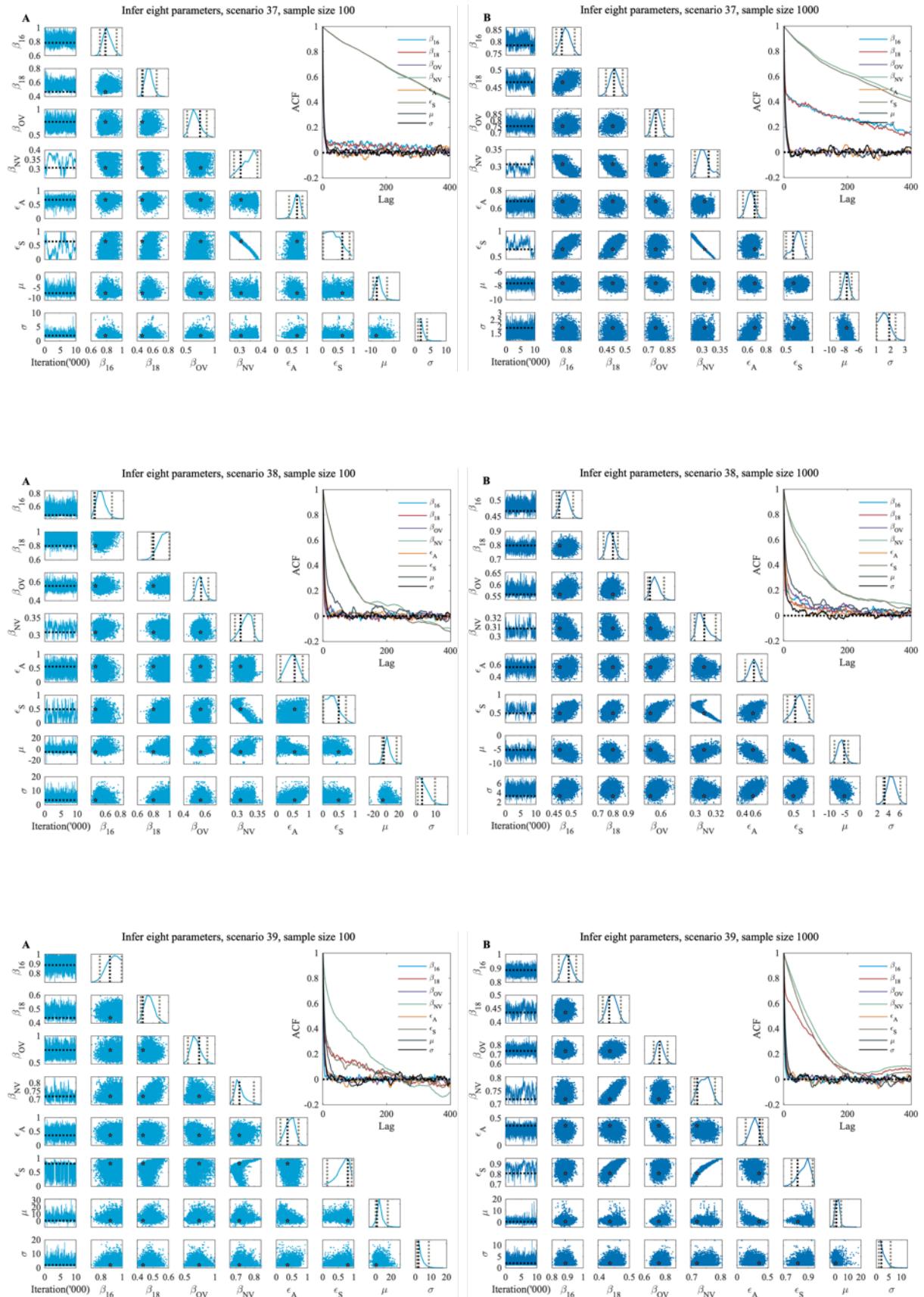
Infer eight parameters, scenario 33, sample size 100

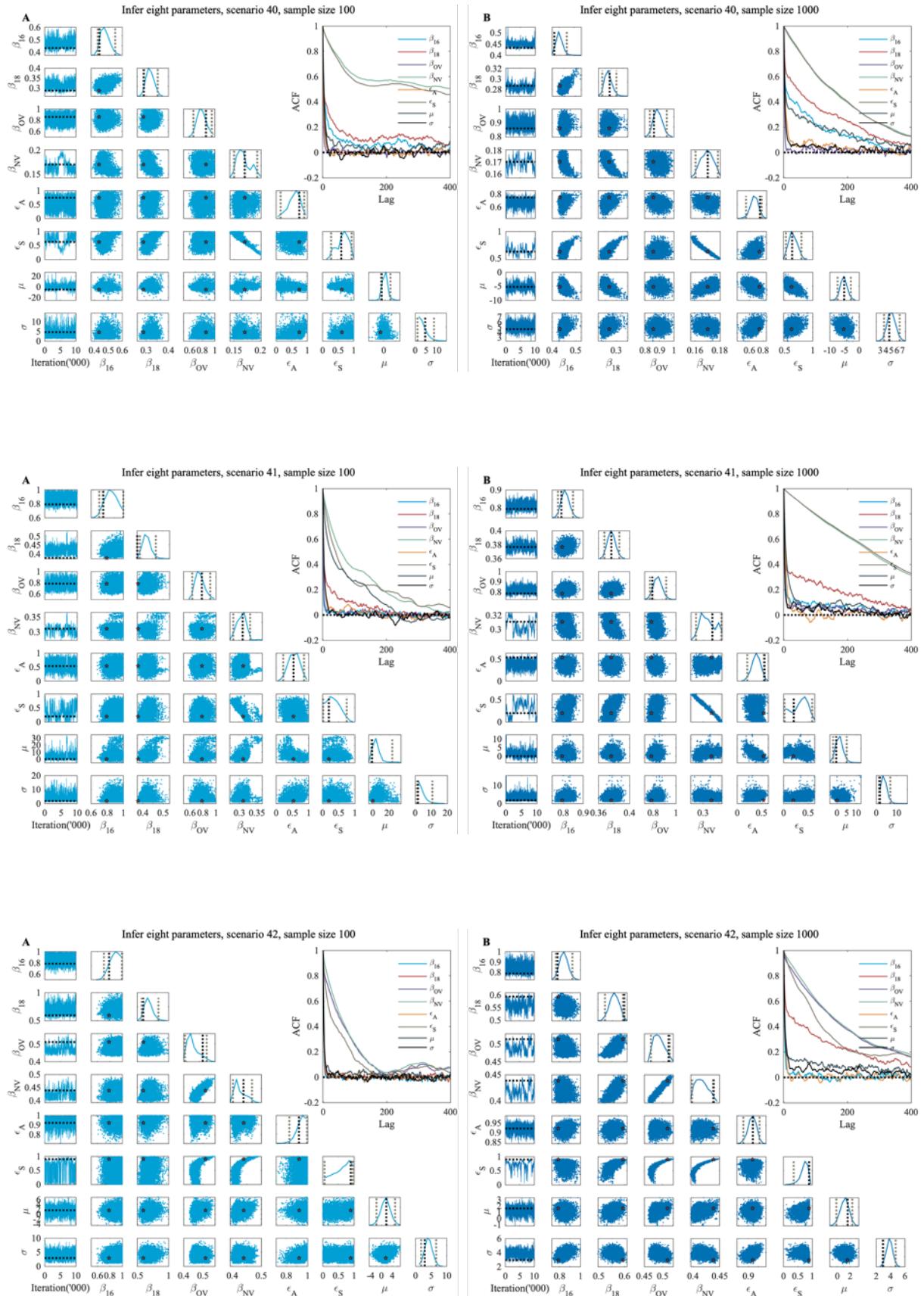


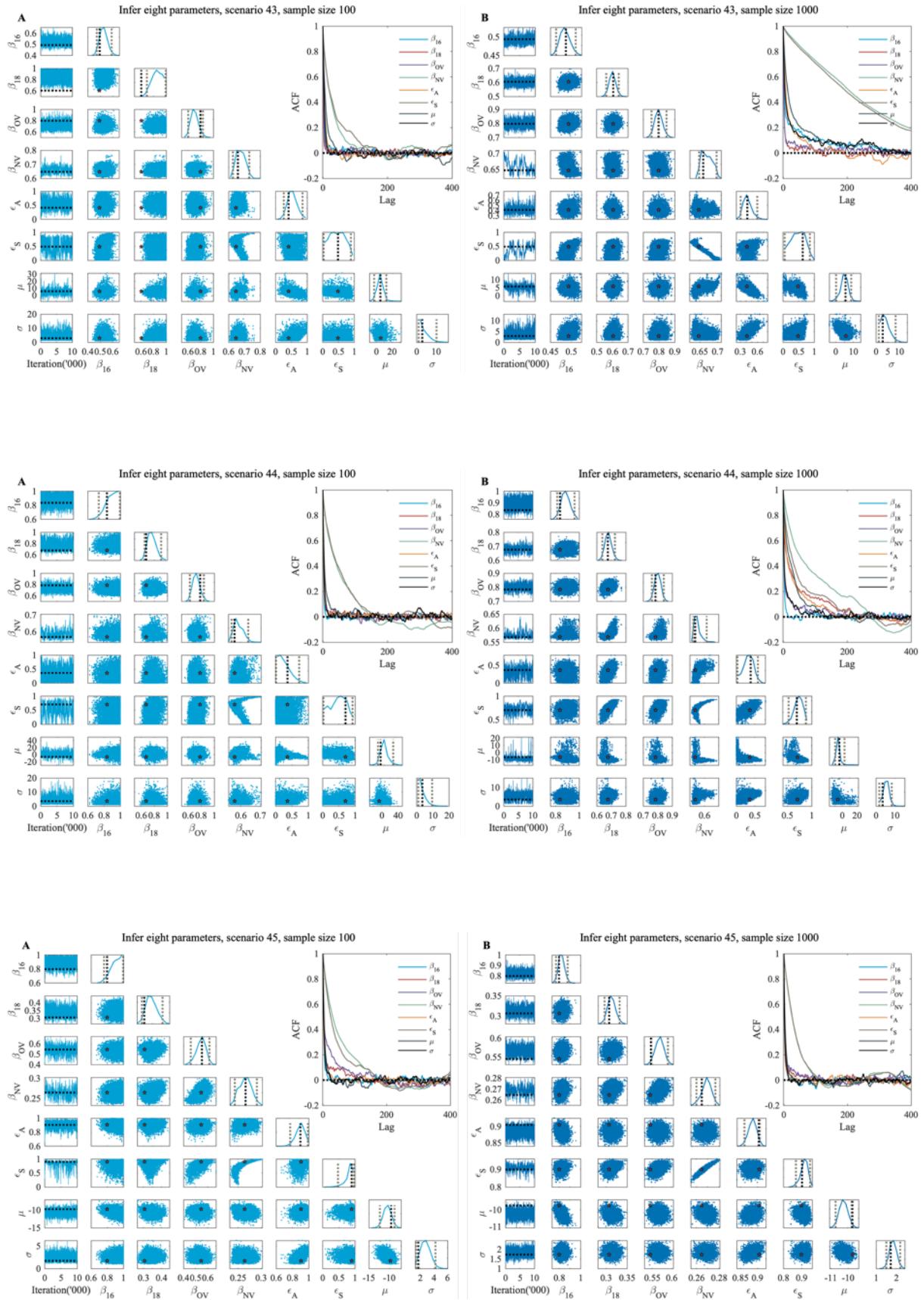
Infer eight parameters, scenario 33, sample size 1000

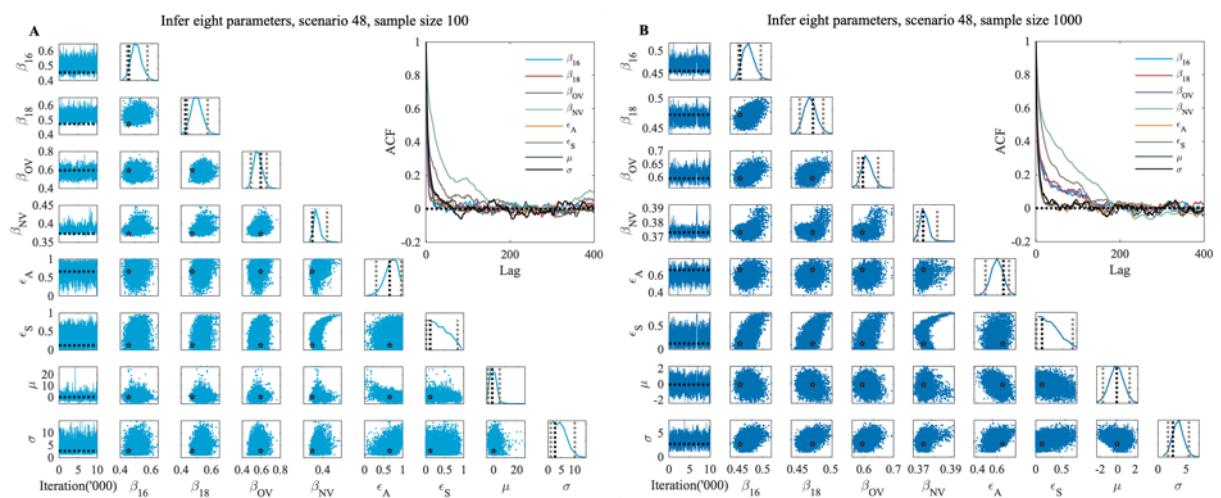
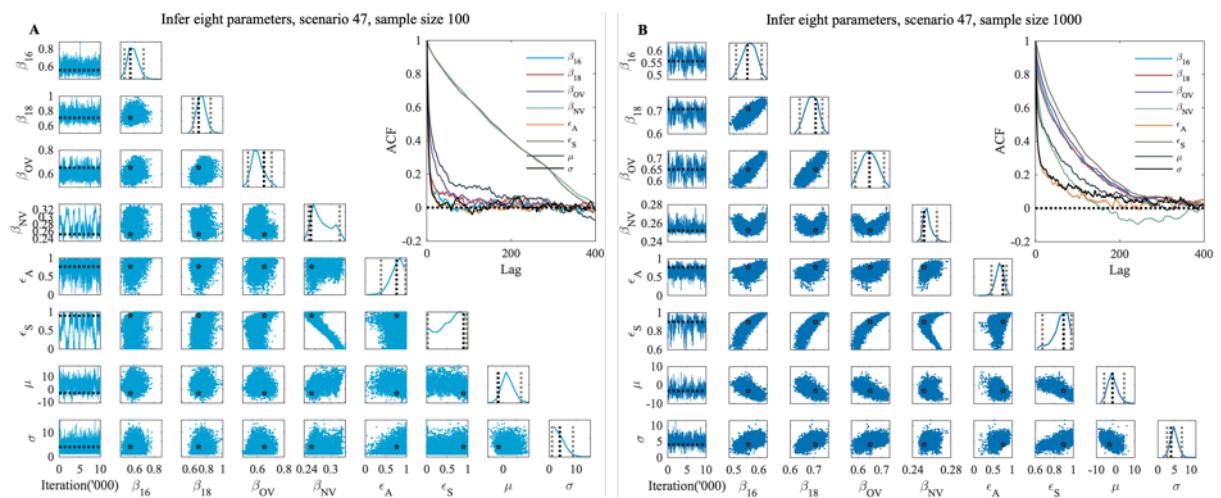
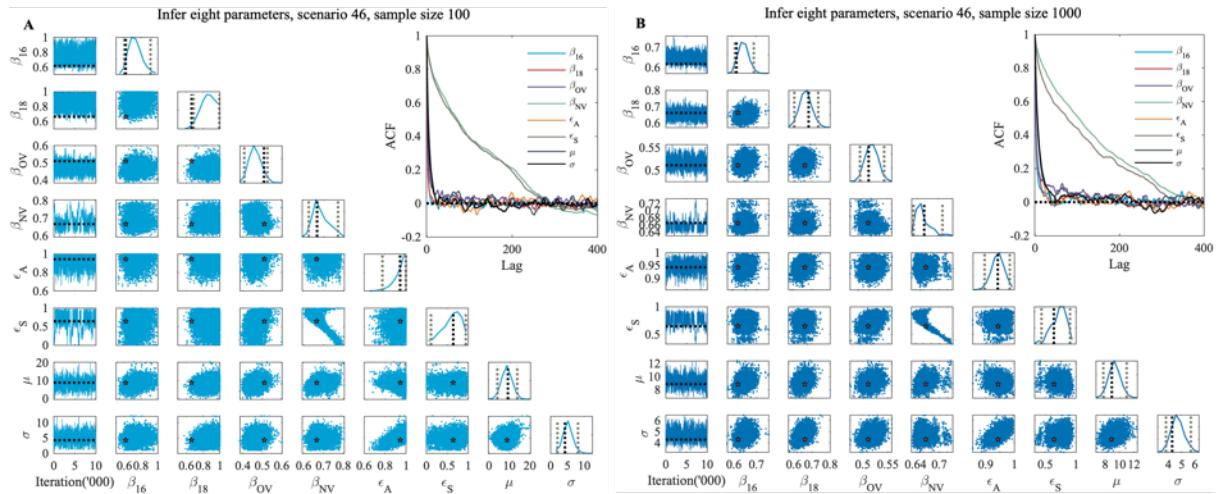


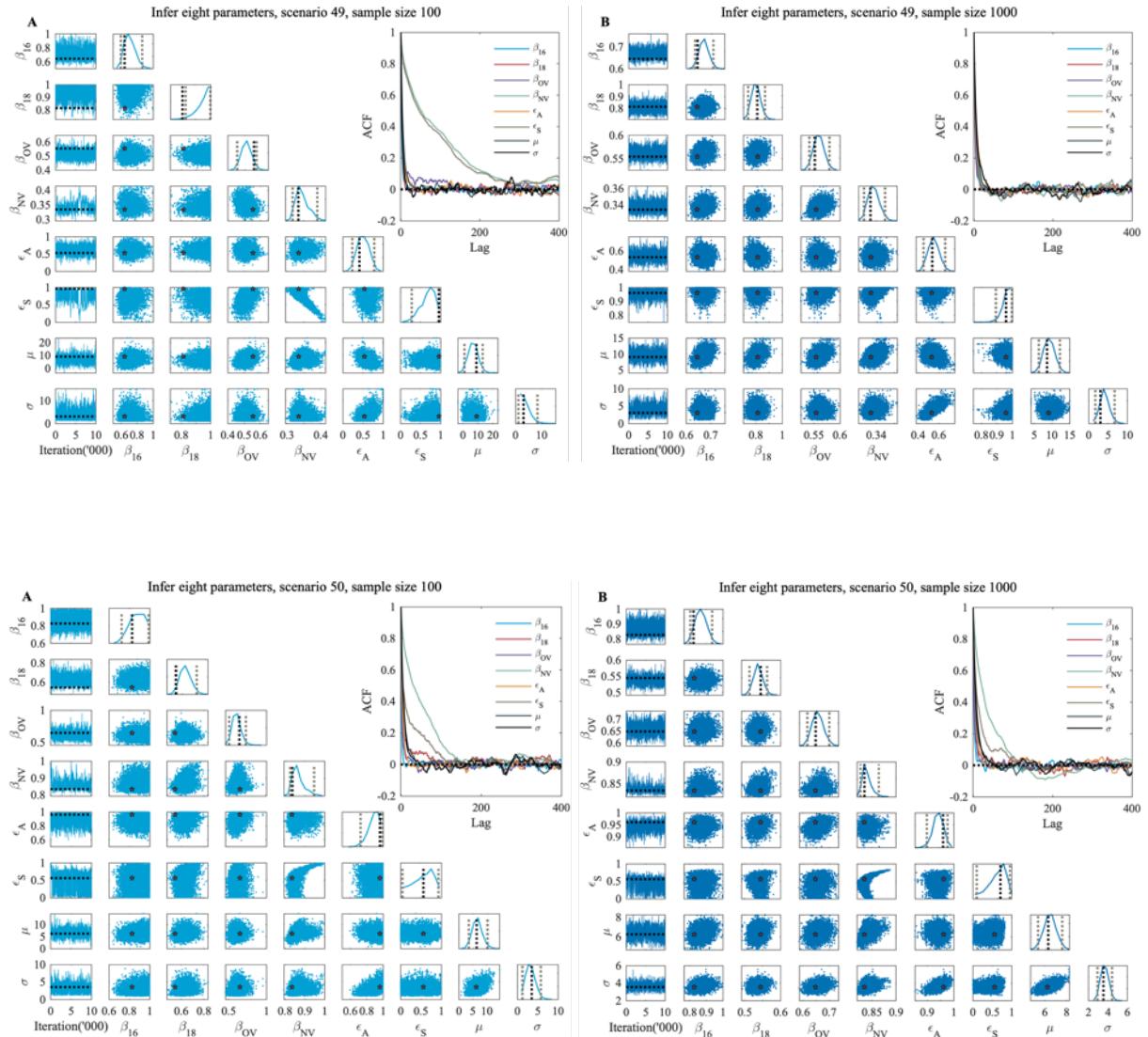






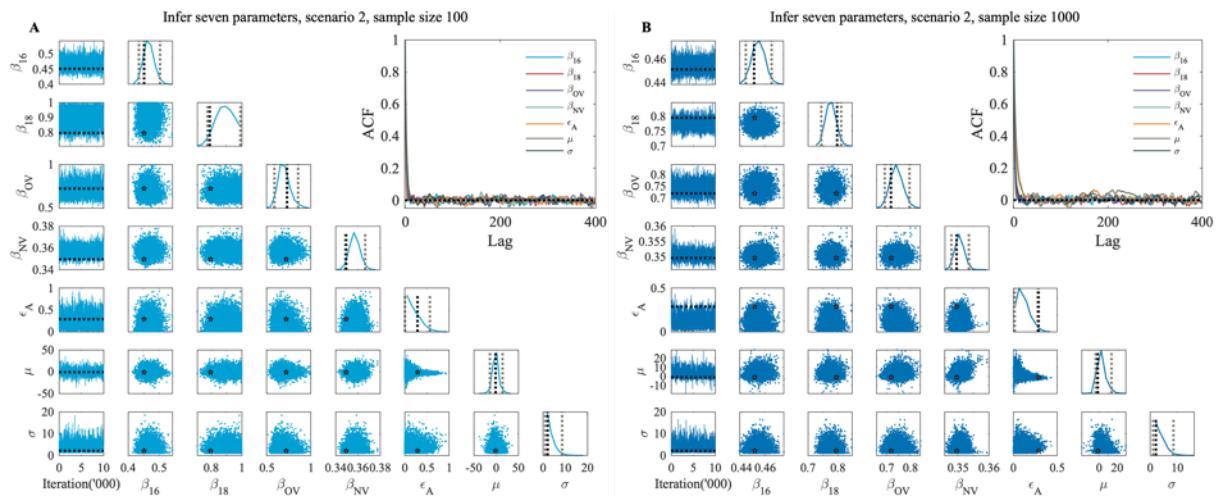
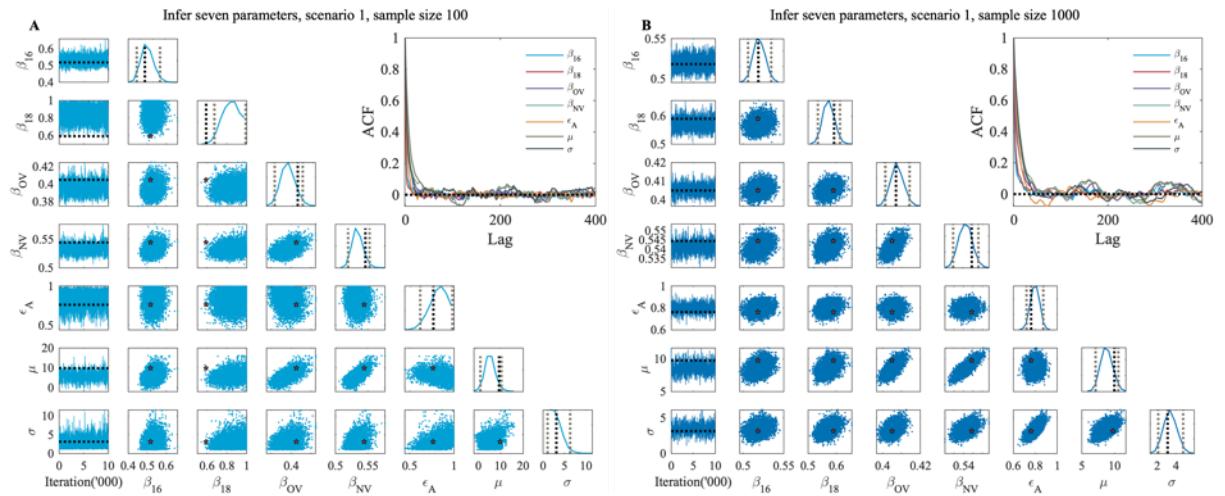


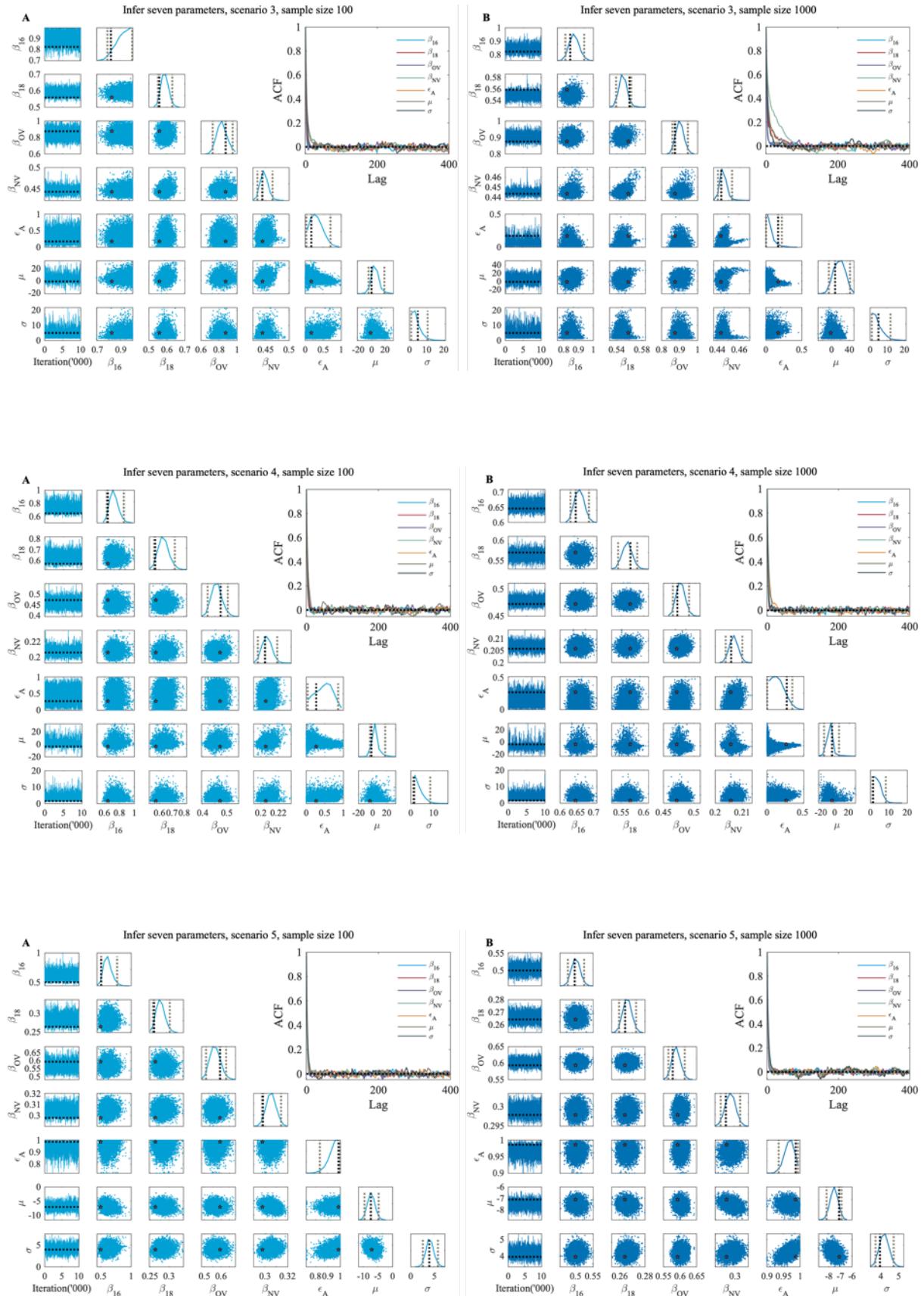


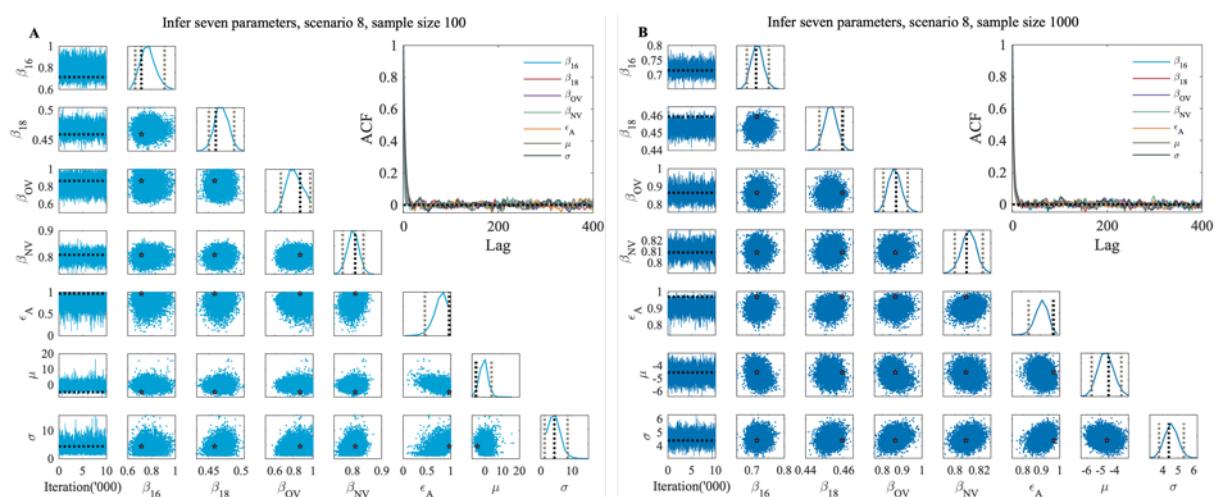
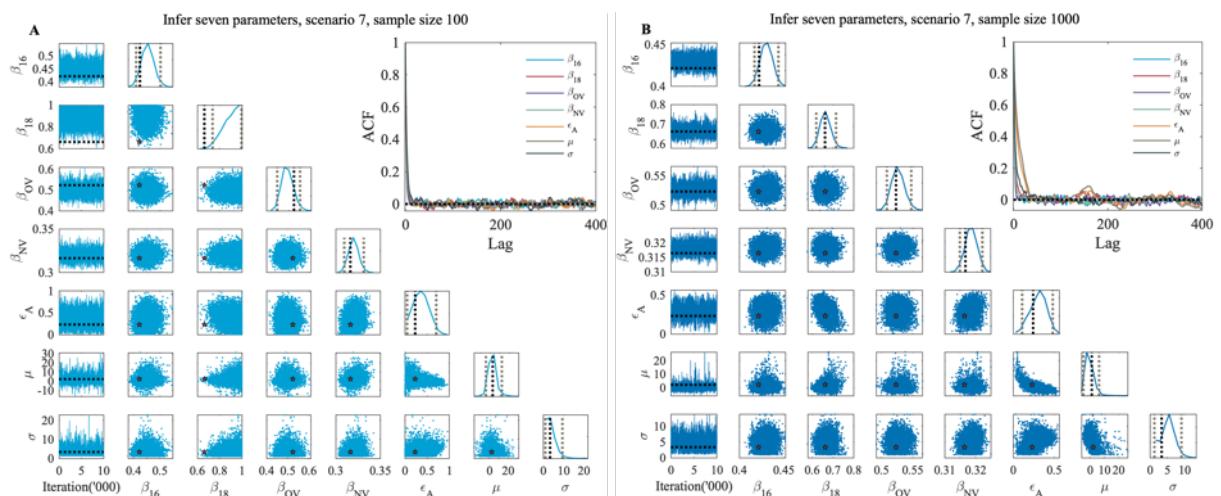
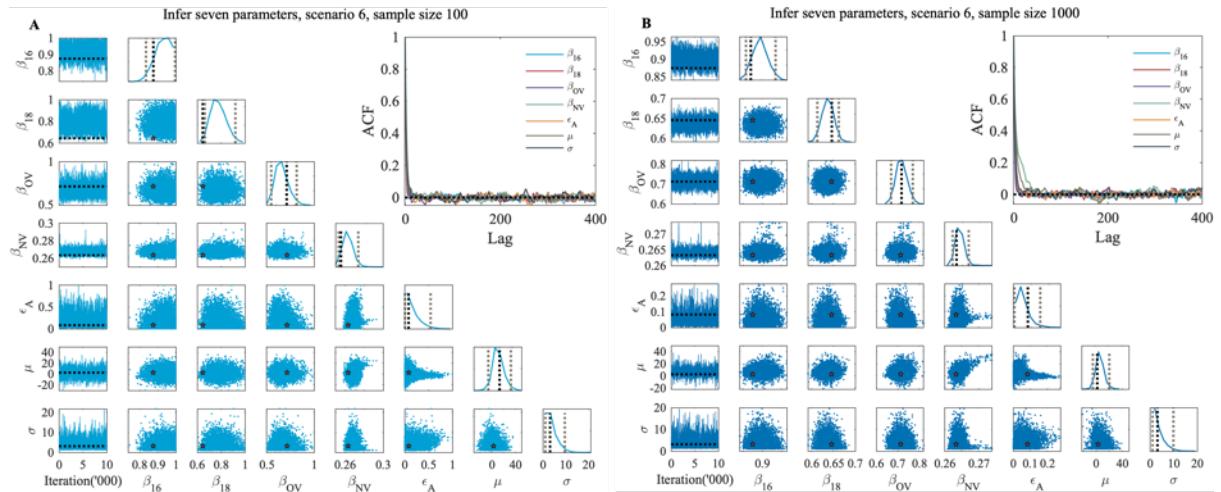


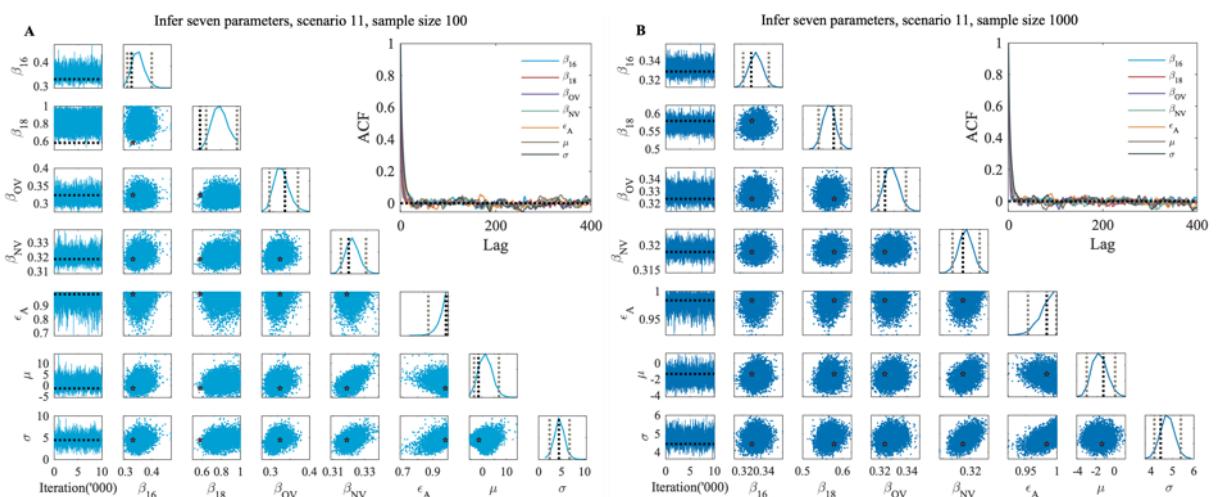
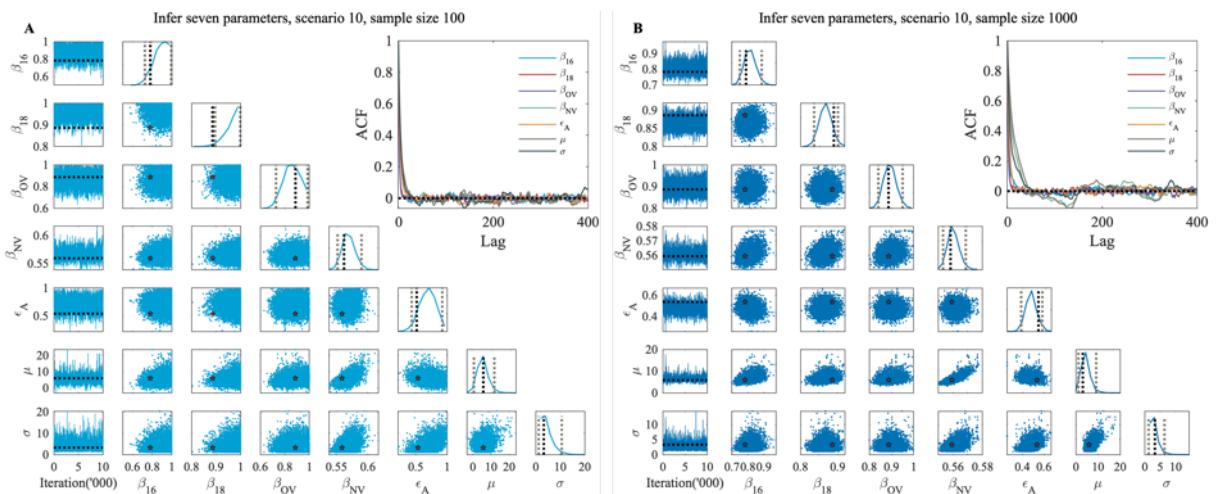
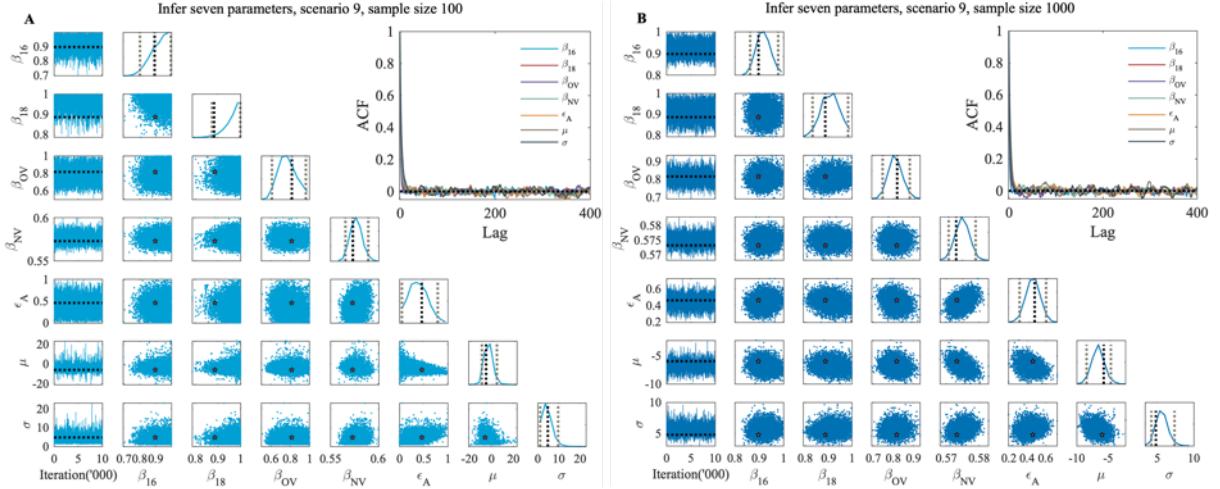
B.3 MCMC result of inferring eight parameters in set Θ_2 ($\Theta_2 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \beta_{NV}, \epsilon_A, \mu, \sigma\}$) using sample size is 100 and 1000 women in each of the 1-year age group under 50 scenarios.

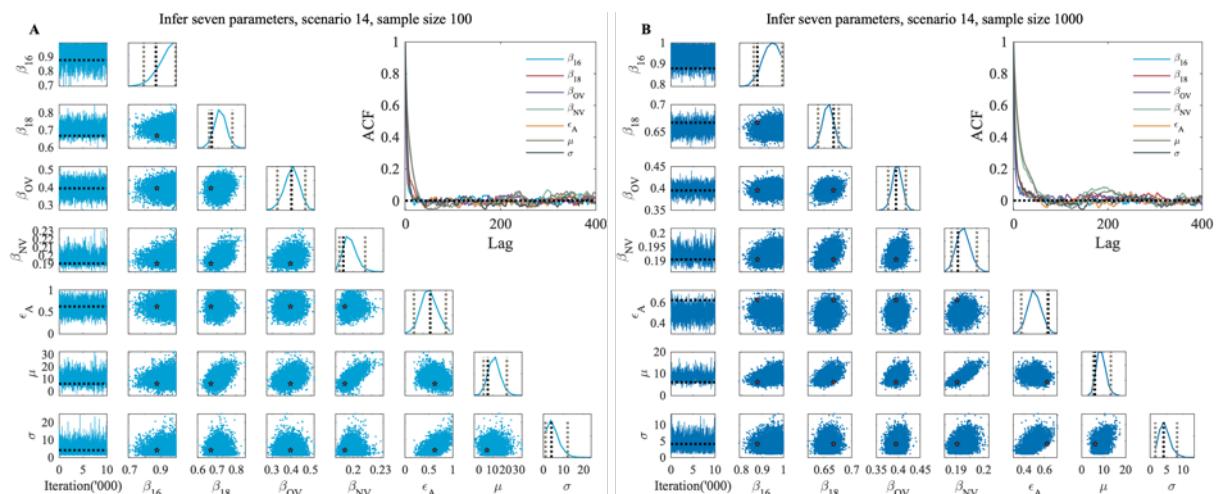
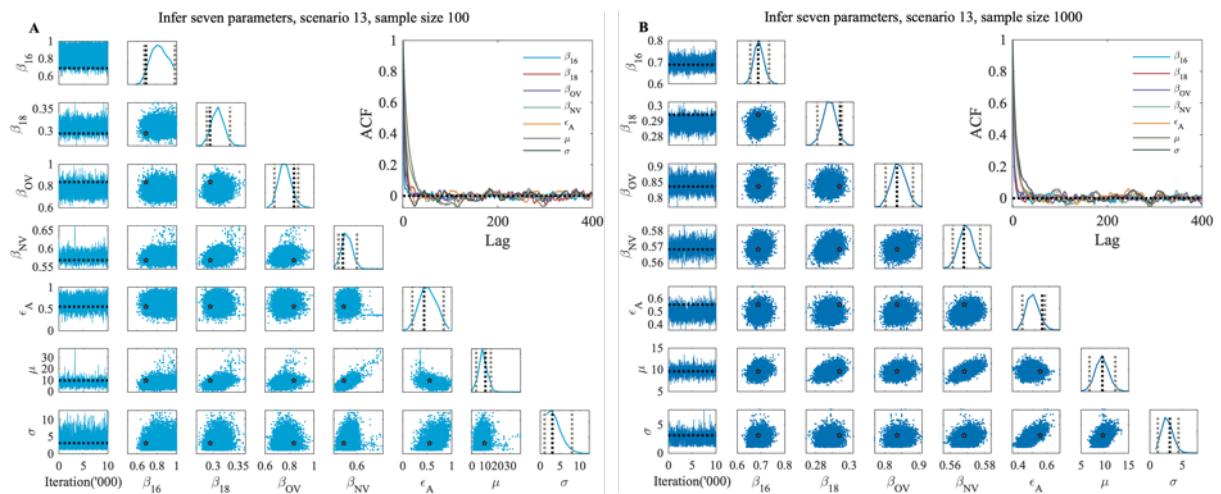
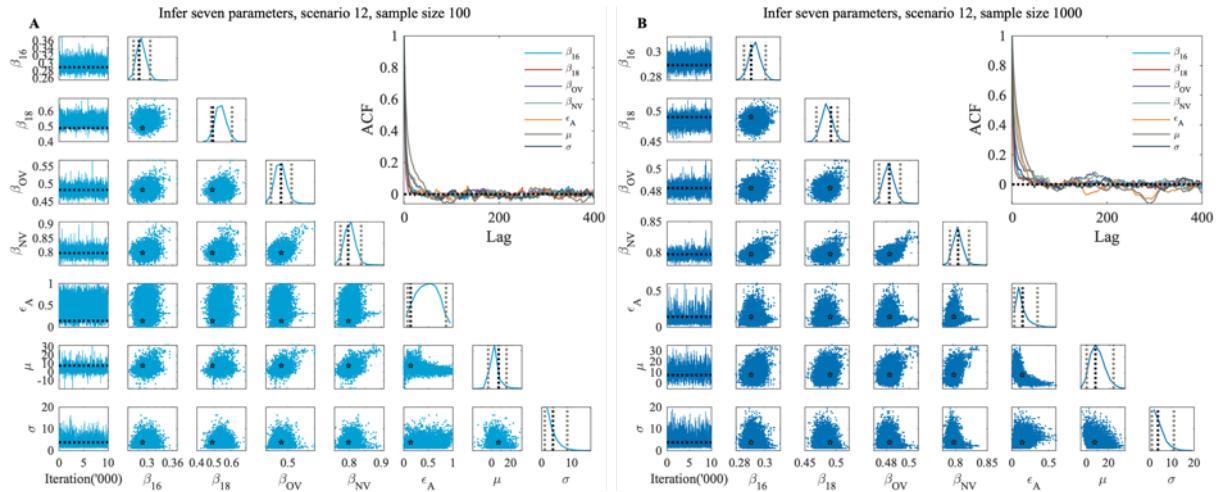
The first column shows the MCMC trace plots. The left triangular matrix shows the posterior distribution of parameters and bivariate distributions of parameter pairs estimated from MCMC. The solid black lines and the stars represent true values. The black dashed line represents 95% CrI. The upper right figure shows the autocorrelation. (A) MCMC result of inferring eight parameters in set Θ_2 with data from 100 women in each of the 1-year age group. (B) MCMC result of inferring eight parameters in set Θ_2 with data from 1,000 women in each of the 1-year age group.

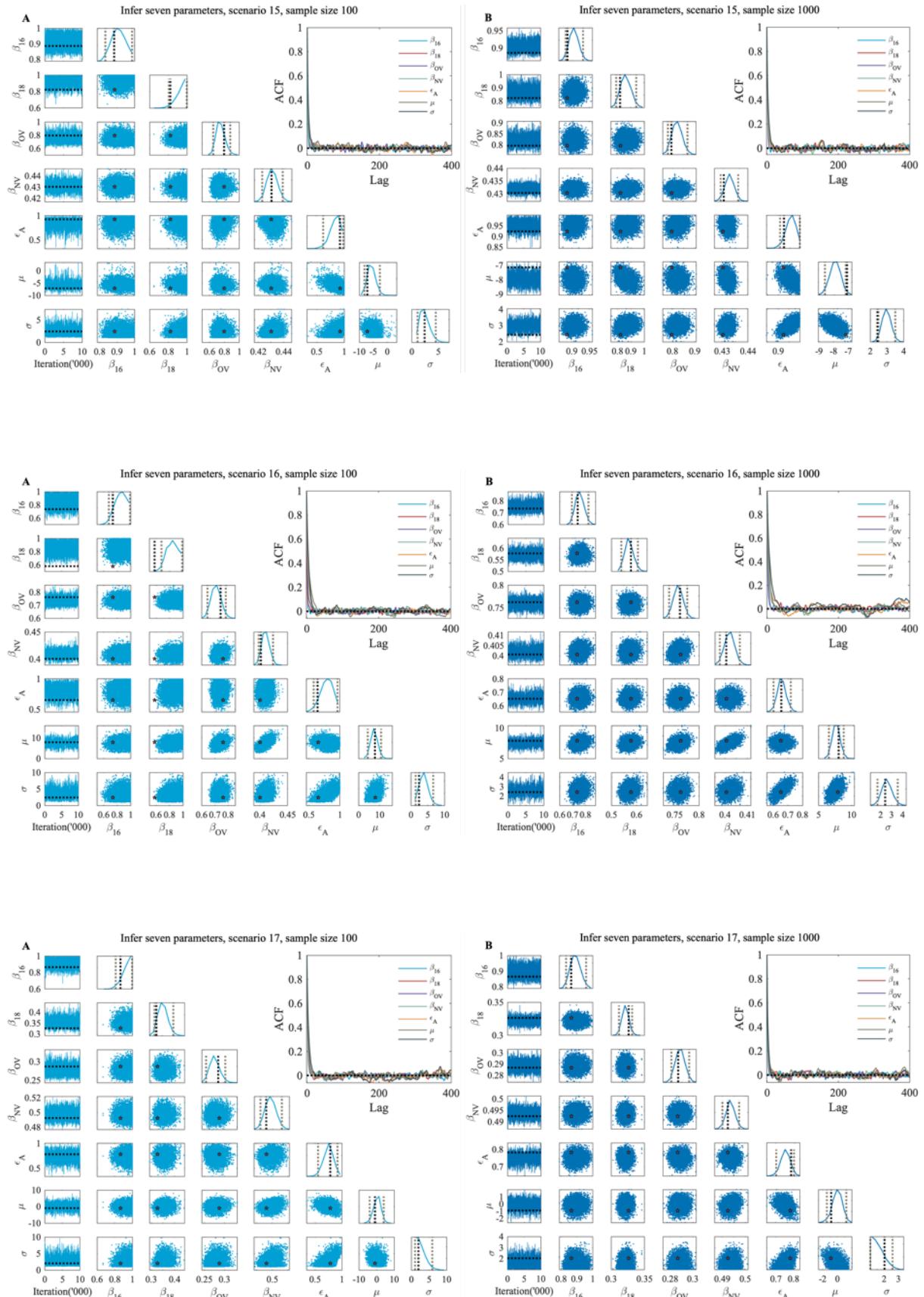


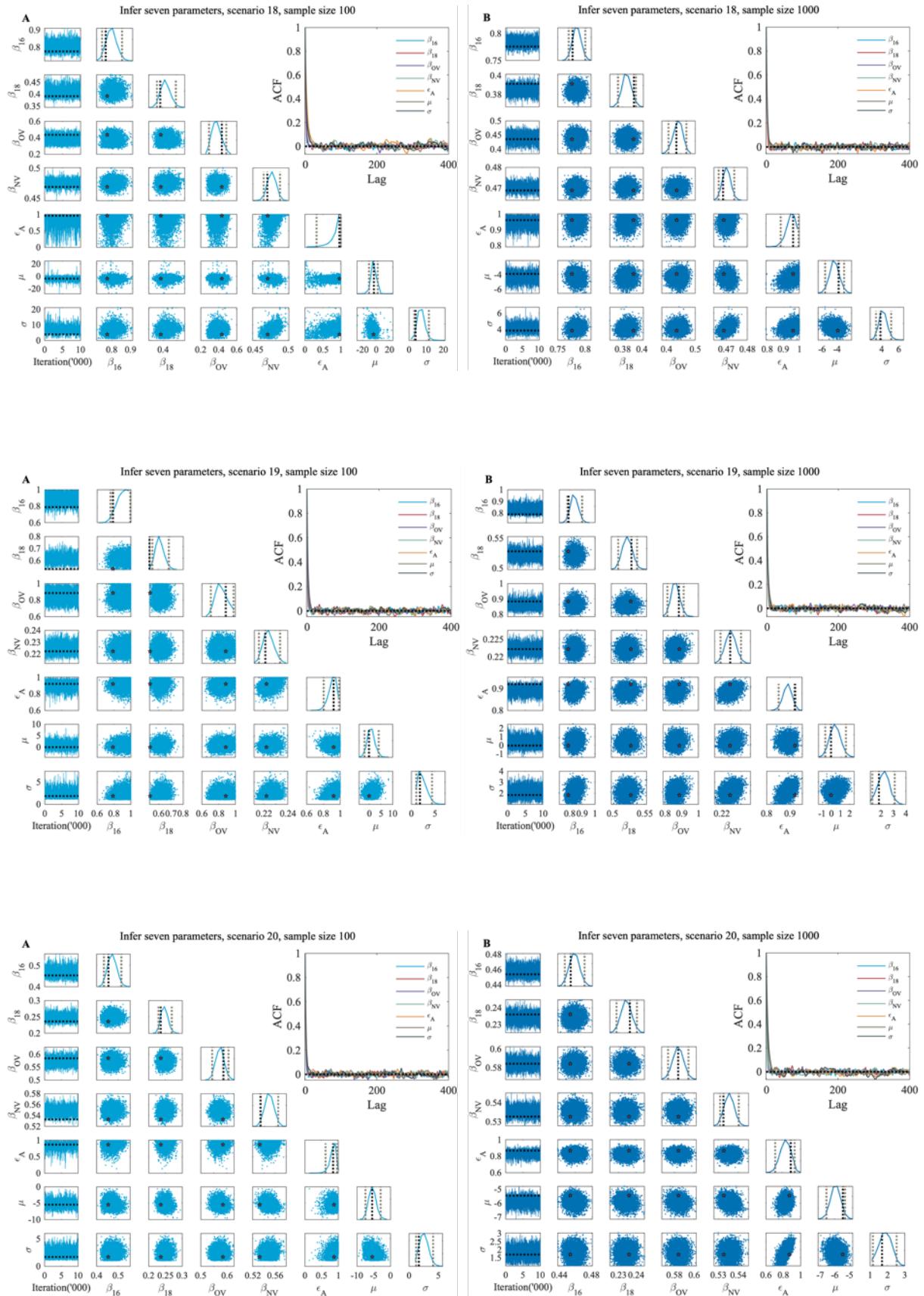


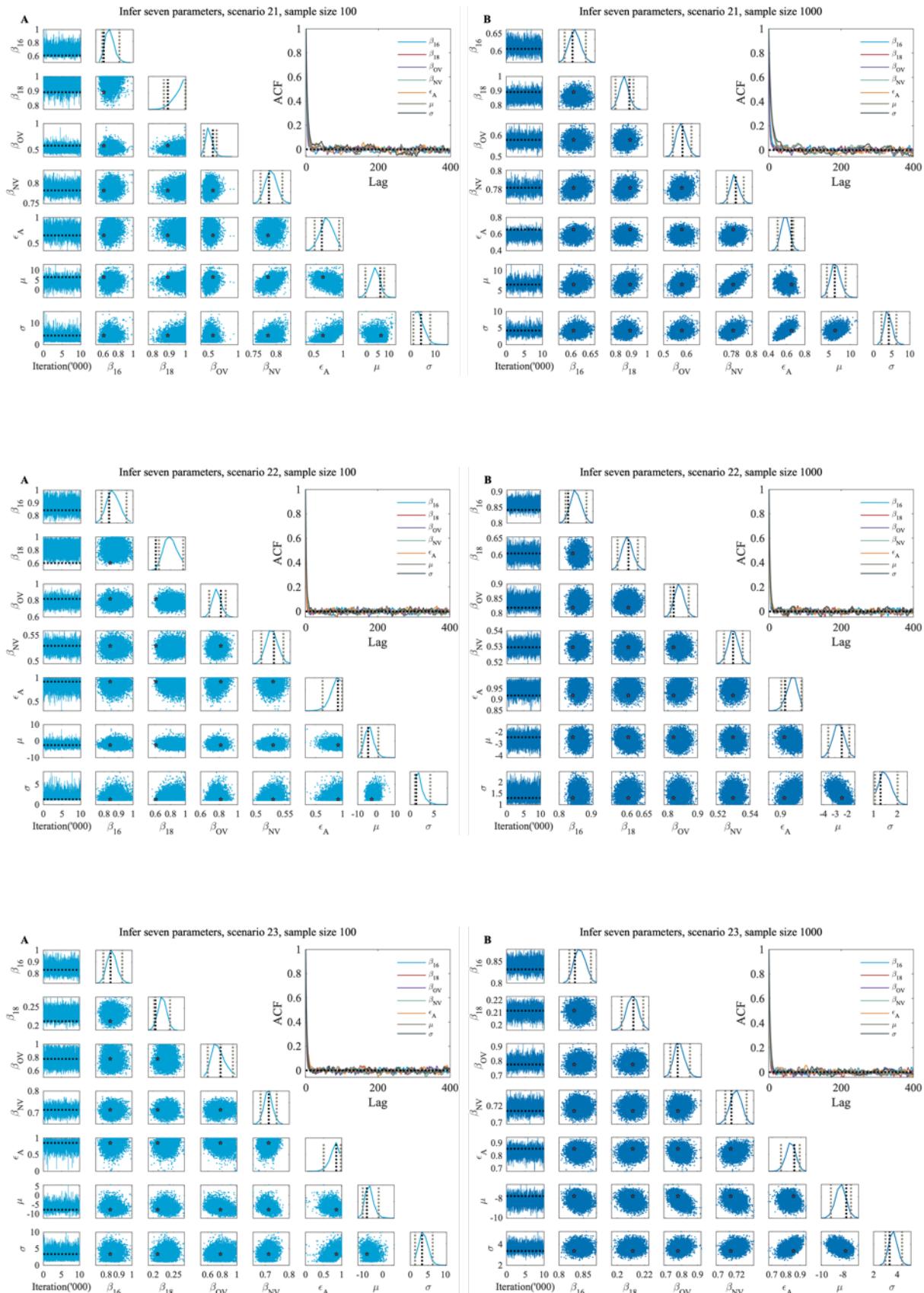


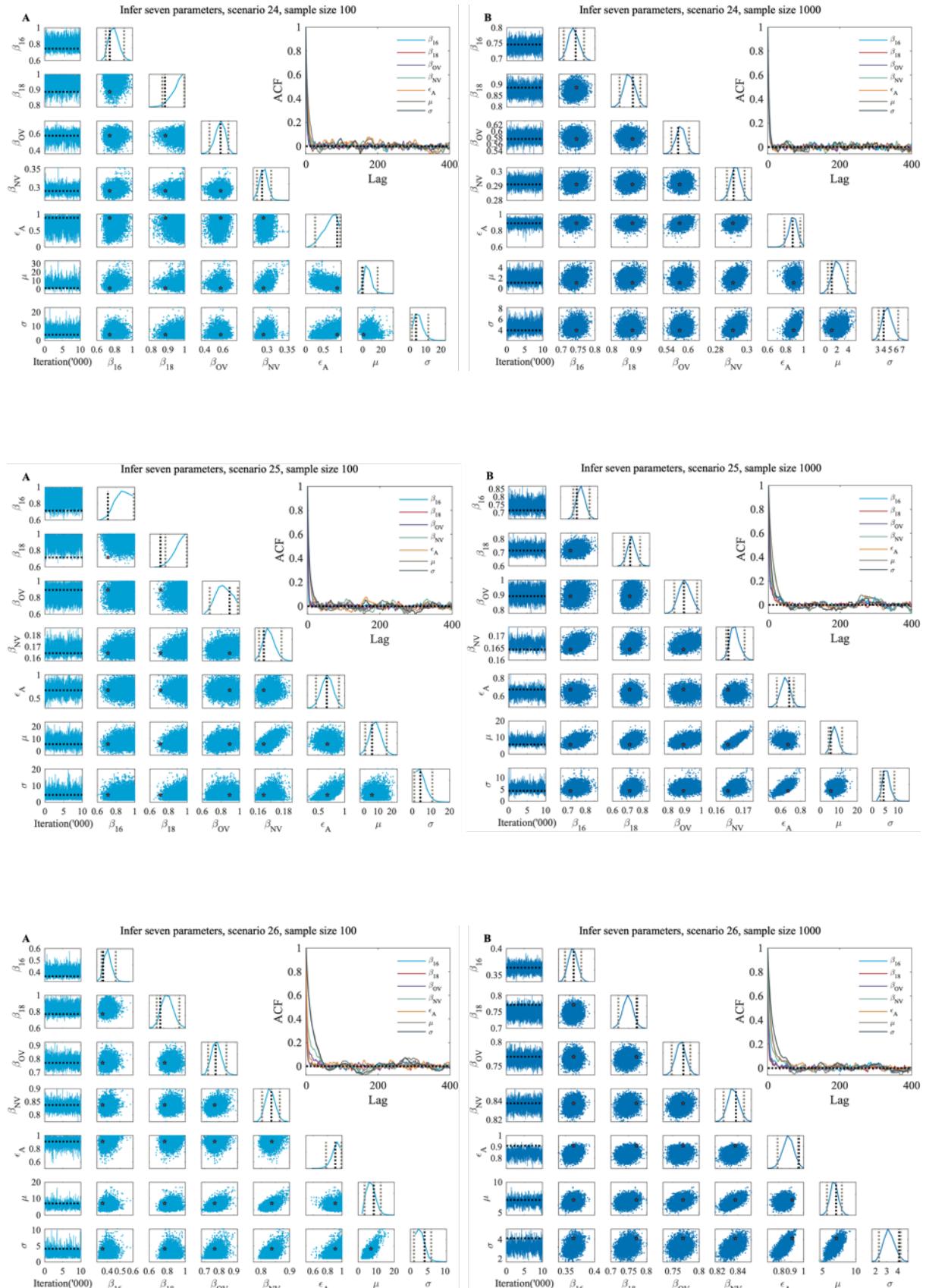


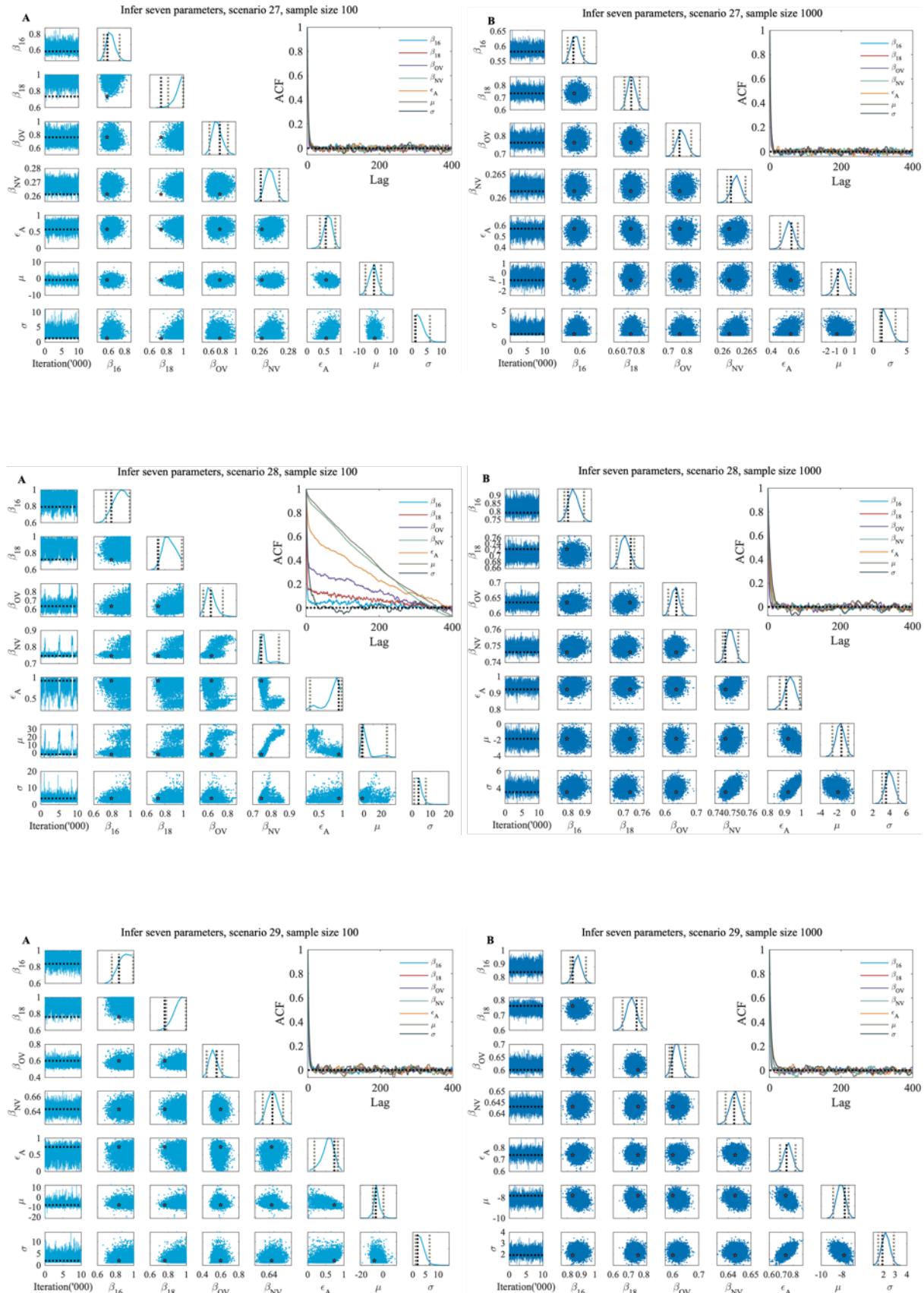


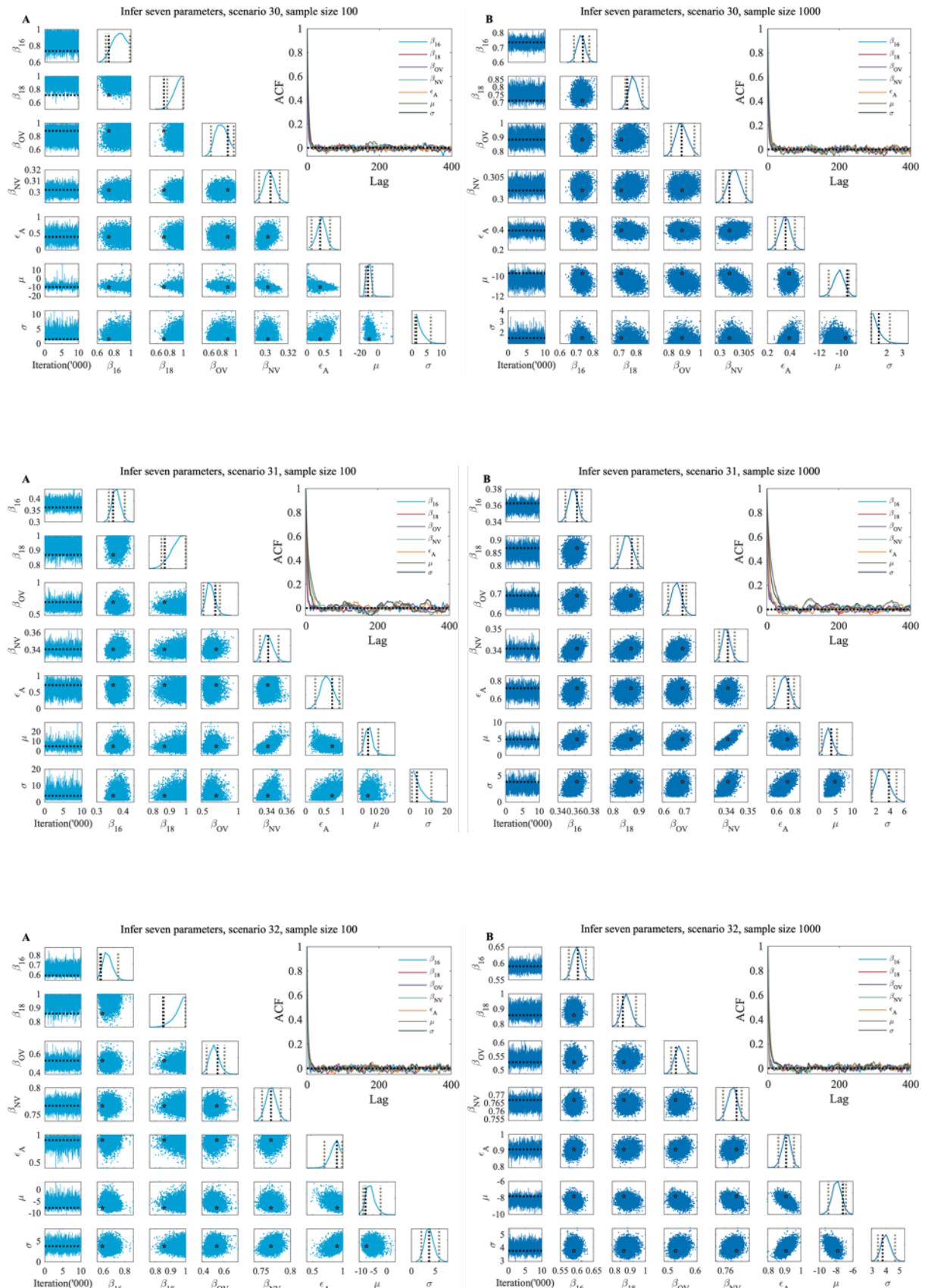


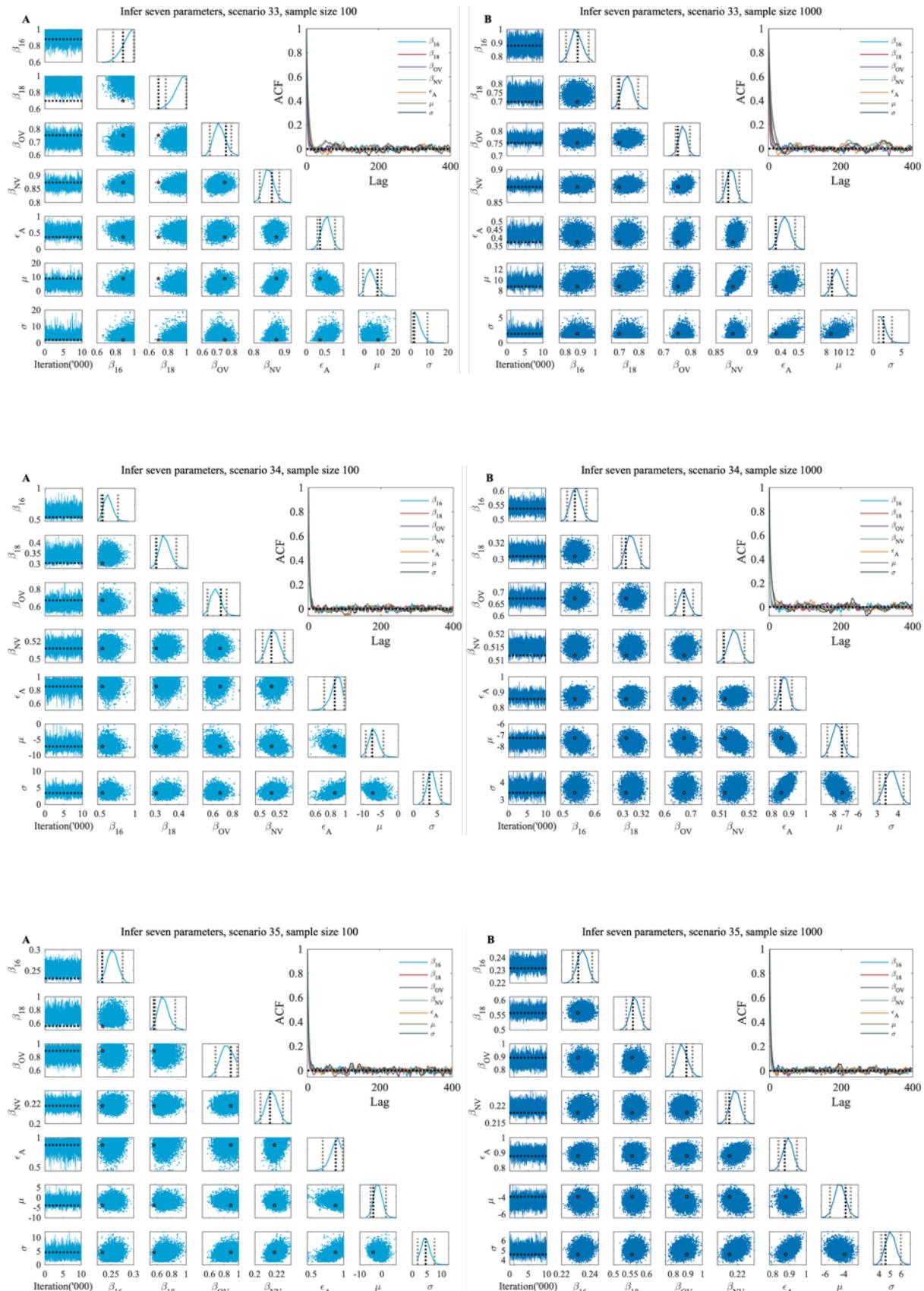


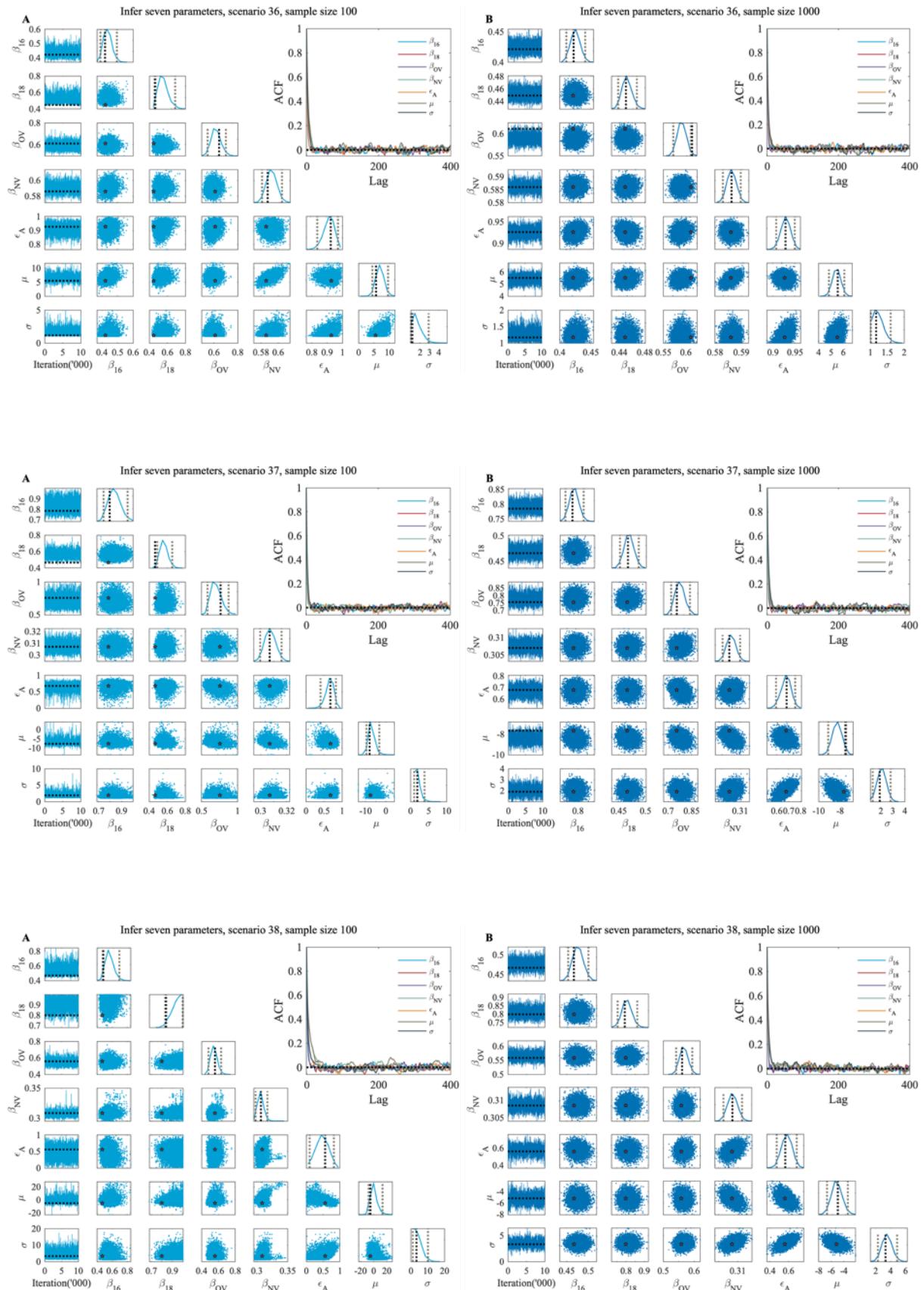


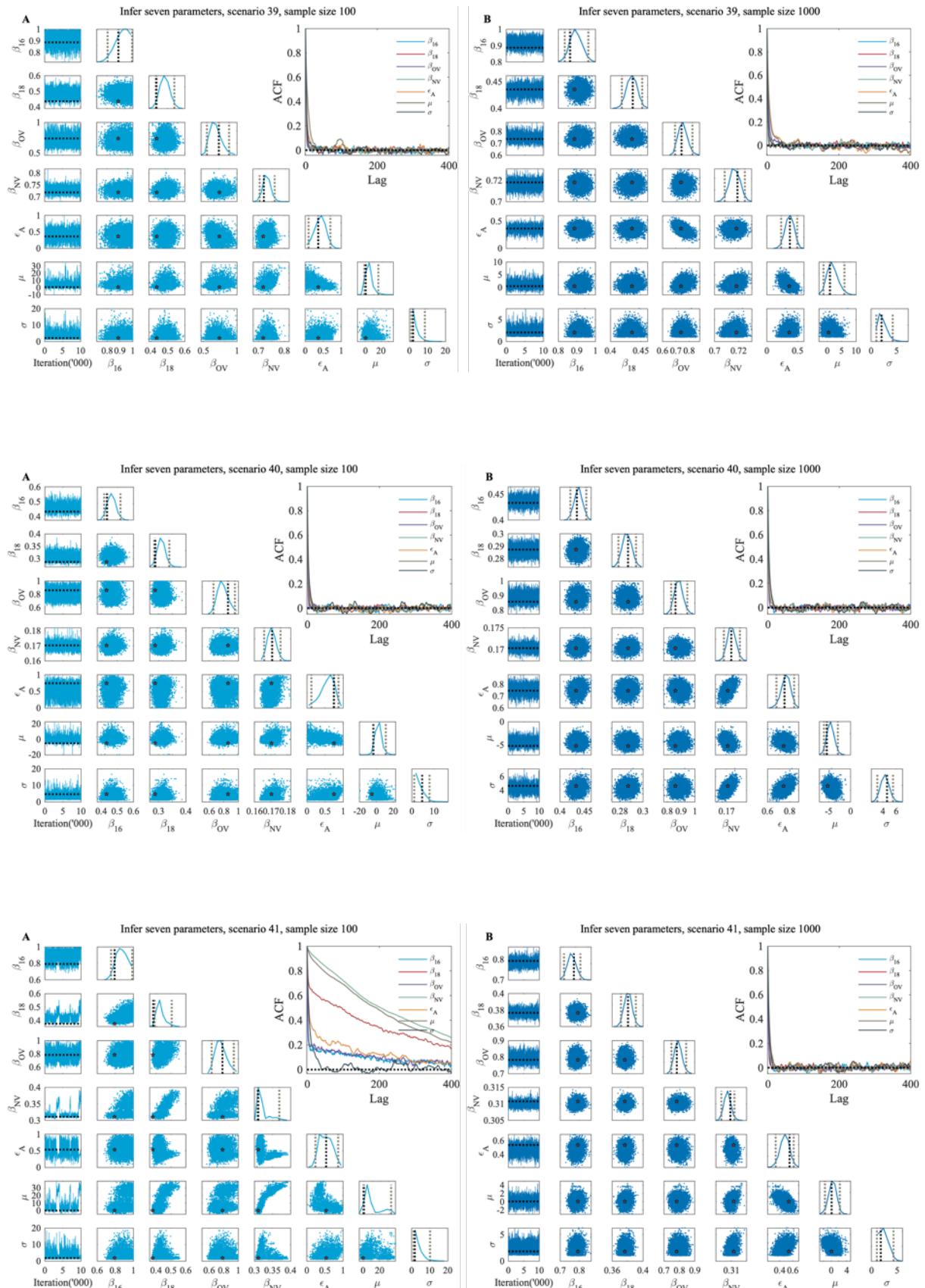


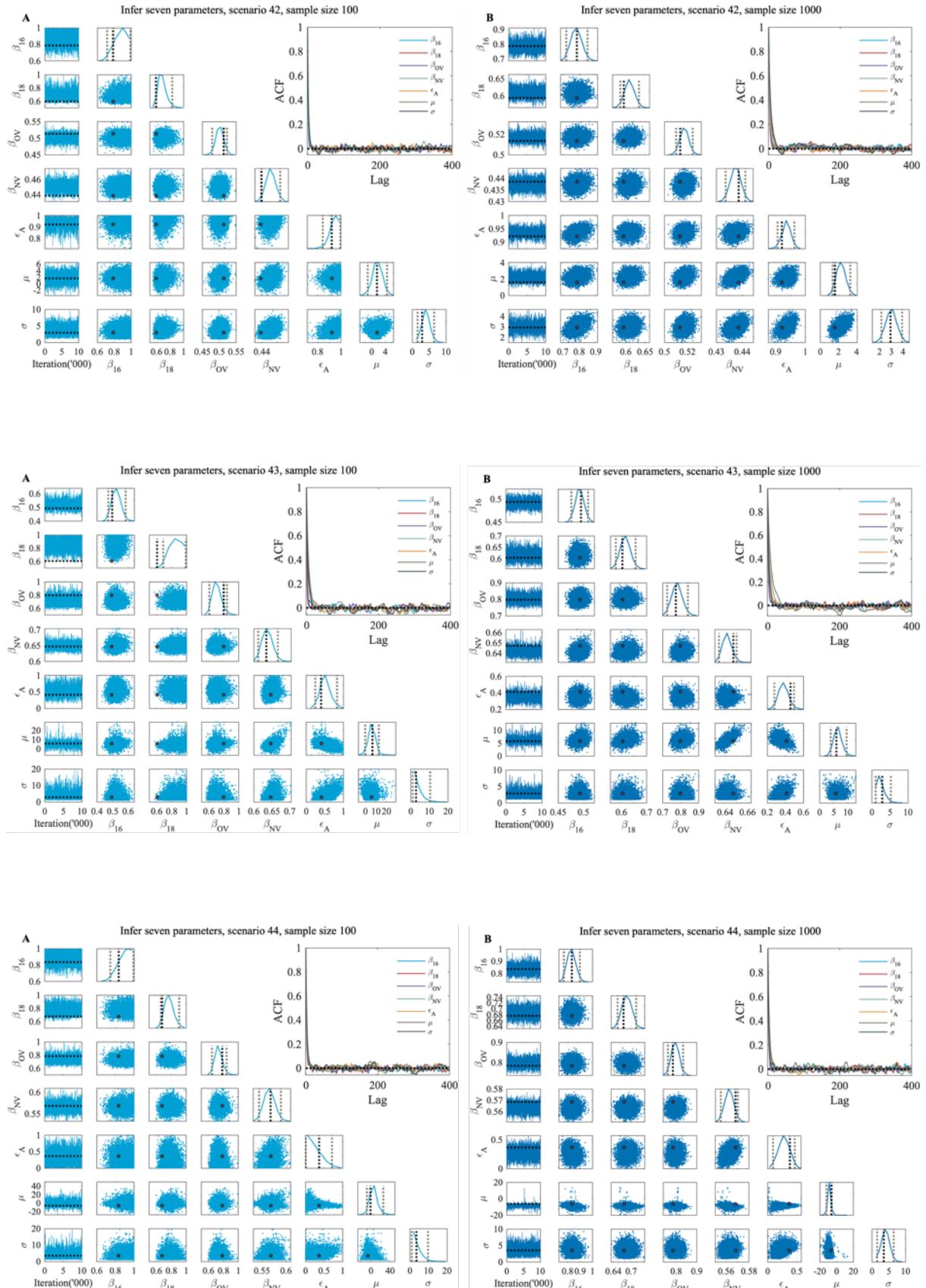


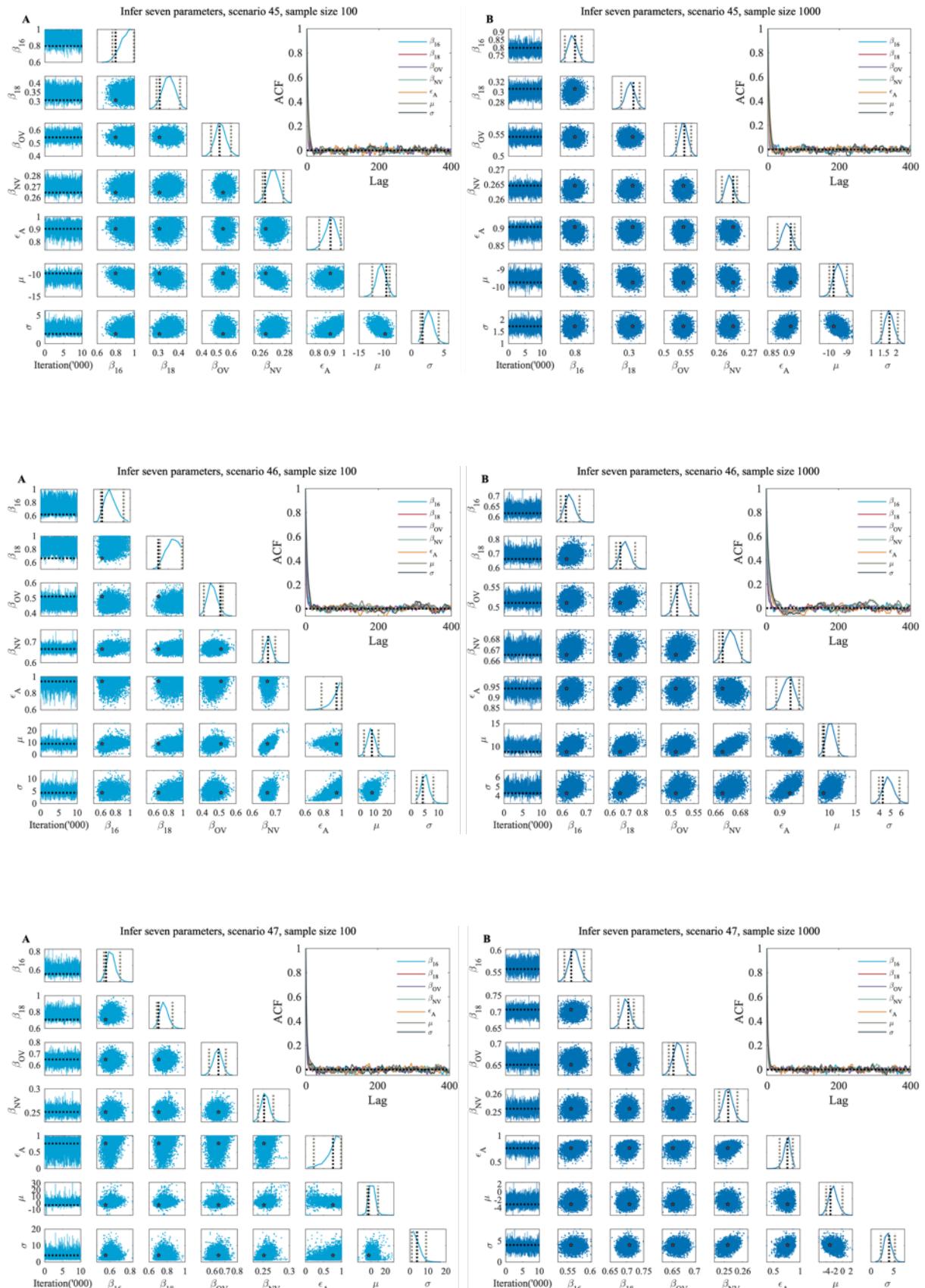


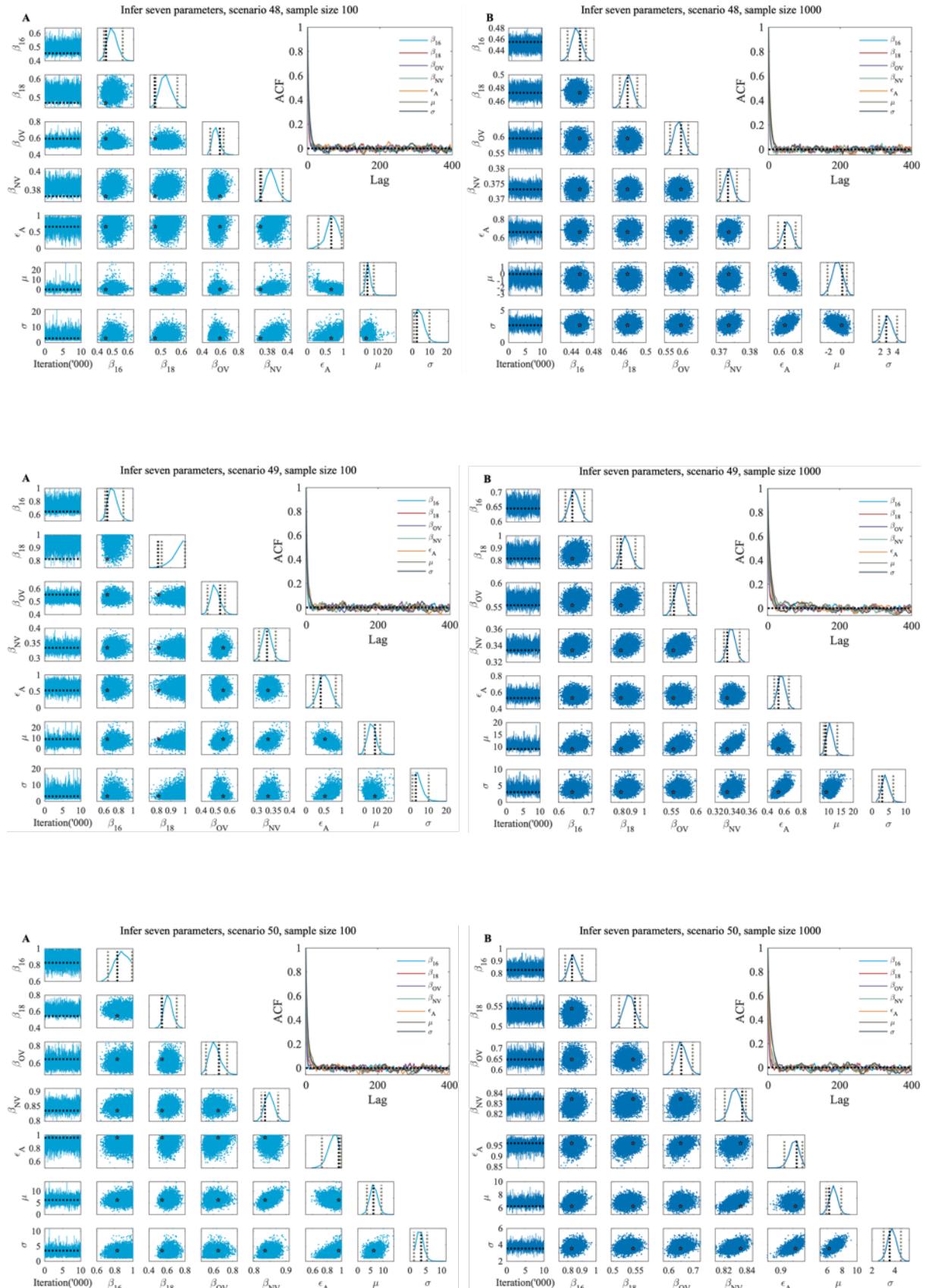






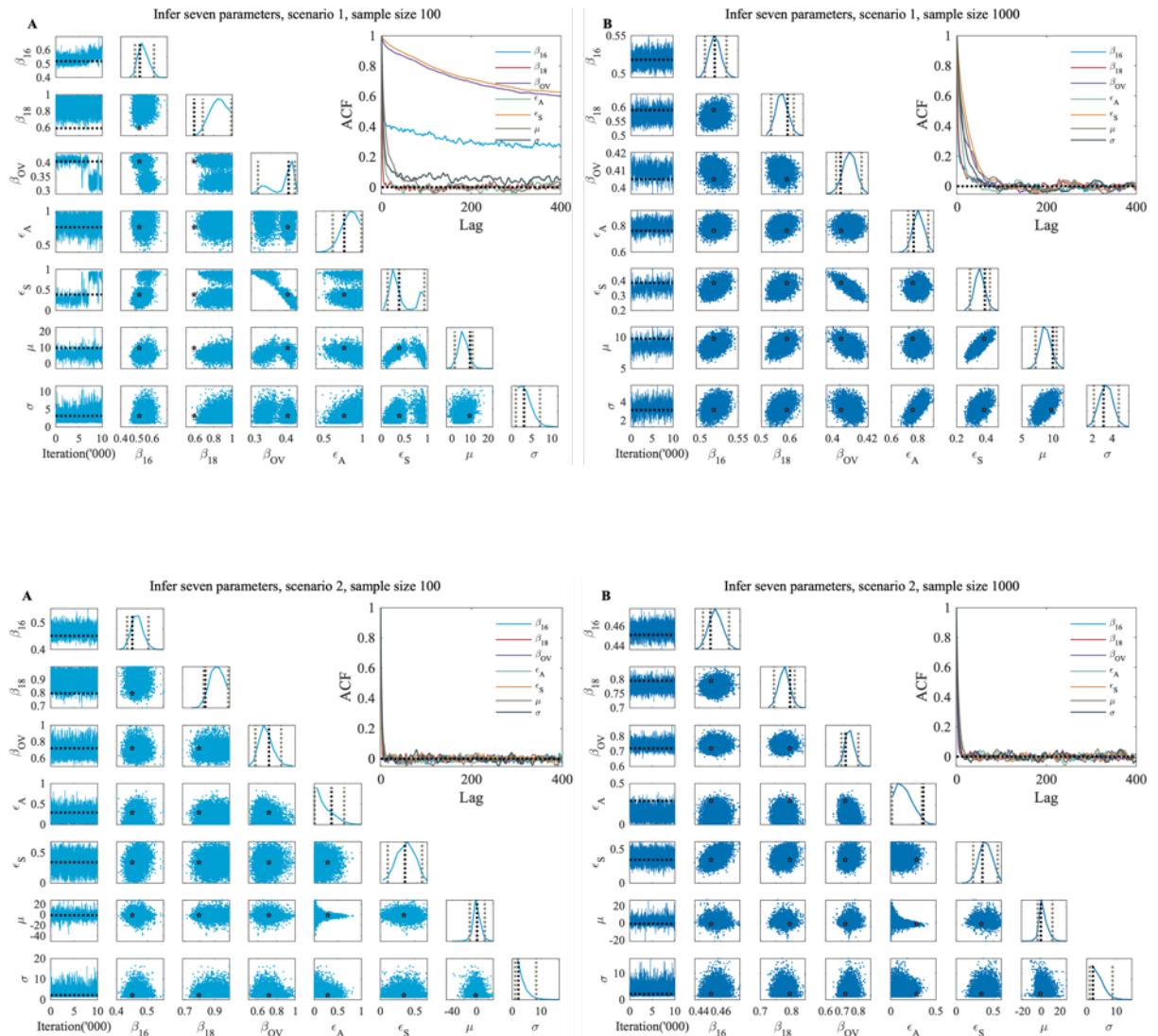


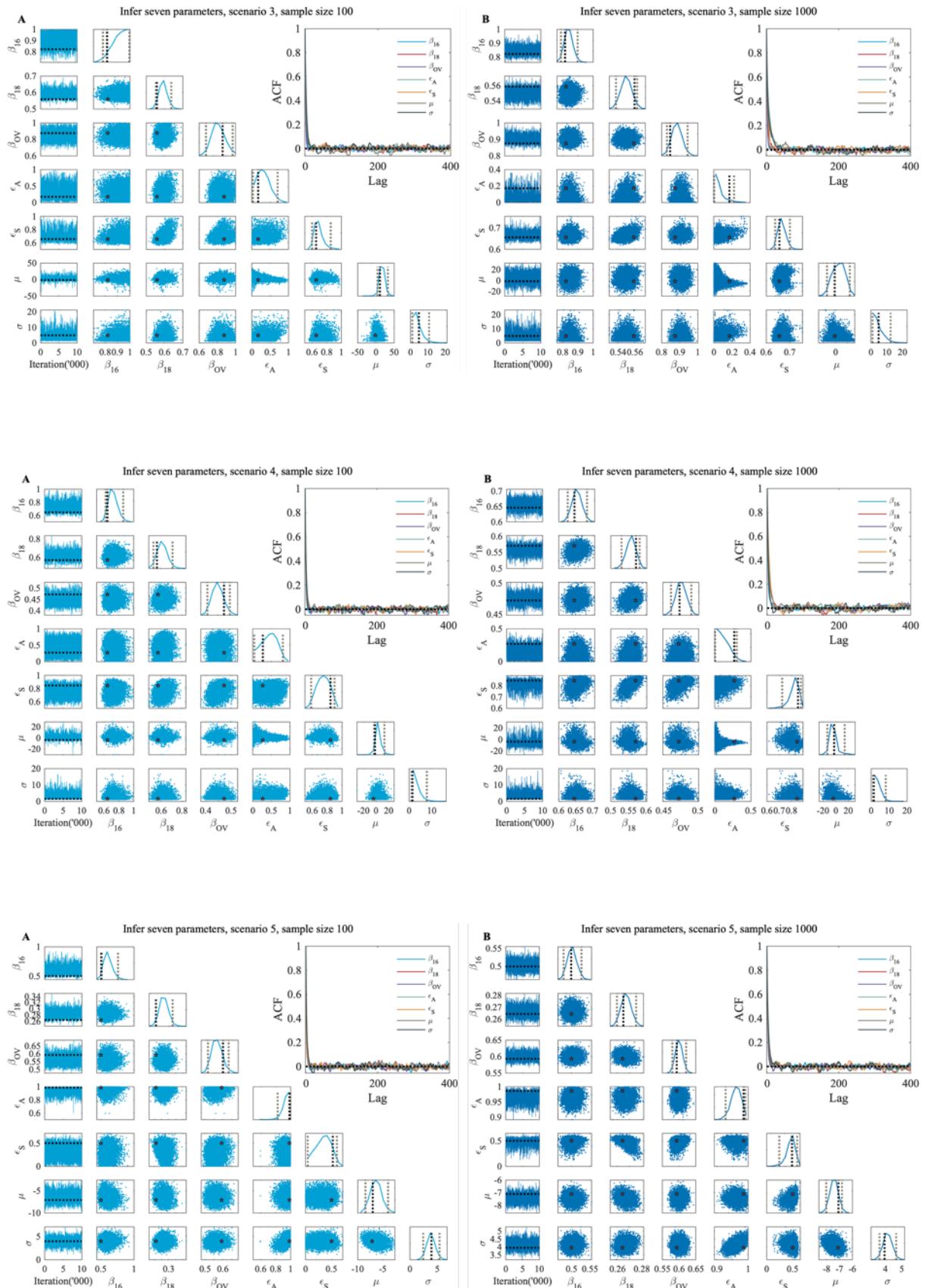


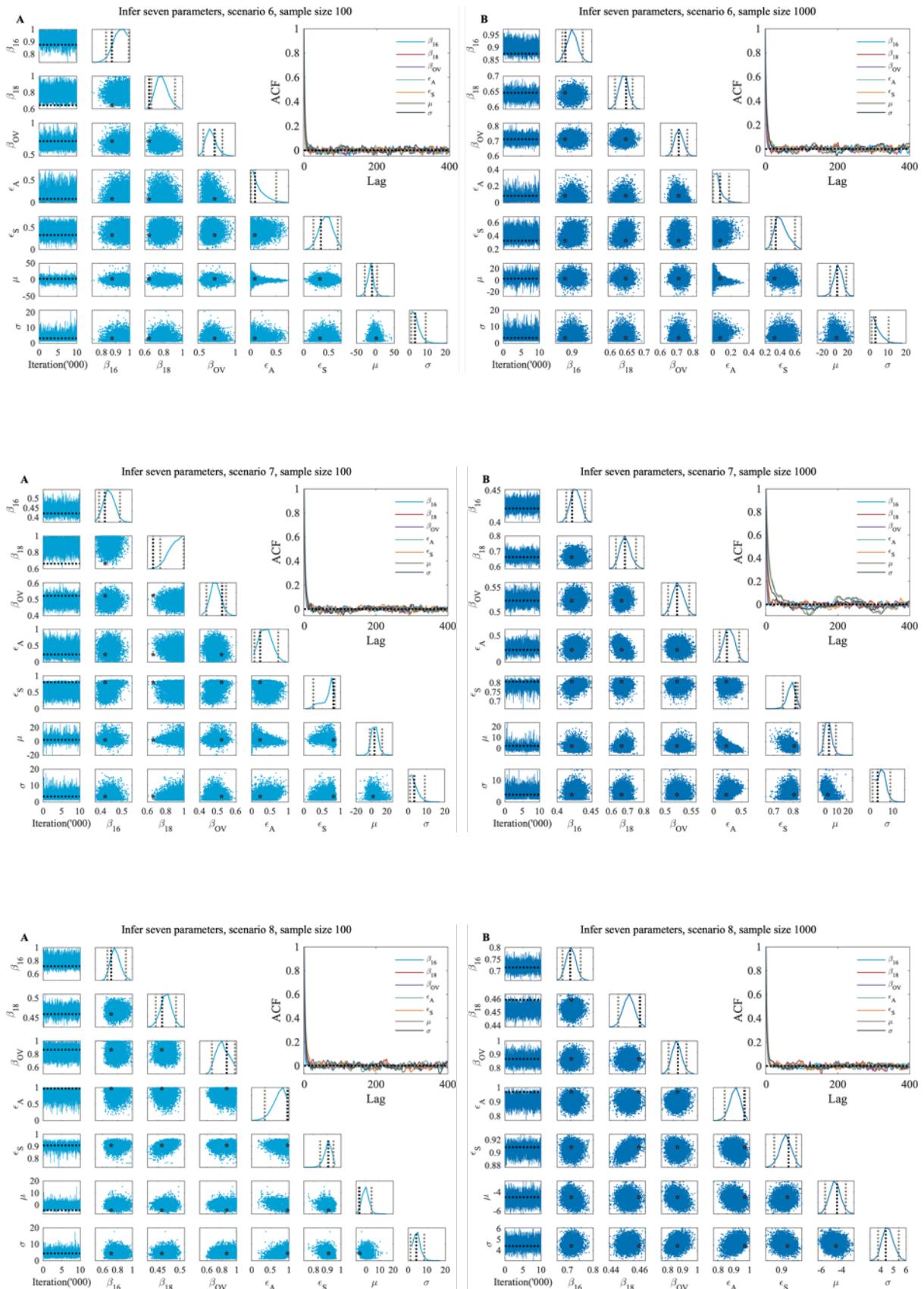


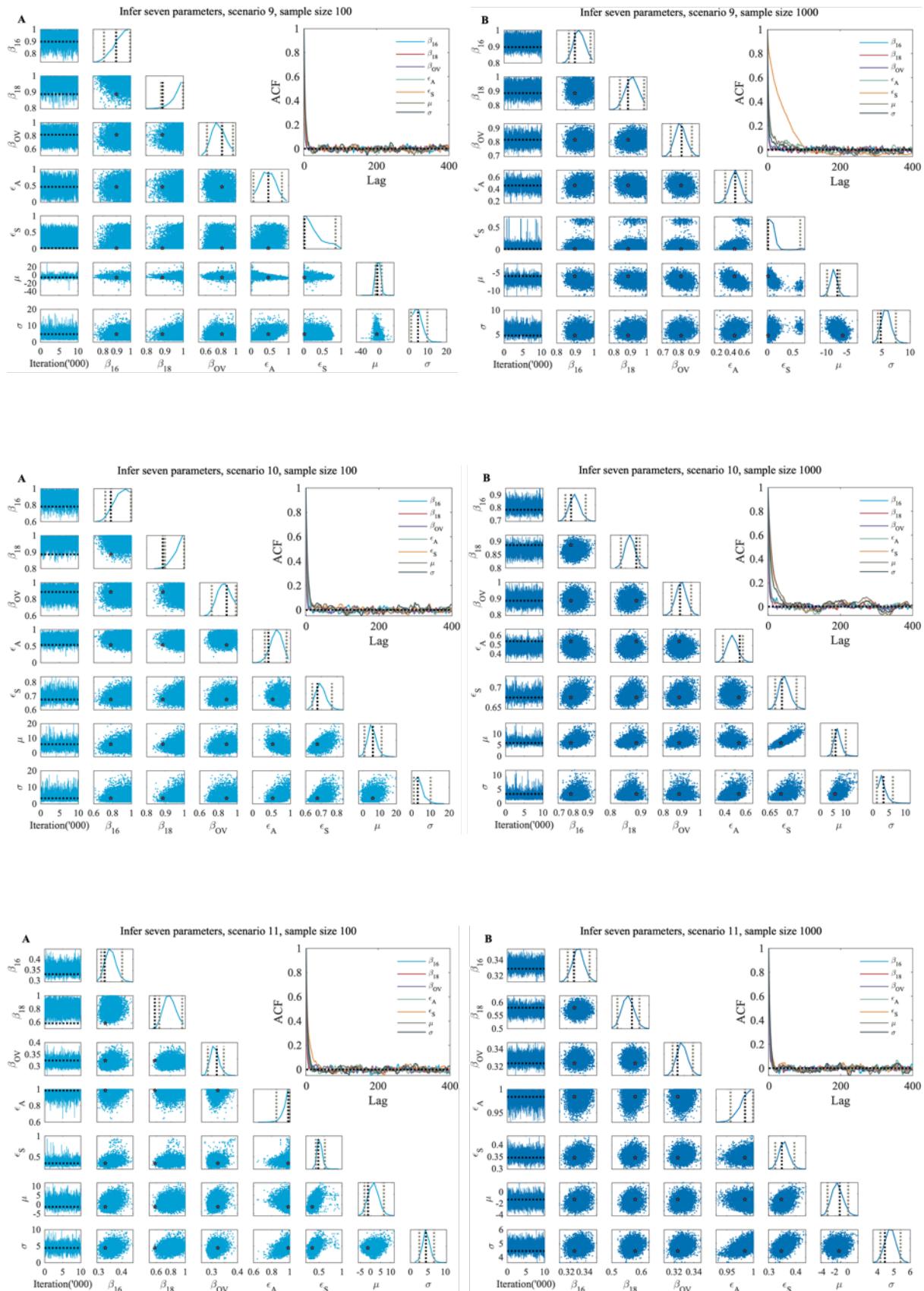
B.4 MCMC result of inferring eight parameters in set Θ_3 ($\Theta_3 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \epsilon_A, \epsilon_S, \mu, \sigma\}$) using sample size is 100 and 1000 women in each of the 1-year age group under 50 scenarios.

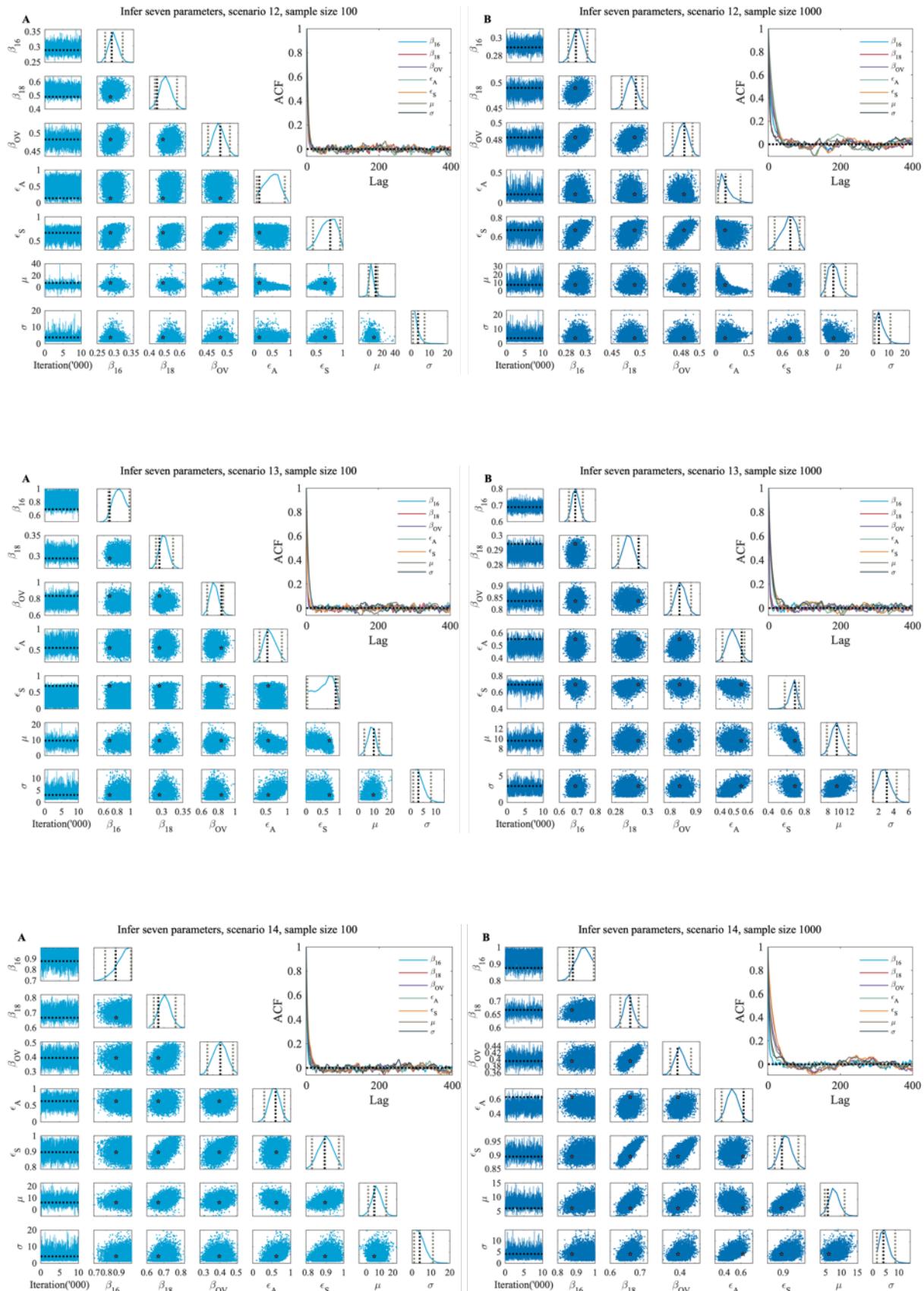
The first column shows the MCMC trace plots. The left triangular matrix shows the posterior distribution of parameters and bivariate distributions of parameter pairs estimated from MCMC. The solid black lines and the stars represent true values. The black dashed line represents 95% CrI. The upper right figure shows the autocorrelation. (A) MCMC result of inferring eight parameters in set Θ_3 with data from 100 women in each of the 1-year age group. (B) MCMC result of inferring eight parameters in set Θ_3 with data from 1,000 women in each of the 1-year age group.

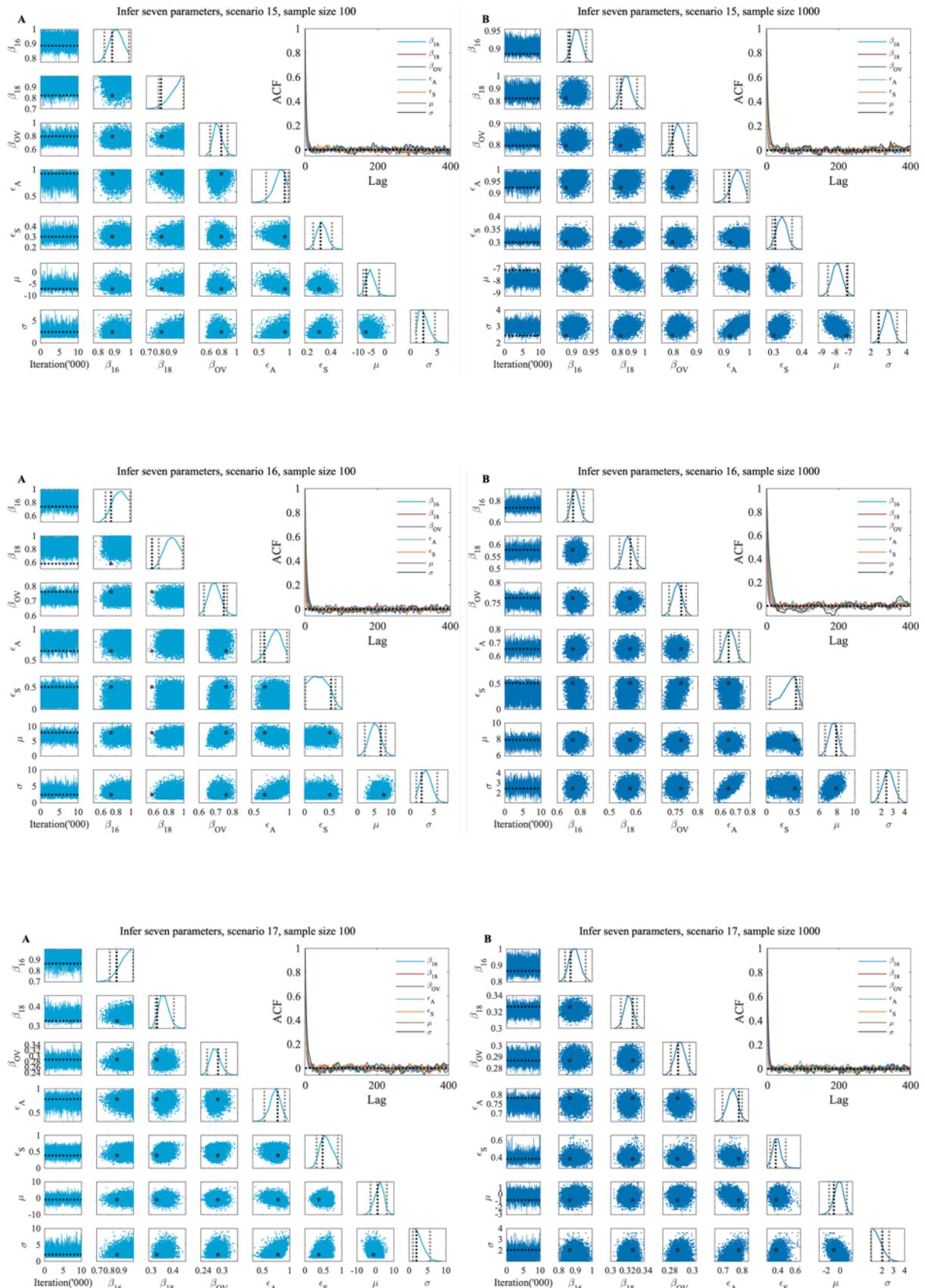


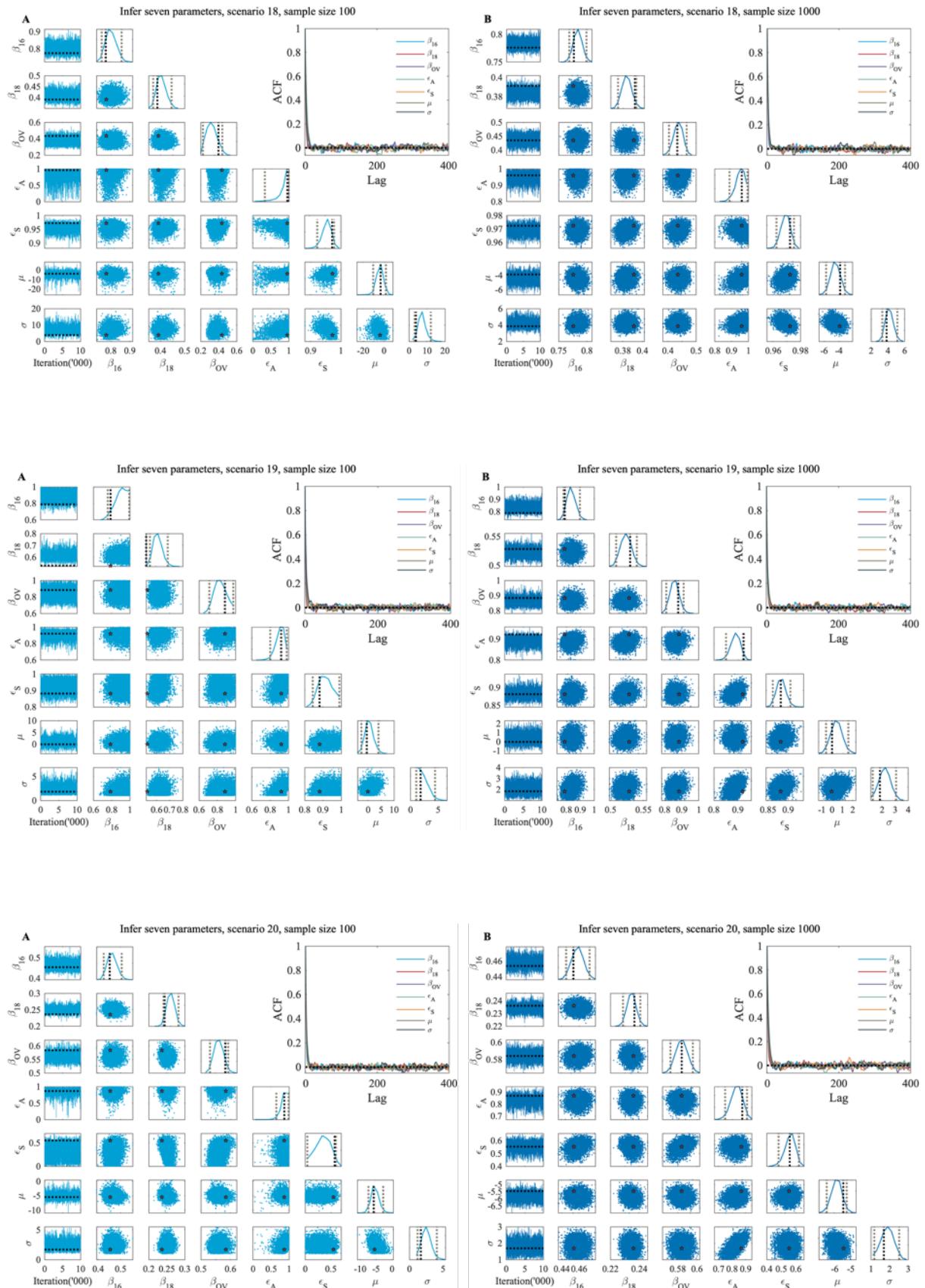


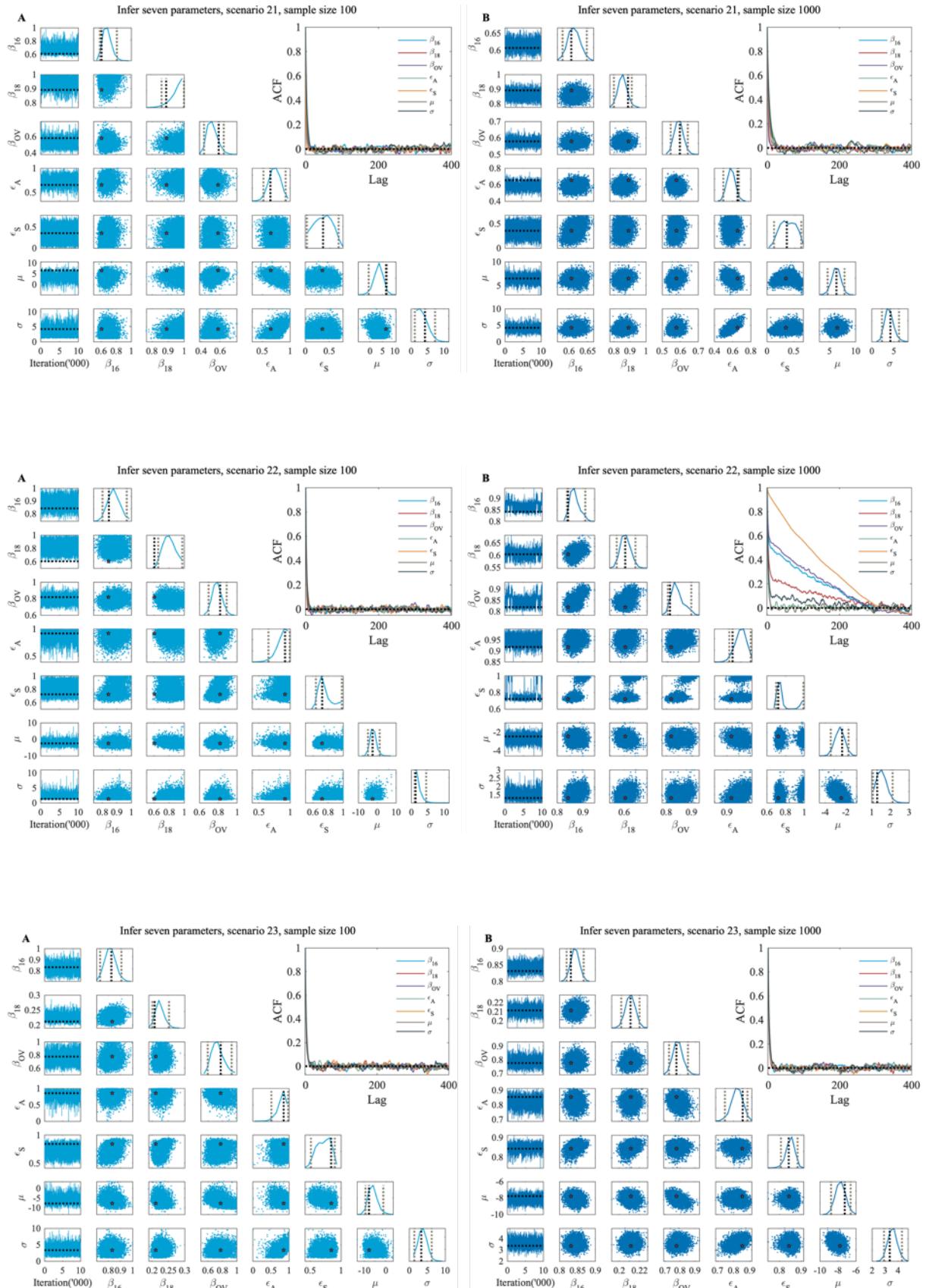


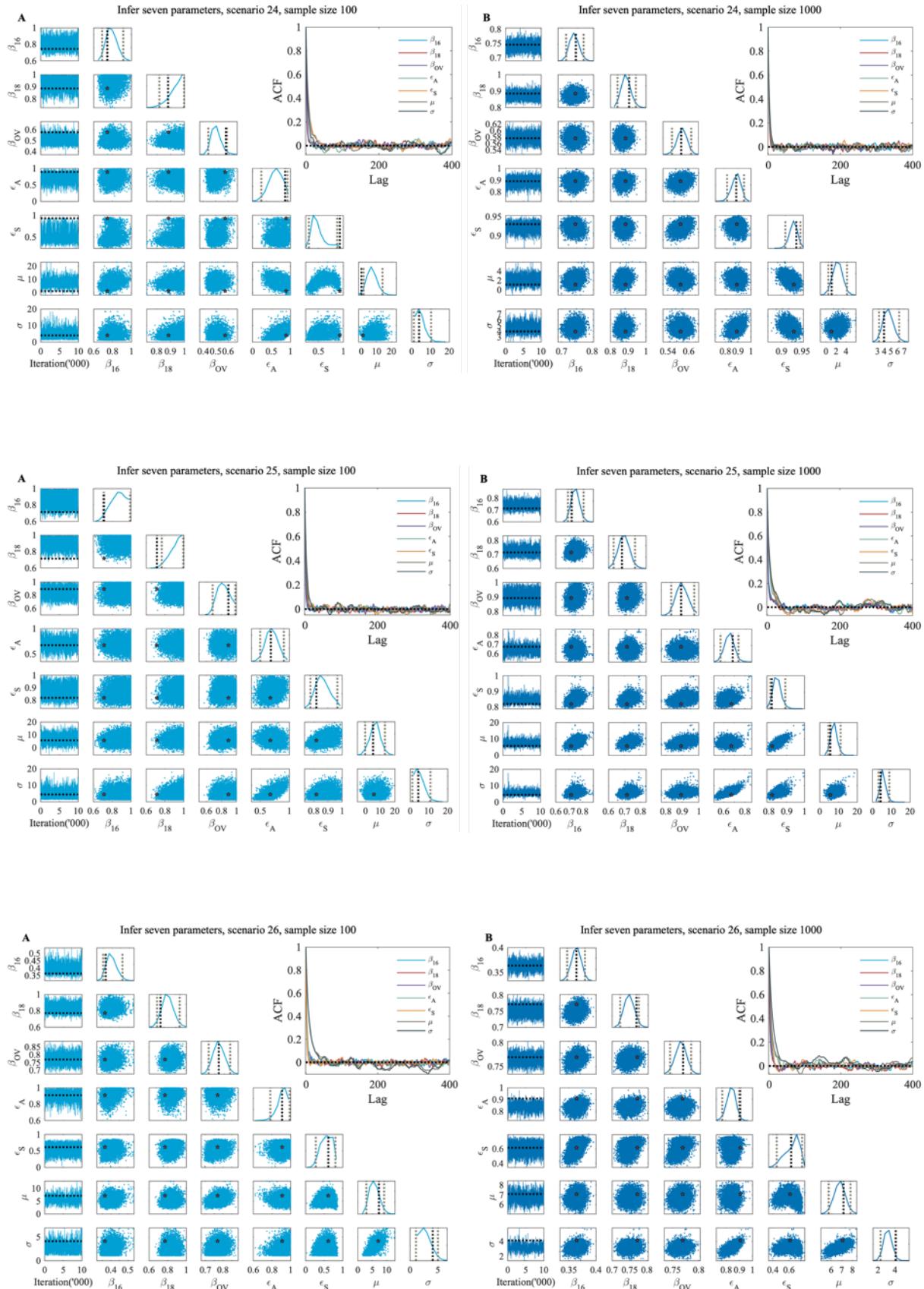


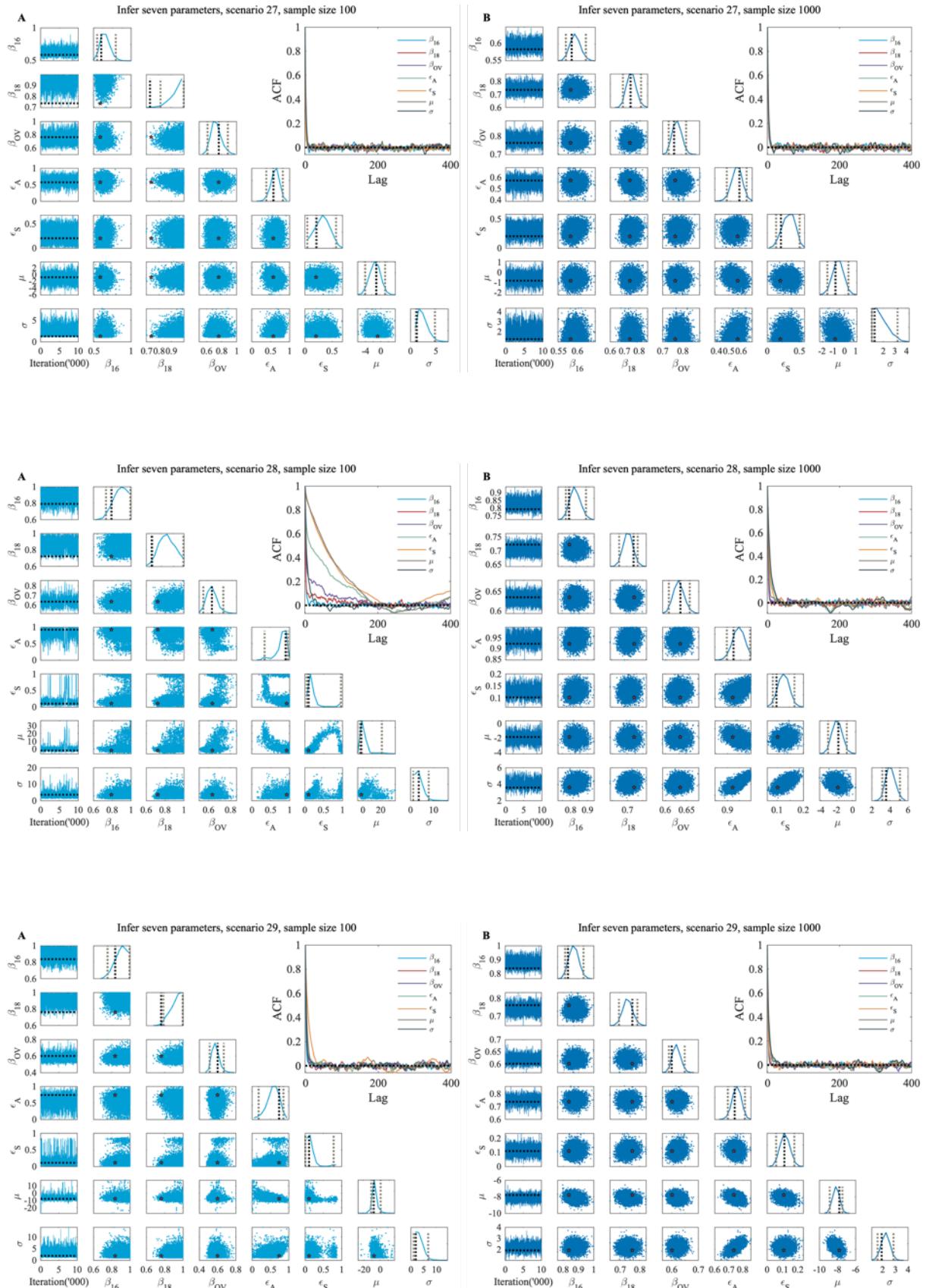


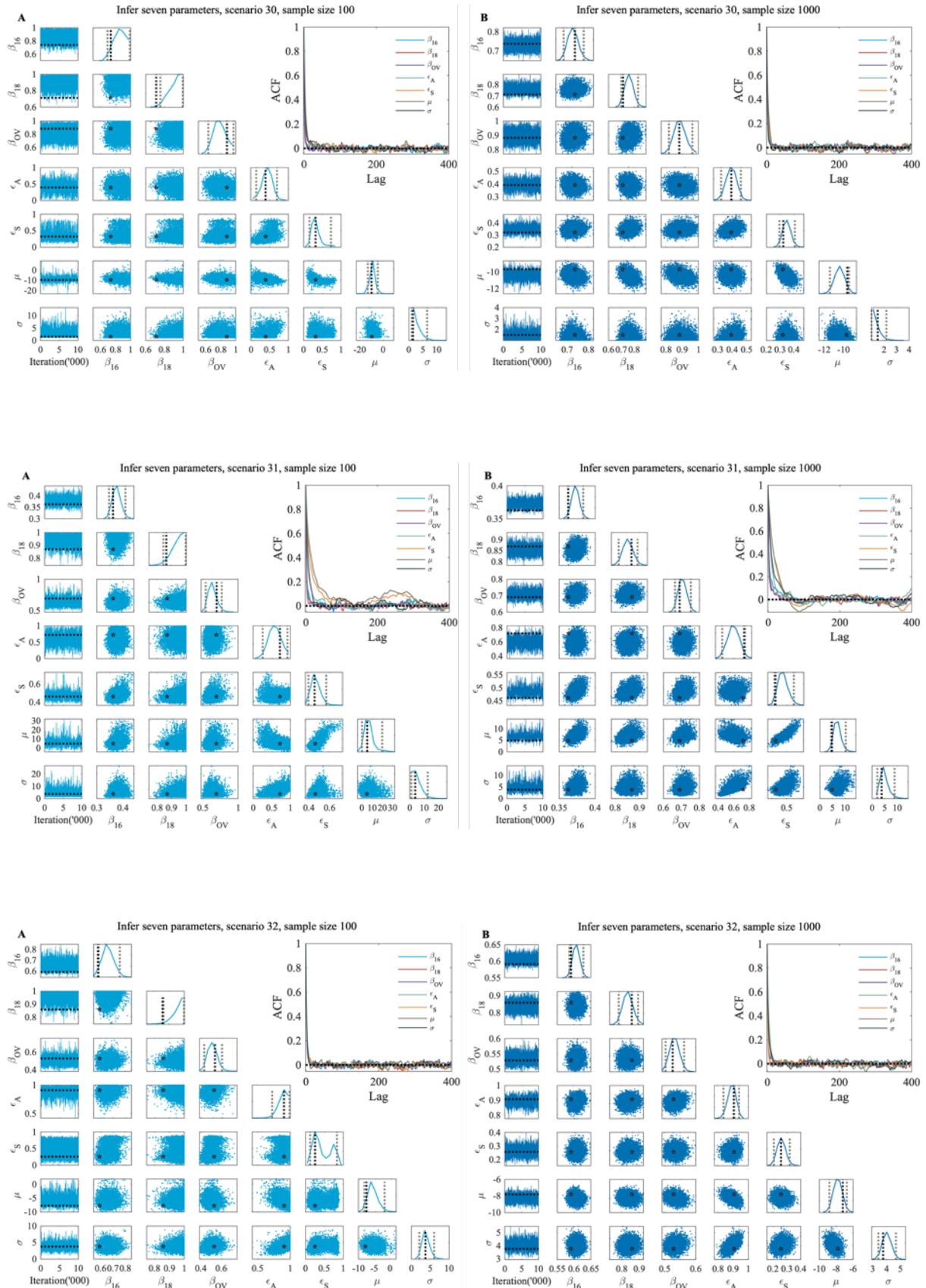


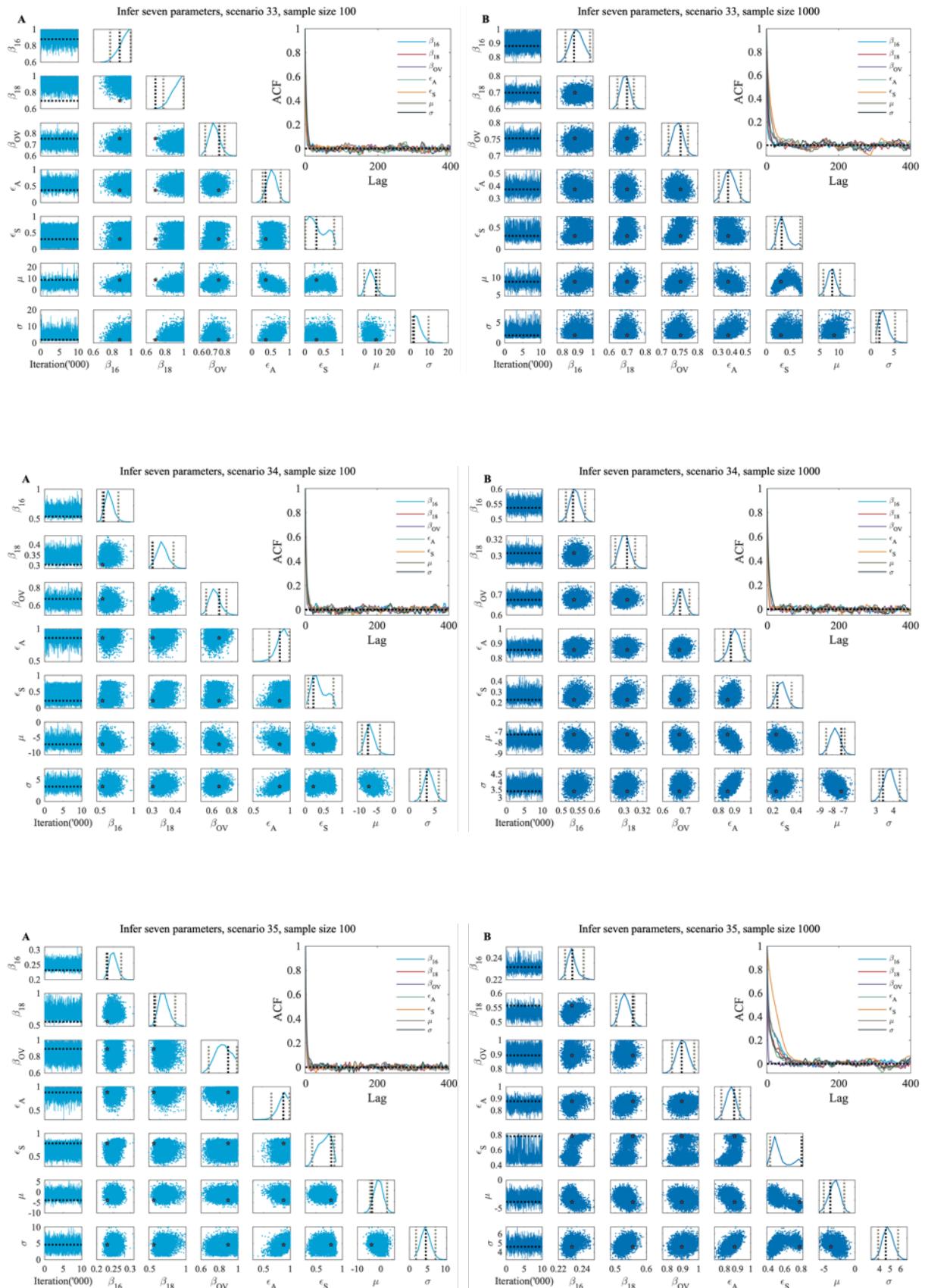


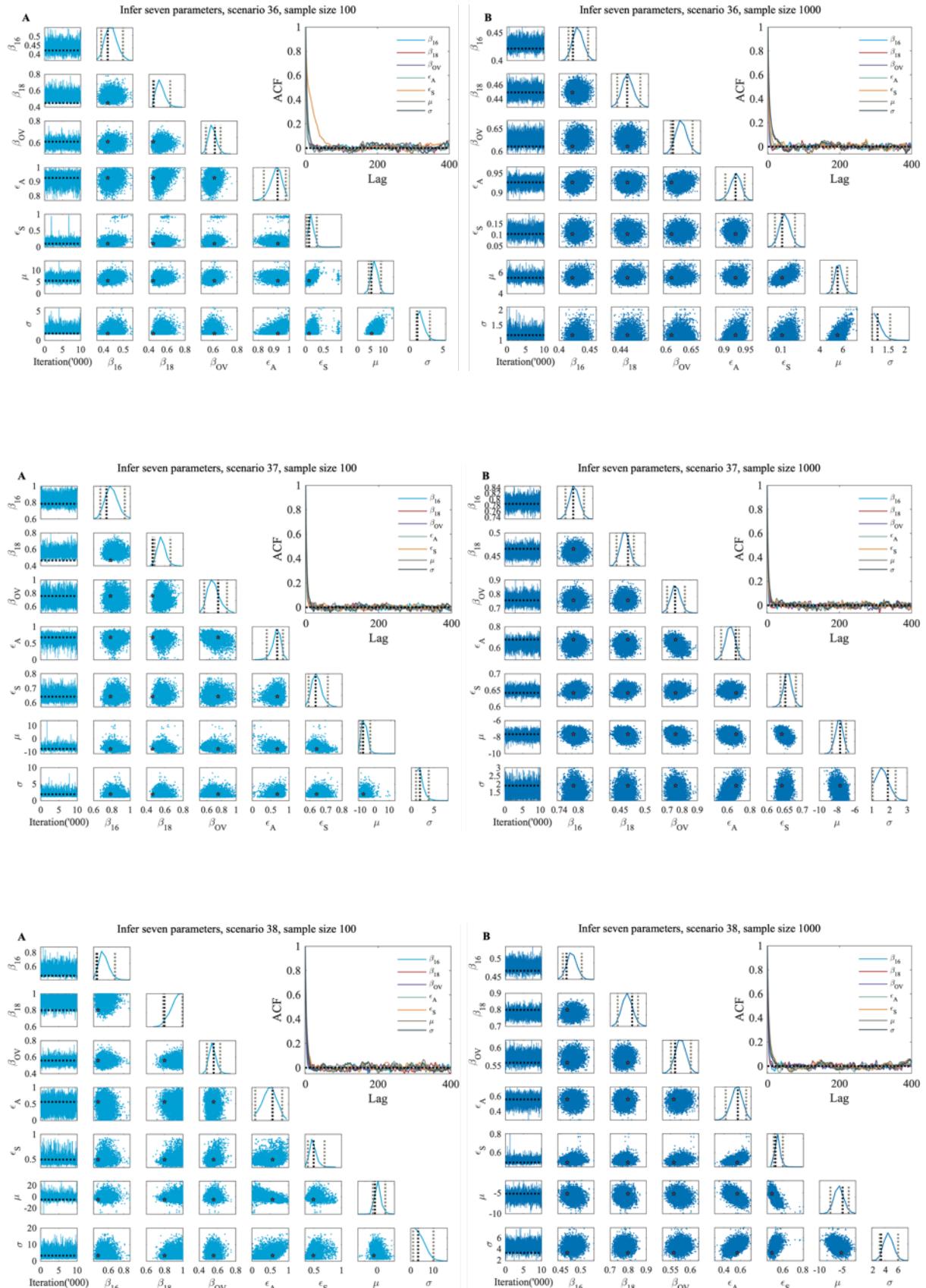


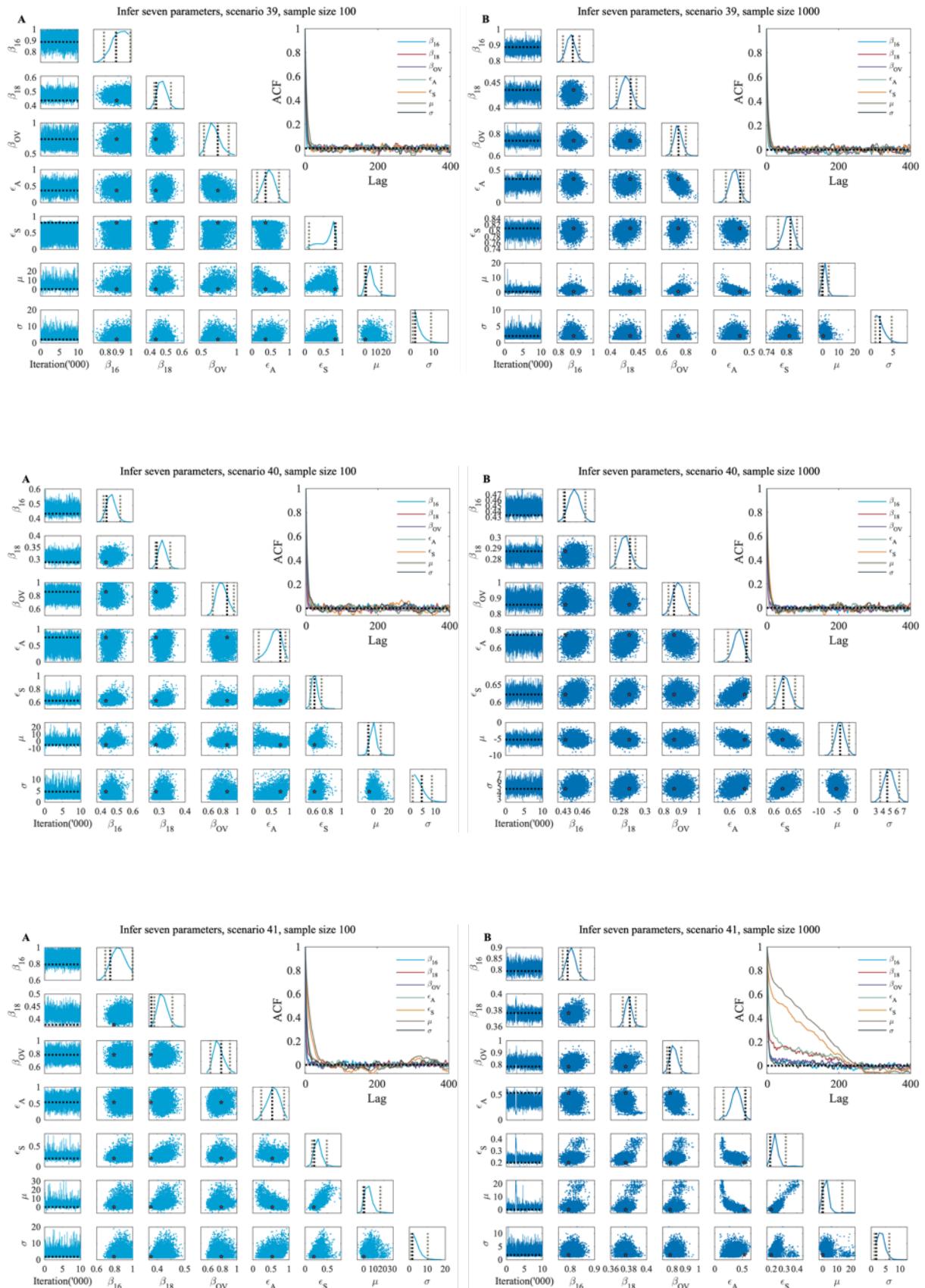


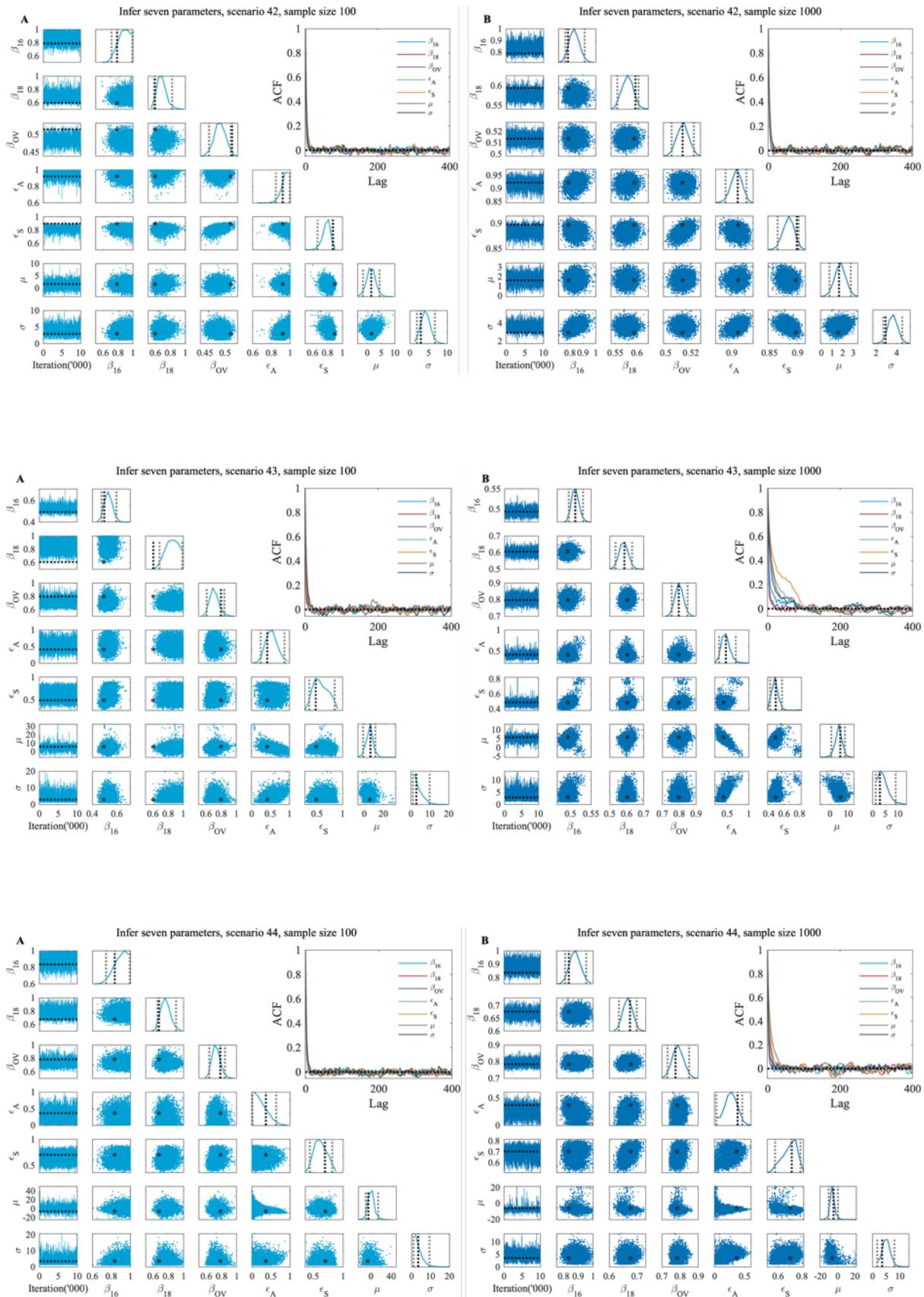


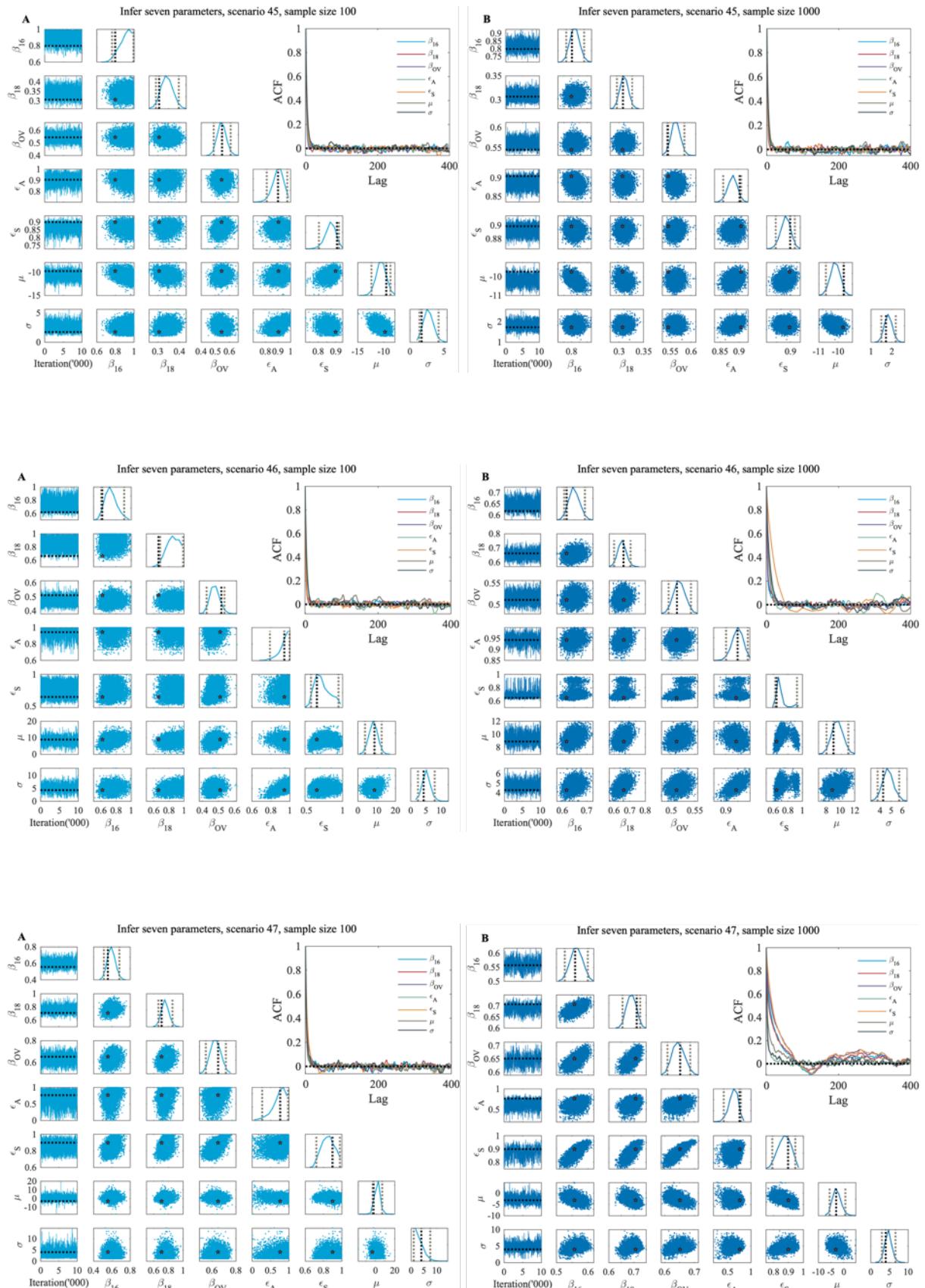


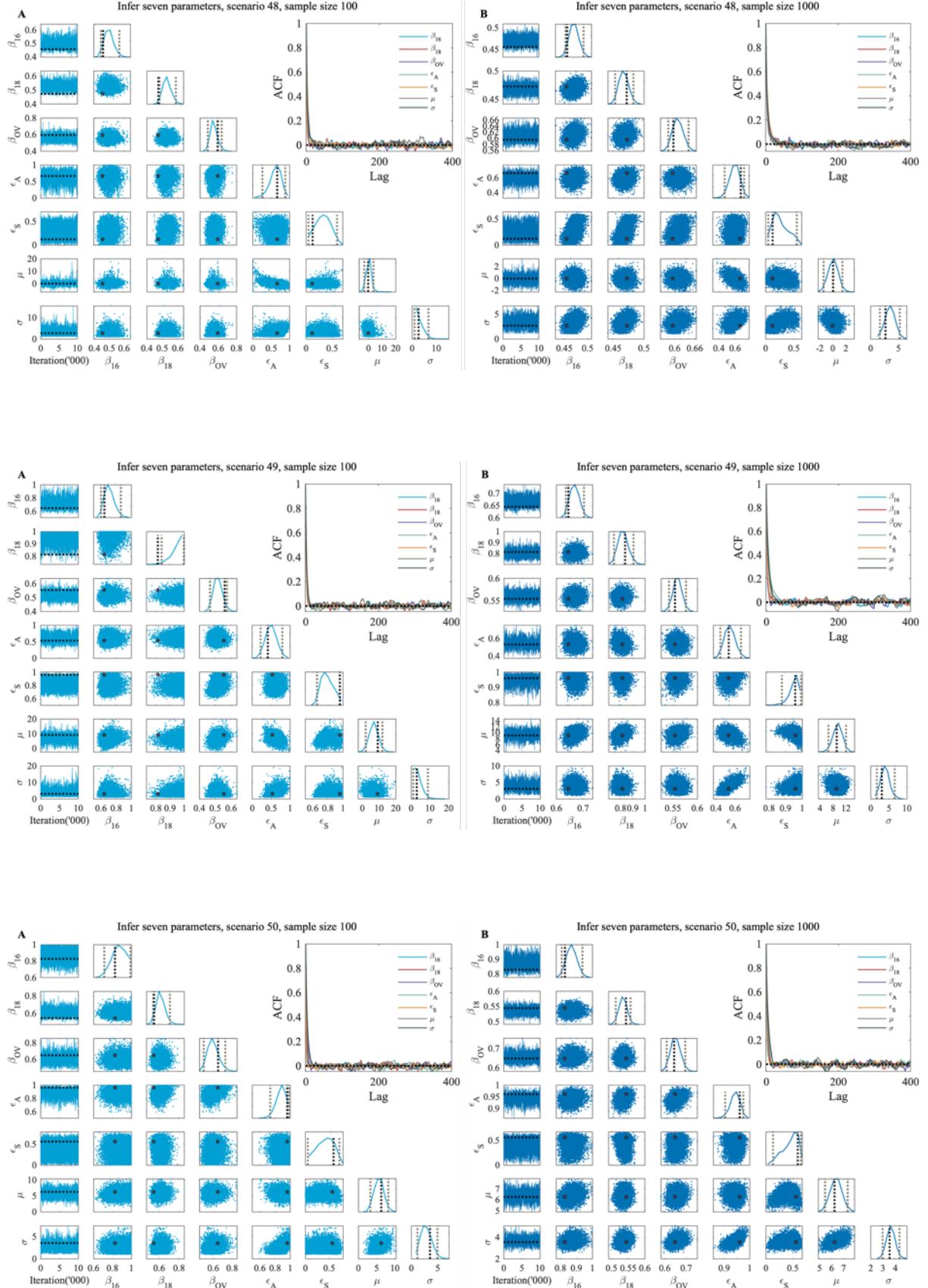






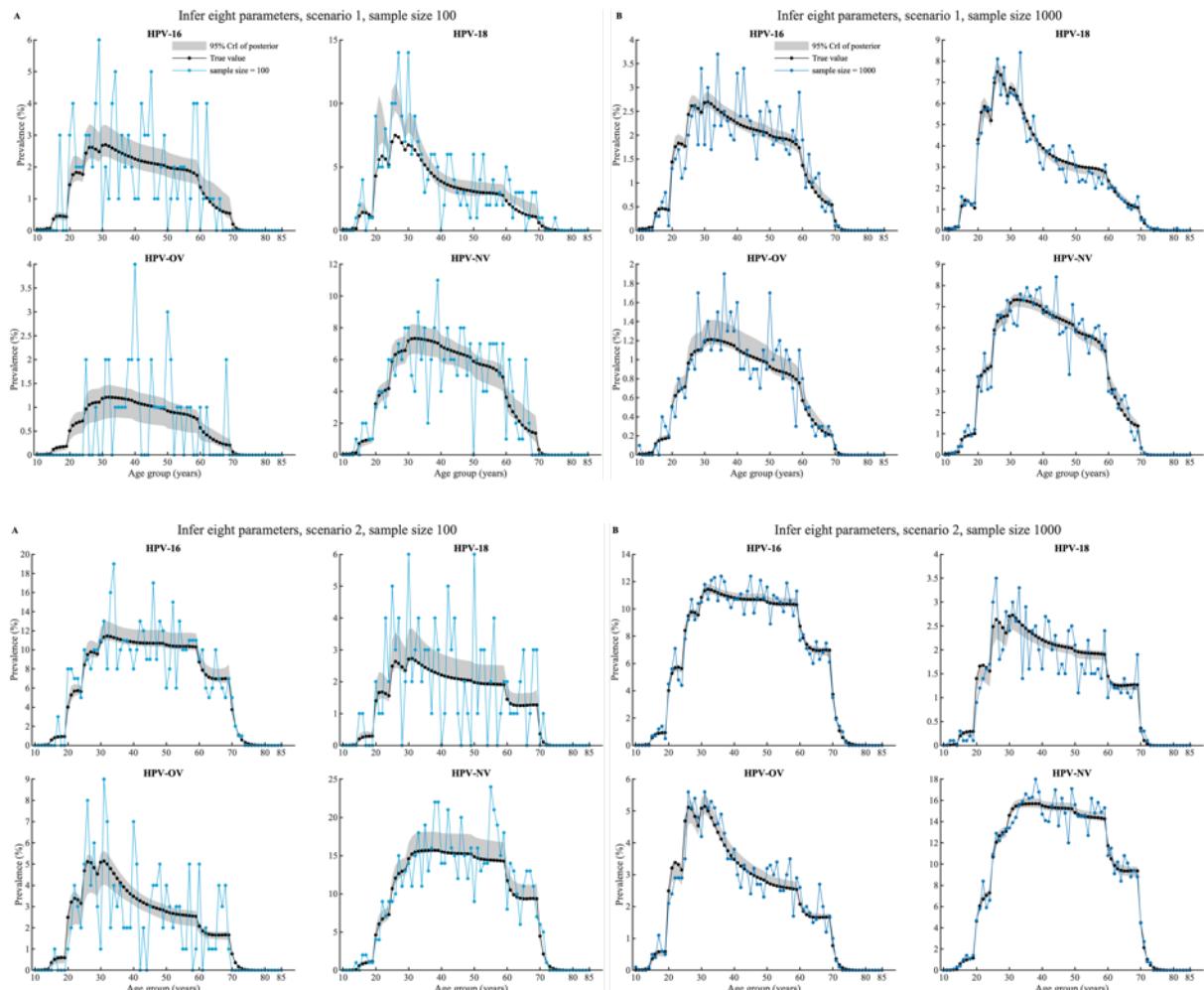


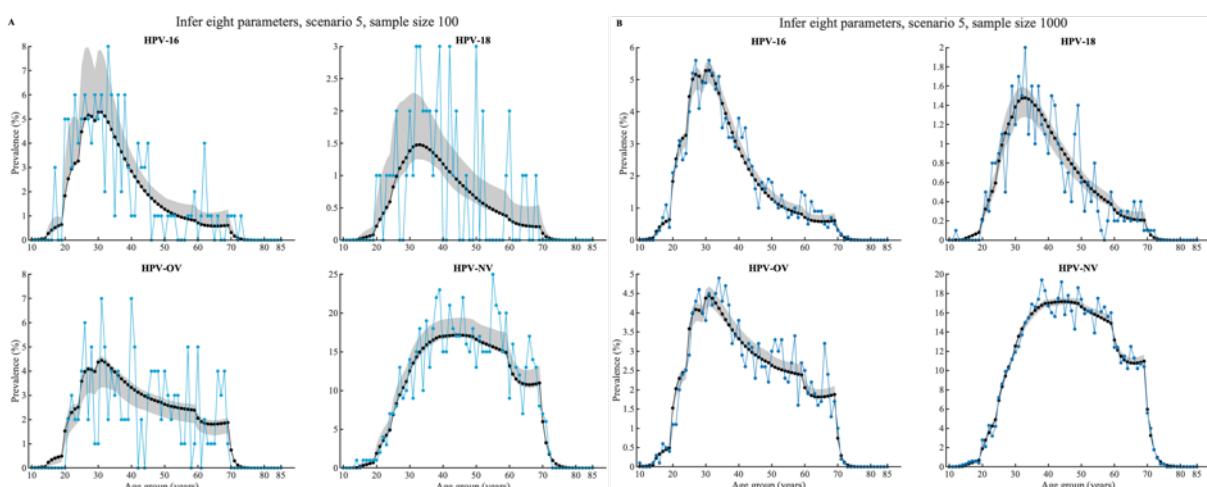
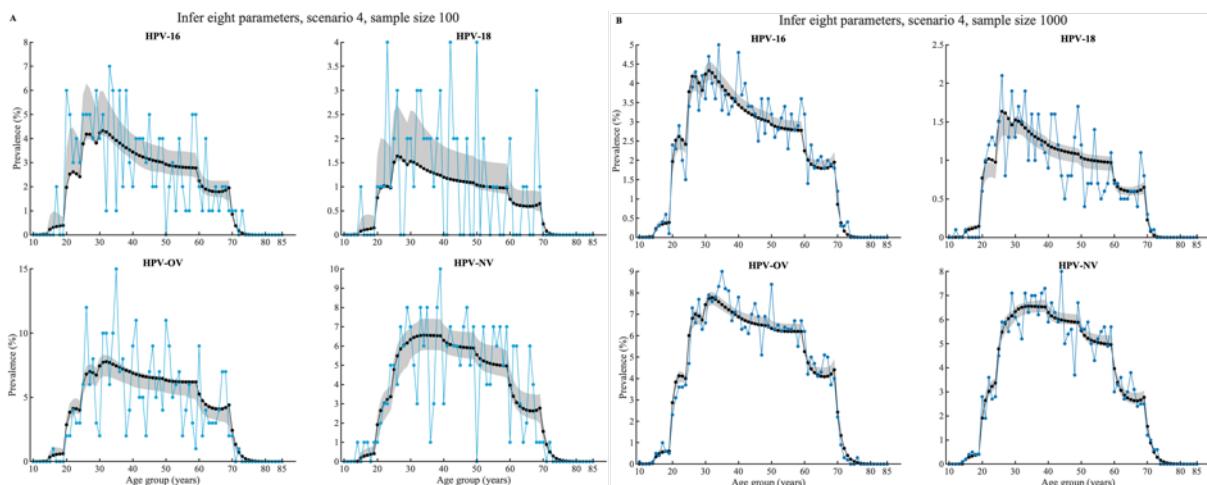
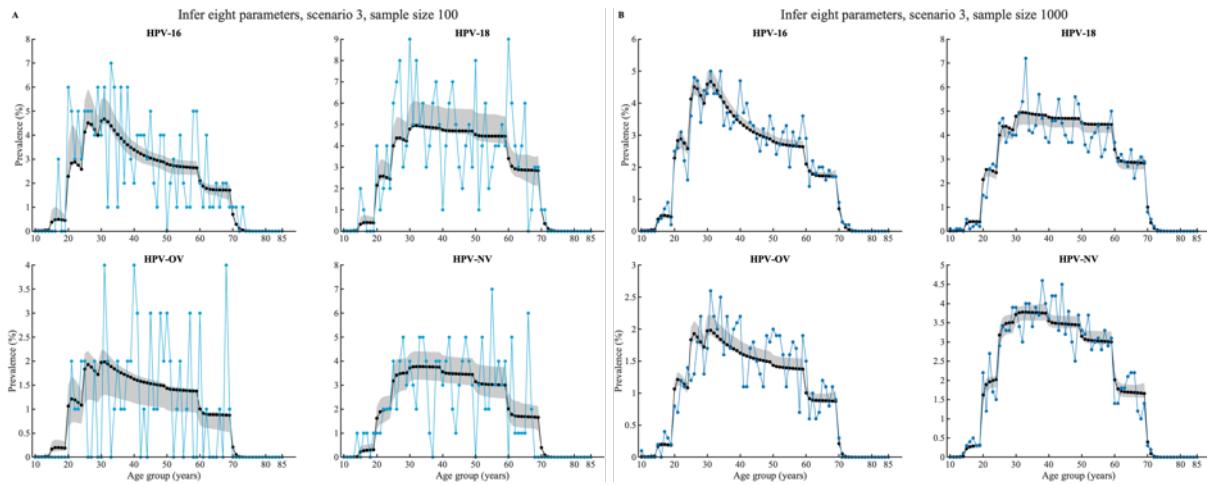


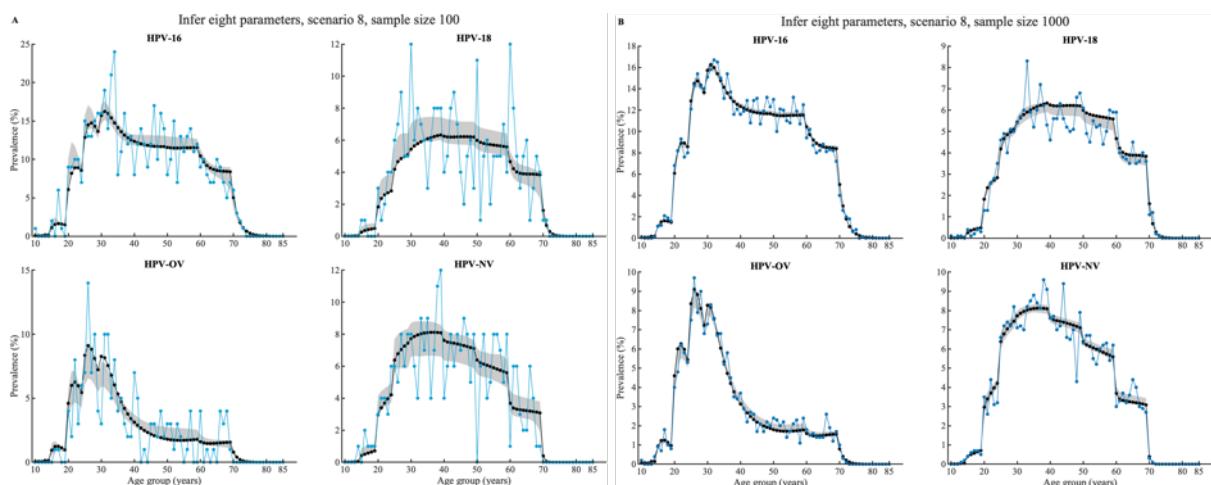
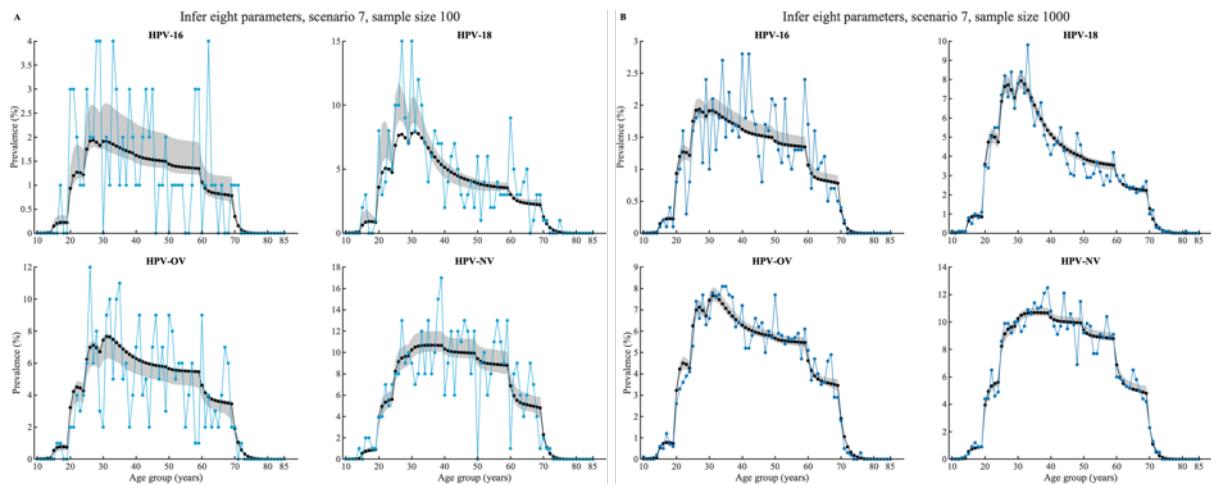
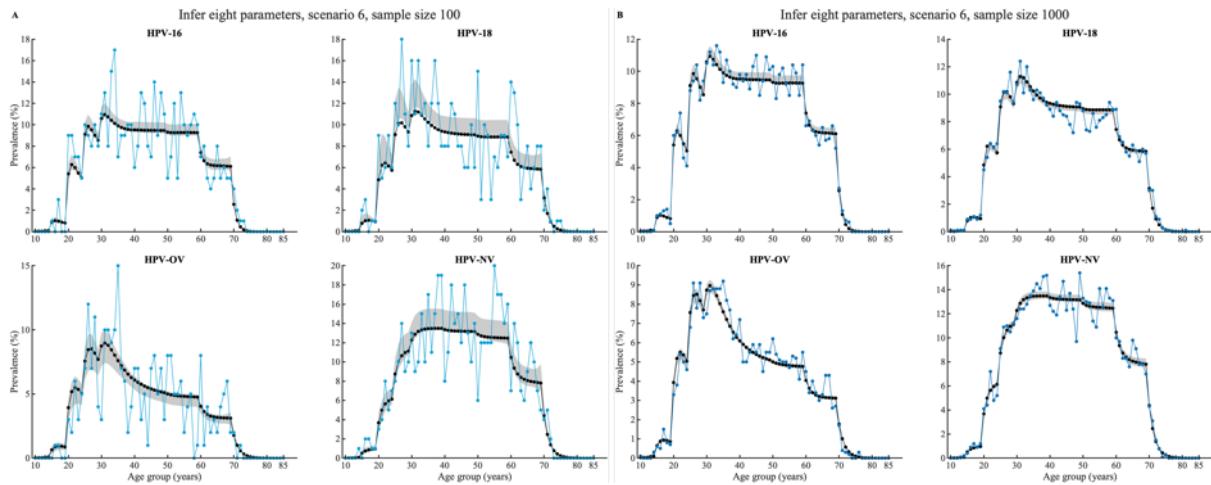


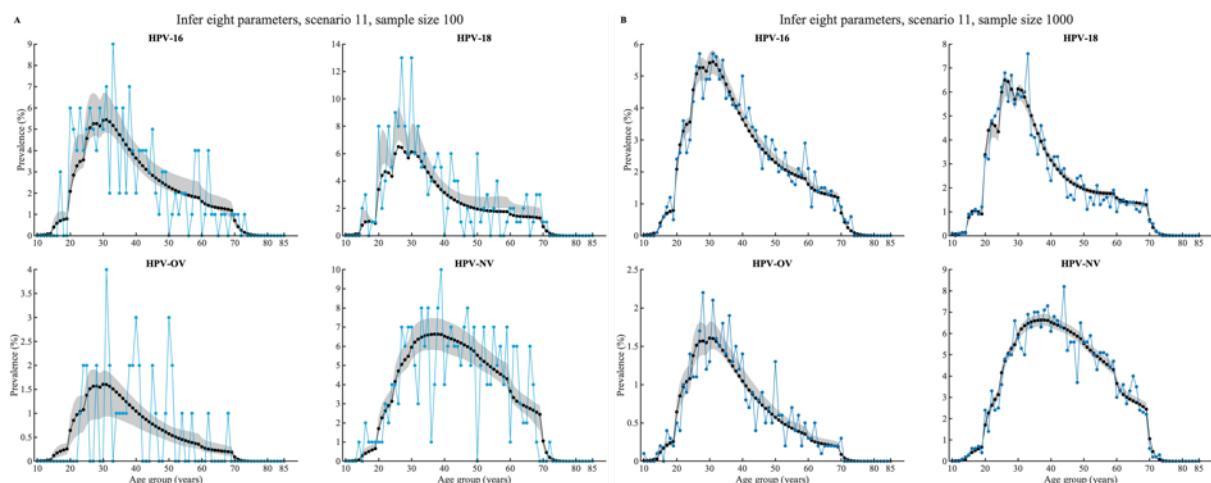
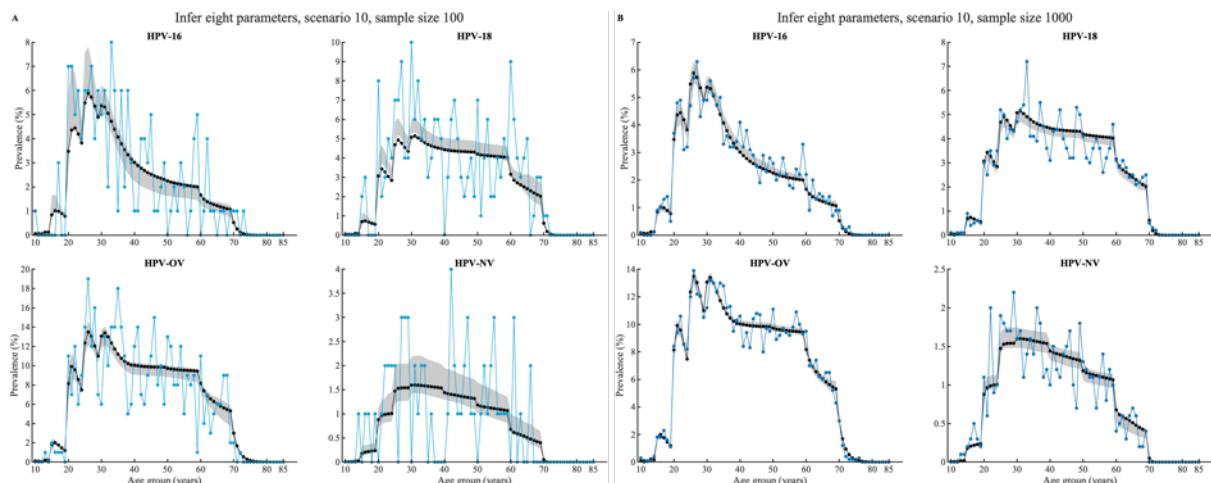
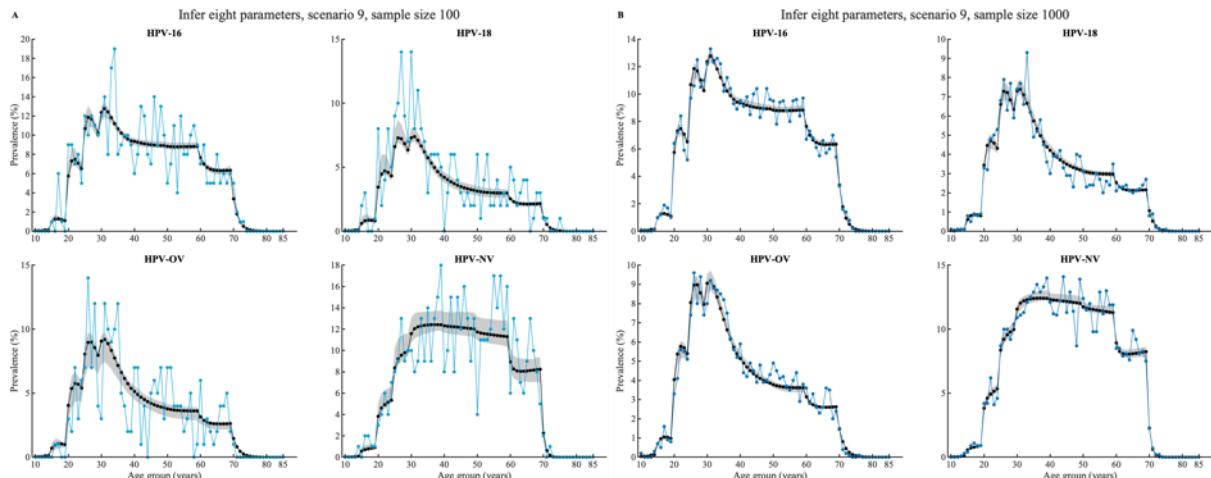
B.5 Comparison of the steady-state prevalence simulated from the true values of parameters and from MCMC inference of eight parameters in set Θ_1 ($\Theta_1 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \beta_{NV}, \epsilon_A, \epsilon_S, \mu, \sigma\}$).

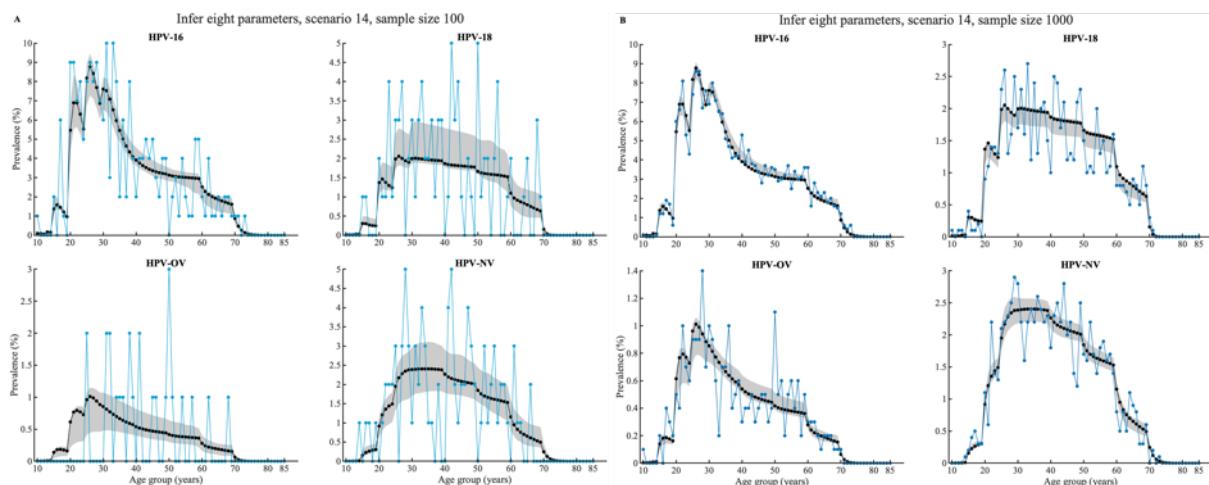
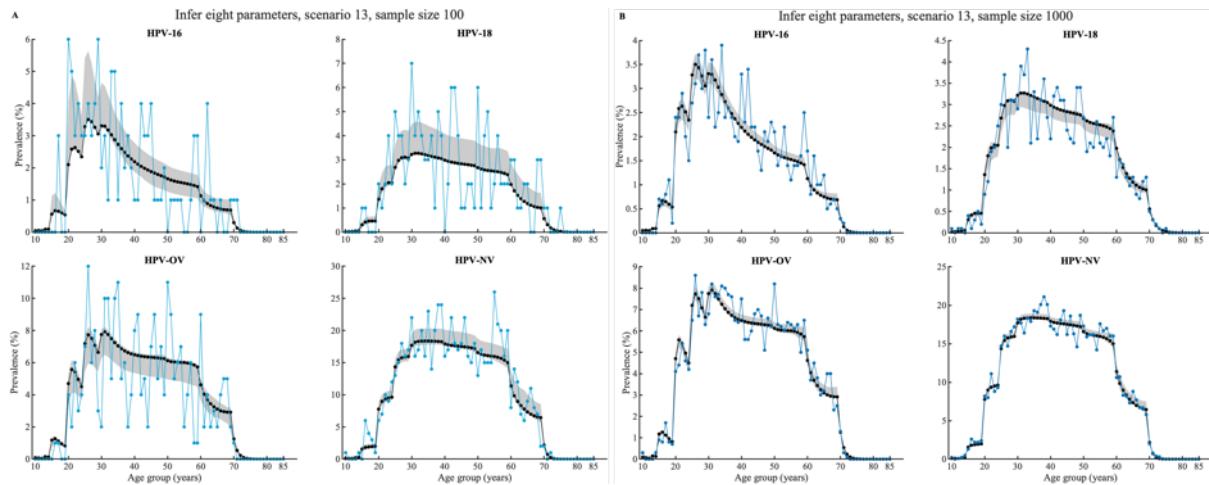
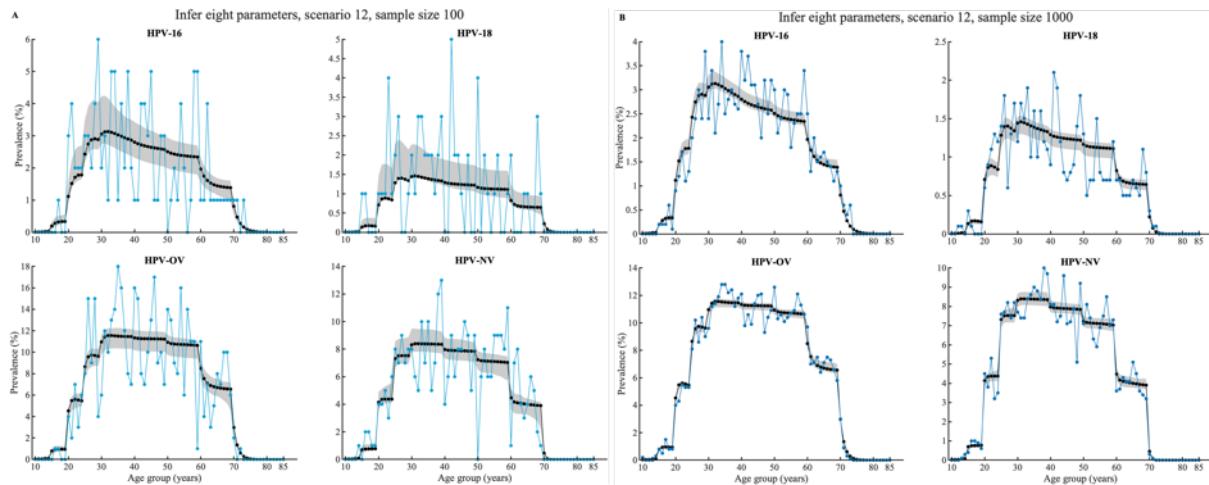
The black lines indicate the steady-state prevalence parameterizing the transmission model using true values of parameters. The shadows indicate the 95% CrI of the steady-state prevalence parameterizing the transmission model by drawing 100 random samples from the posterior distributions of parameters. The blue lines indicate the steady-state prevalence calculated by dividing the number of HPV test positive women by the number of tested women. The number of HPV test positive women from a binomial distribution with the number of tested women and success probability from the steady-state HPV prevalence from the transmission model parameterized using true values of parameters. (A) The steady-state HPV prevalence when model parameters are estimated with data from 100 women in each of the 1-year age group. (B) The steady-state HPV prevalence when model parameters are estimated with data from 1,000 women in each of the 1-year age group.

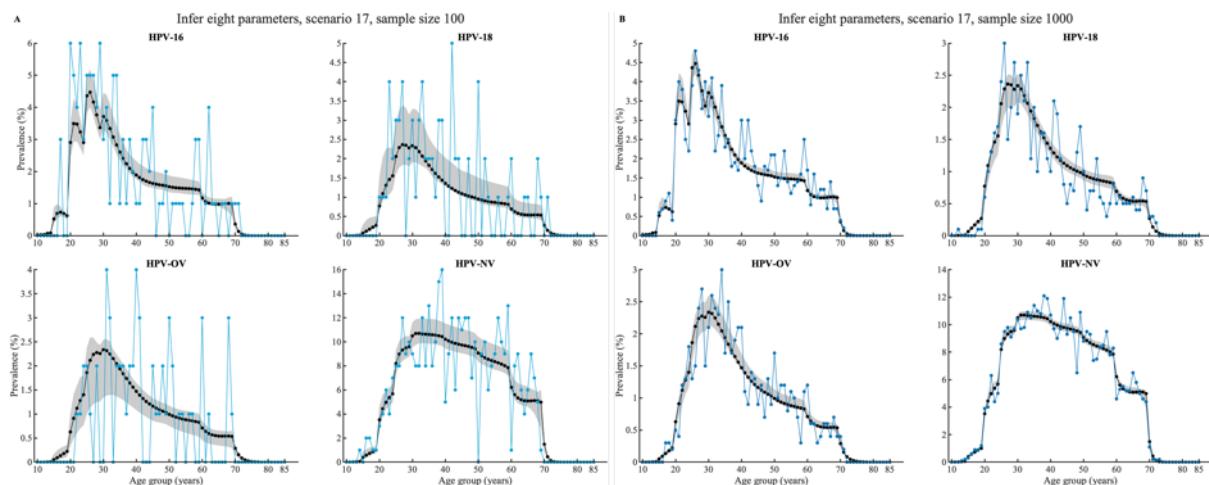
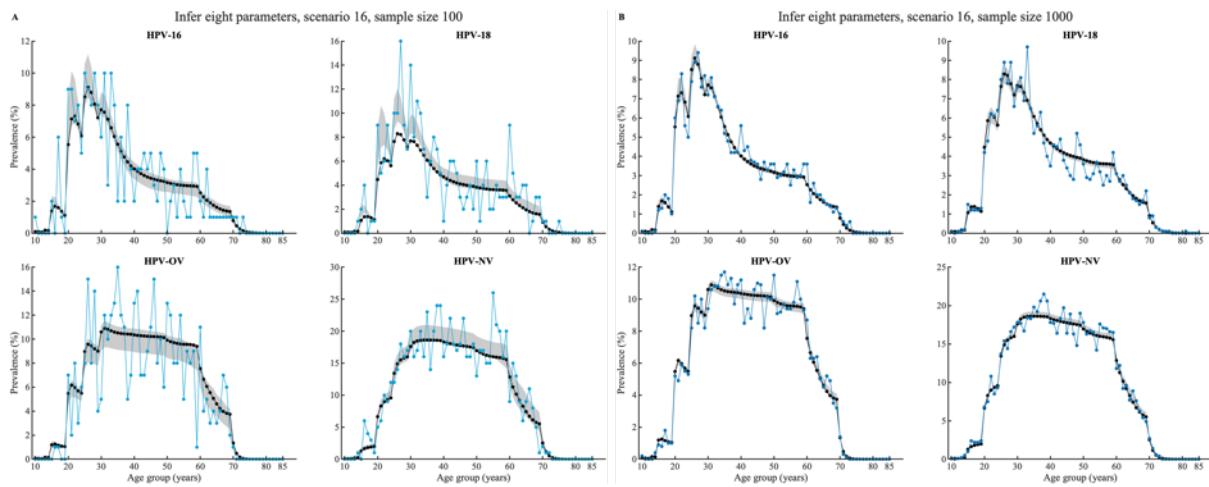
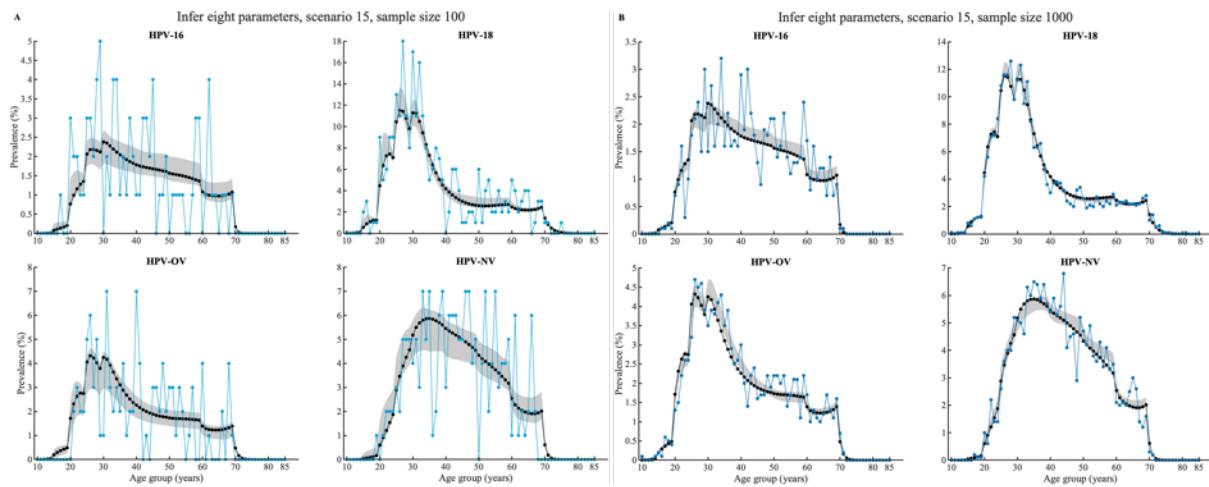


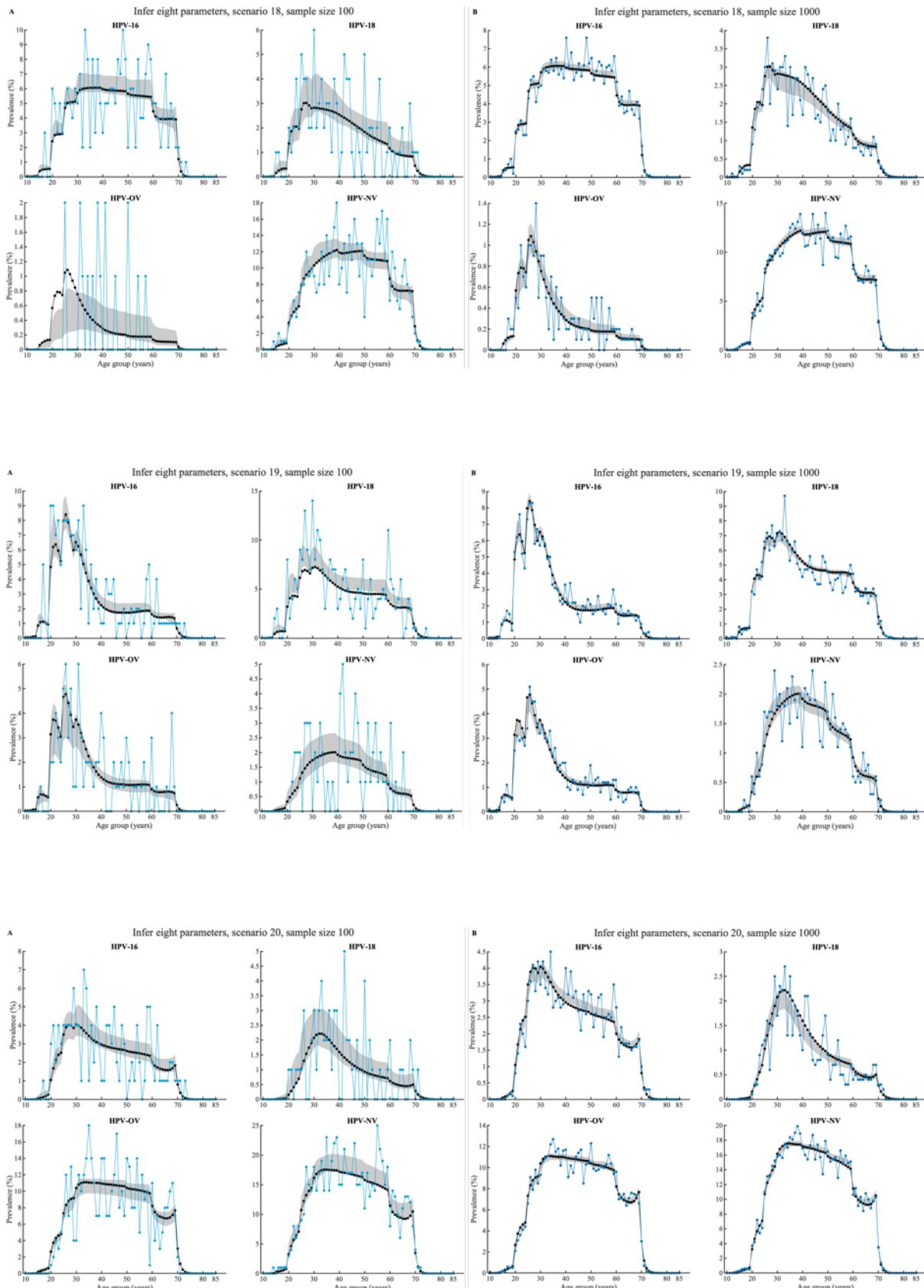


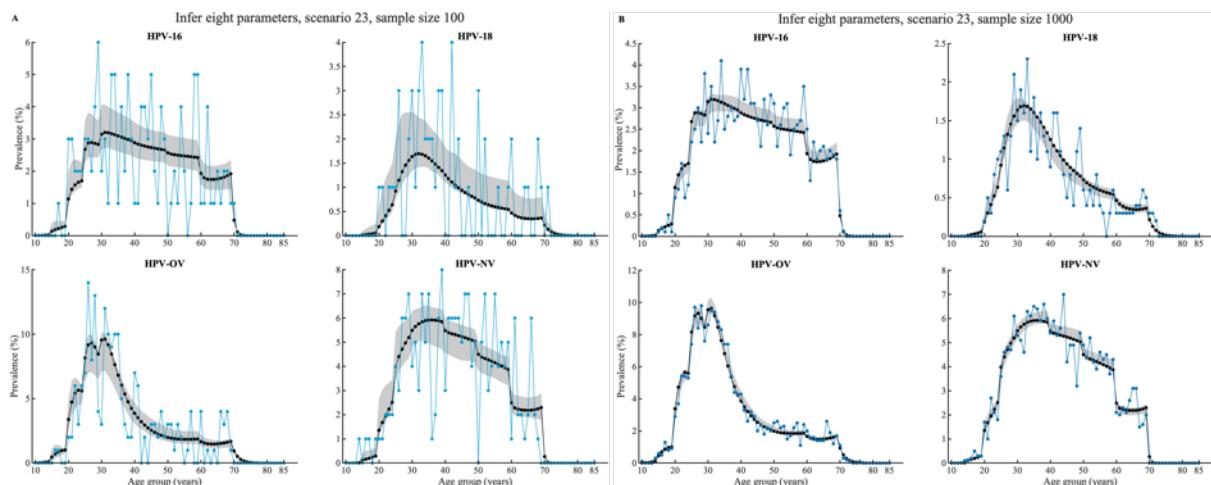
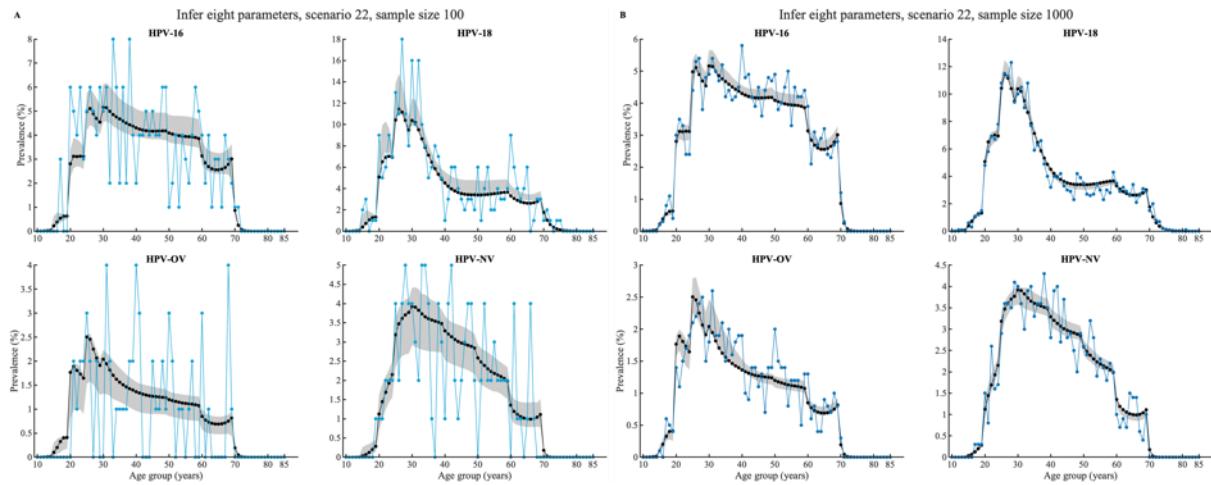
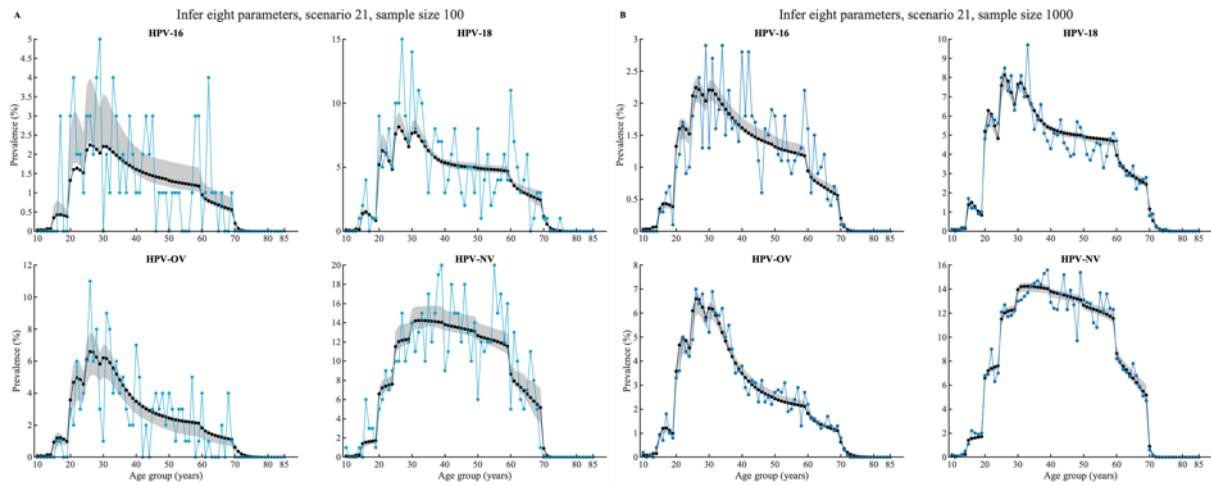


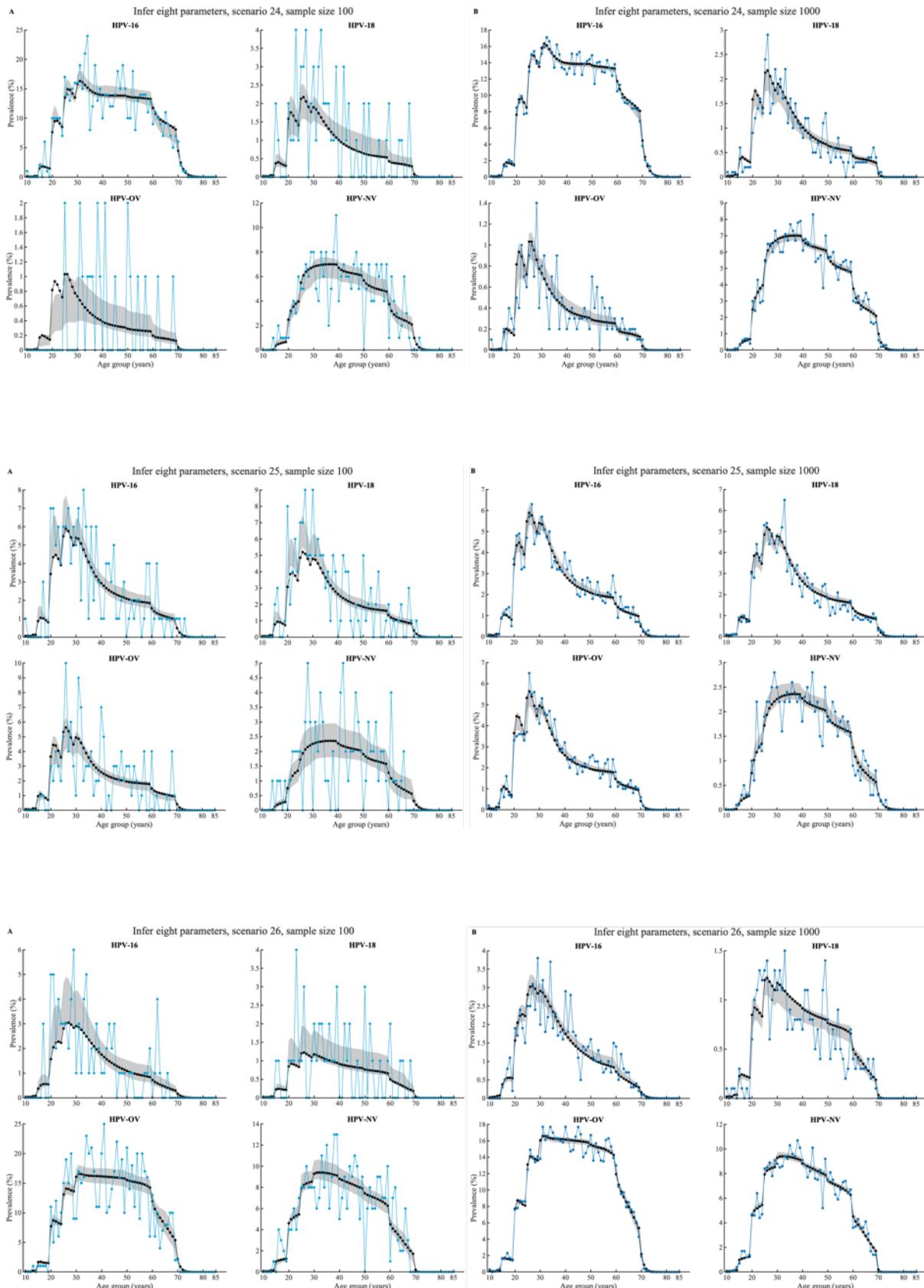


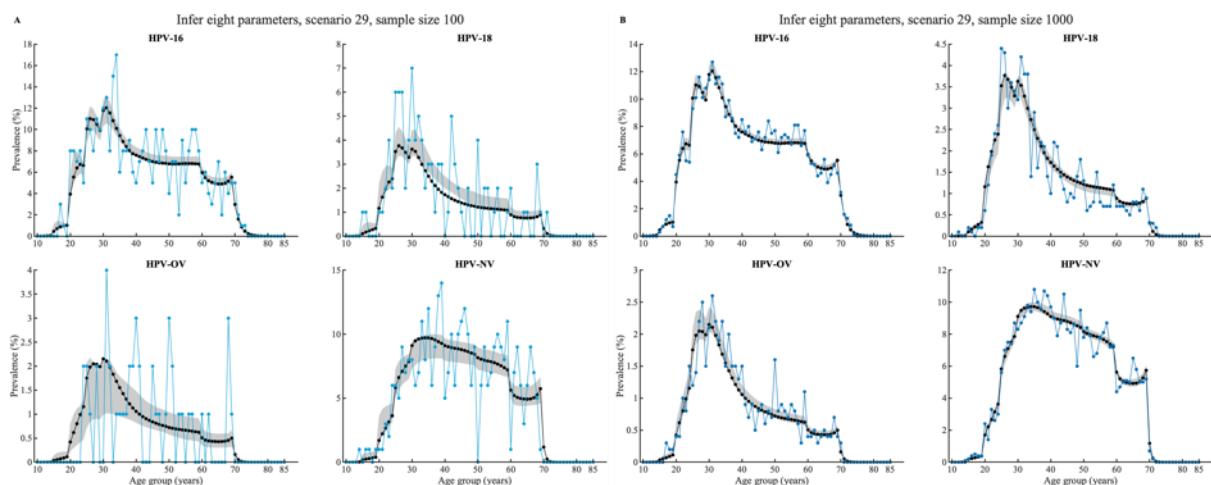
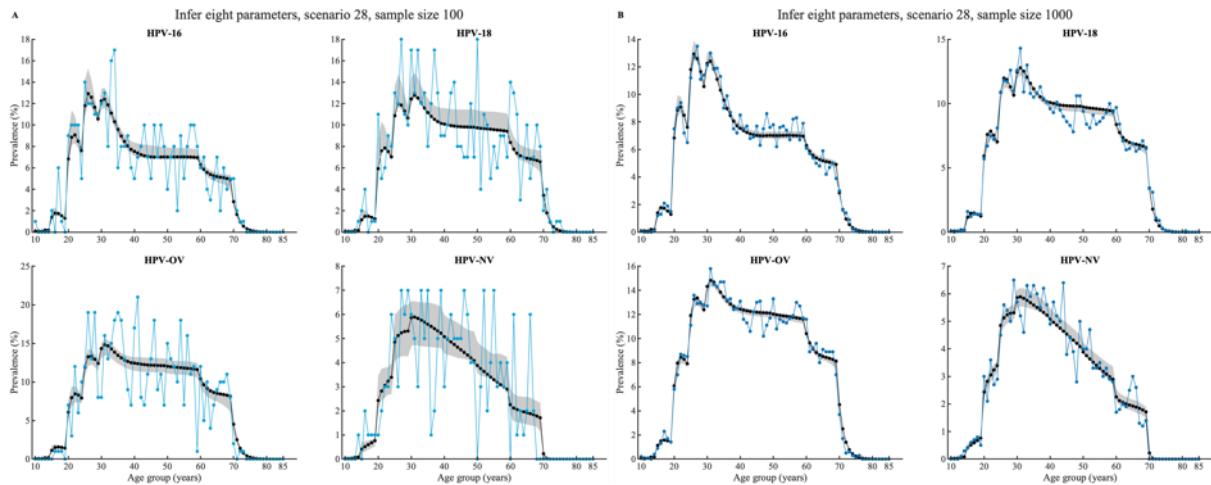
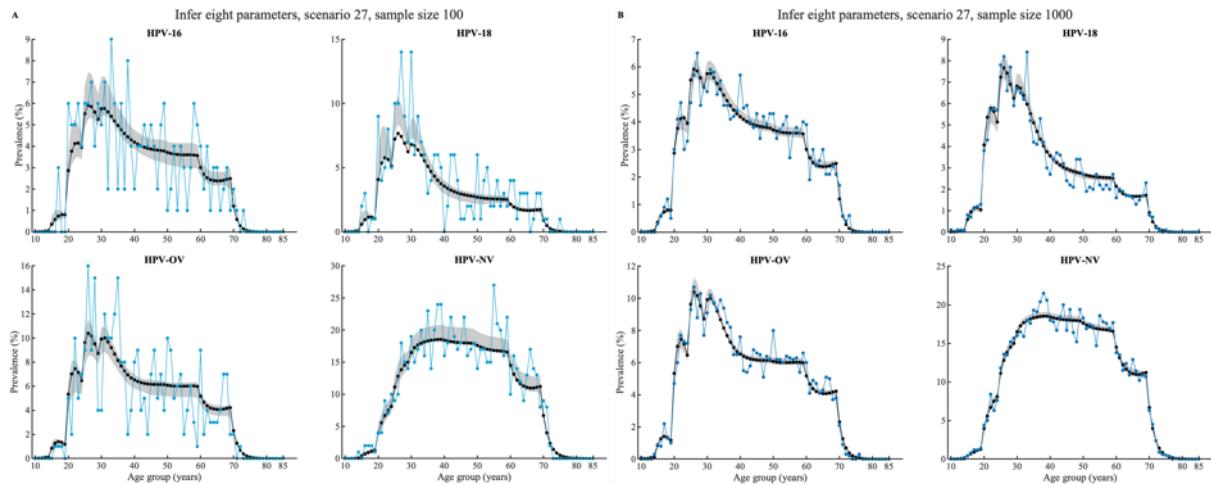


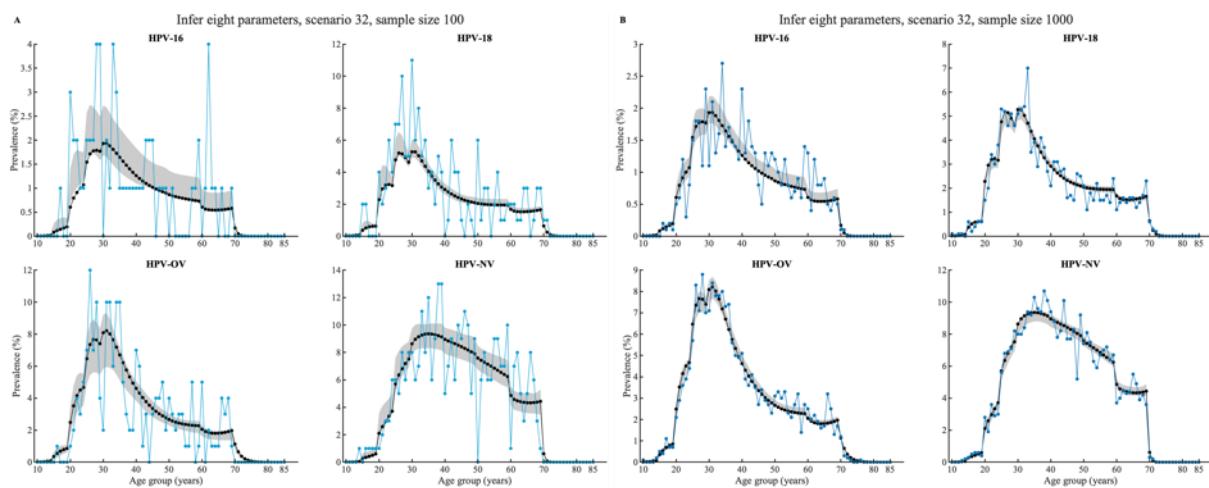
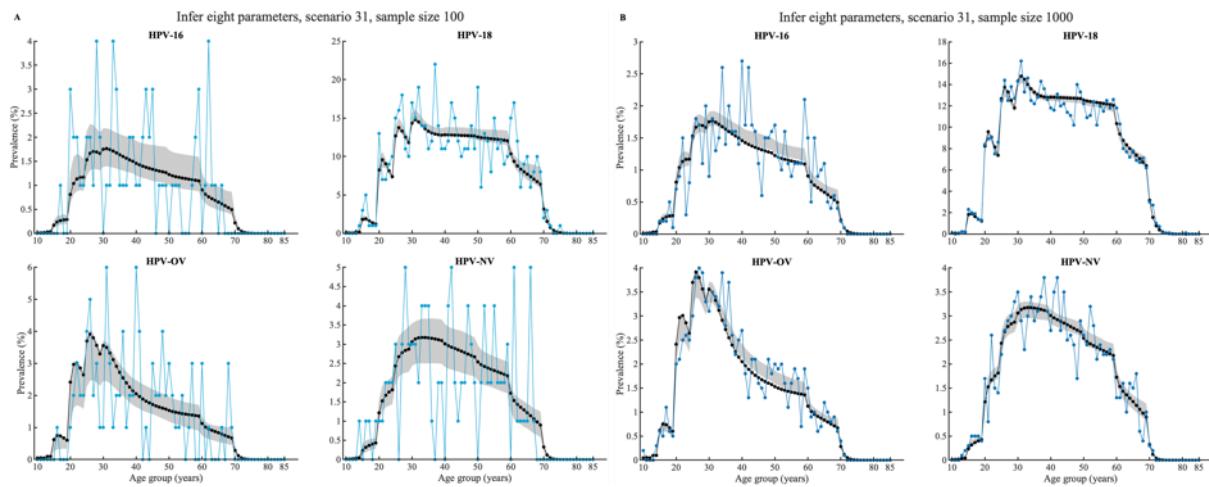
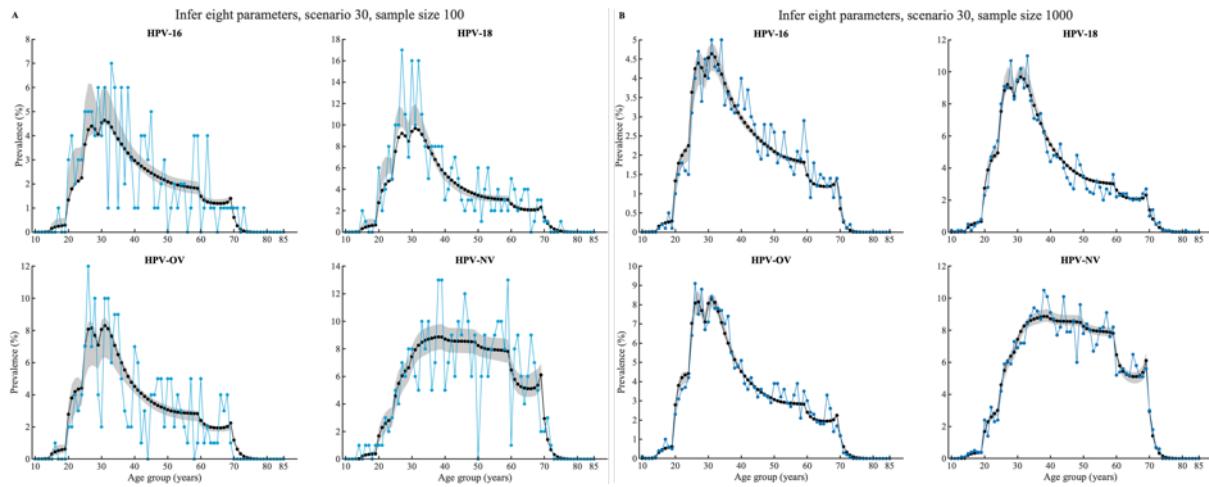


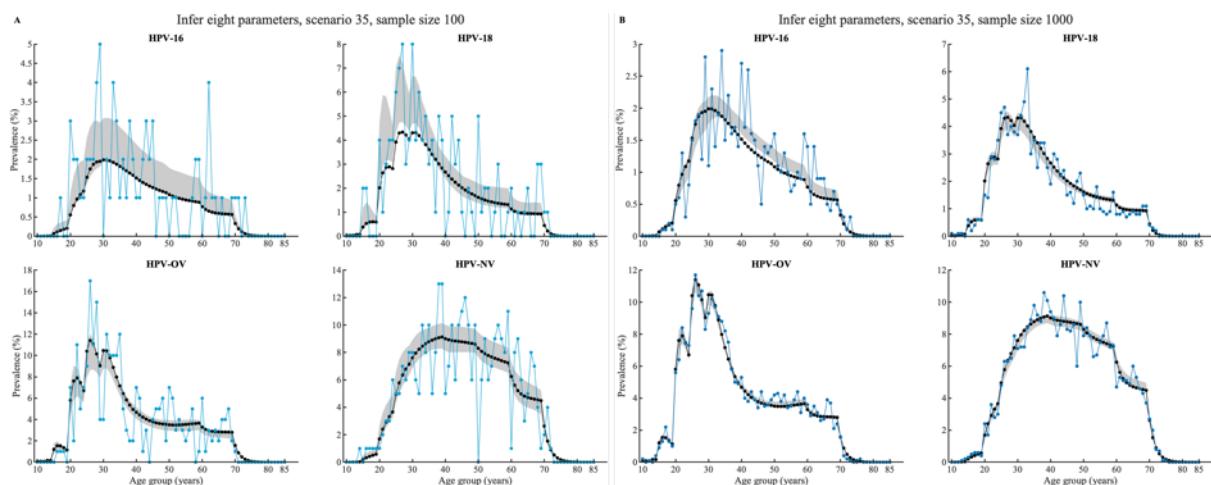
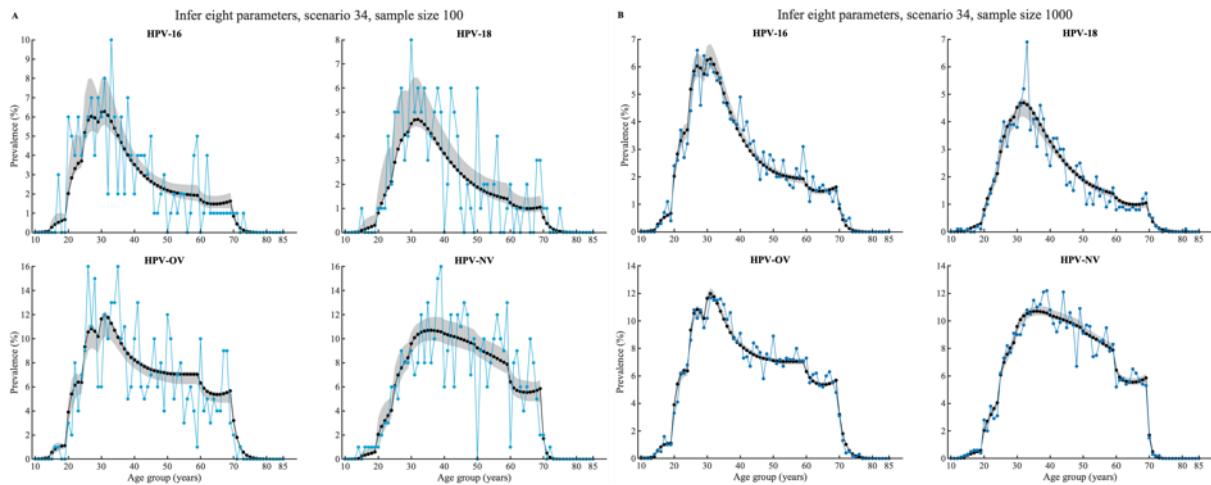
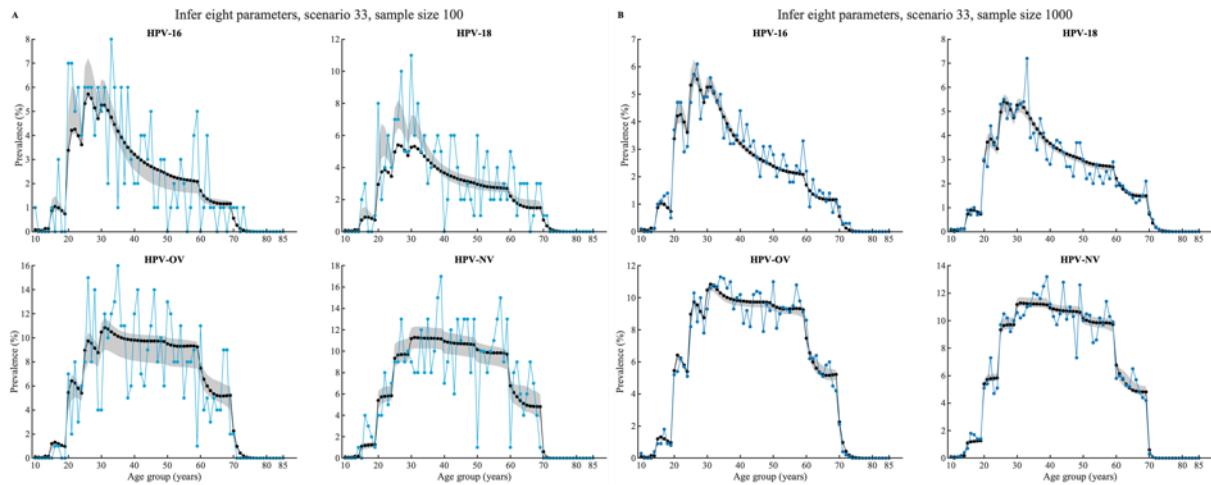


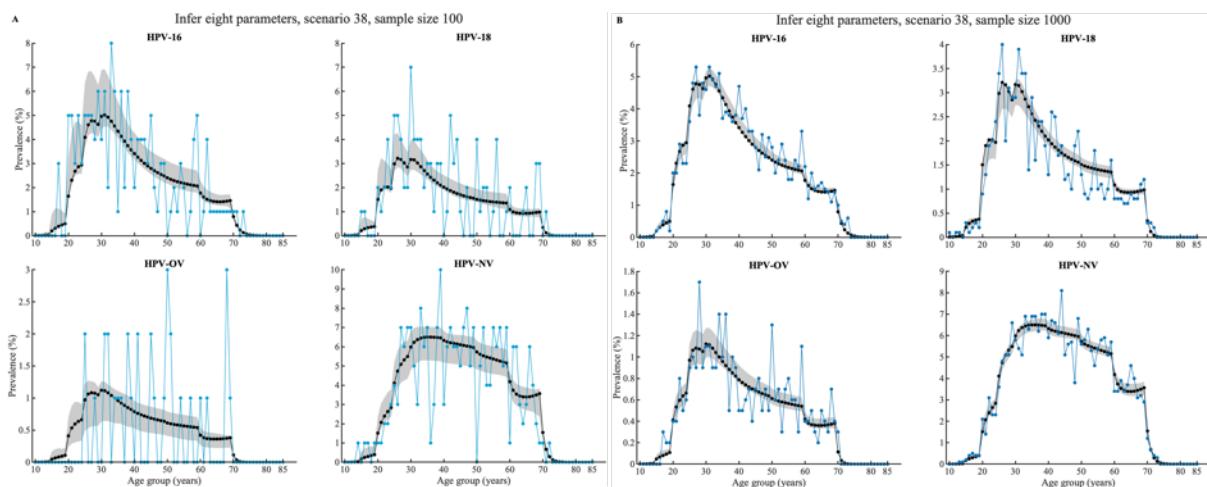
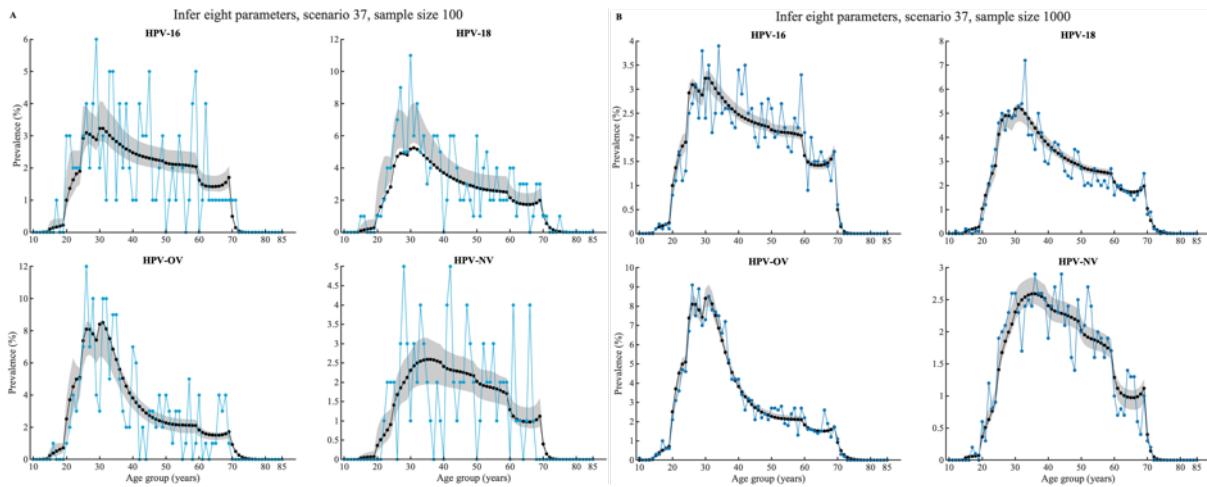
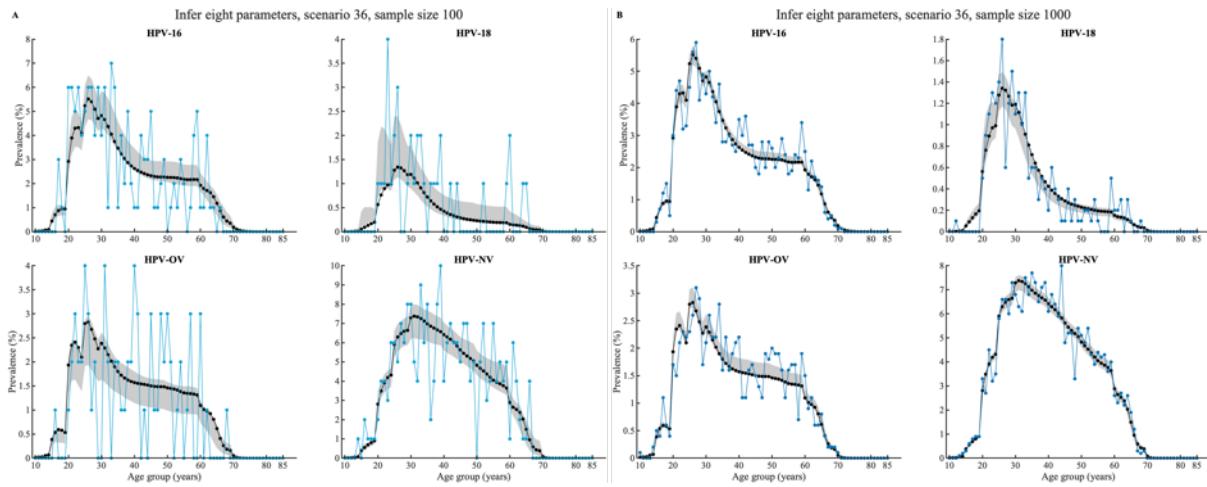


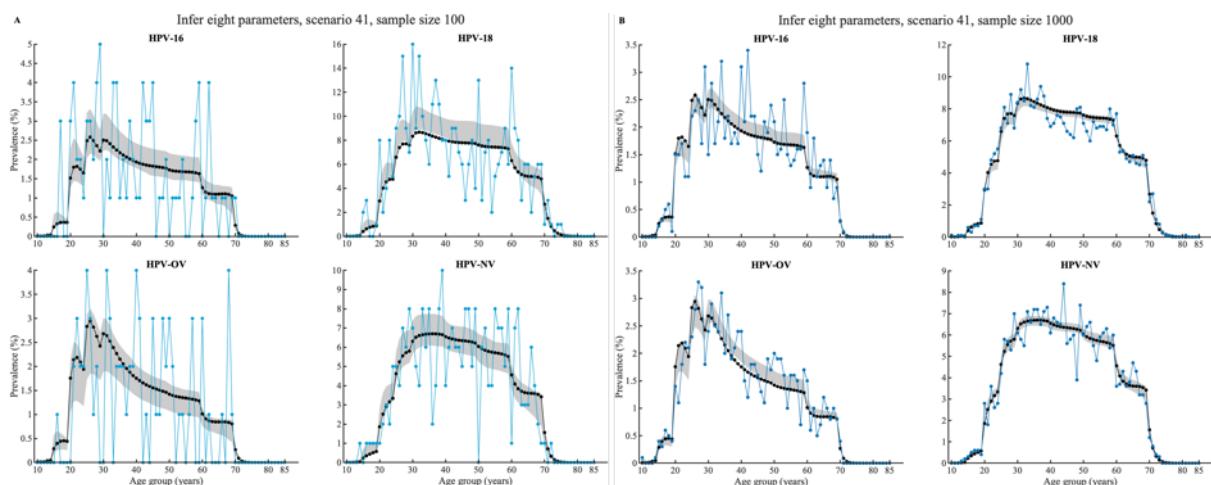
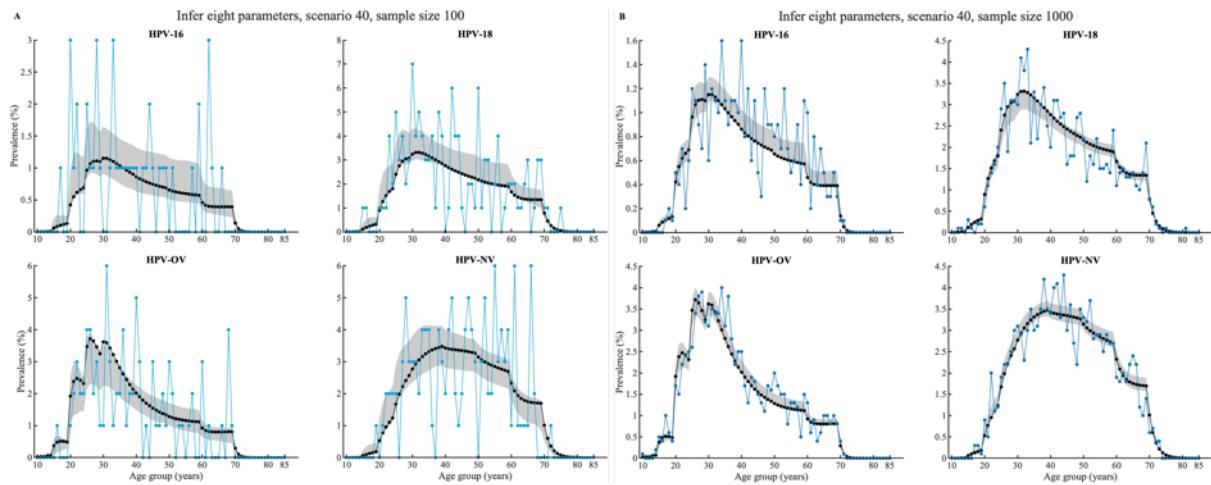
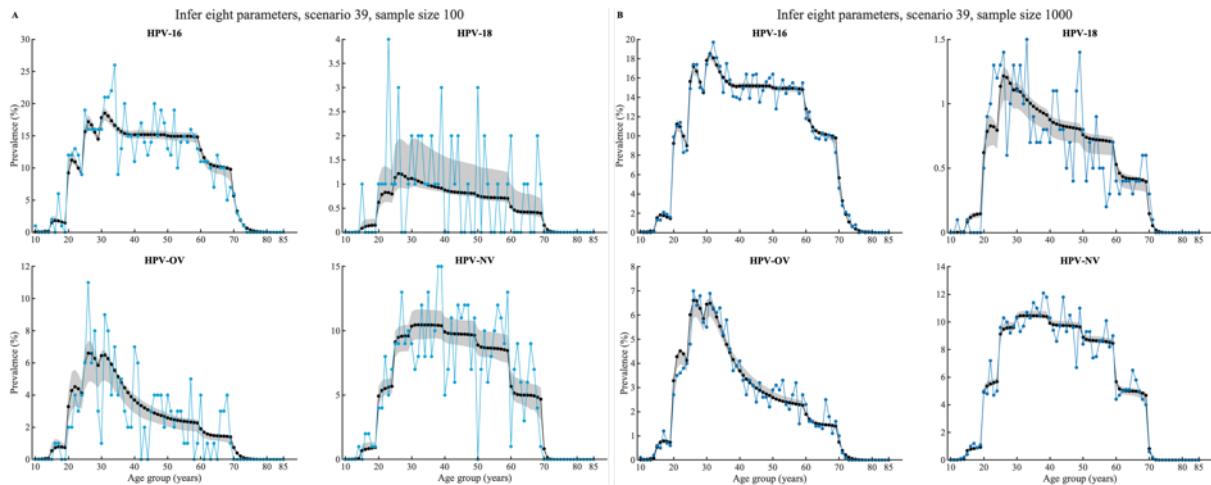


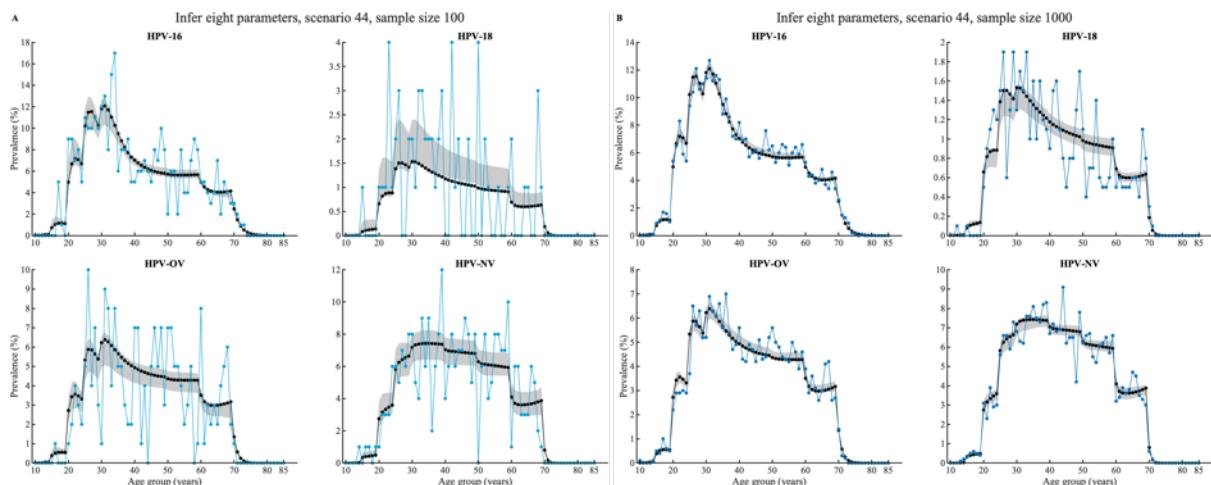
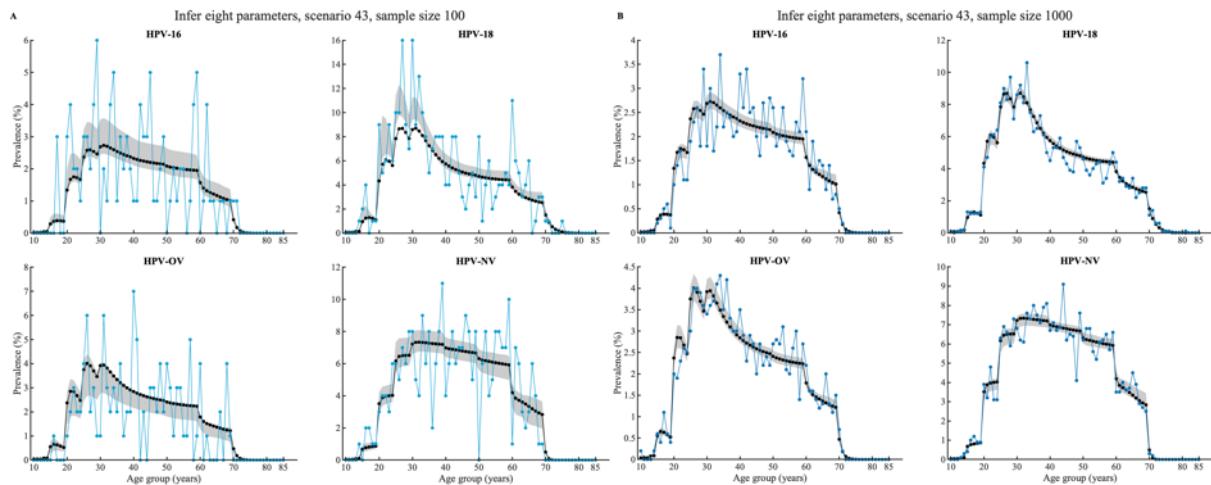
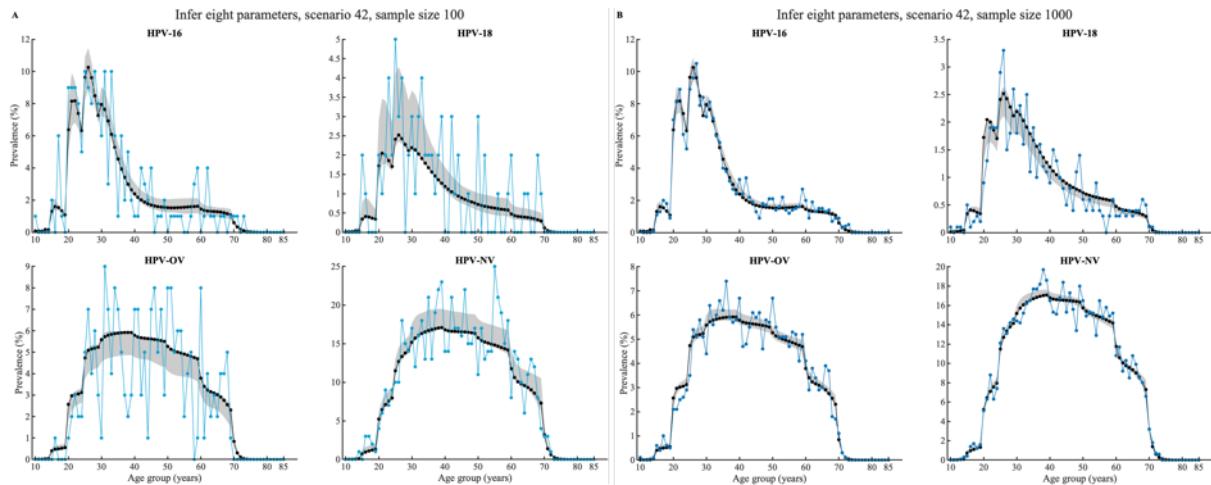


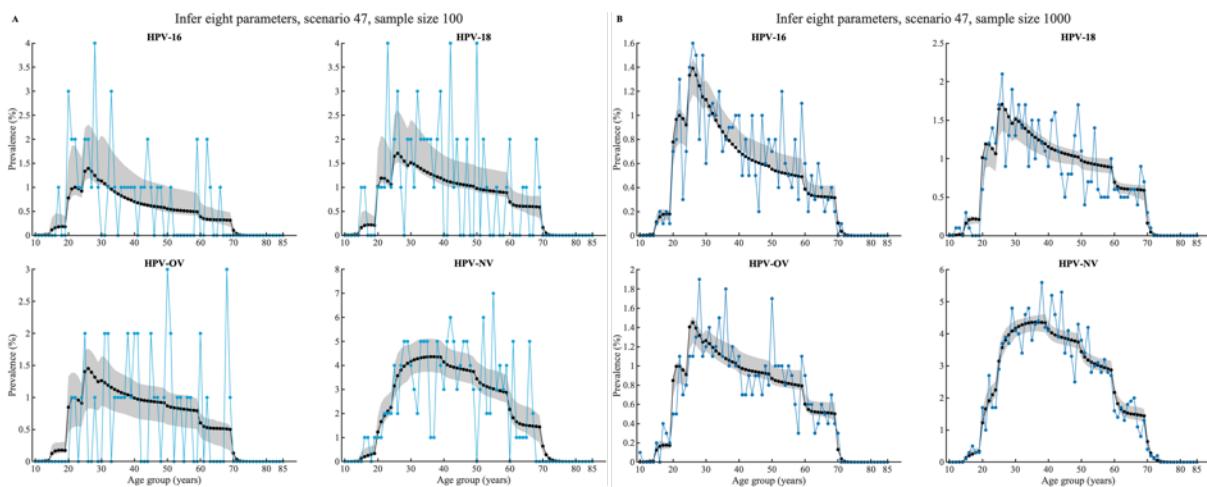
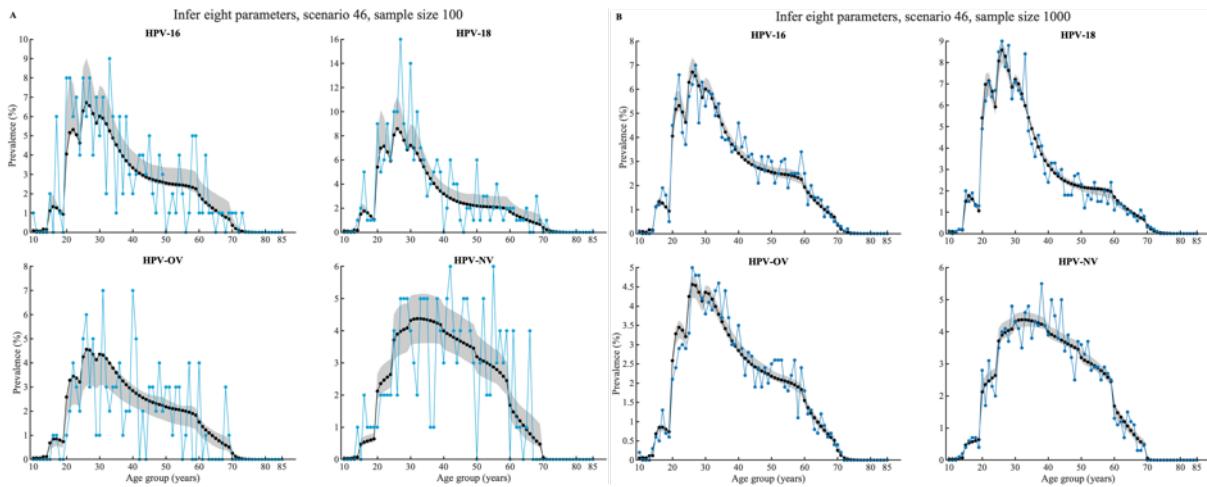
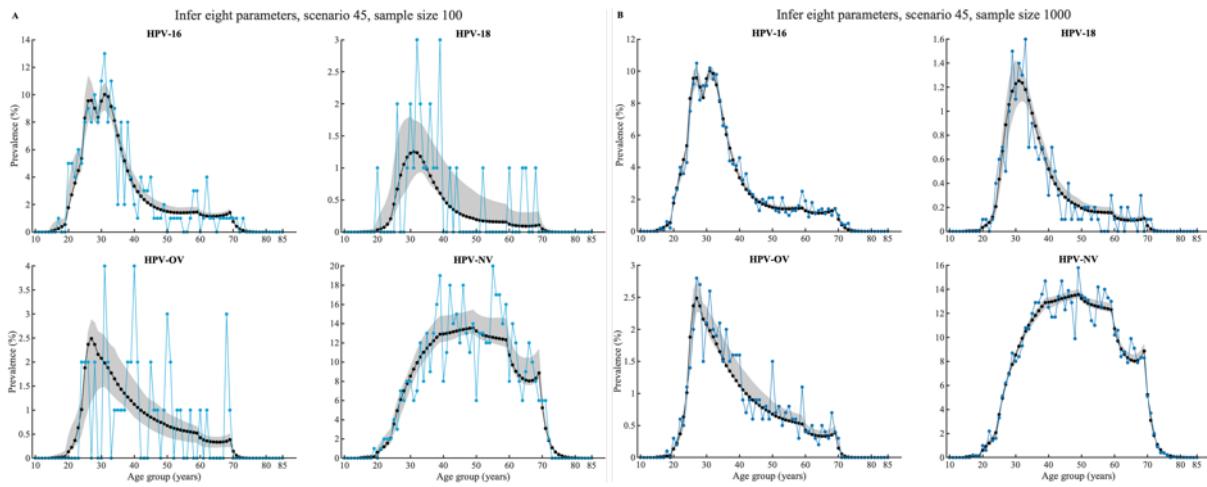


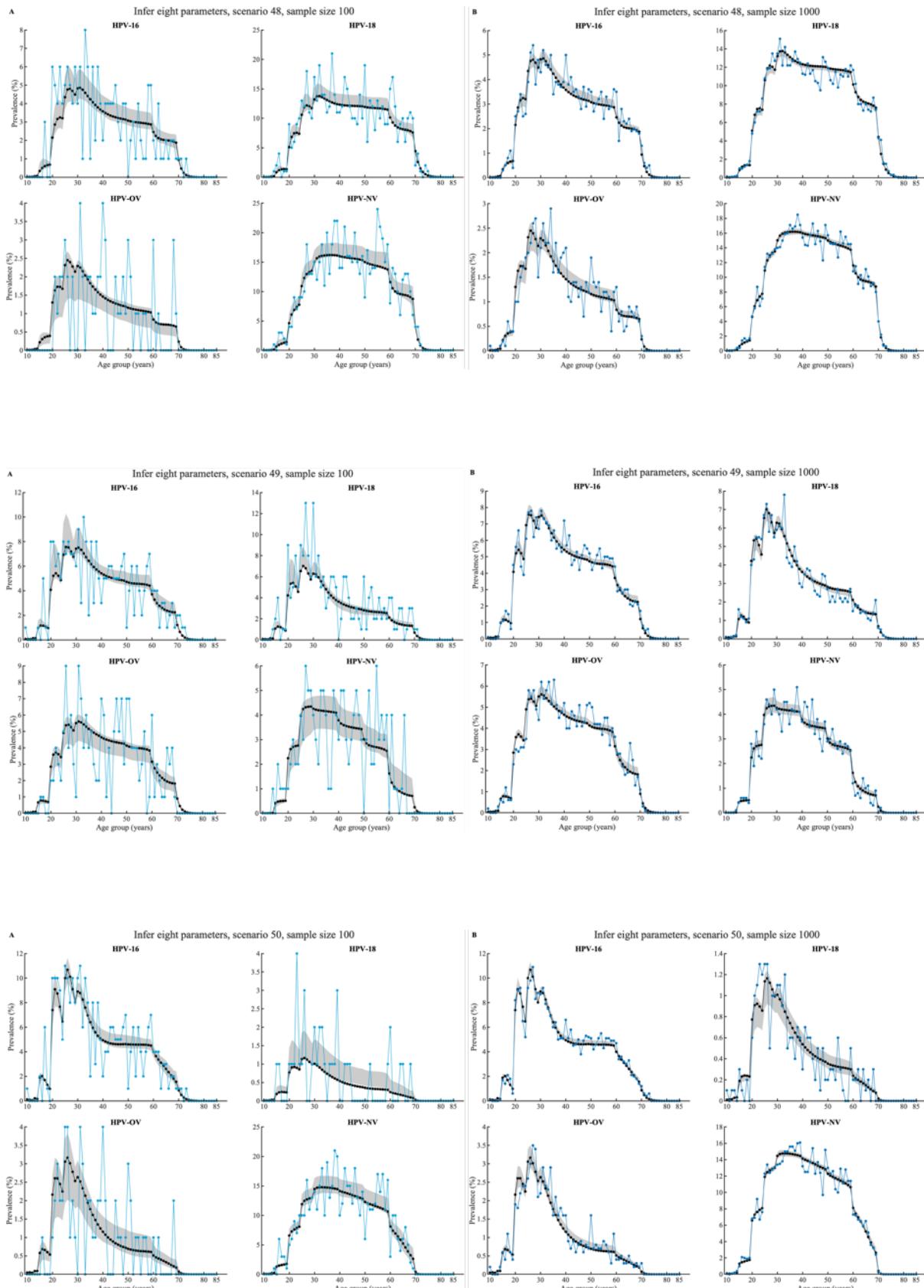






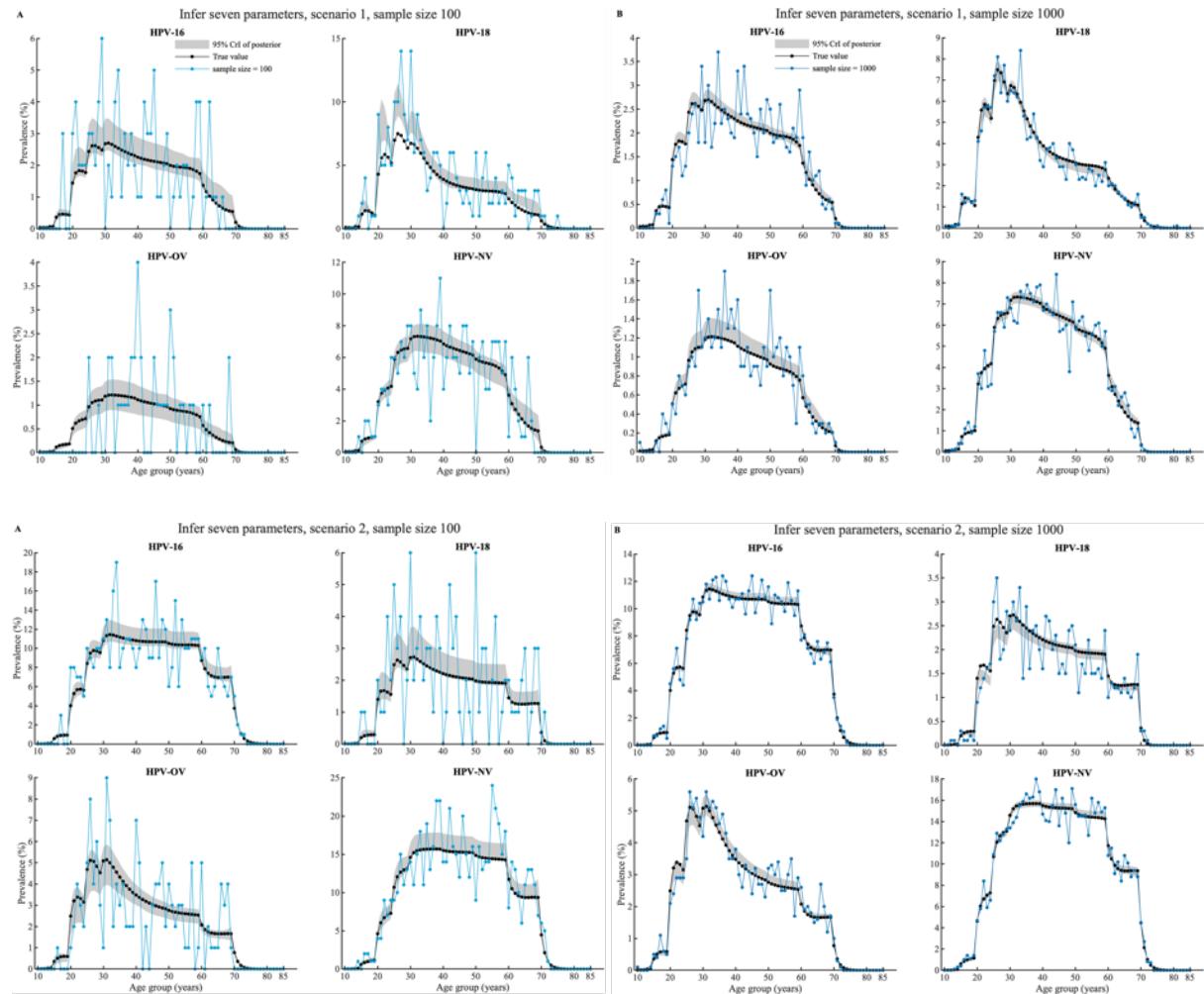


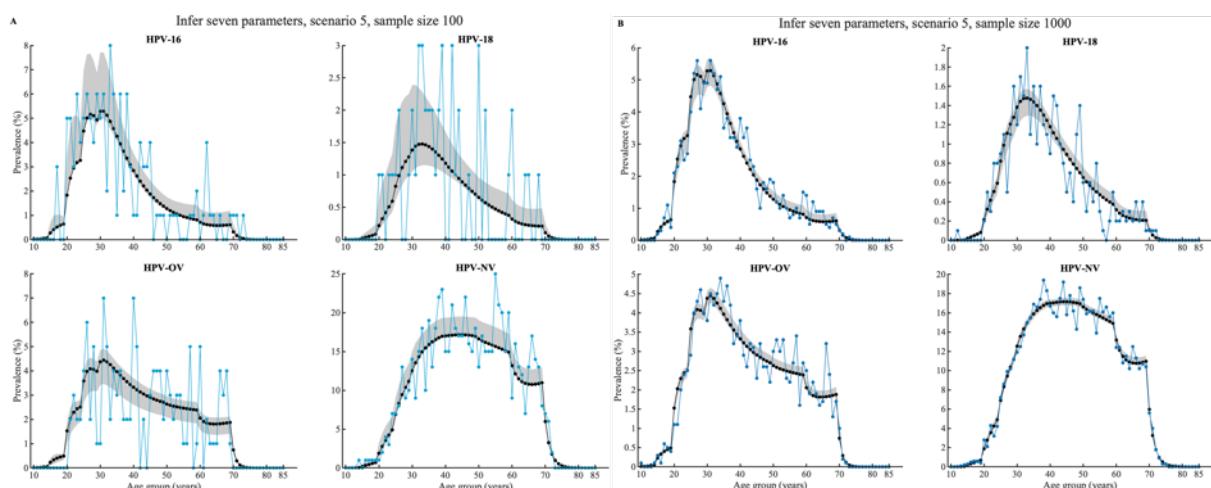
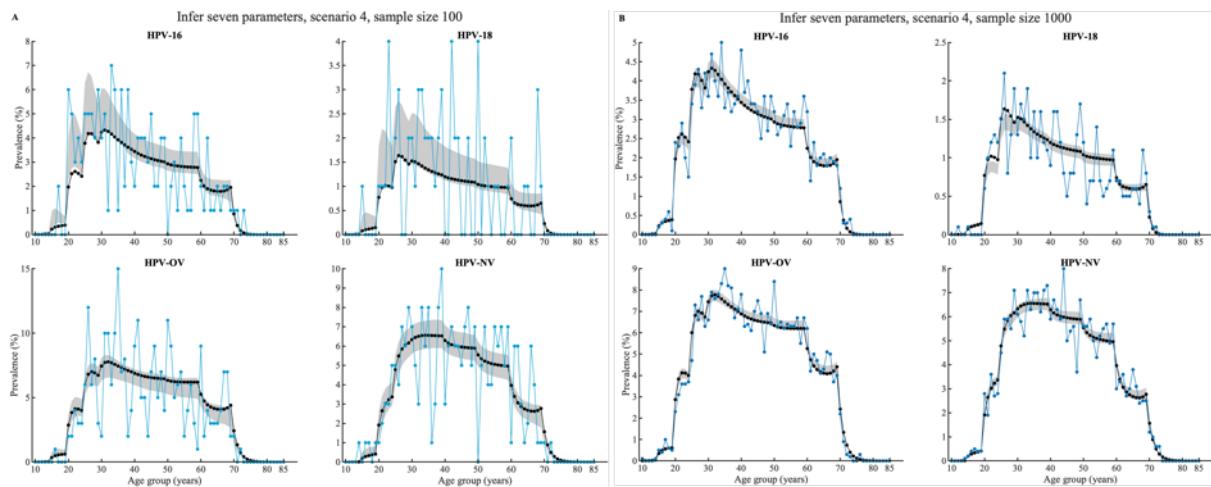
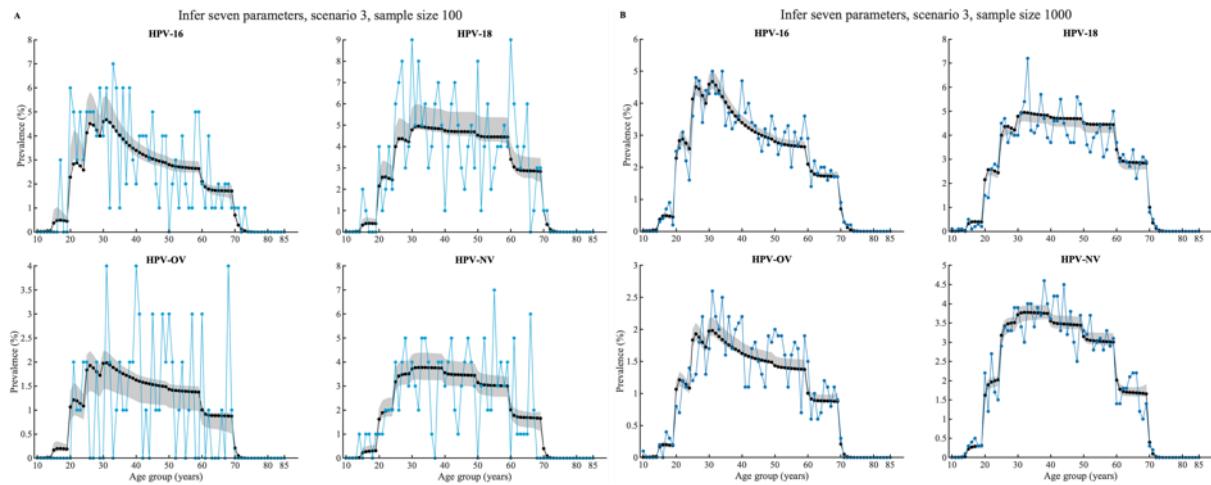


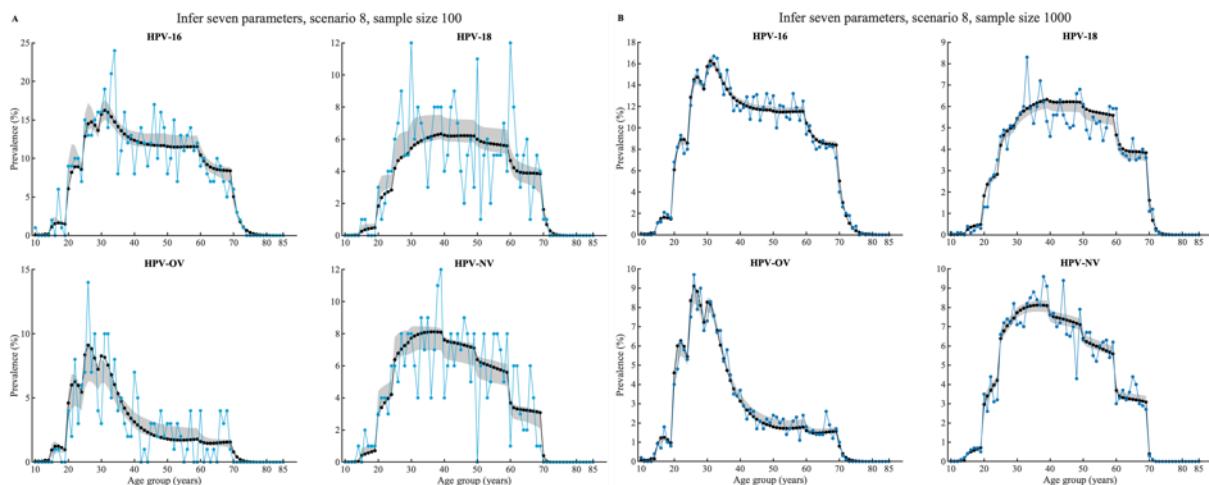
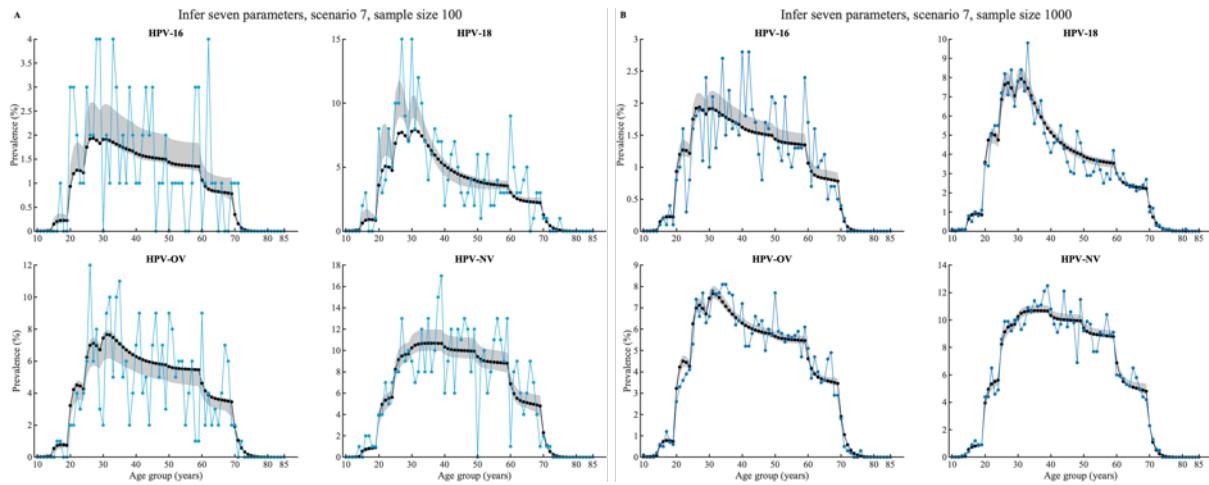
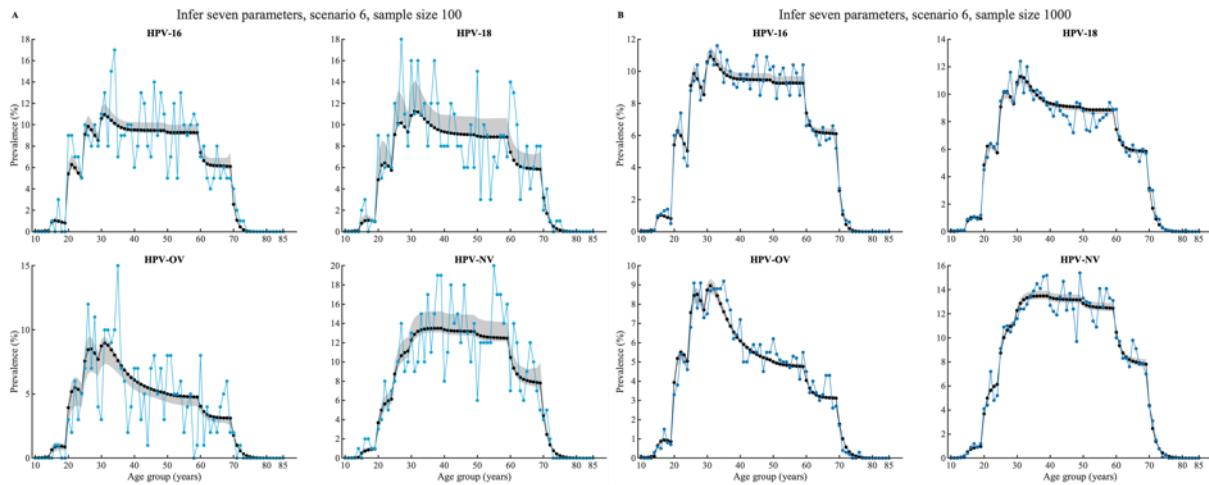


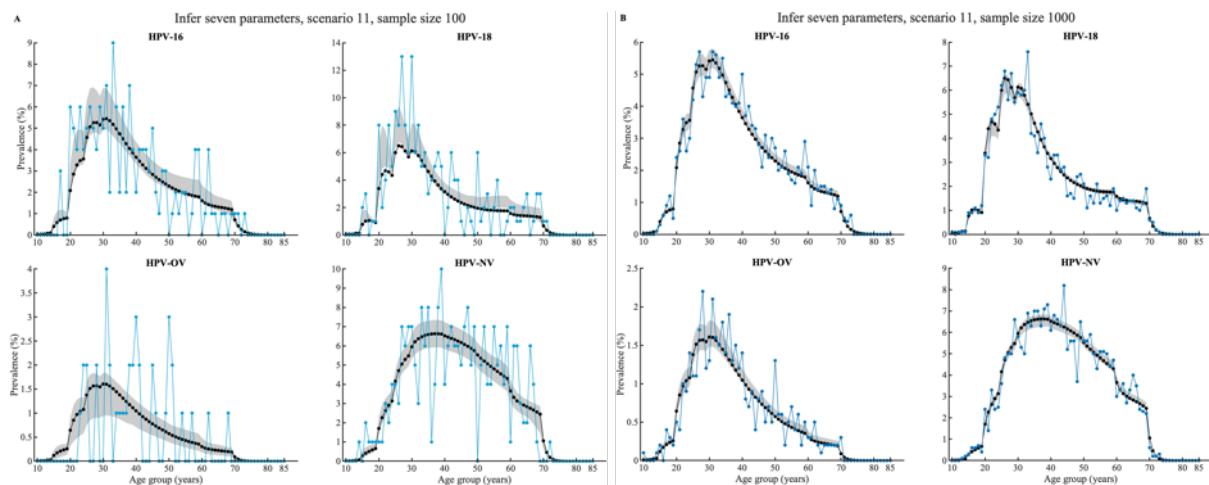
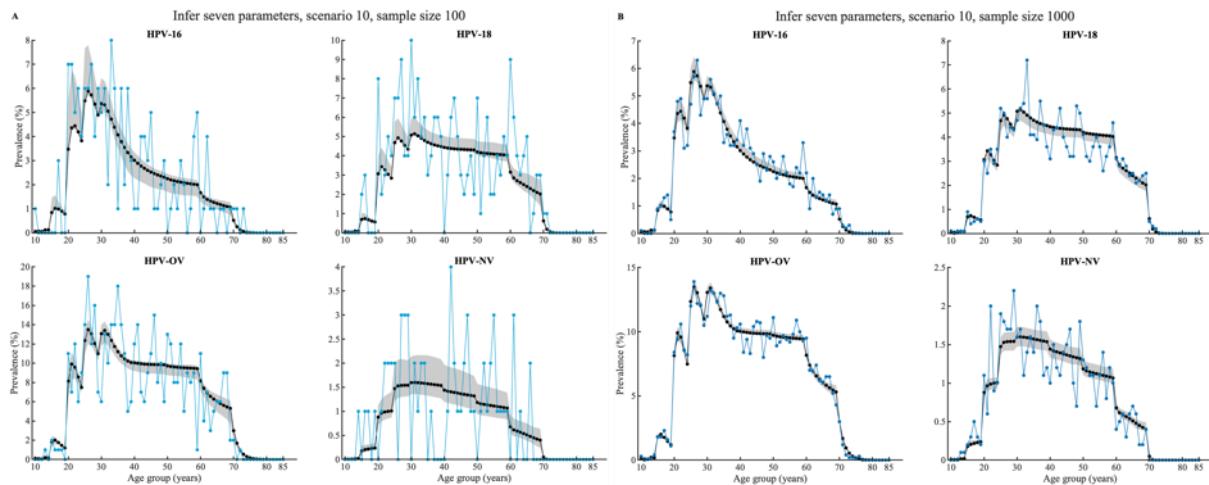
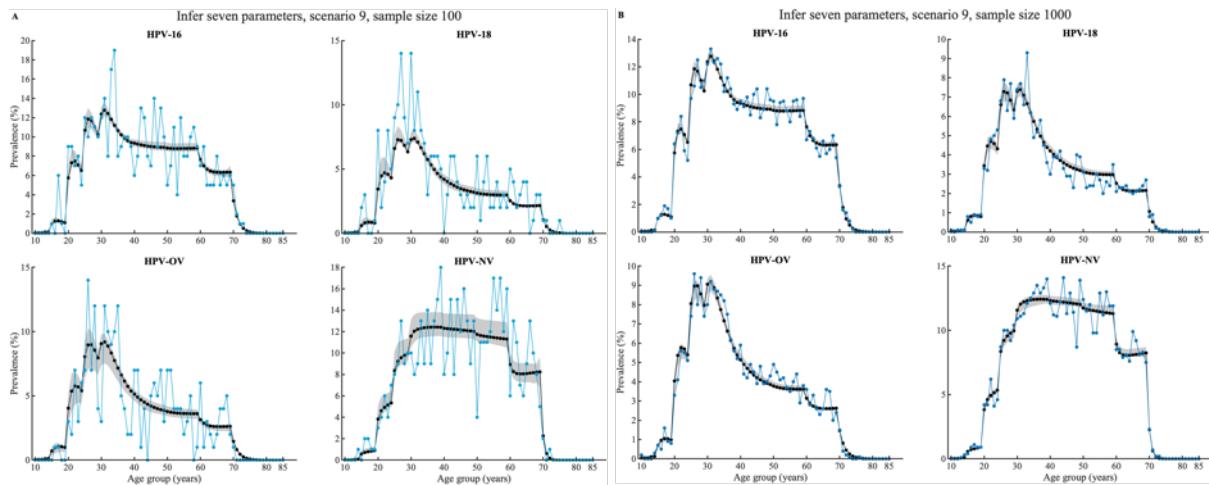
B.6 Comparison of the steady-state prevalence simulated from the true values of parameters and from MCMC inference of eight parameters in set Θ_2 ($\Theta_2 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \beta_{NV}, \epsilon_A, \mu, \sigma\}$).

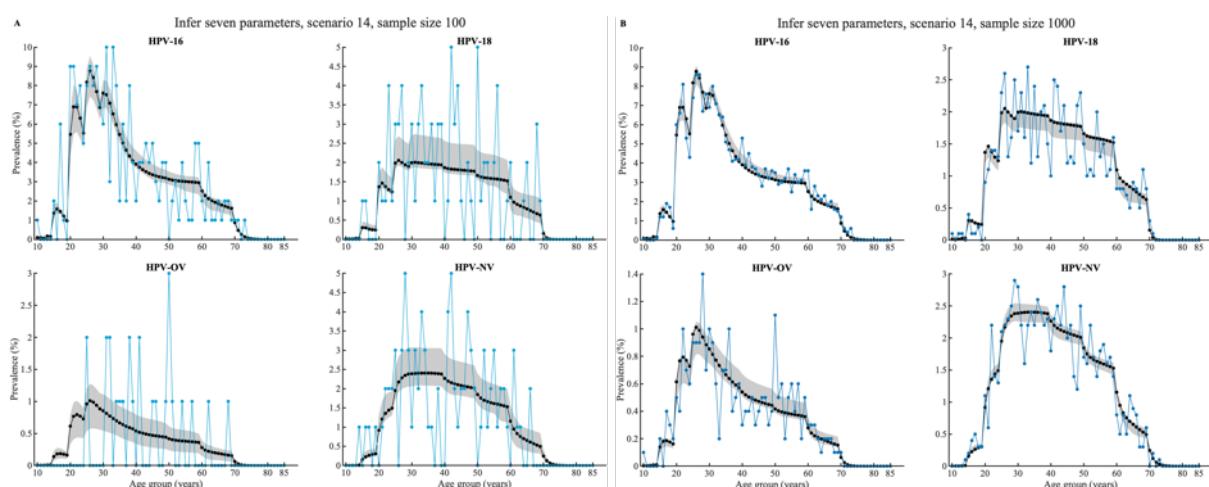
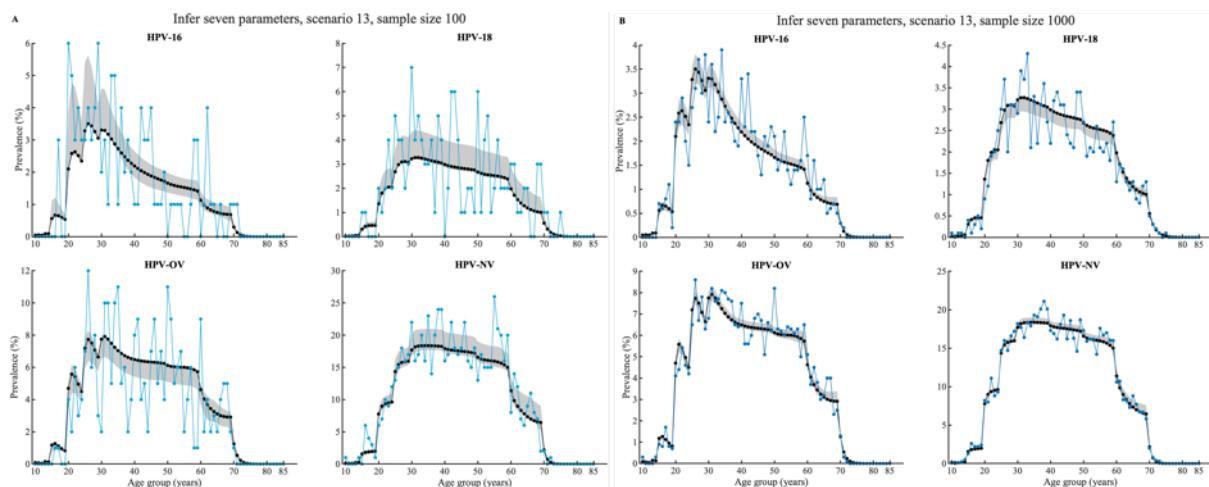
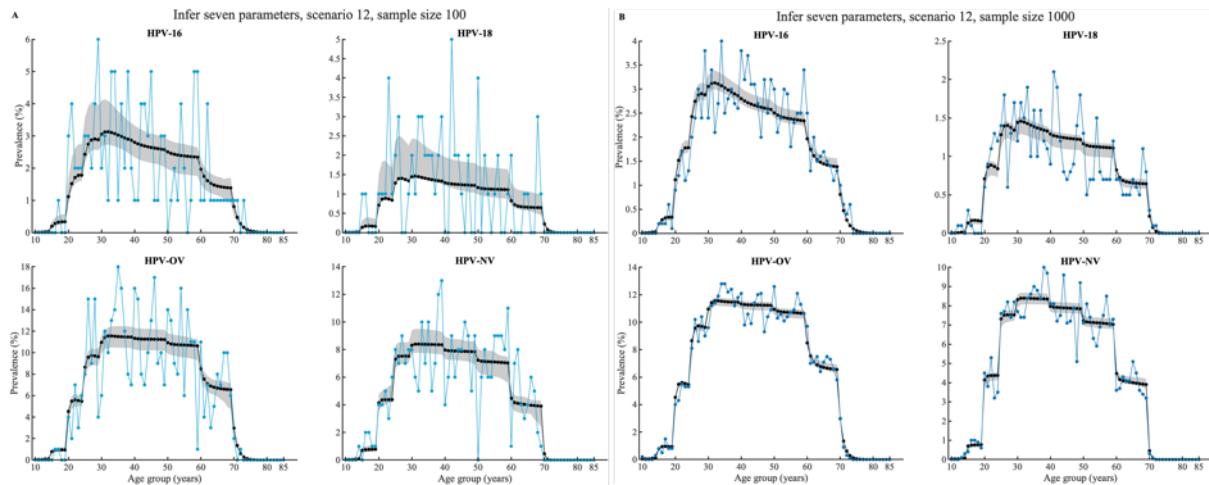
The black lines indicate the steady-state prevalence parameterizing the transmission model using true values of parameters. The shadows indicate the 95% CrI of the steady-state prevalence parameterizing the transmission model by drawing 100 random samples from the posterior distributions of parameters. The blue lines indicate the steady-state prevalence calculated by dividing the number of HPV test positive women by the number of tested women. The number of HPV test positive women from a binomial distribution with the number of tested women and success probability from the steady-state HPV prevalence from the transmission model parameterized using true values of parameters. (A) The steady-state HPV prevalence when model parameters are estimated with data from 100 women in each of the 1-year age group. (B) The steady-state HPV prevalence when model parameters are estimated with data from 1,000 women in each of the 1-year age group.

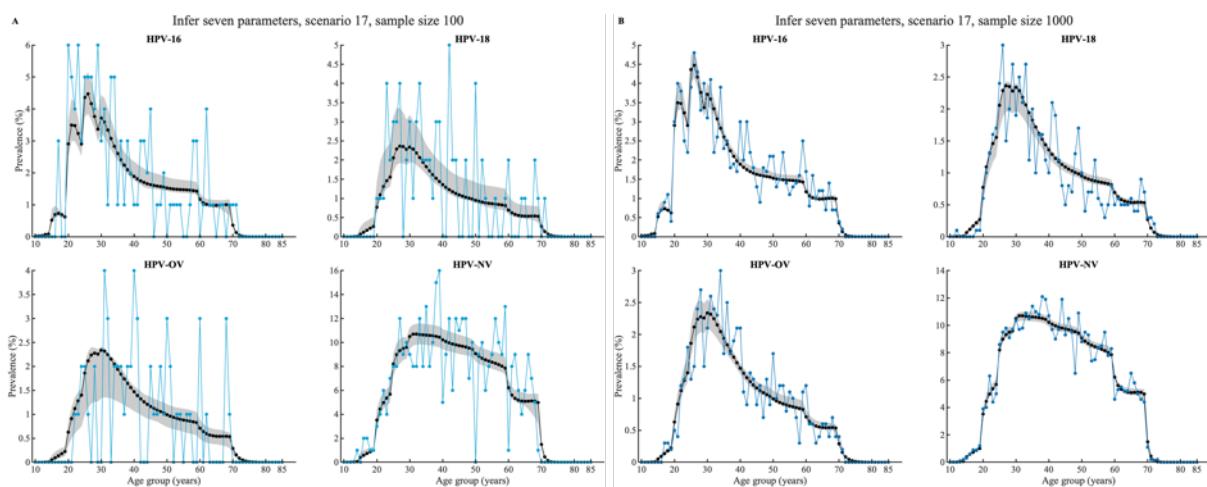
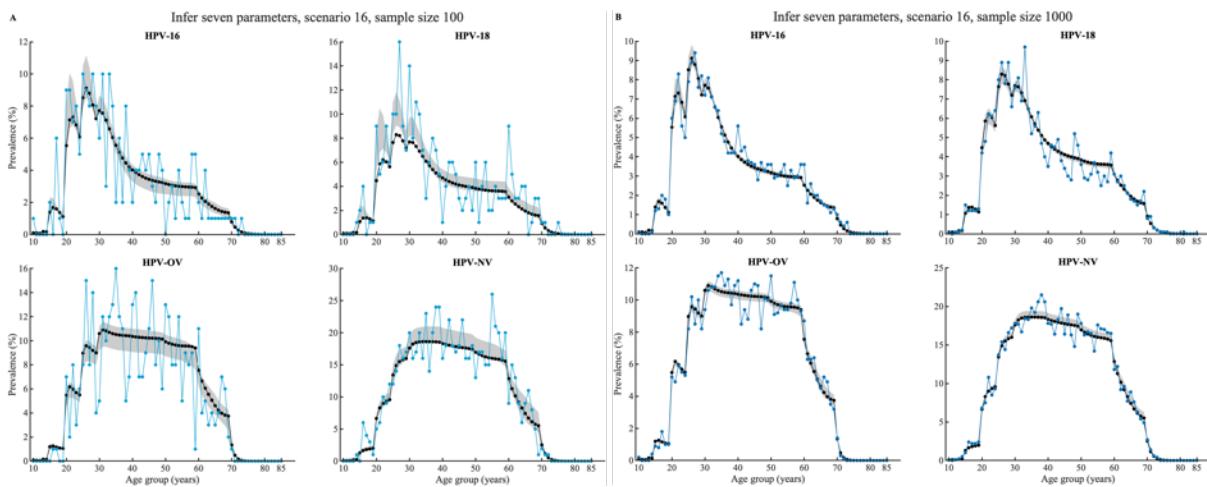
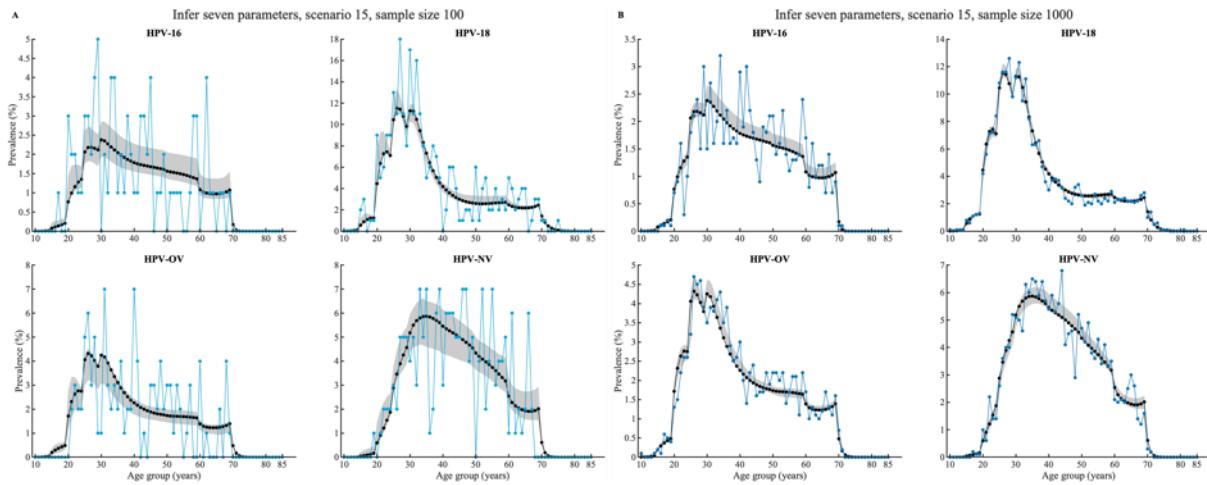


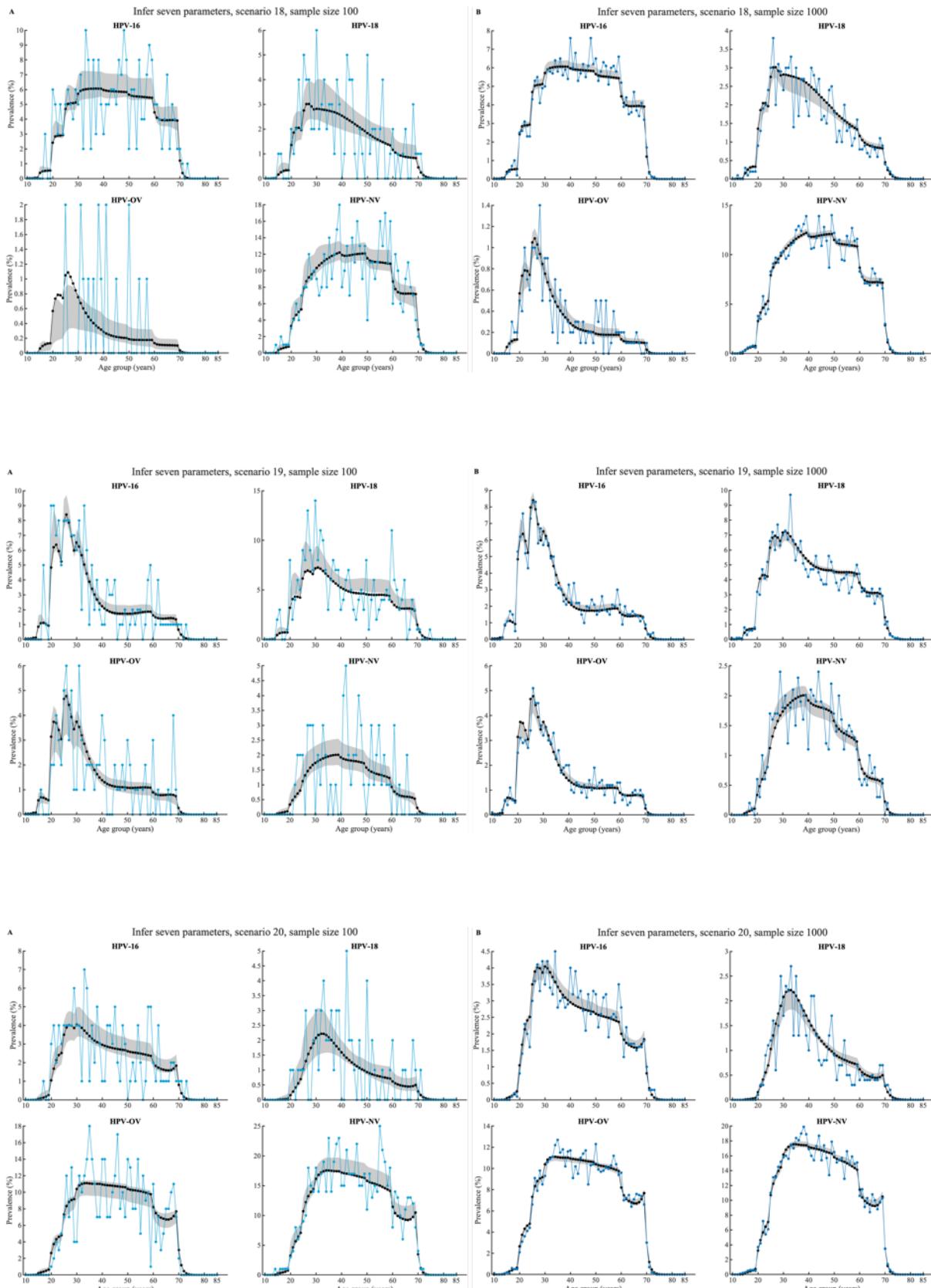


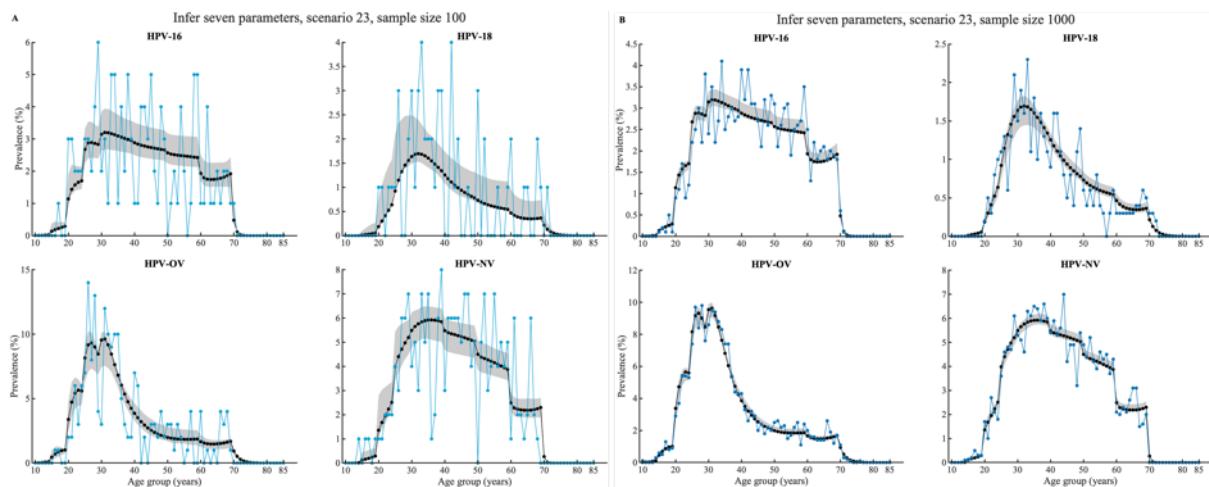
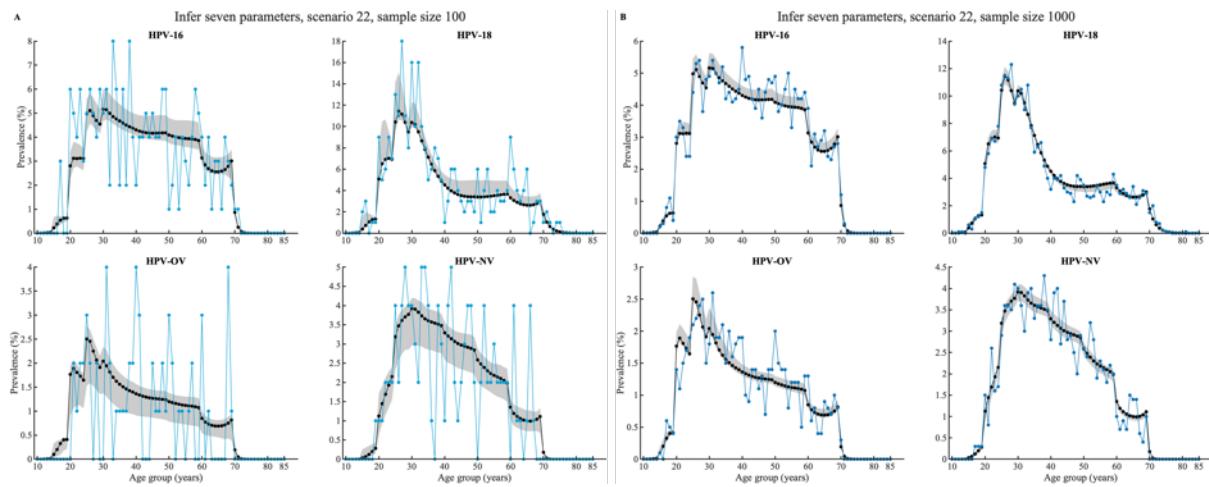
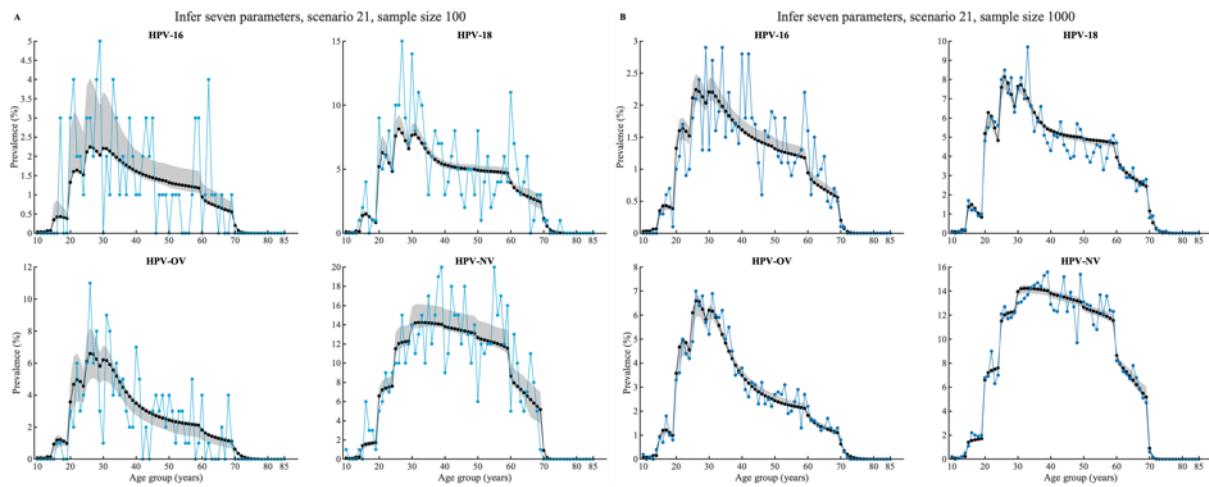


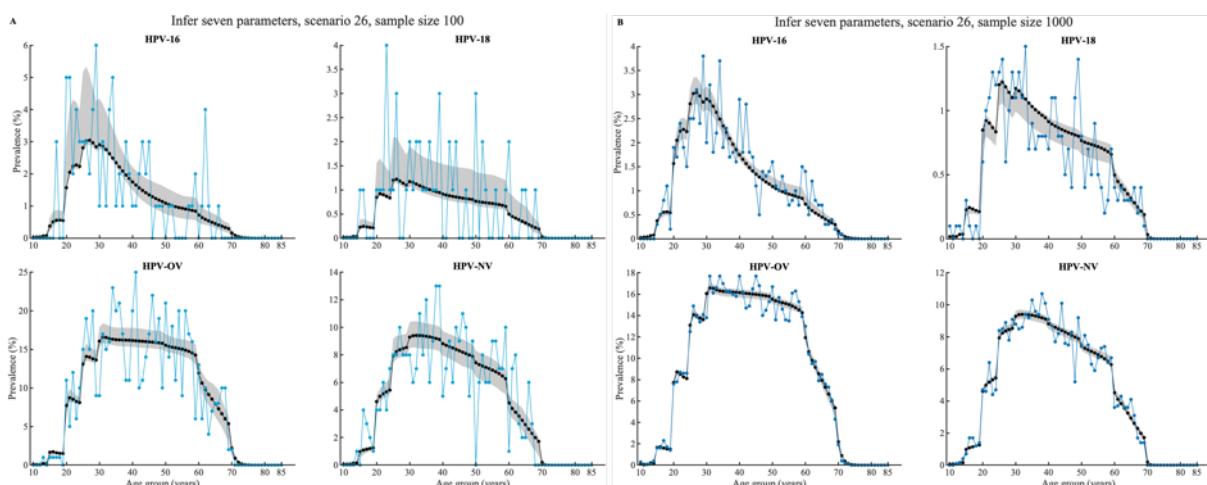
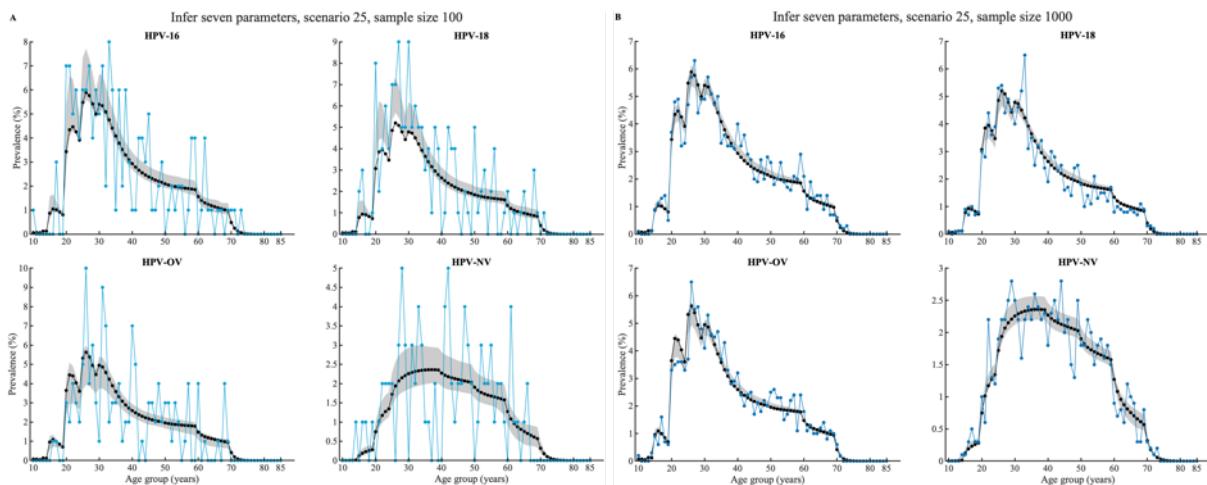
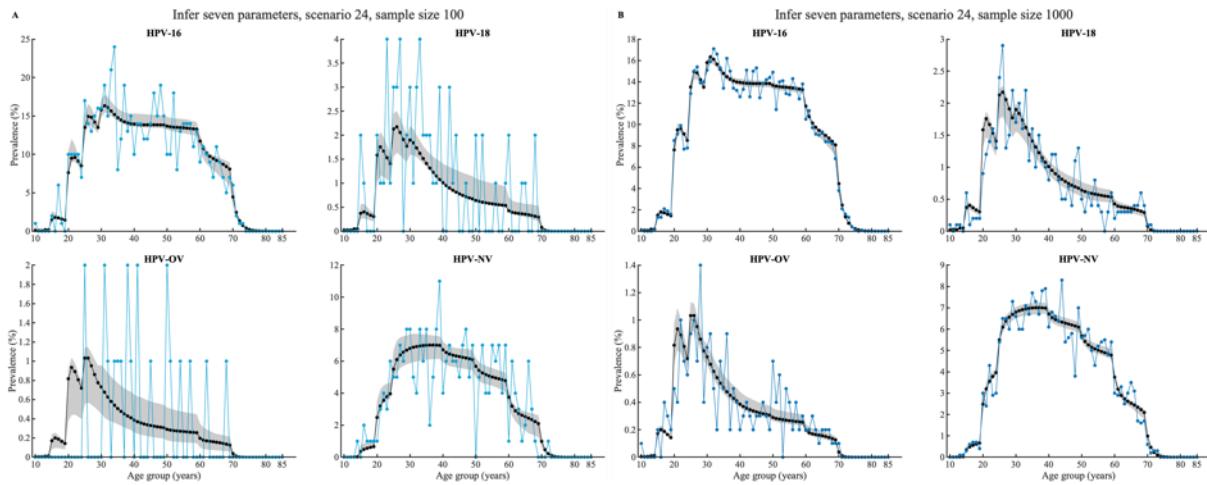


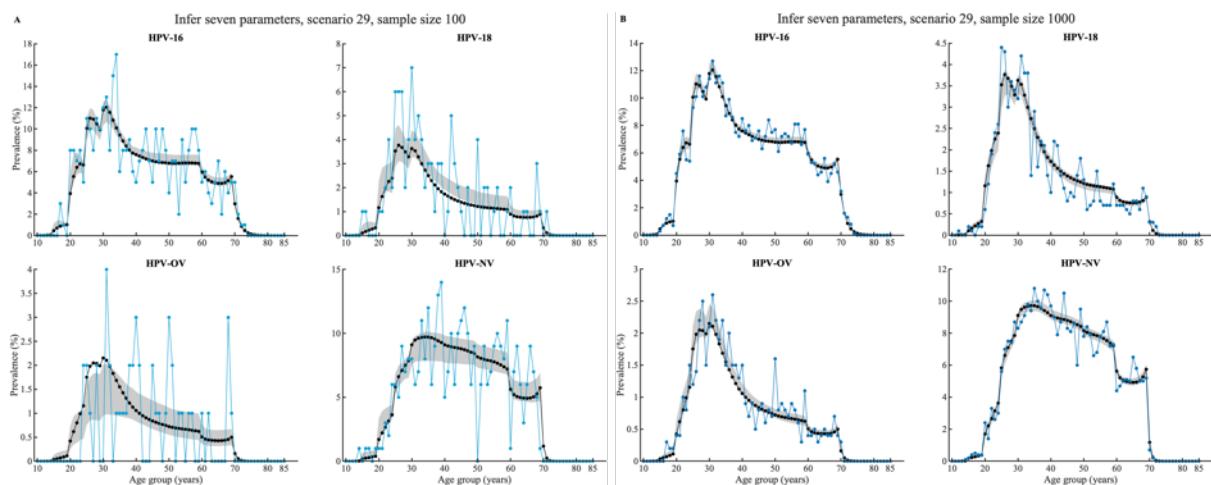
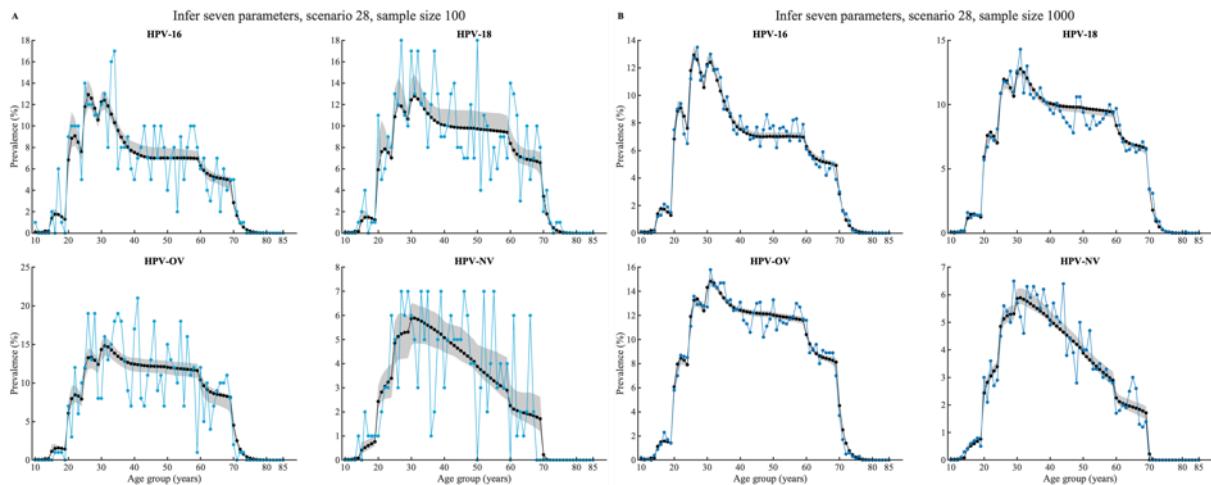
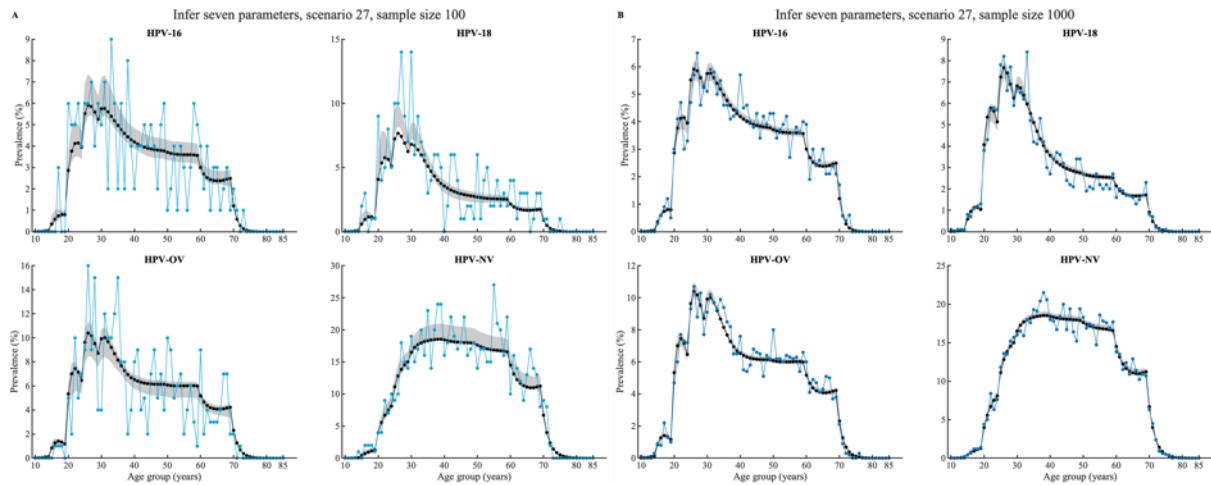


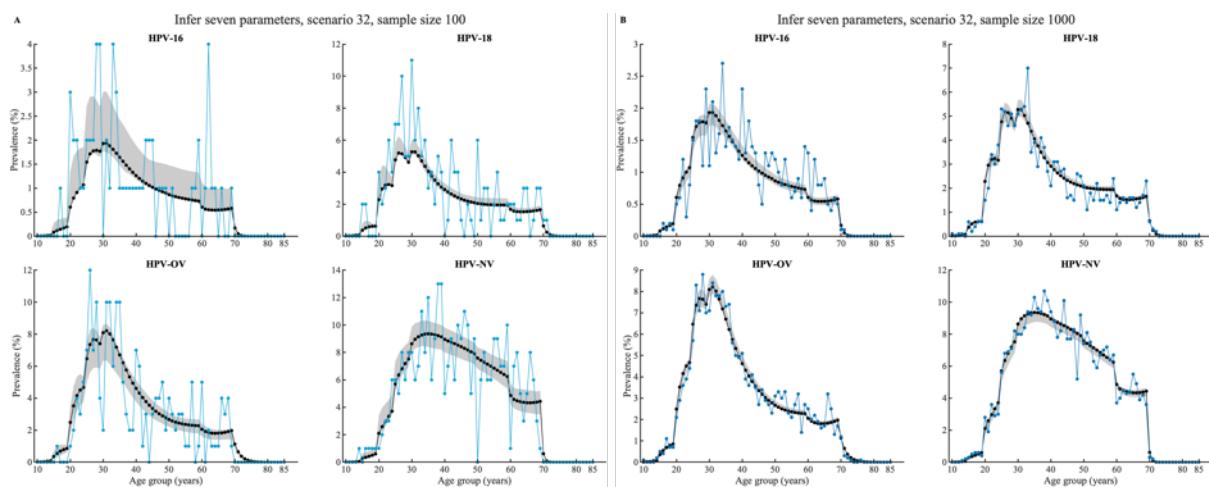
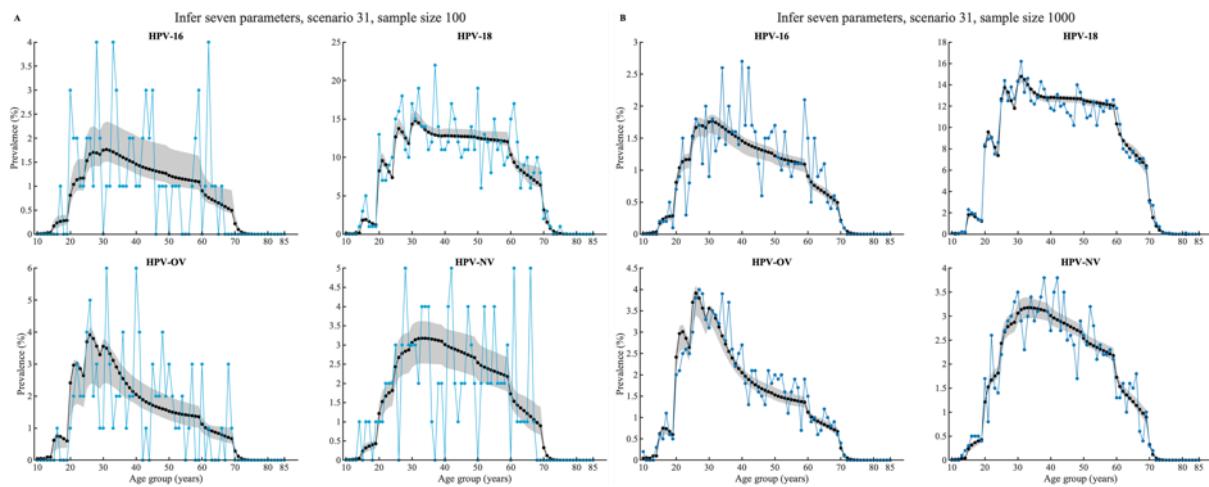
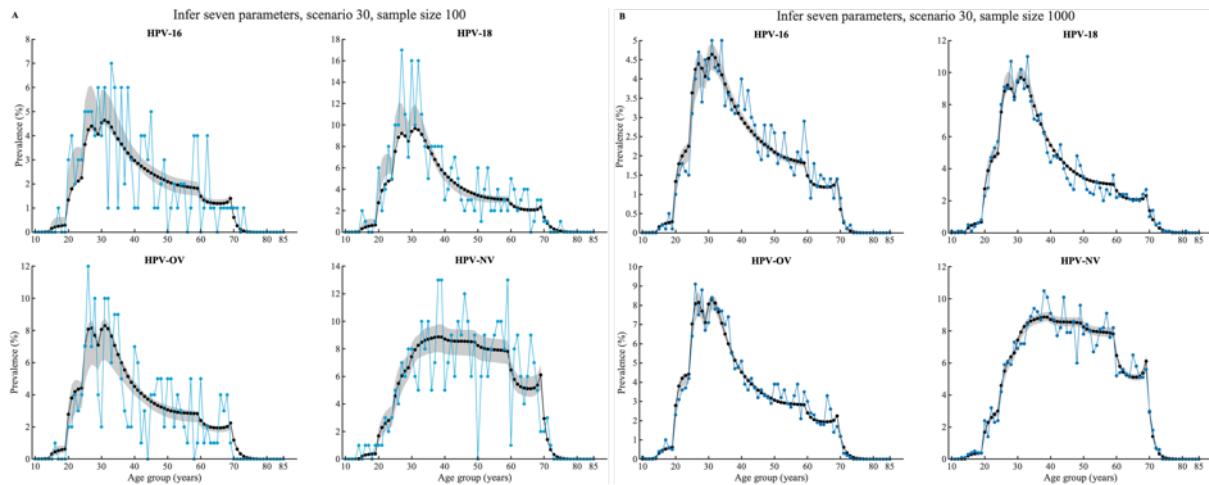


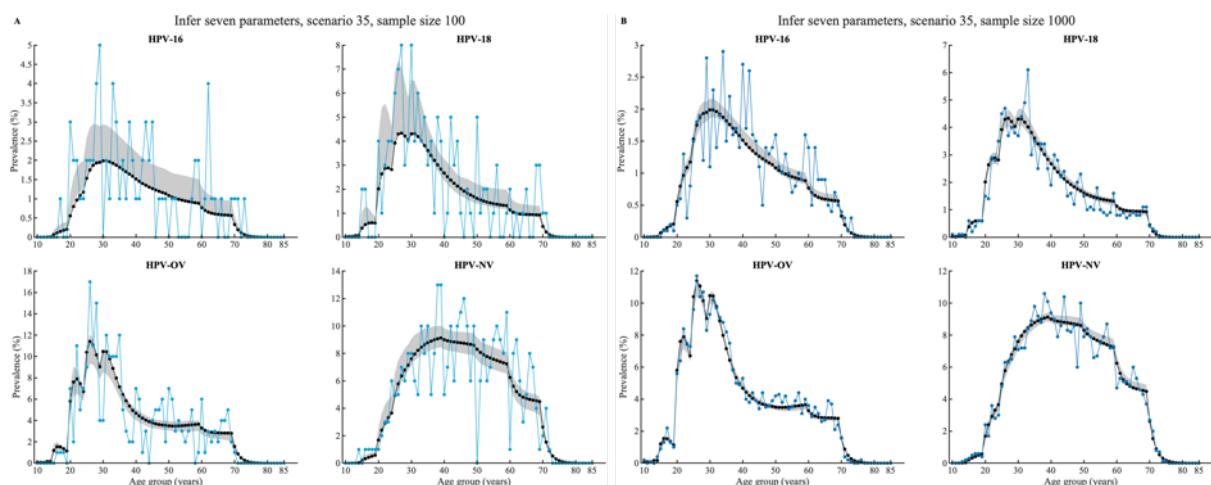
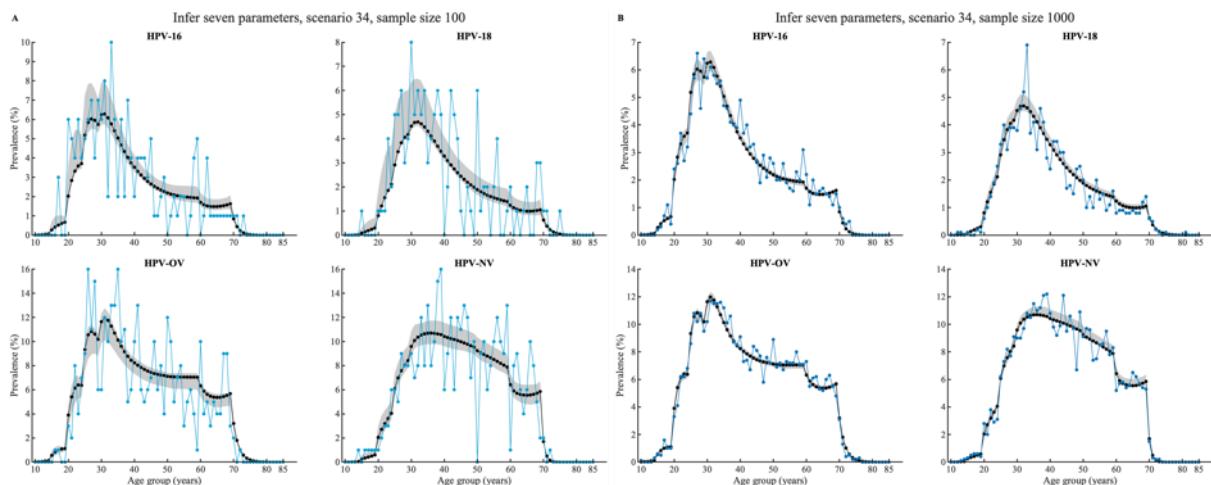
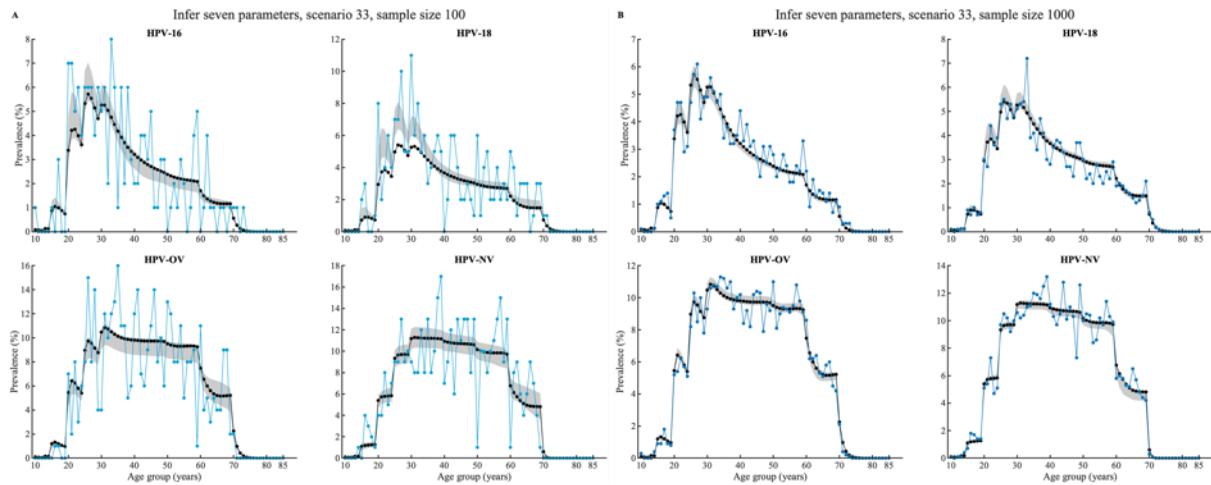


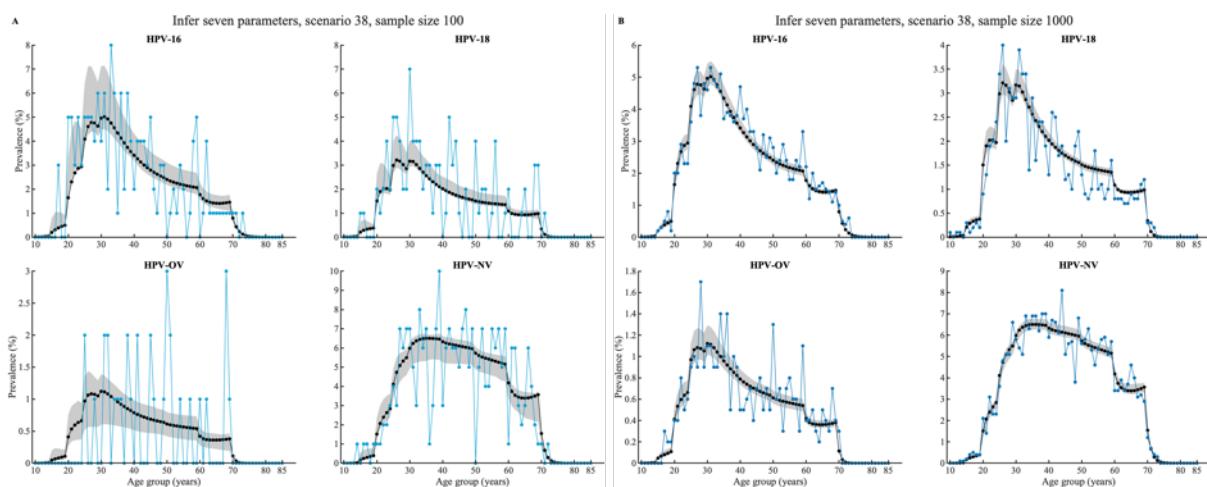
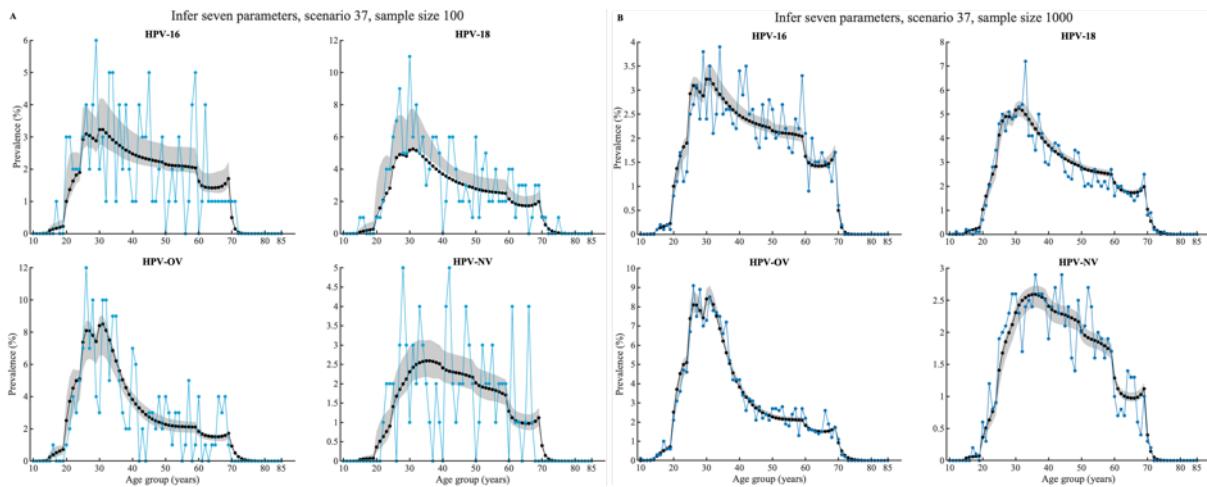
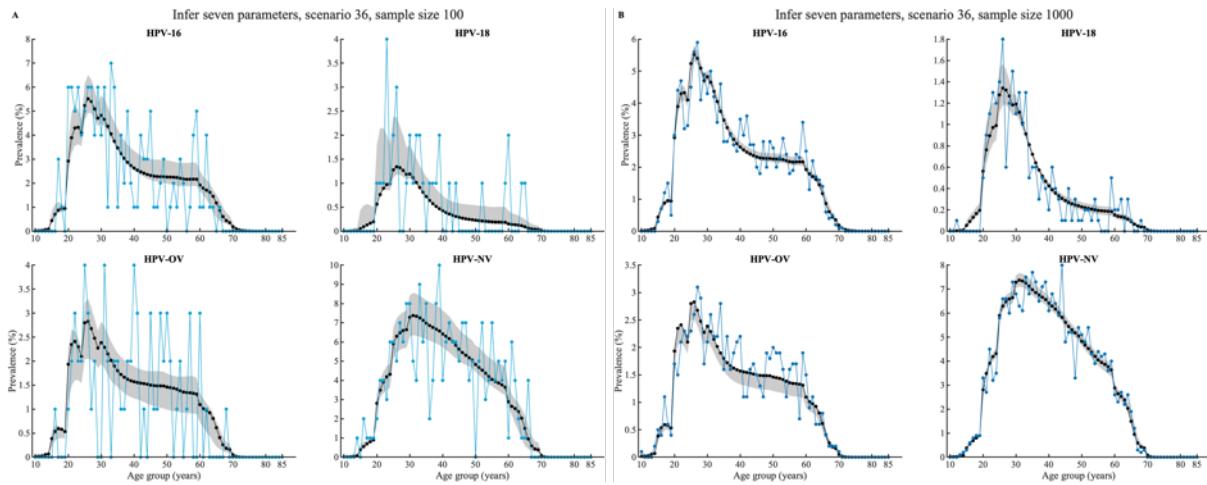


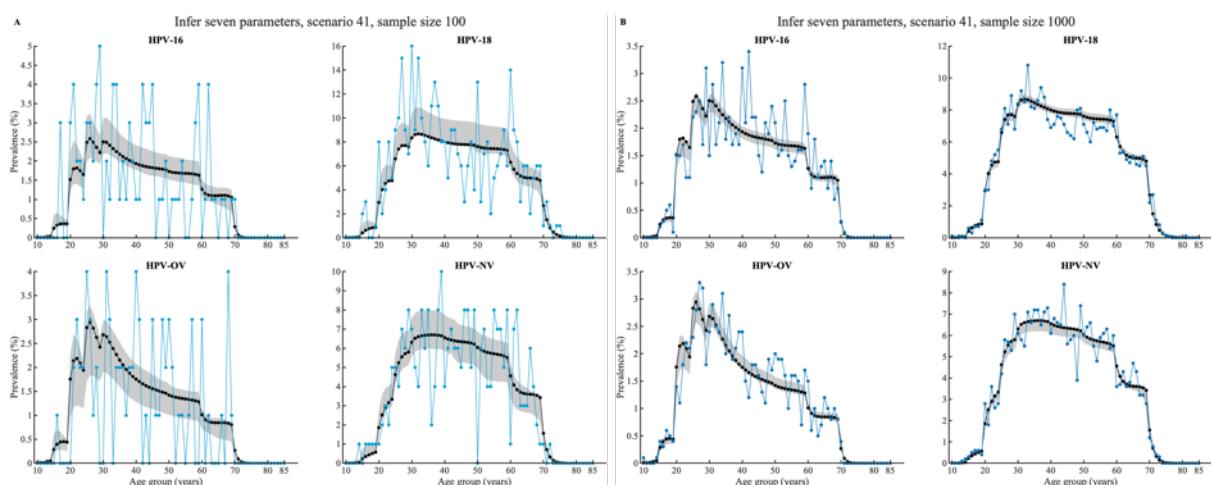
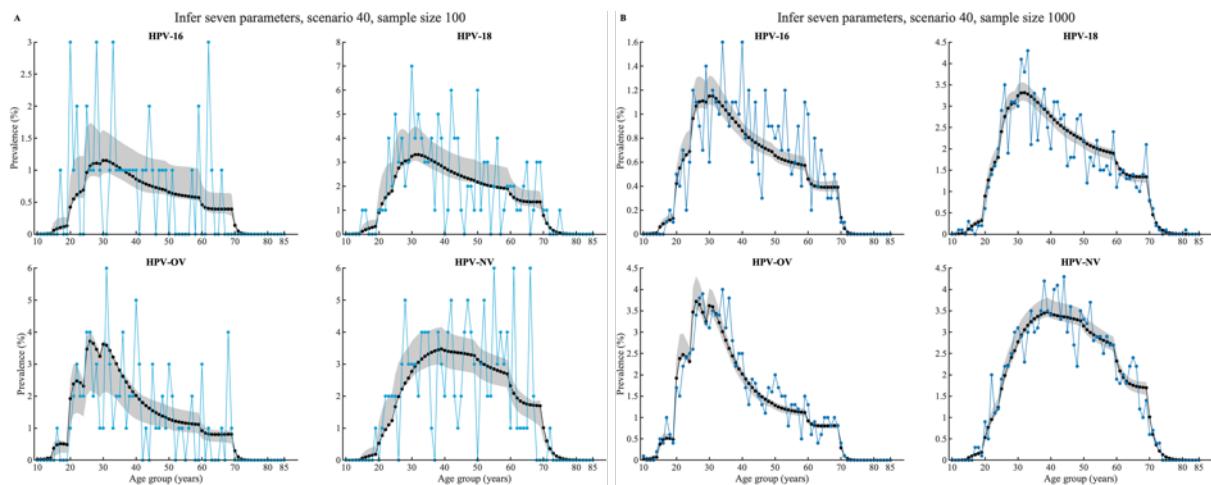
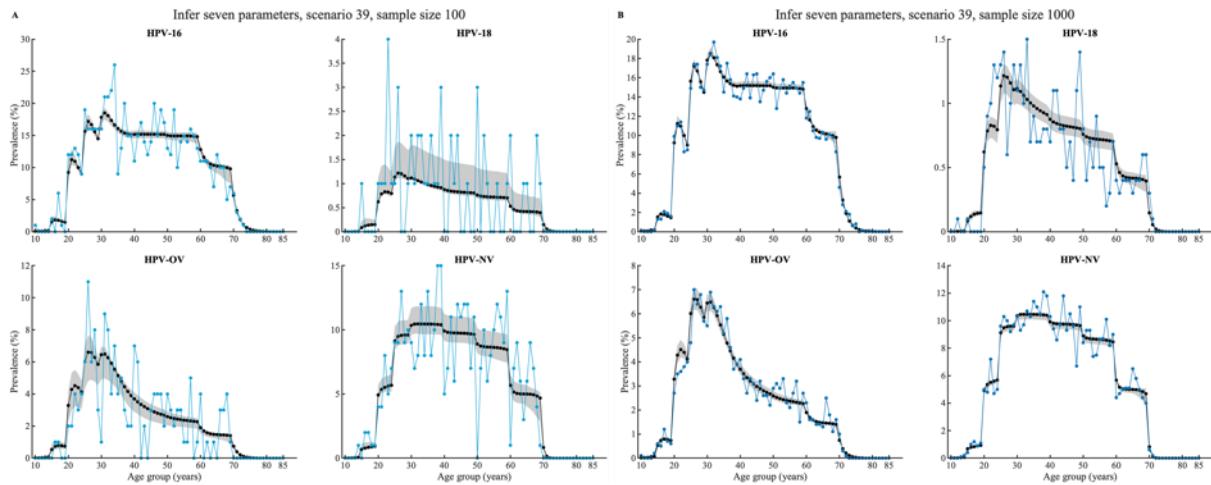


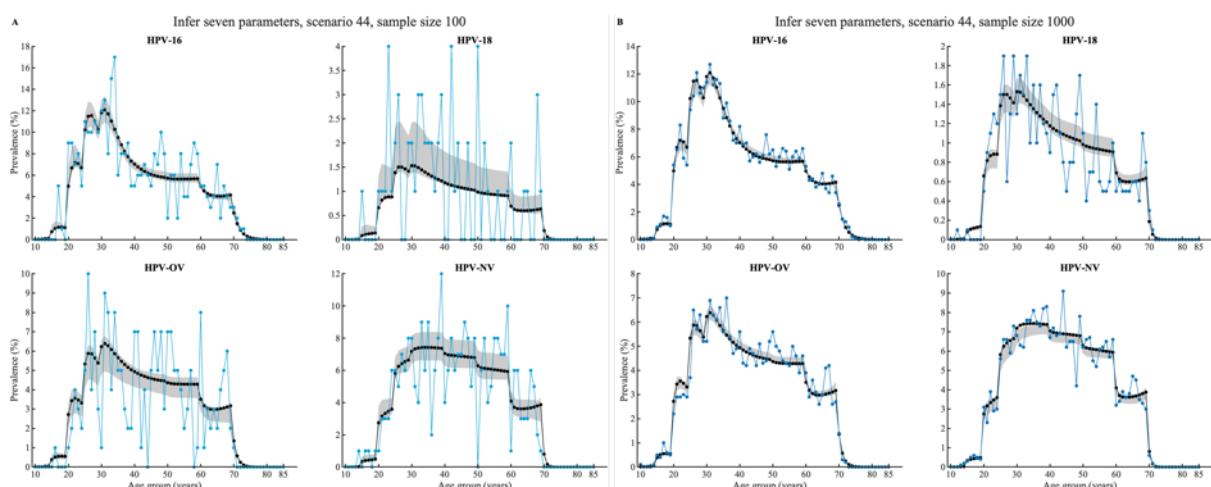
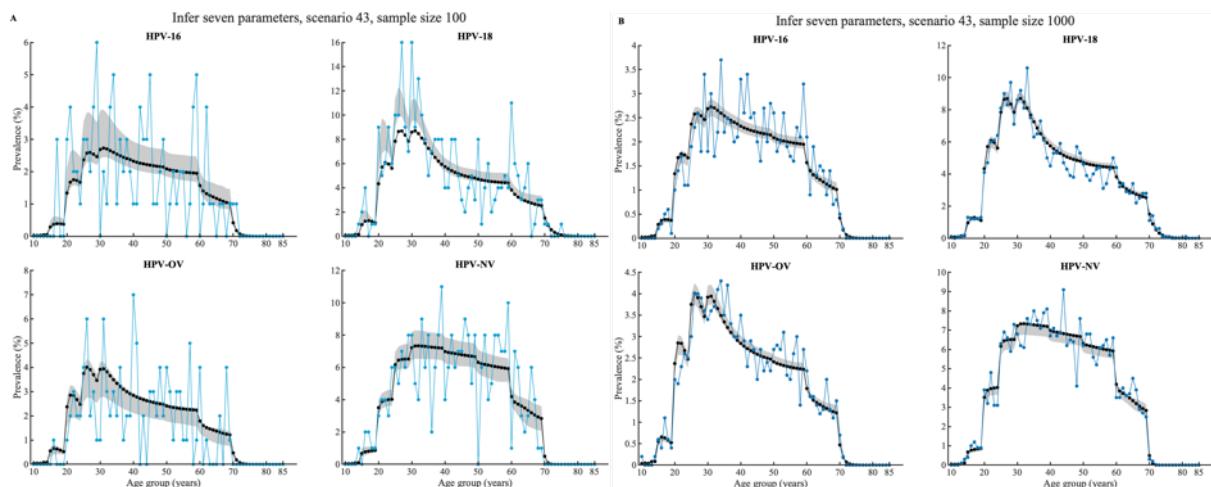
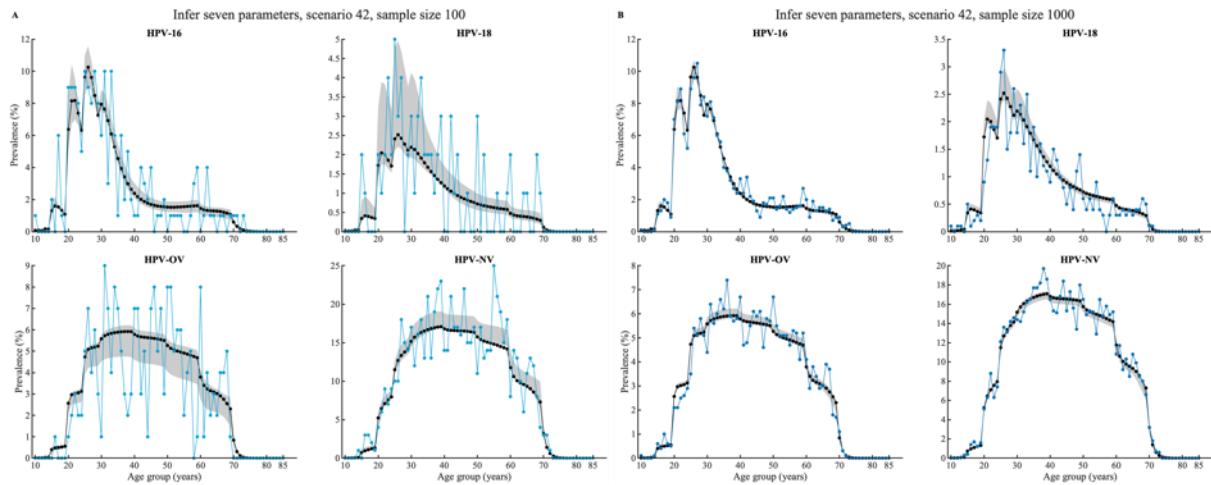


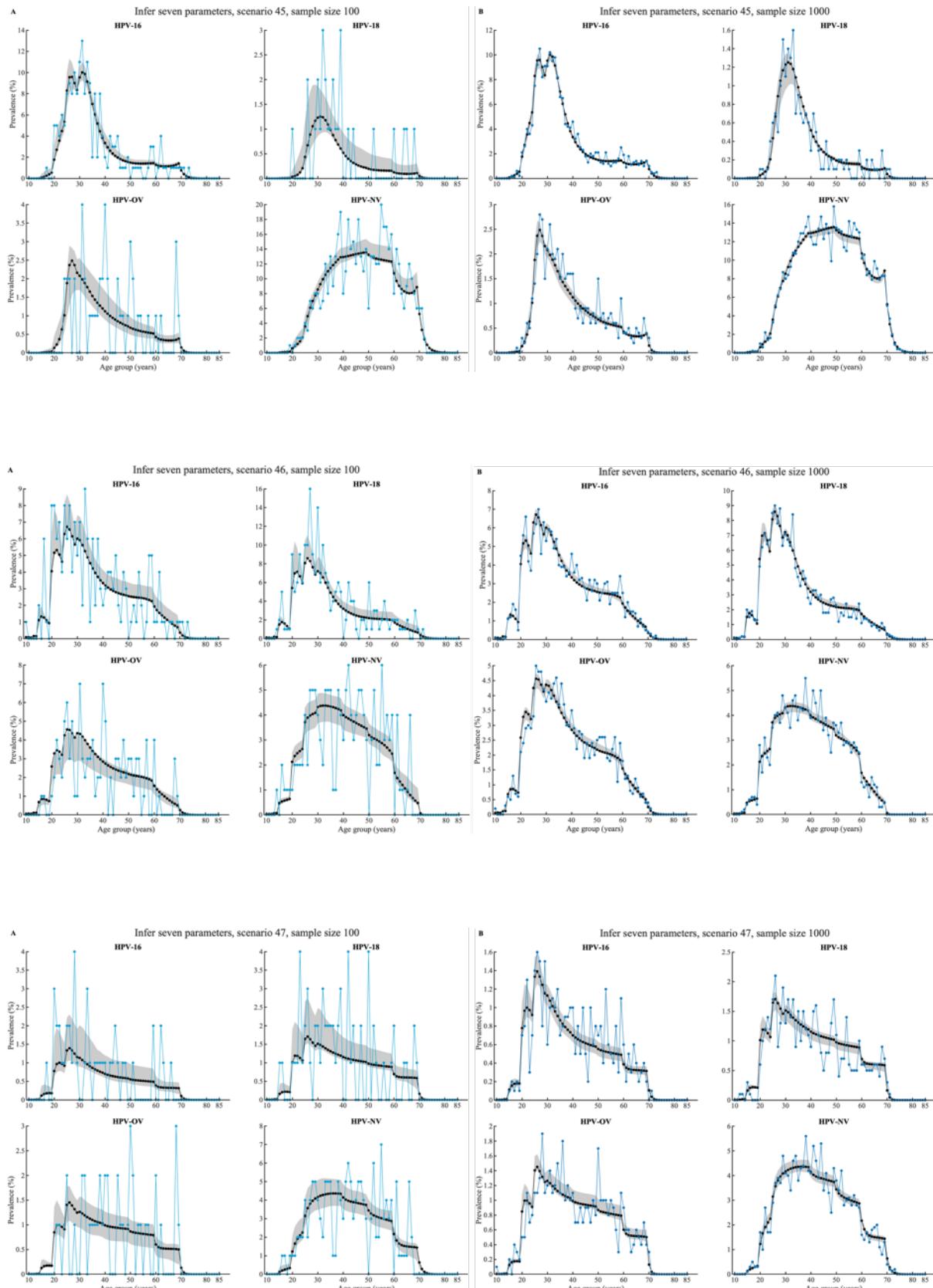


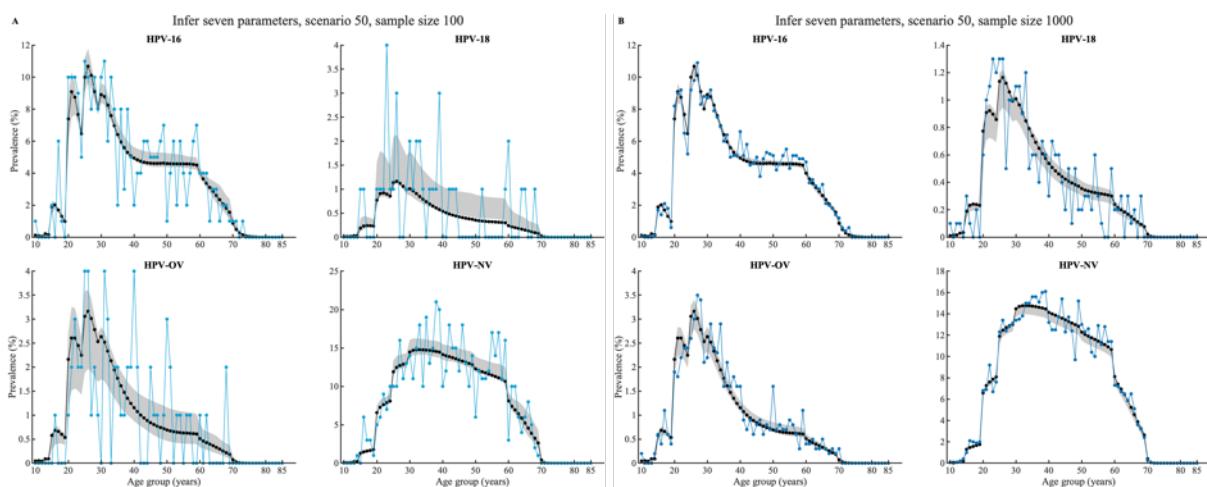
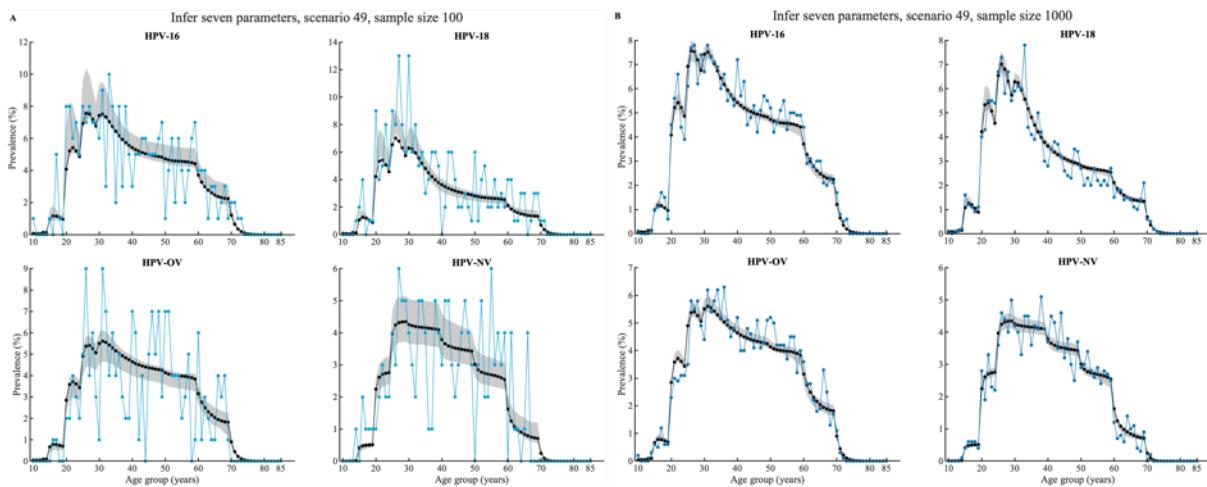
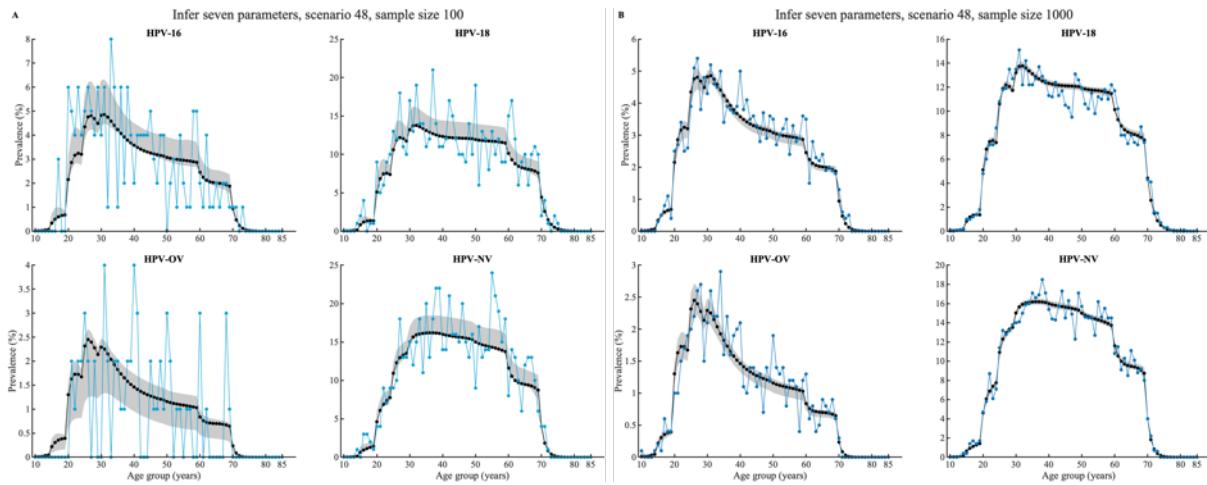












B.7 Comparison of the steady-state prevalence simulated from the true values of parameters and from MCMC inference of eight parameters in set Θ_3 ($\Theta_3 = \{\beta_{16}, \beta_{18}, \beta_{OV}, \varepsilon_A, \varepsilon_S, \mu, \sigma\}$).

The black lines indicate the steady-state prevalence parameterizing the transmission model using true values of parameters. The shadows indicate the 95% CrI of the steady-state prevalence parameterizing the transmission model by drawing 100 random samples from the posterior distributions of parameters. The blue lines indicate the steady-state prevalence calculated by dividing the number of HPV test positive women by the number of tested women. The number of HPV test positive women from a binomial distribution with the number of tested women and success probability from the steady-state HPV prevalence from the transmission model parameterized using true values of parameters. (A) The steady-state HPV prevalence when model parameters are estimated with data from 100 women in each of the 1-year age group. (B) The steady-state HPV prevalence when model parameters are estimated with data from 1,000 women in each of the 1-year age group.

