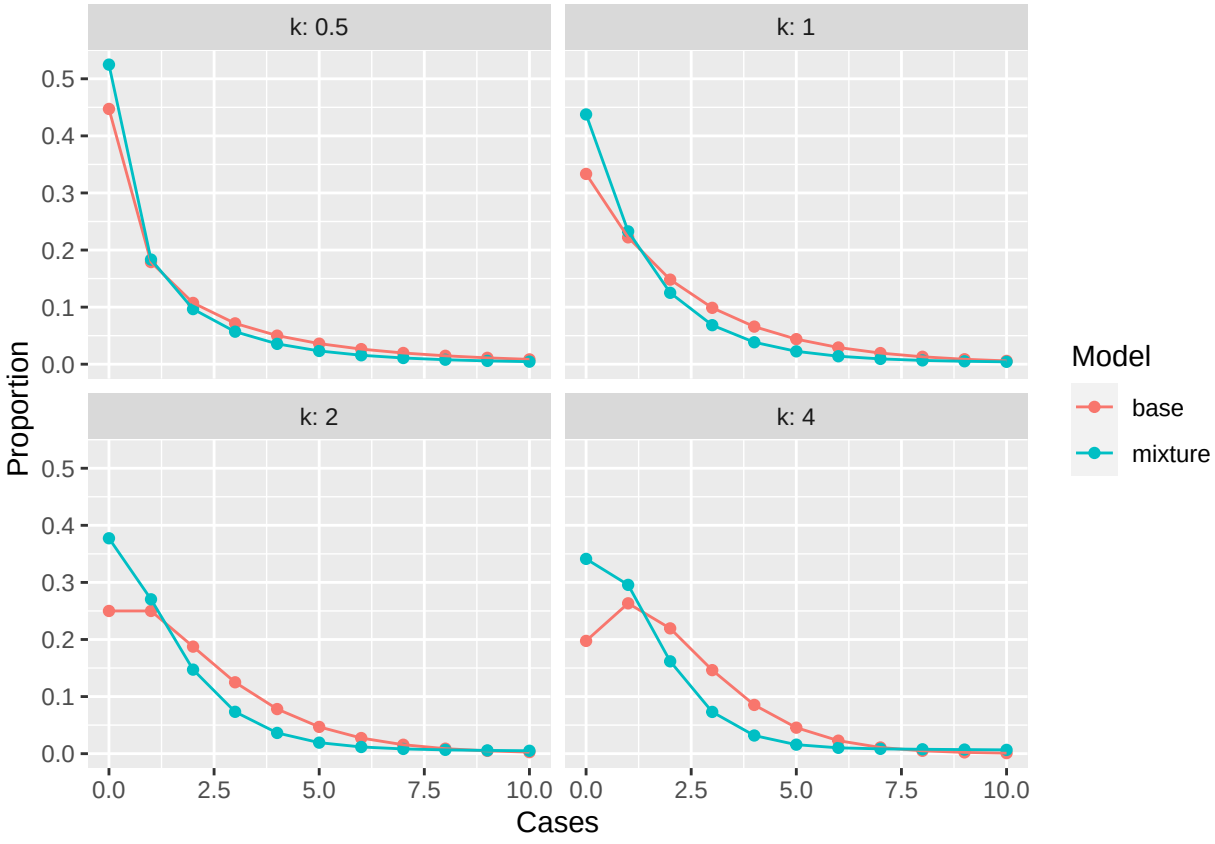
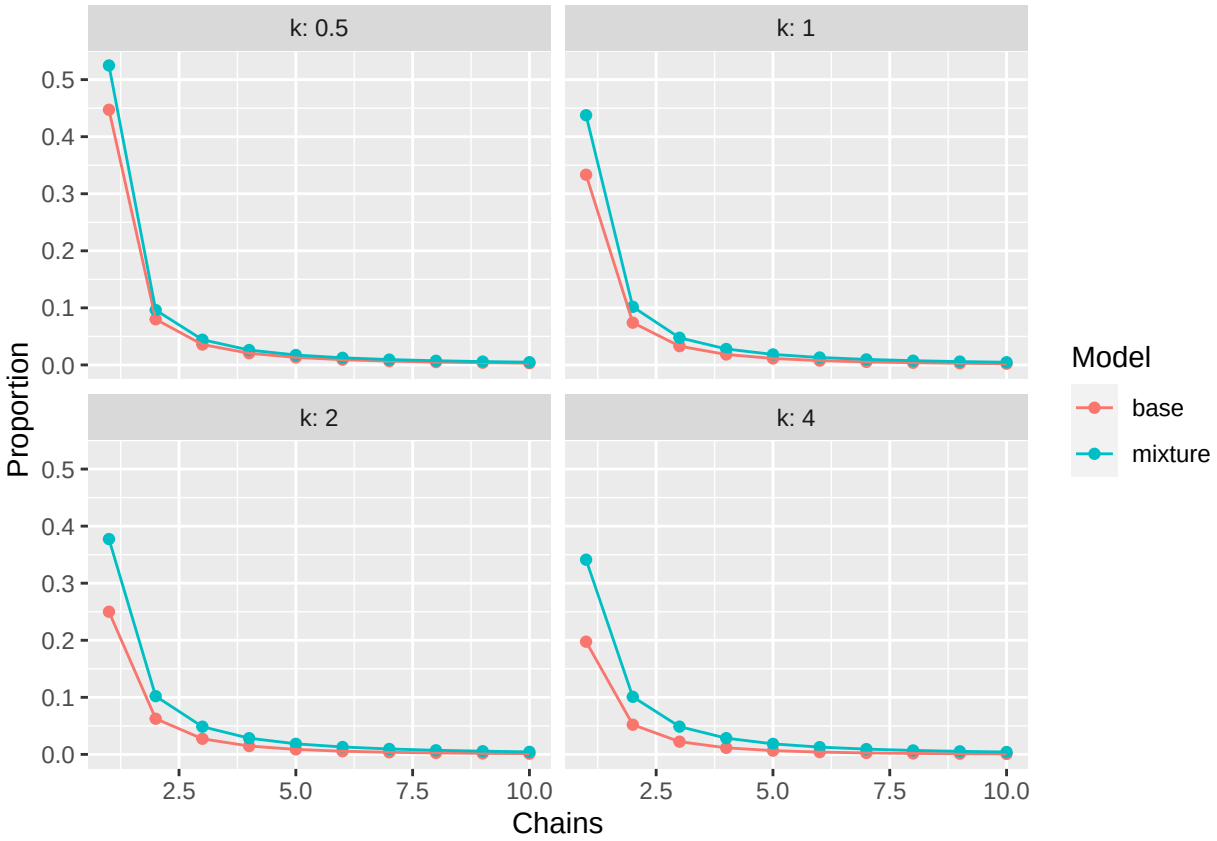
Negative binomial mixture branching process model of transmission

Probability mass function



Corresponding chain size distributions for the mixtures for each value of k:

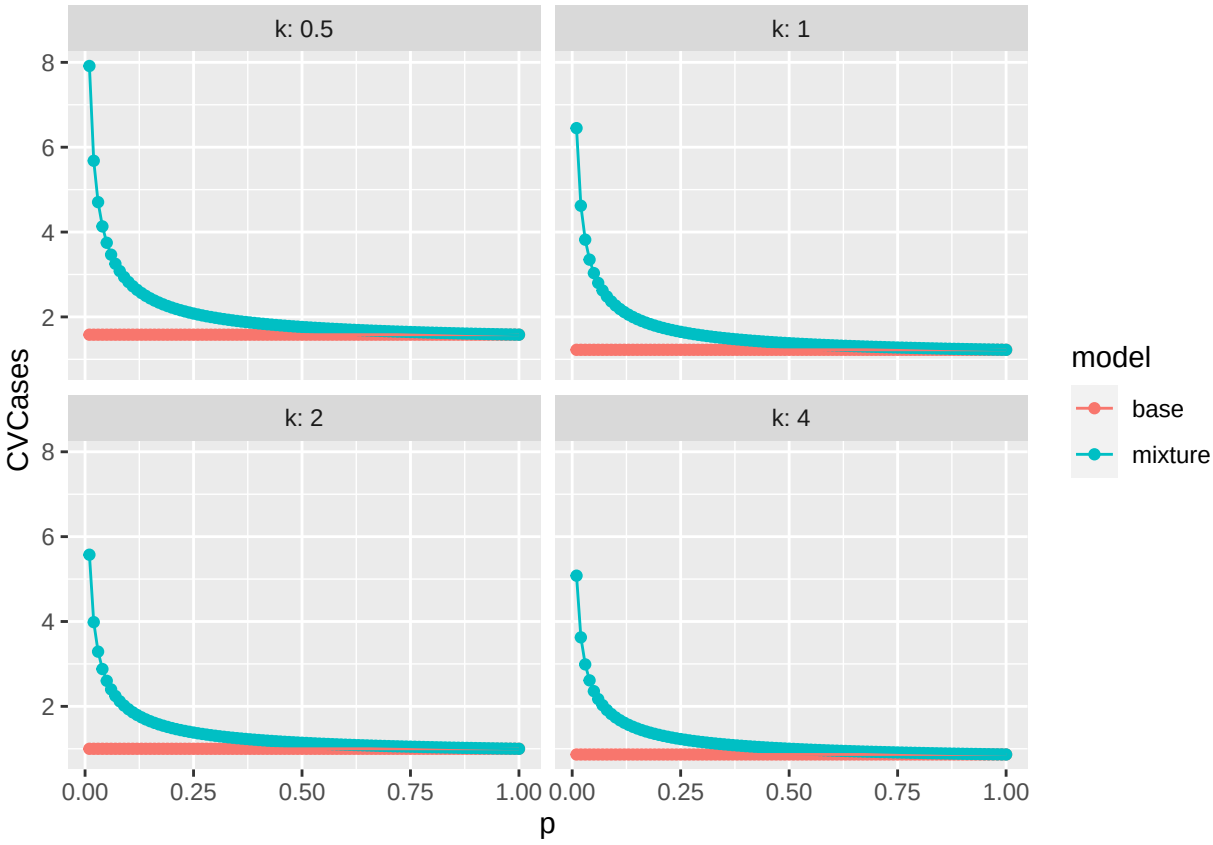
Plot shows that chain size distribution from a mixture is fatter tailed when $R_0 > 1$:



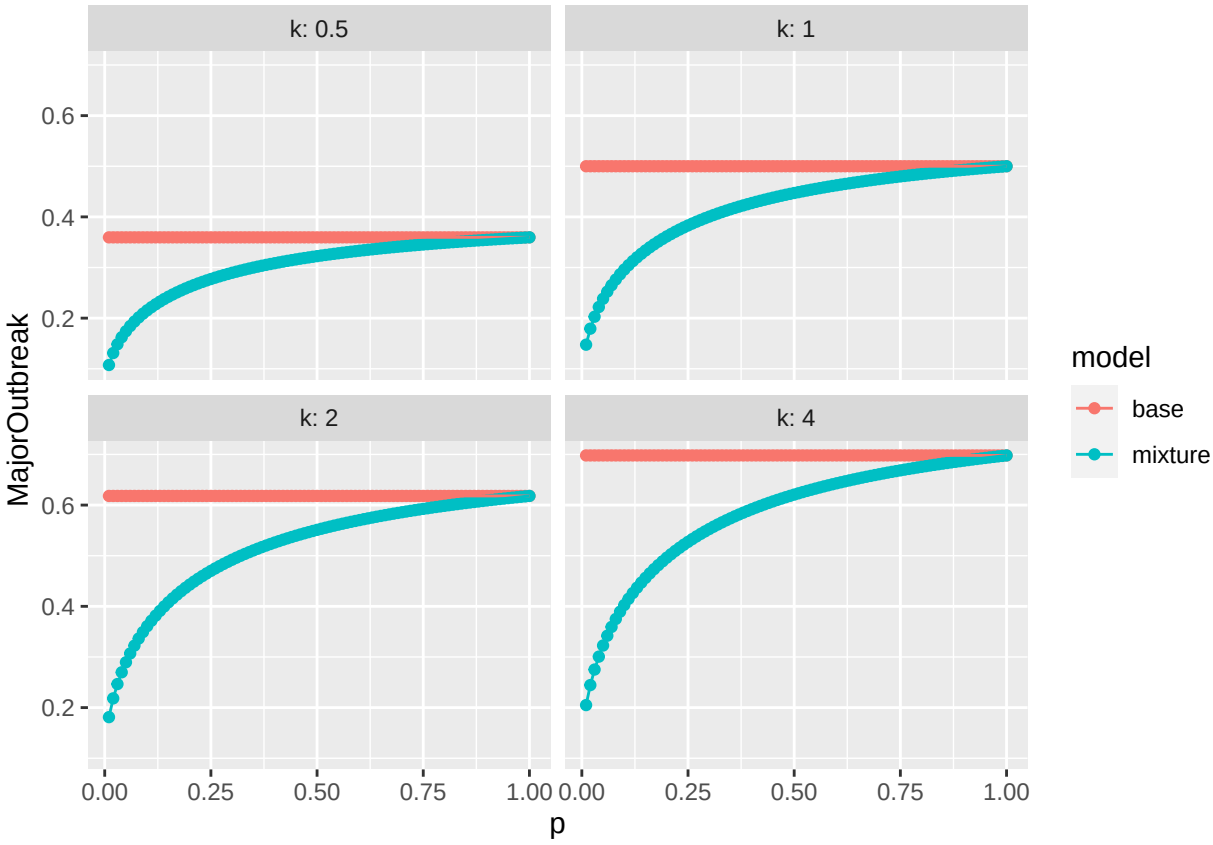
In each of the following, p and δ are varied but $R_0 = R_0^D + \delta$ is fixed at $R_0 = 2$. The following figures show that smaller values of p (and larger values of δ) lead to more heterogeneous epidemics, even if $k > 1$. Hallmarks of heterogeneous transmission include:

- Greater variability in the number of secondary infections (fat tailed)
- Smaller probability of major epidemics
- Greater variability in chain sizes
- Larger probability of observing no secondary infections and small chains that go extinct

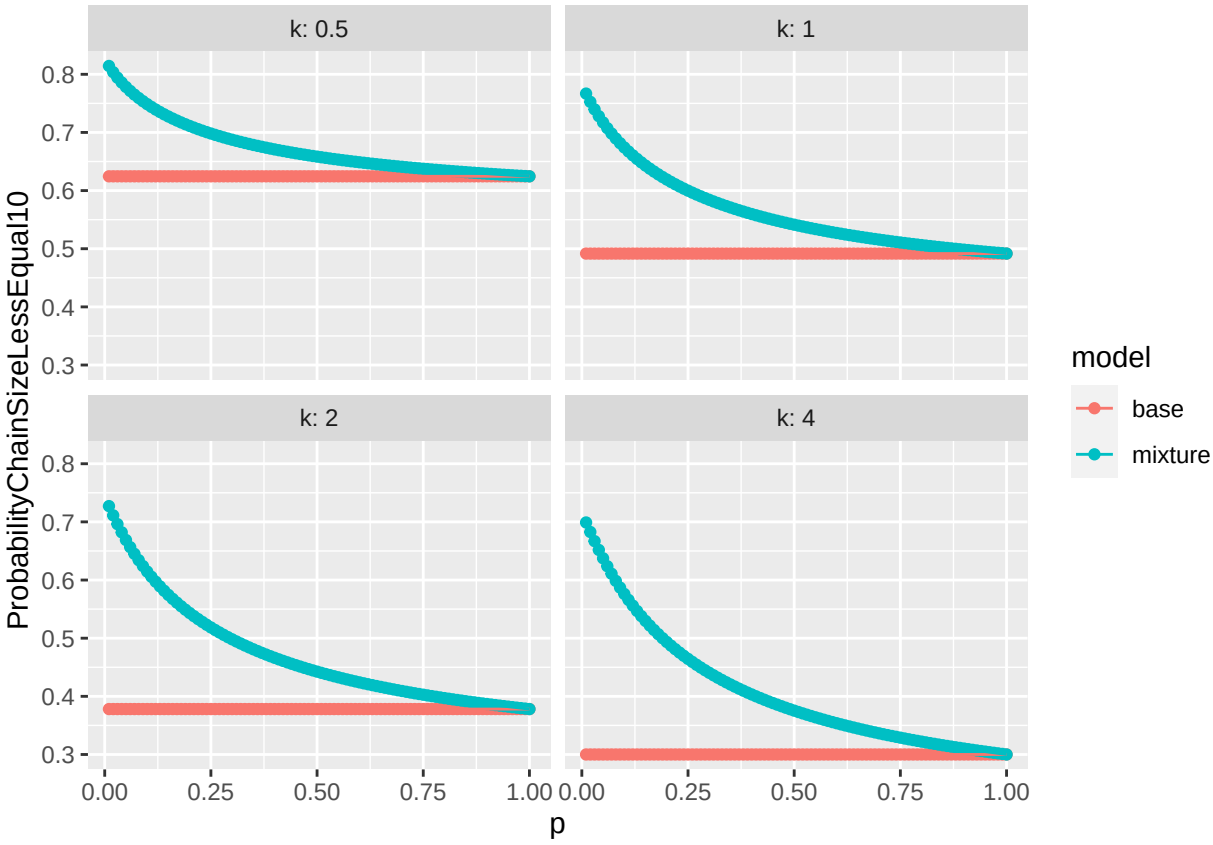
CV offspring distribution



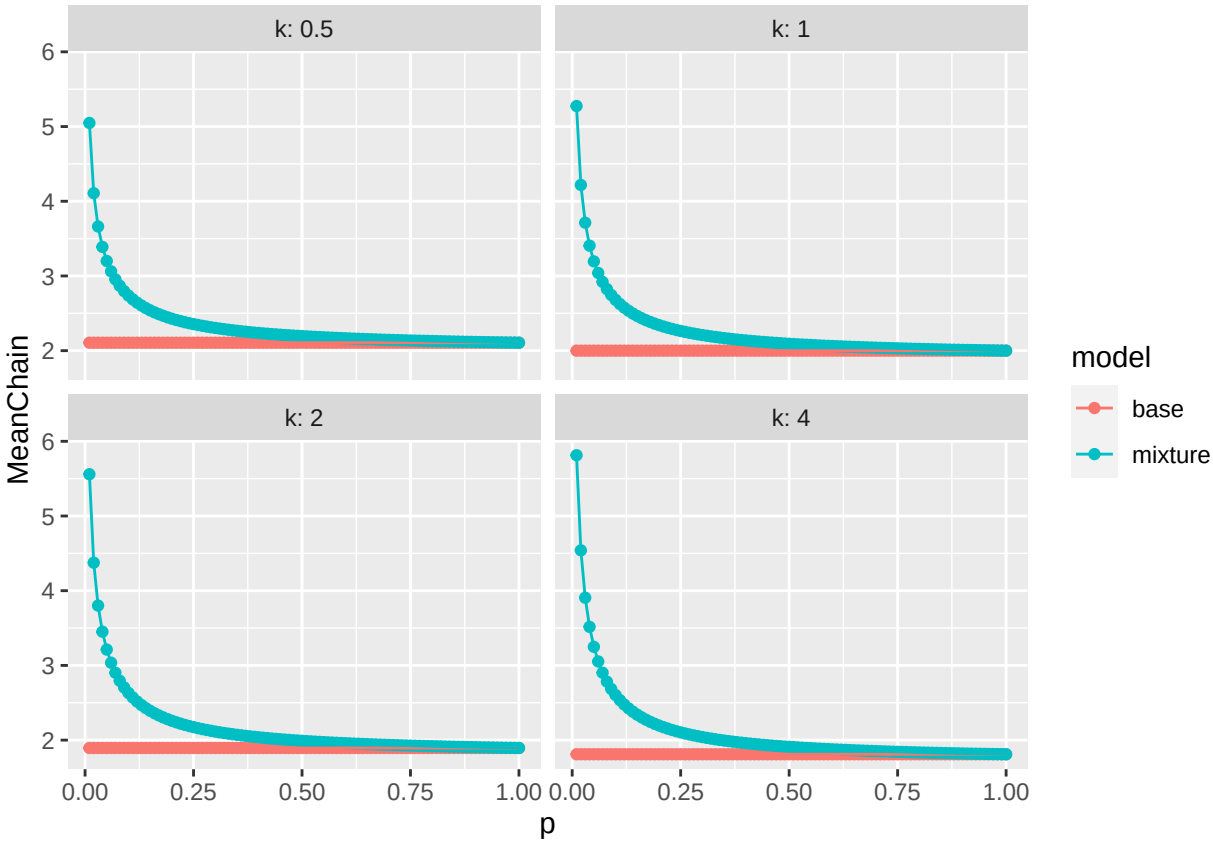
Probability of major outbreak



Probability of observing a transmission chain of size <= 10



Mean chain size



CV chain size