# effectOfIndividualInputs

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## Investigation into effects of individual inputs on time to reach resistance thresholds.

## version 2 - in progress

### Based on 1000 runs with all inputs varying at once which explains the variability at particular input values.

### Within each figure the plots are divided into 6 sub-plots according to the insecticide use strategy and when the resistance threshold is reached

1. insecticide 1 : sole use
2. insecticide 2 : sole use
3. Mixture 1 : threshold reached for either insecticide in mixture
4. Mixture 2 : once threshold reached for either insecticide in mixture, switch to sole use of other until it too reaches threshold
5. Mixture 3 : threshold reached for both insecticides in mixture
6. Sequential : sole use of one insecticide, switch to other when threshold reached until it too reaches threshold

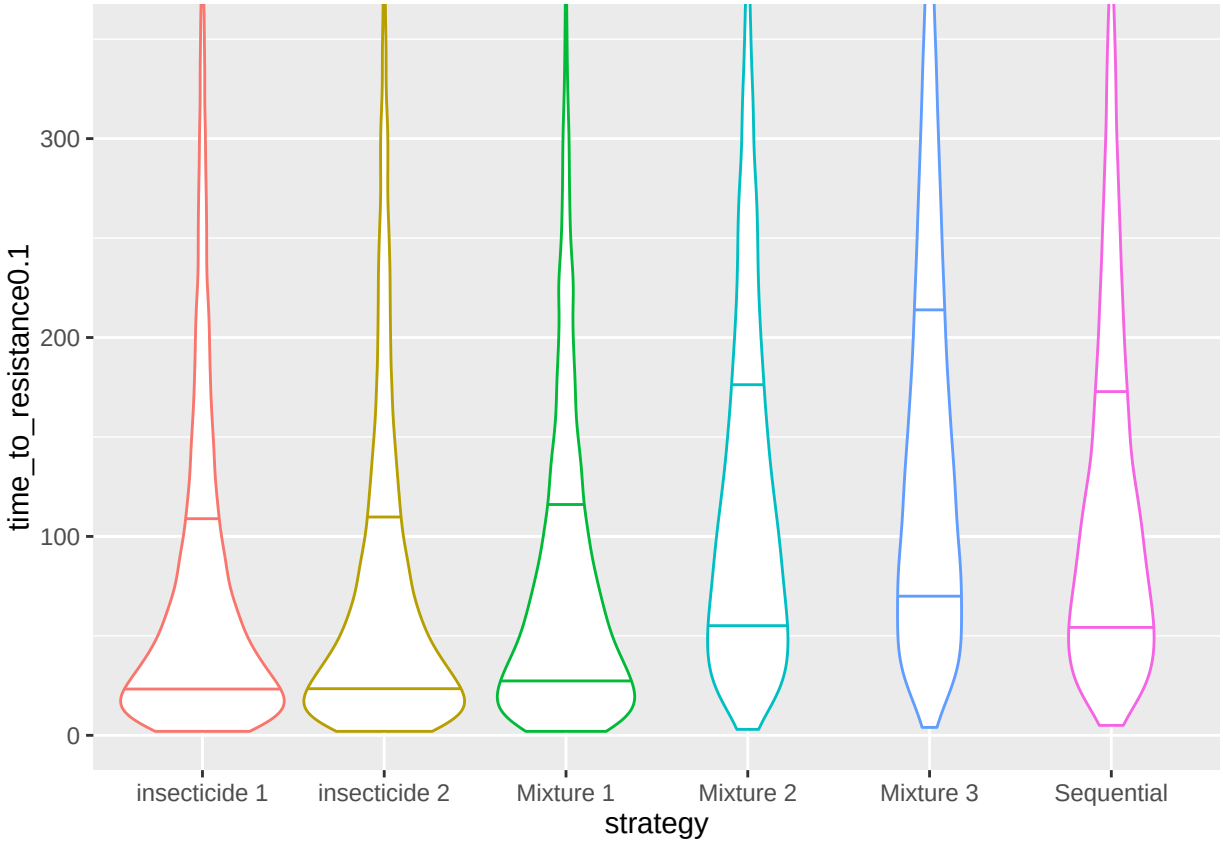
These plots show gen_cP0.2, which is the number of generations to reach 20% resistance.

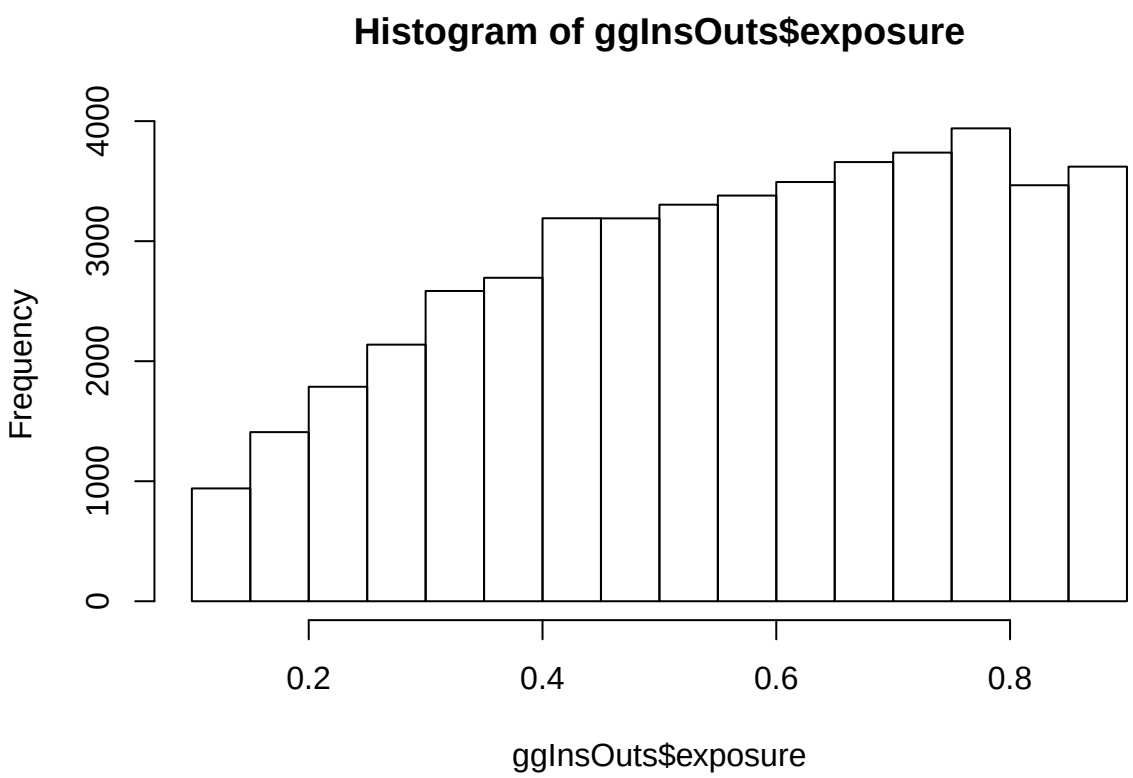
Red dashed lines are a smoothed mean.

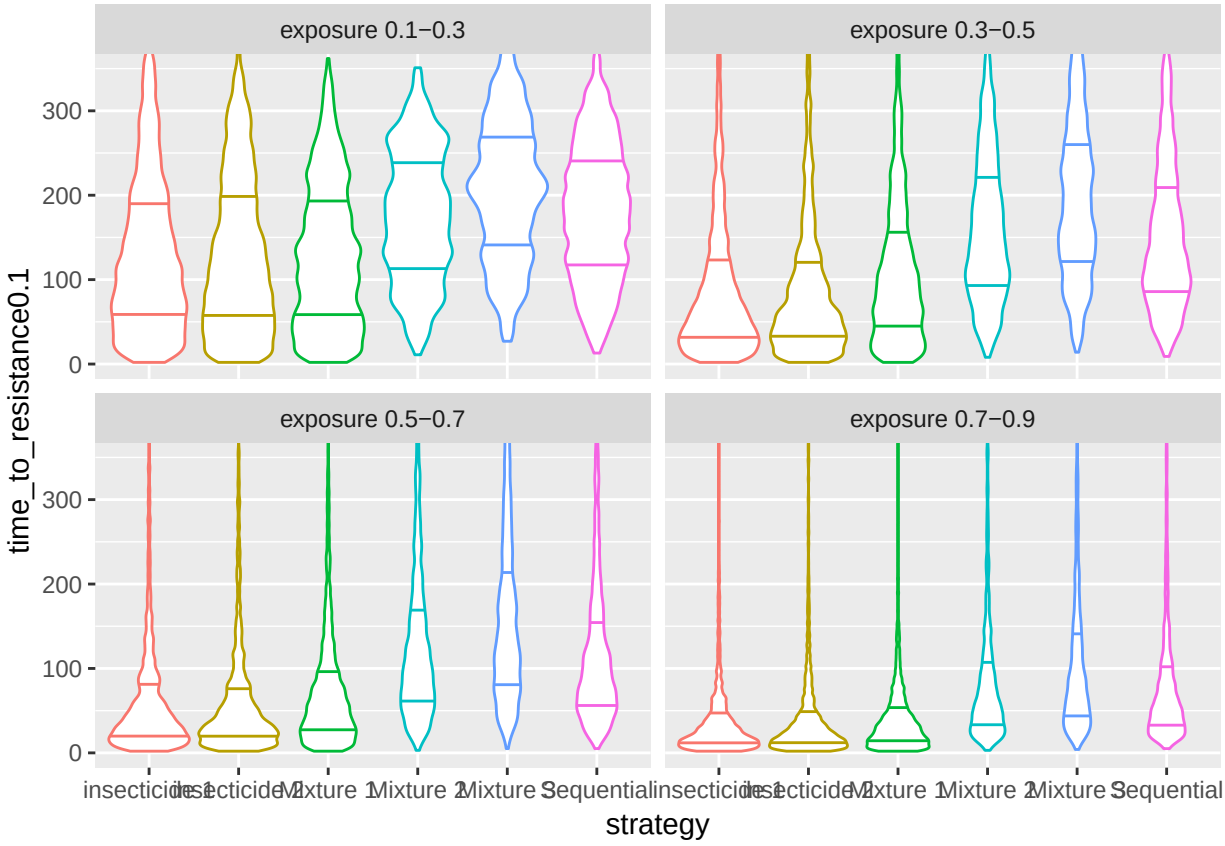
Runs where resistance thresholds have not been reached have been removed.

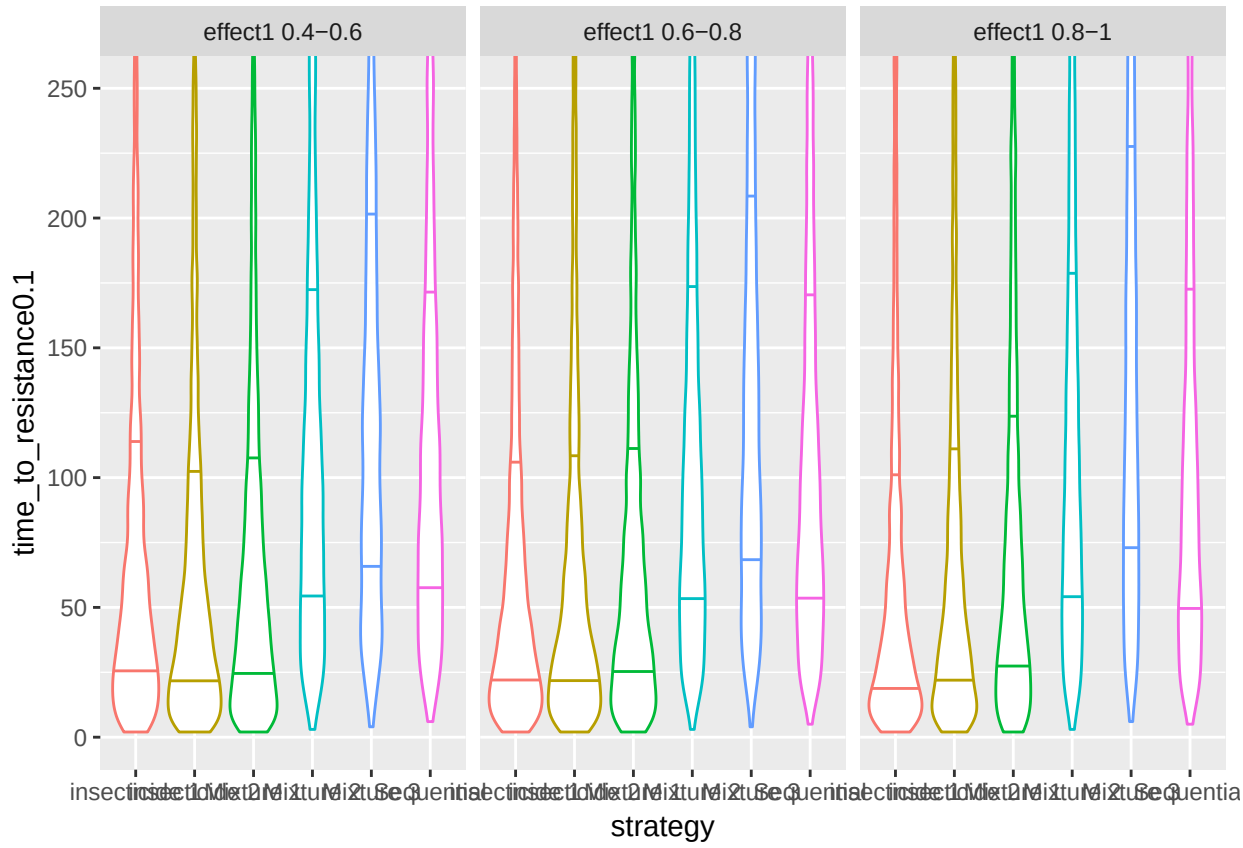
Previous plots showed a set of points at 1000 generations. The model is run for 500 generations, any runs which have not reached the resistance threshold by this time are given a value of 1000. This has little effect on questions of whether mixtures or sequential use is better.

**Plot time to resistance for each strategy using all sensitivity analysis values**

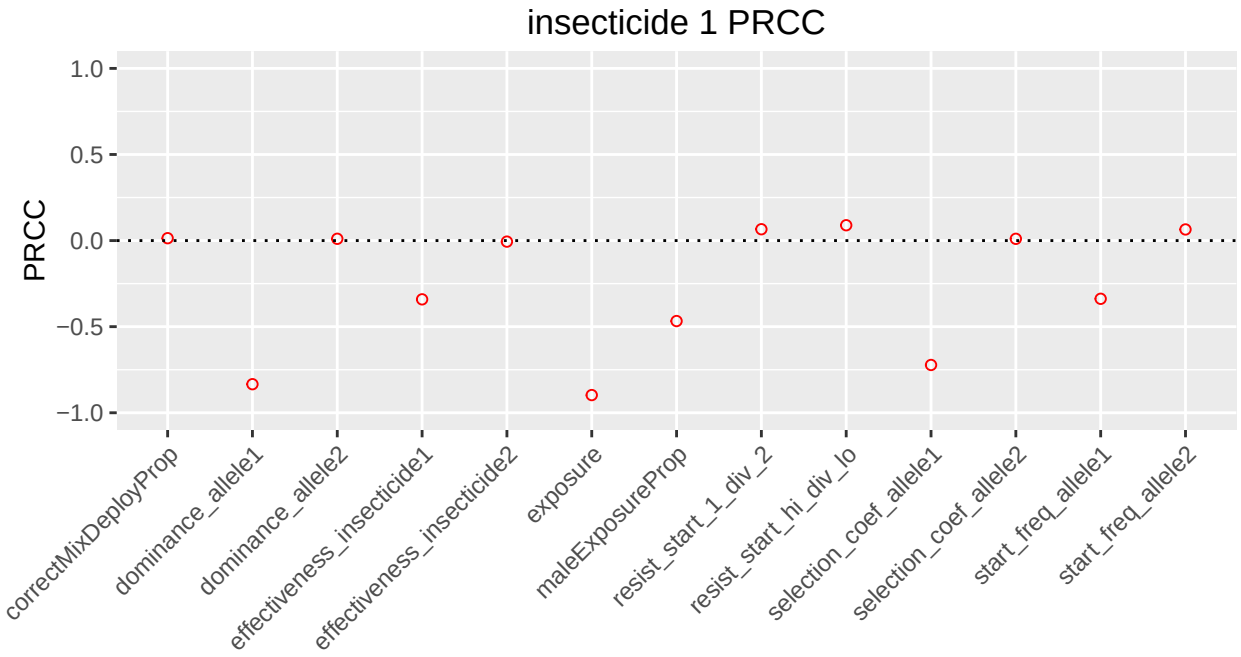


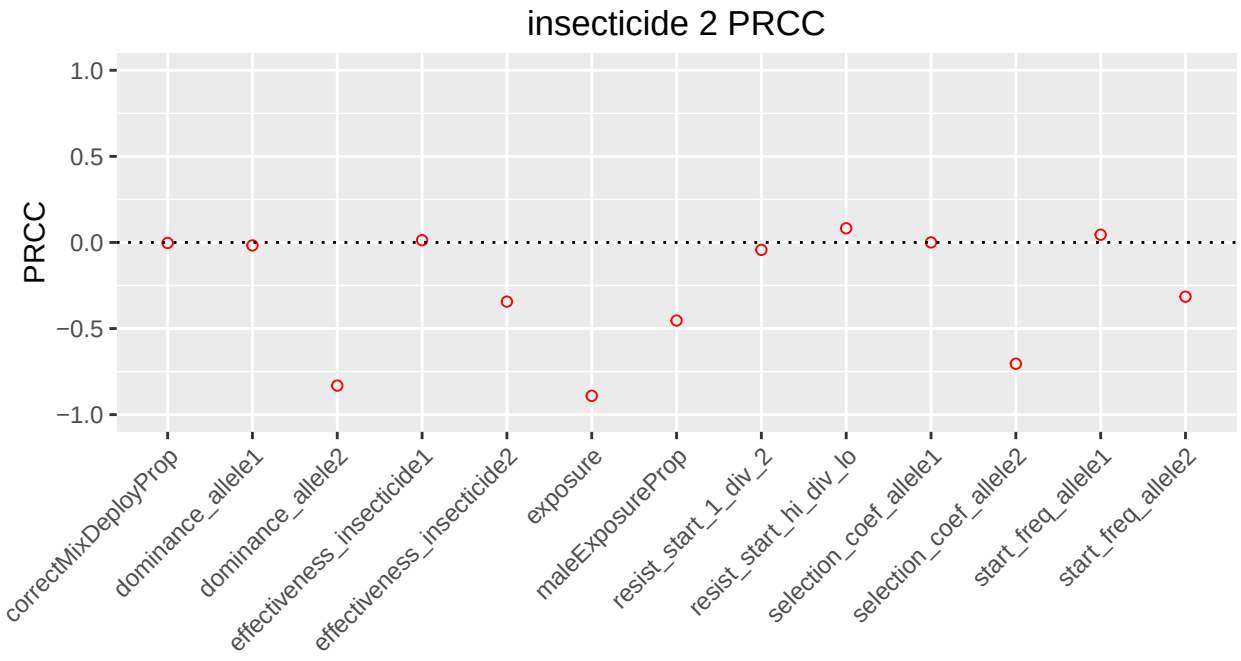

Histogram of ggInsOuts$exposure
Frequency
0
1000
2000
3000
4000
0.2
0.4
0.6
0.8
ggInsOuts$exposure

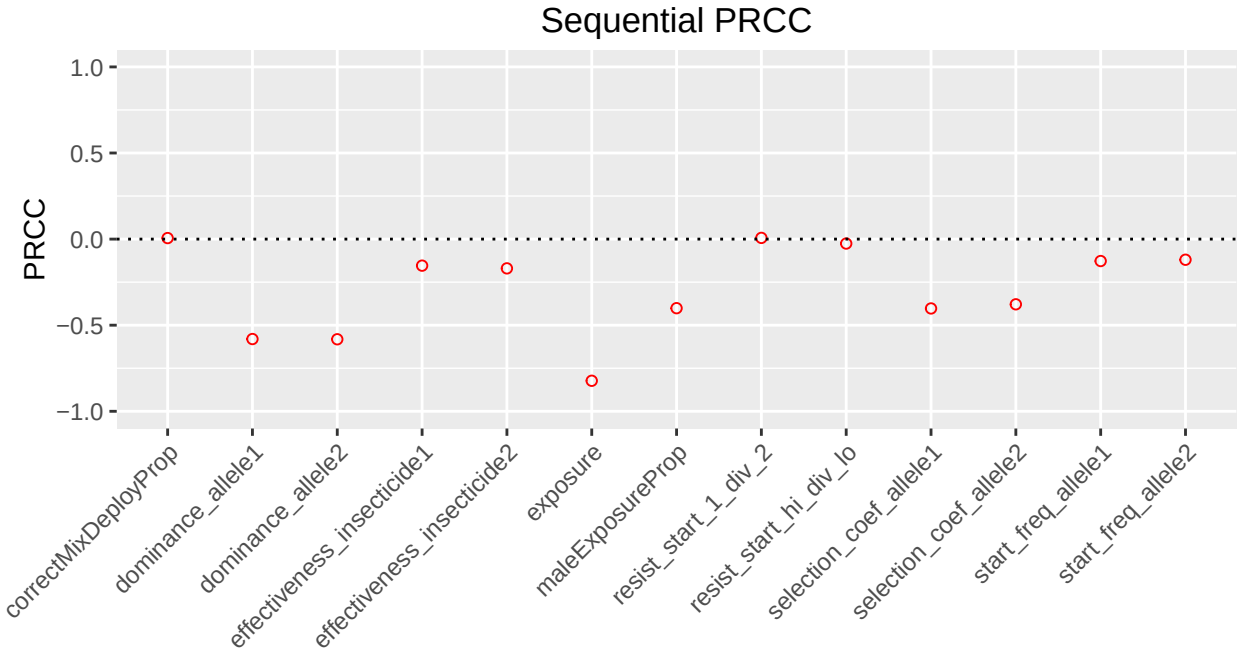

exposure 0.1−0.3
exposure 0.3−0.5
exposure 0.5−0.7
exposure 0.7−0.9
time_to_resistance0.1
0
100
200
300
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
strategy

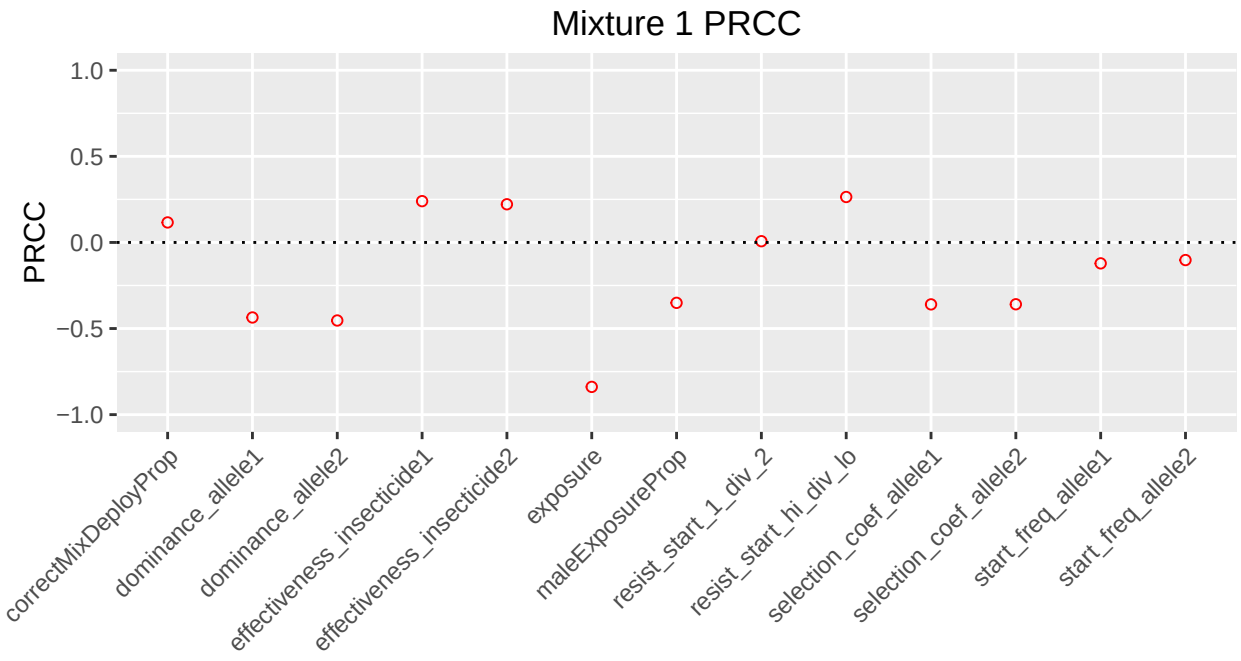


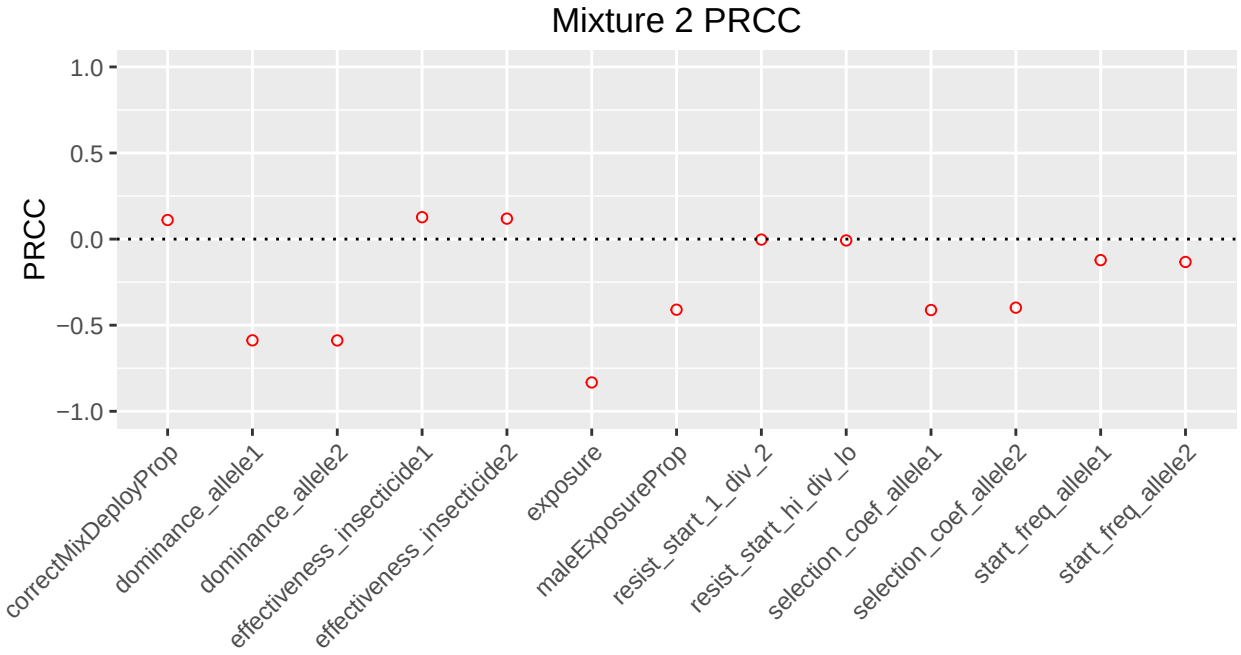

**trying a PRCC analysis using the package sensitivity**

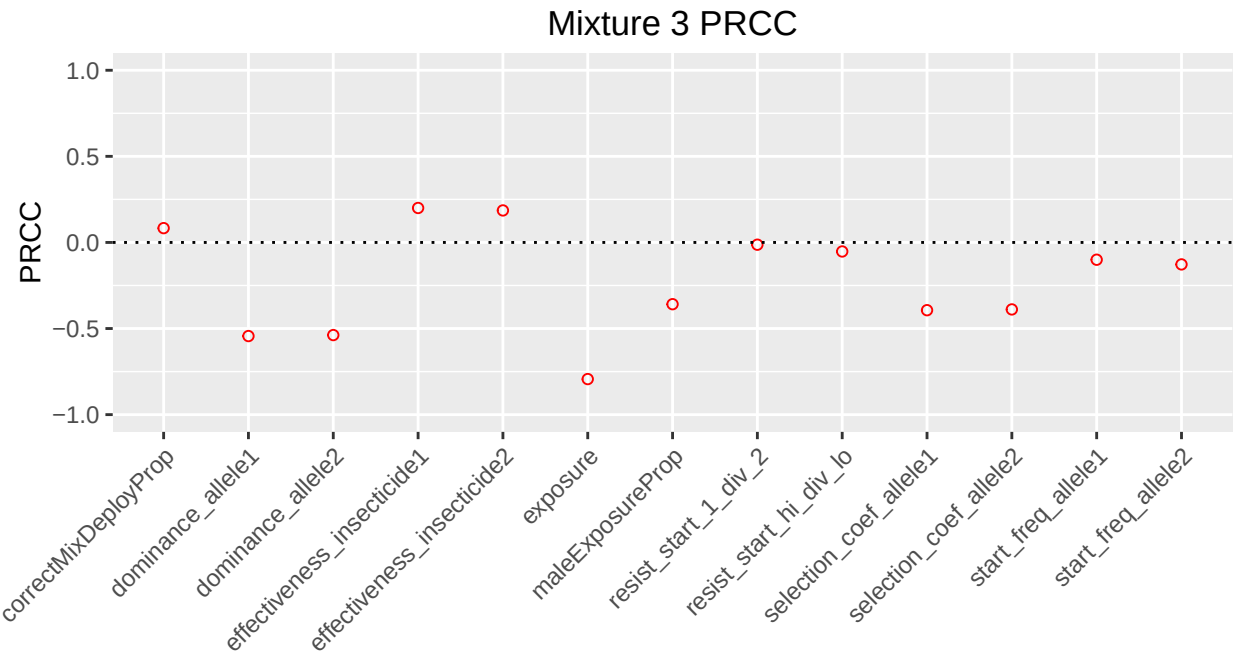



insecticide 2 PRCC
PRCC
1.0
0.5
0.0
−0.5
−1.0
correctMixDeployProp
dominance_allele1
dominance_allele2
effectiveness_insecticide1
effectiveness_insecticide2
exposure
maleExposureProp
resist_start_1_div_2
resist_start_hi_div_lo
selection_coef_allele1
selection_coef_allele2
start_freq_allele1
start_freq_allele2

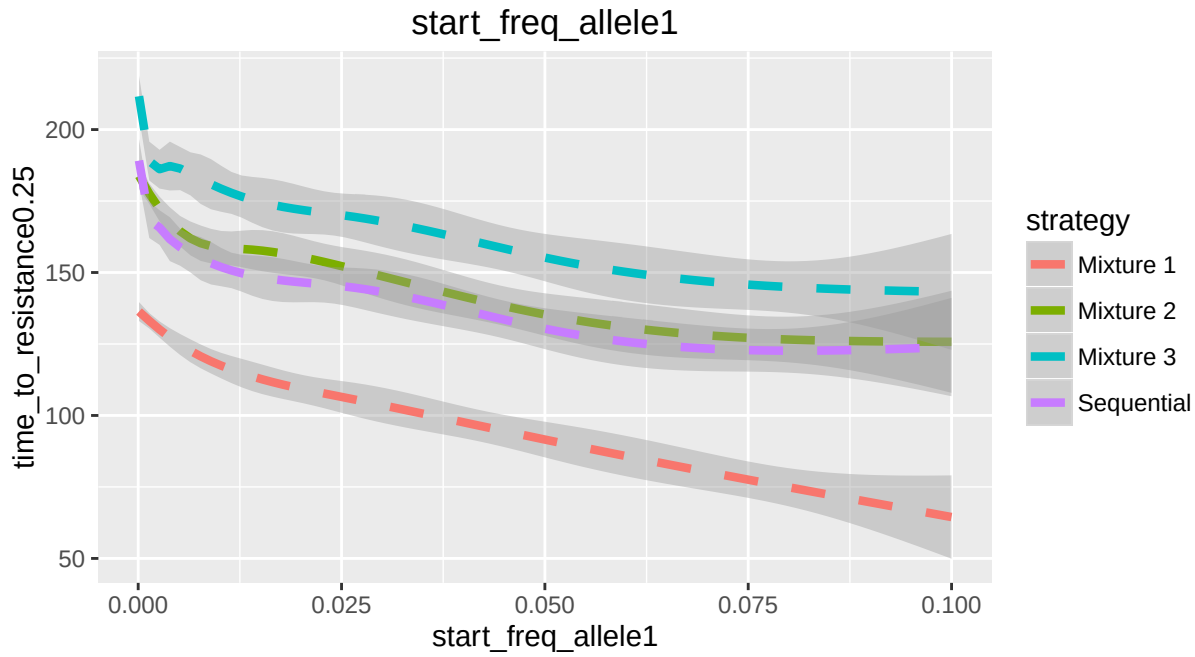

Sequential PRCC
PRCC
1.0
0.5
0.0
−0.5
−1.0
correctMixDeployProp
dominance_allele1
dominance_allele2
effectiveness_insecticide1
effectiveness_insecticide2
exposure
maleExposureProp
resist_start_1_div_2
resist_start_hi_div_lo
selection_coef_allele1
selection_coef_allele2
start_freq_allele1
start_freq_allele2

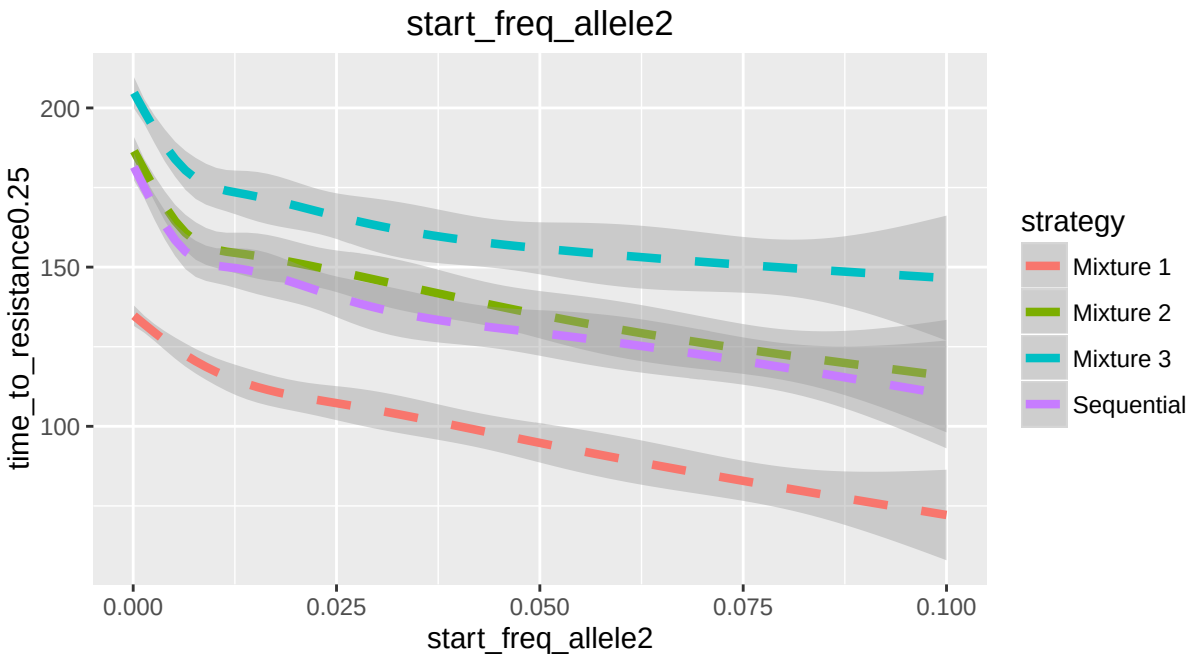

Mixture 1 PRCC
PRCC
1.0
0.5
0.0
−0.5
−1.0
correctMixDeployProp
dominance_allele1
dominance_allele2
effectiveness_insecticide1
effectiveness_insecticide2
exposure
maleExposureProp
resist_start_1_div_2
resist_start_hi_div_lo
selection_coef_allele1
selection_coef_allele2
start_freq_allele1
start_freq_allele2

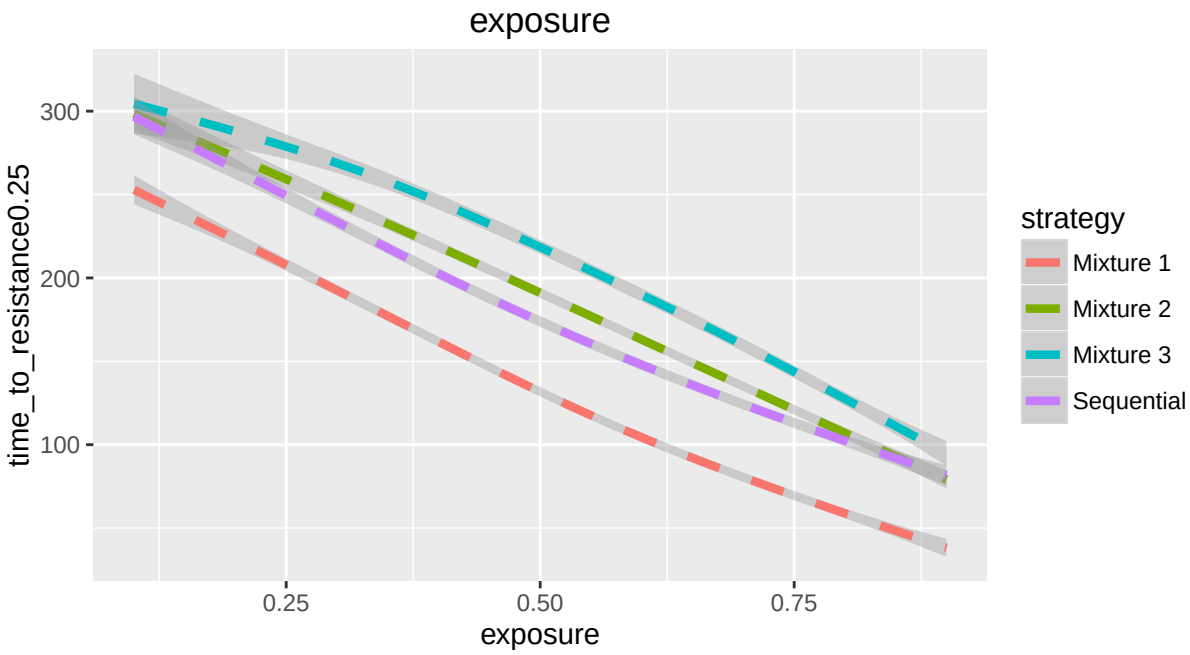

Mixture 2 PRCC
PRCC
1.0
0.5
0.0
−0.5
−1.0
correctMixDeployProp
dominance_allele1
dominance_allele2
effectiveness_insecticide1
effectiveness_insecticide2
exposure
maleExposureProp
resist_start_1_div_2
resist_start_hi_div_lo
selection_coef_allele1
selection_coef_allele2
start_freq_allele1
start_freq_allele2

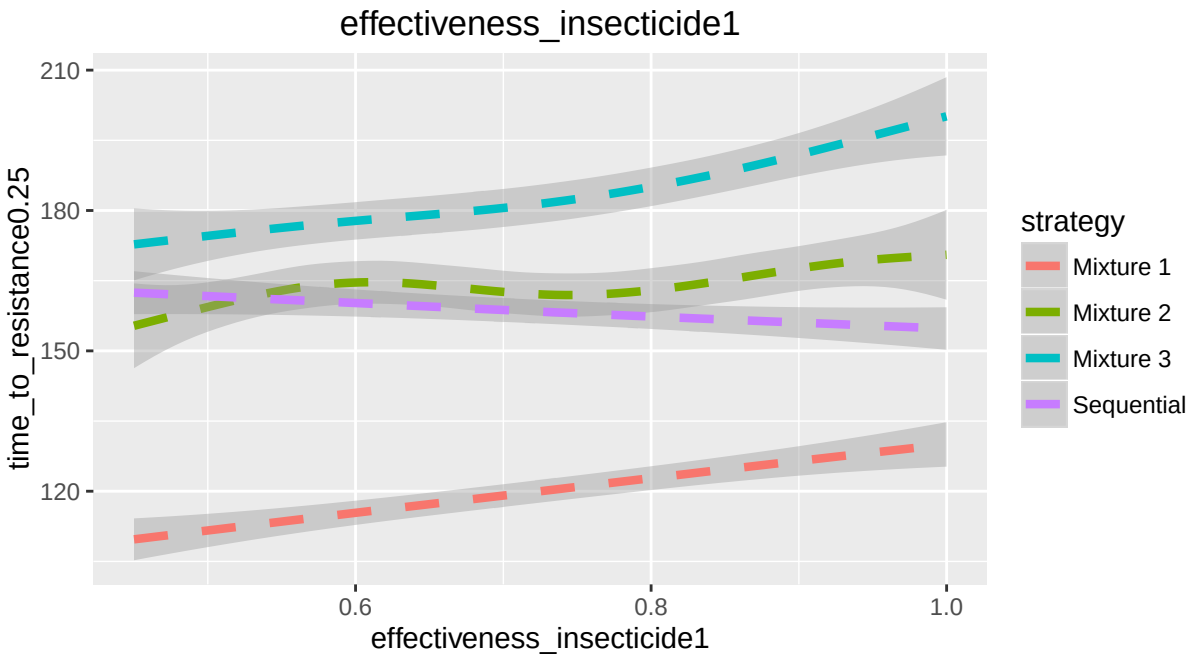


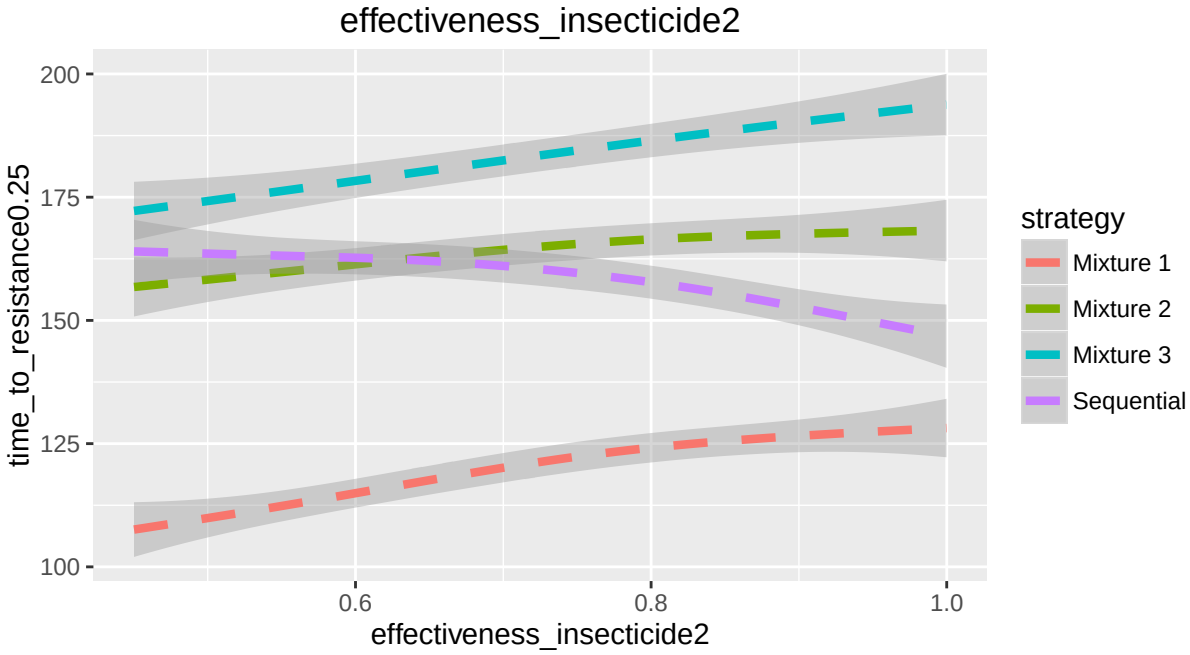

**trying to highlight differences between sequential and mixture strategies in response of time-to-resistance to inputs**

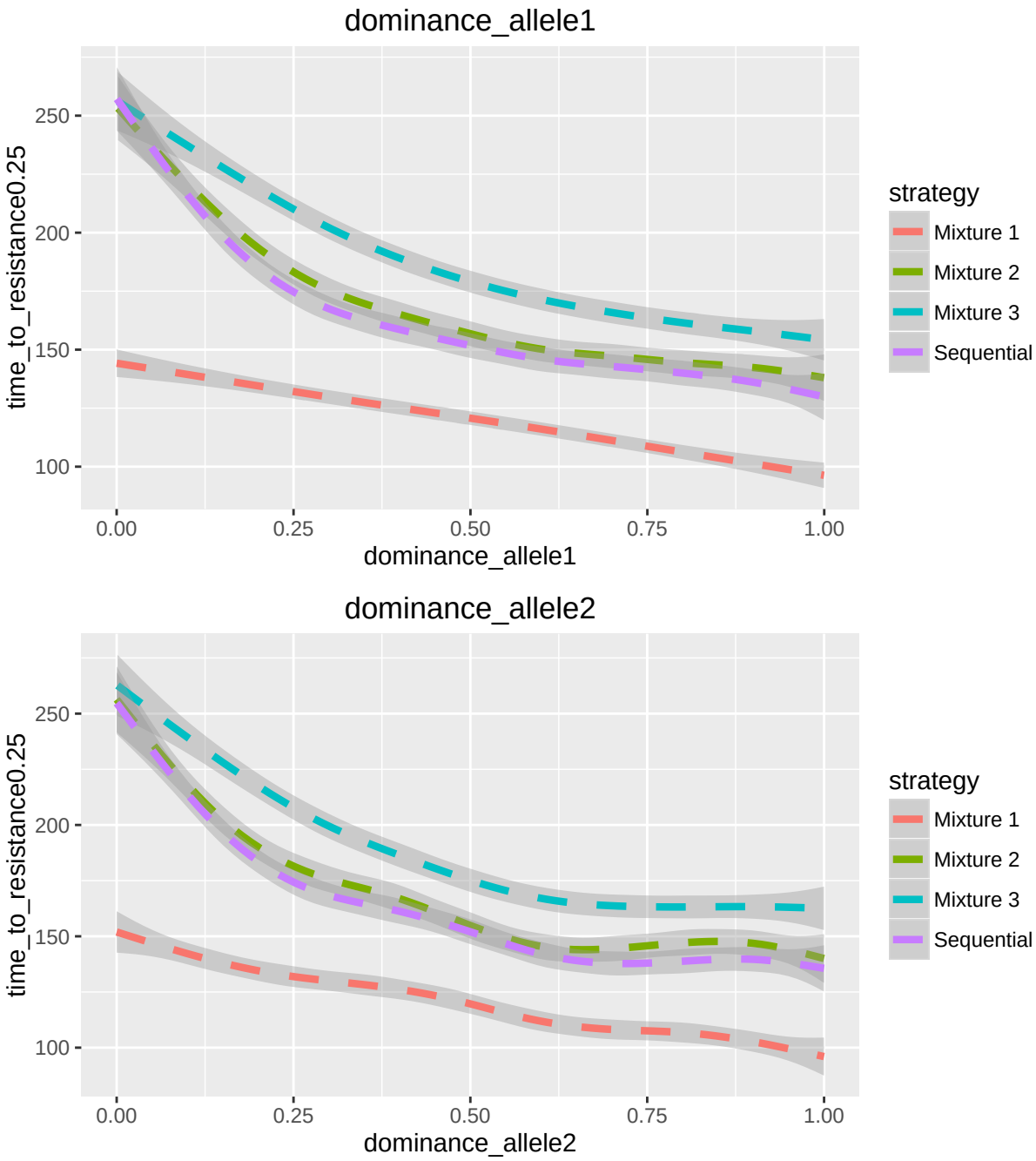


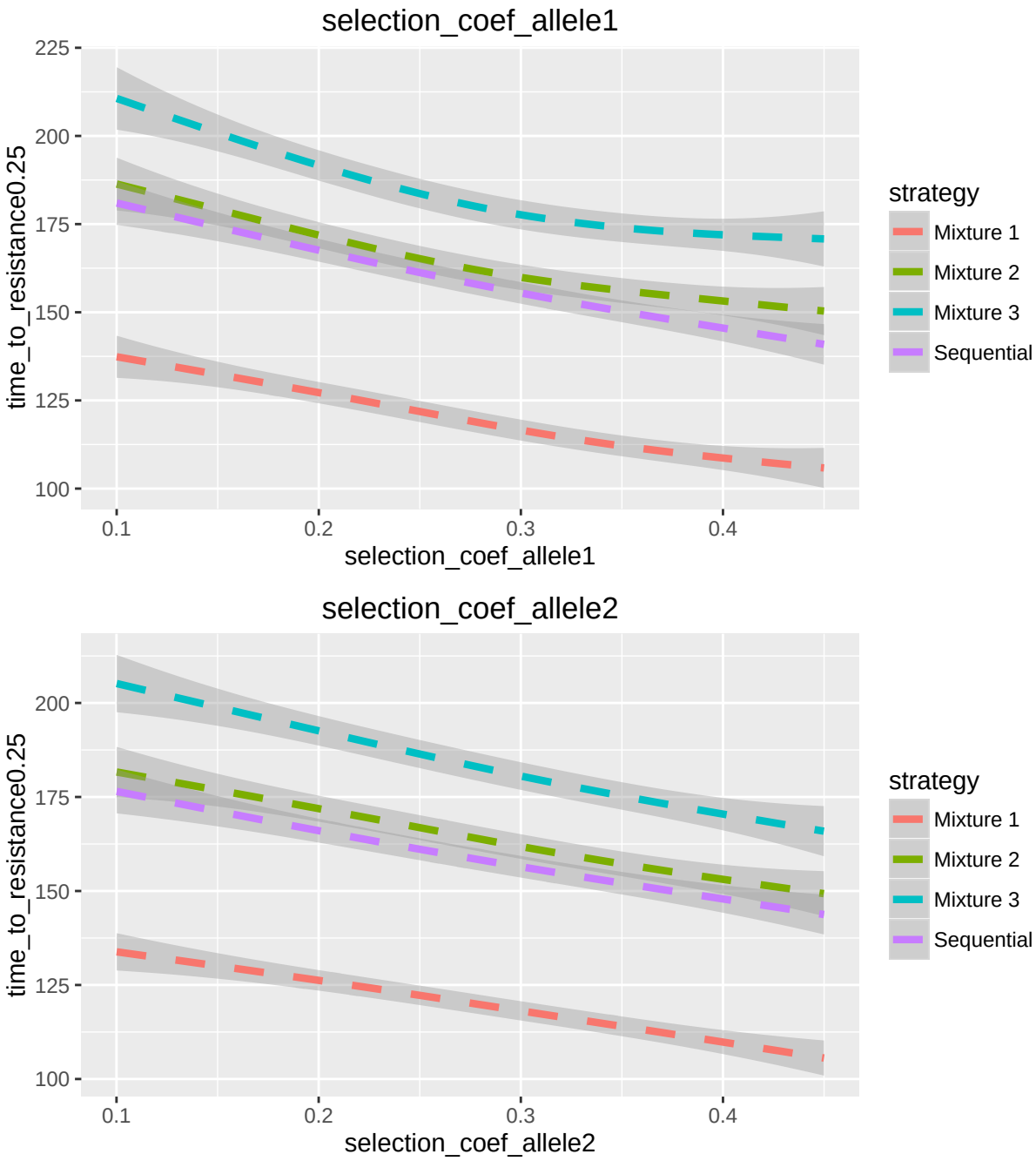

start_freq_allele2
time_to_resistance0.25
200
150
100
0.000
0.025
0.050
0.075
0.100
start_freq_allele2
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

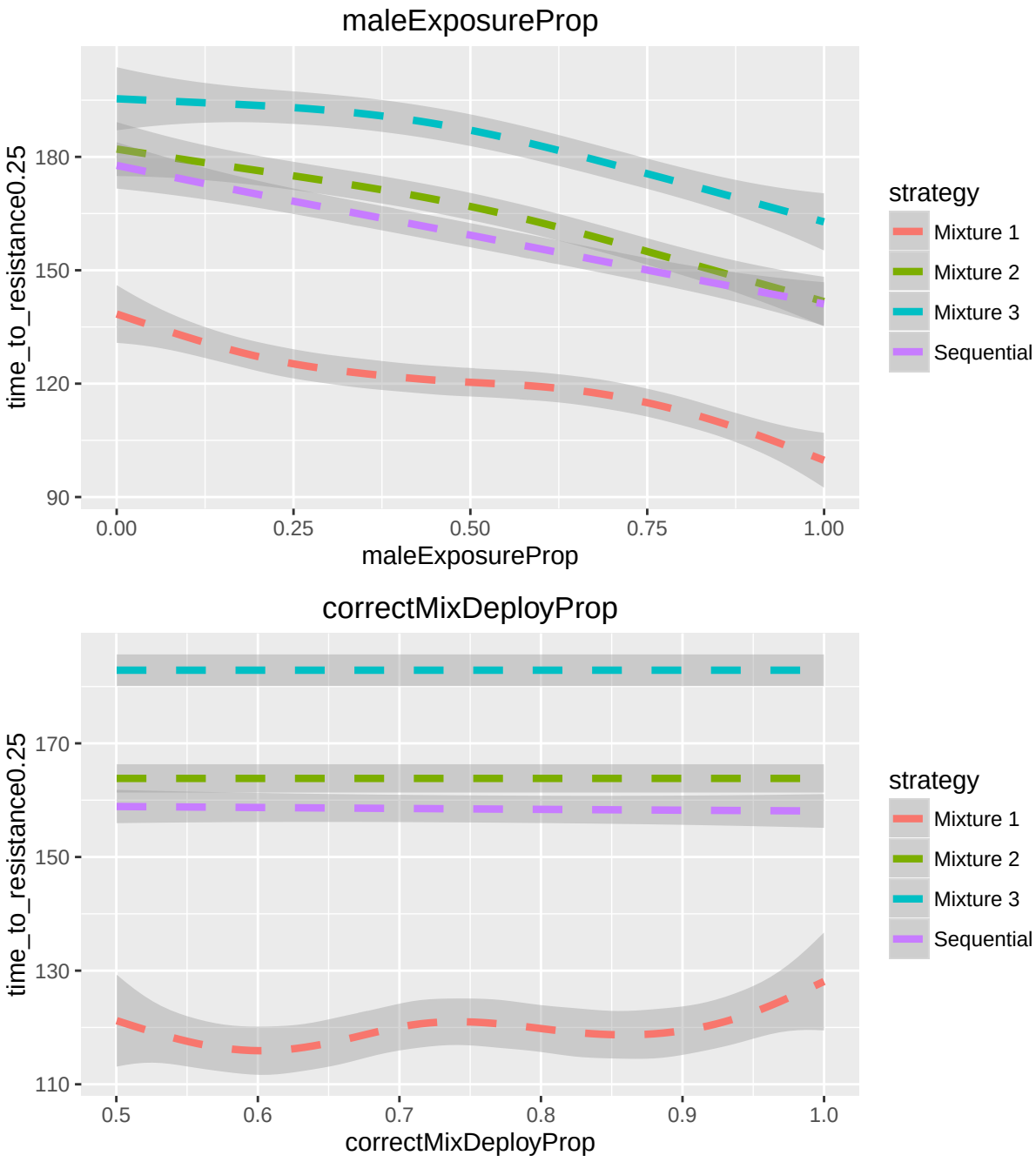

exposure
time_to_resistance0.25
300
200
100
0.25
0.50
0.75
exposure
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

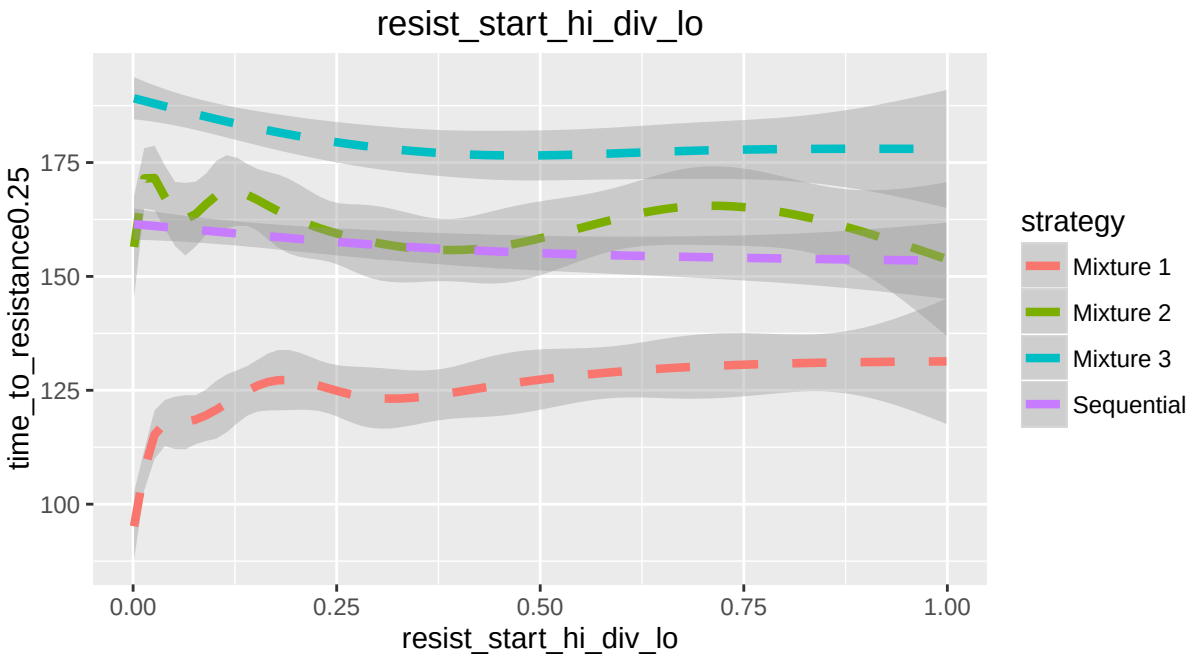

effectiveness_insecticide1
time_to_resistance0.25
210
180
150
120
0.6
0.8
1.0
effectiveness_insecticide1
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

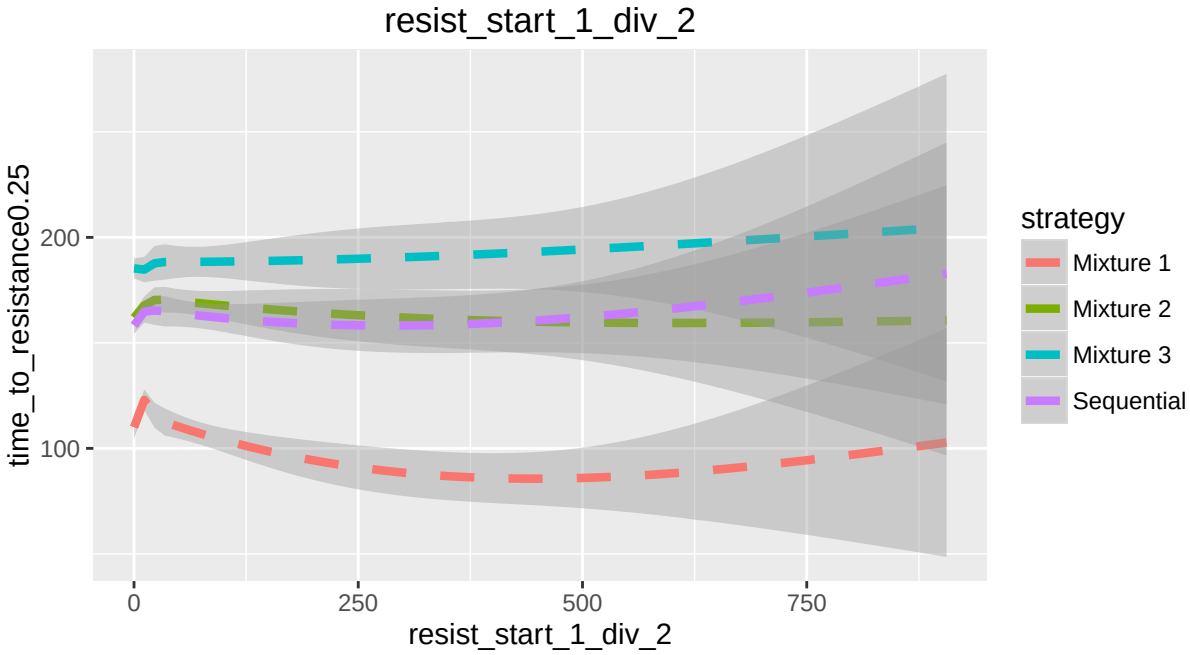

effectiveness_insecticide2
time_to_resistance0.25
200
175
150
125
100
0.6
0.8
1.0
effectiveness_insecticide2
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential


dominance_allele1
time_to_resistance0.25
250
200
150
100
0.00
0.25
0.50
0.75
1.00
dominance_allele1
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential
dominance_allele2
time_to_resistance0.25
250
200
150
100
0.00
0.25
0.50
0.75
1.00
dominance_allele2
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

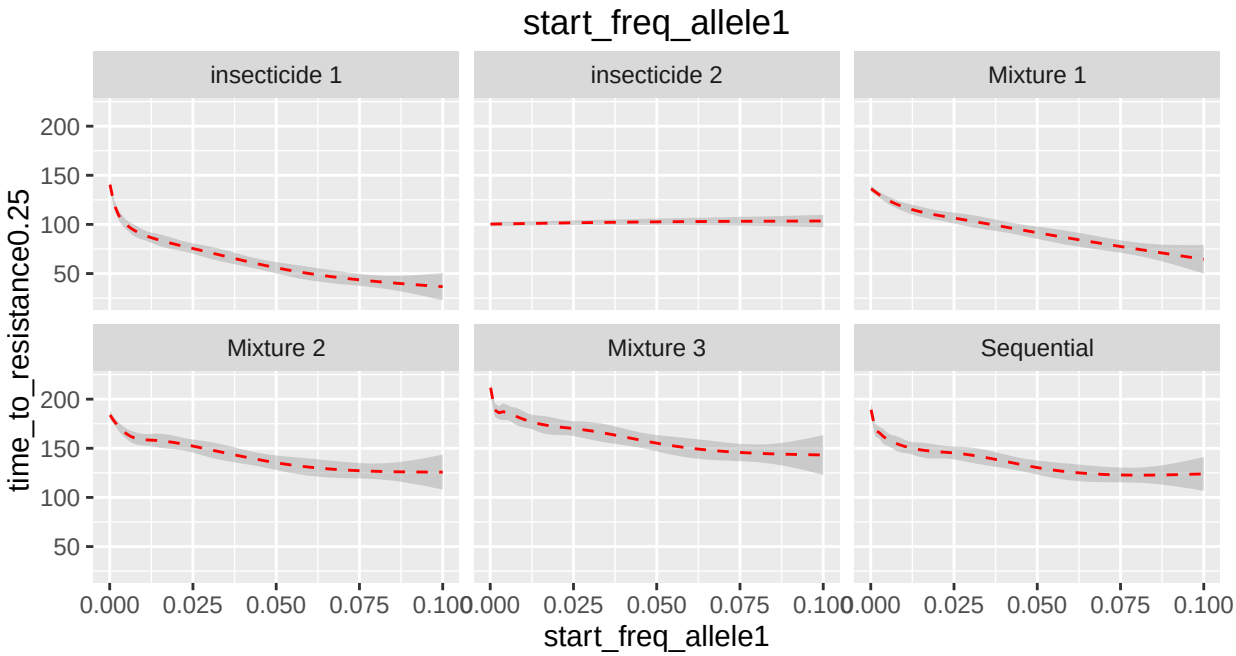

selection_coef_allele1
time_to_resistance0.25
225
200
175
150
125
100
0.1
0.2
0.3
0.4
selection_coef_allele1
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential
selection_coef_allele2
time_to_resistance0.25
200
175
150
125
100
0.1
0.2
0.3
0.4
selection_coef_allele2
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

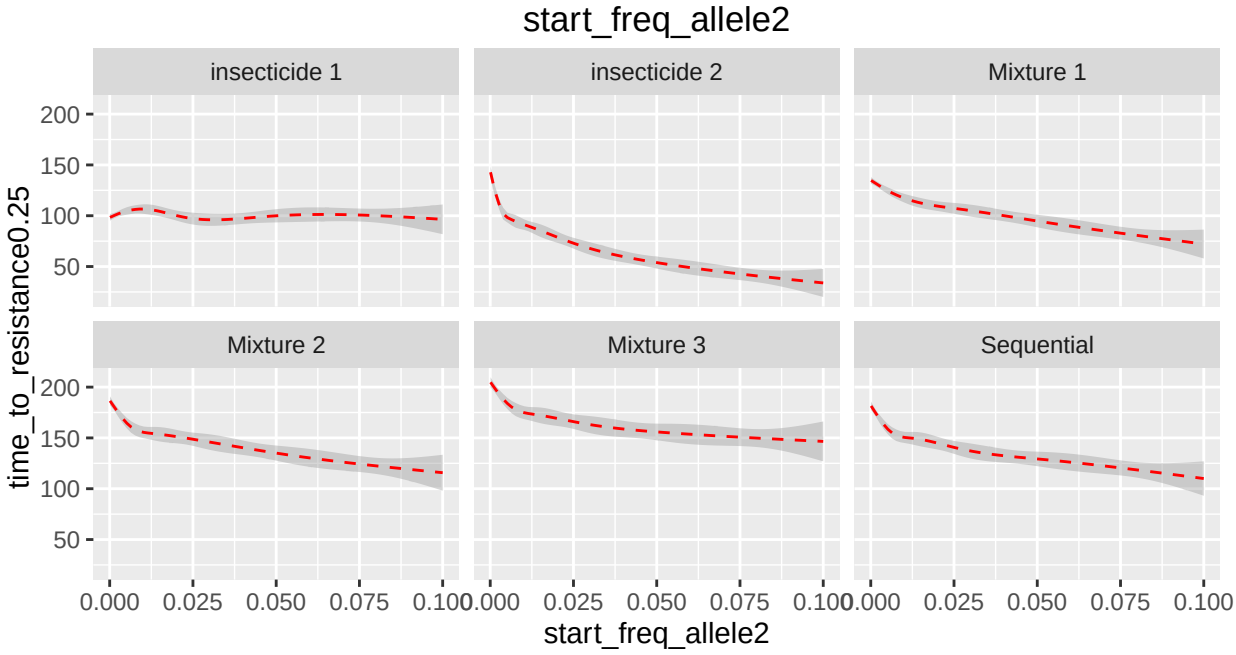

maleExposureProp
time_to_resistance0.25
180
150
120
90
0.00
0.25
0.50
0.75
1.00
maleExposureProp
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential
correctMixDeployProp
time_to_resistance0.25
170
150
130
110
0.5
0.6
0.7
0.8
0.9
1.0
correctMixDeployProp
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

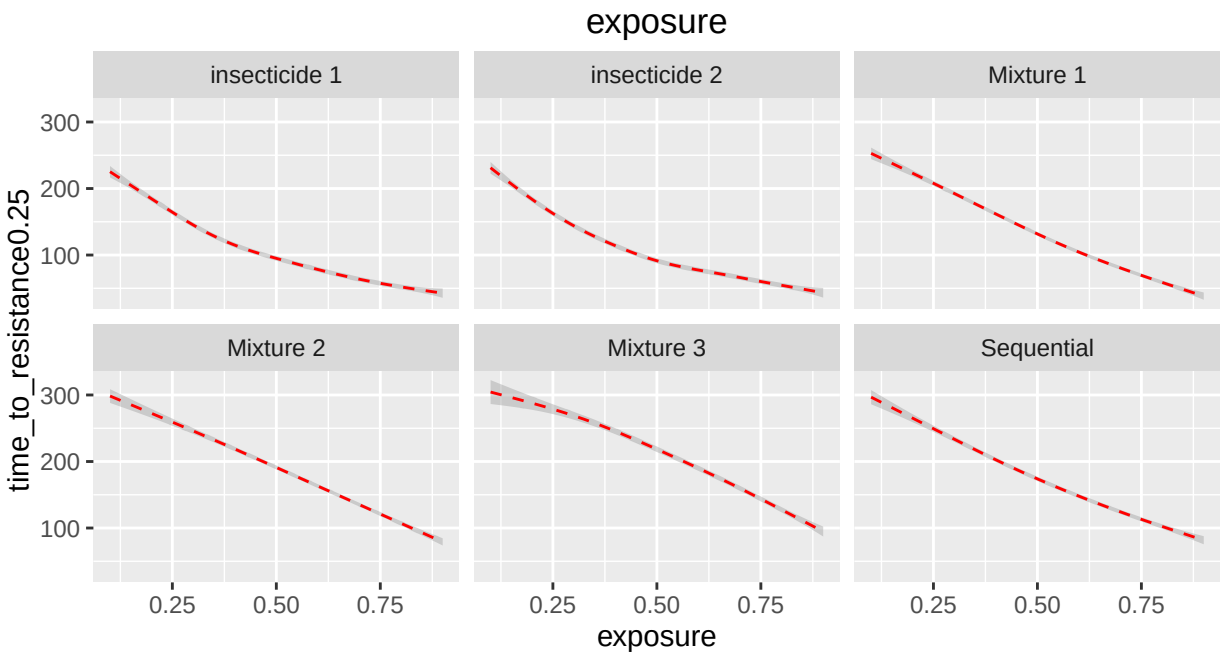

resist_start_hi_div_lo
time_to_resistance0.25
175
150
125
100
0.00
0.25
0.50
0.75
1.00
resist_start_hi_div_lo
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

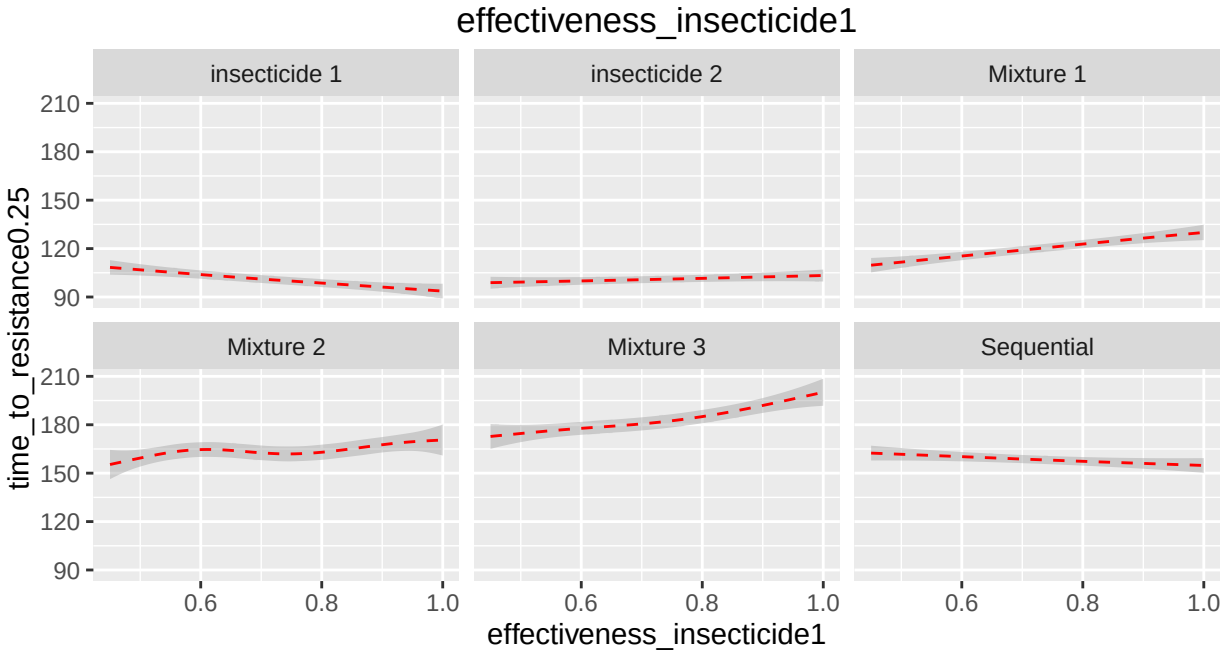

resist_start_1_div_2
time_to_resistance0.25
200
100
0
250
500
750
resist_start_1_div_2
strategy
Mixture 1
Mixture 2
Mixture 3
Sequential

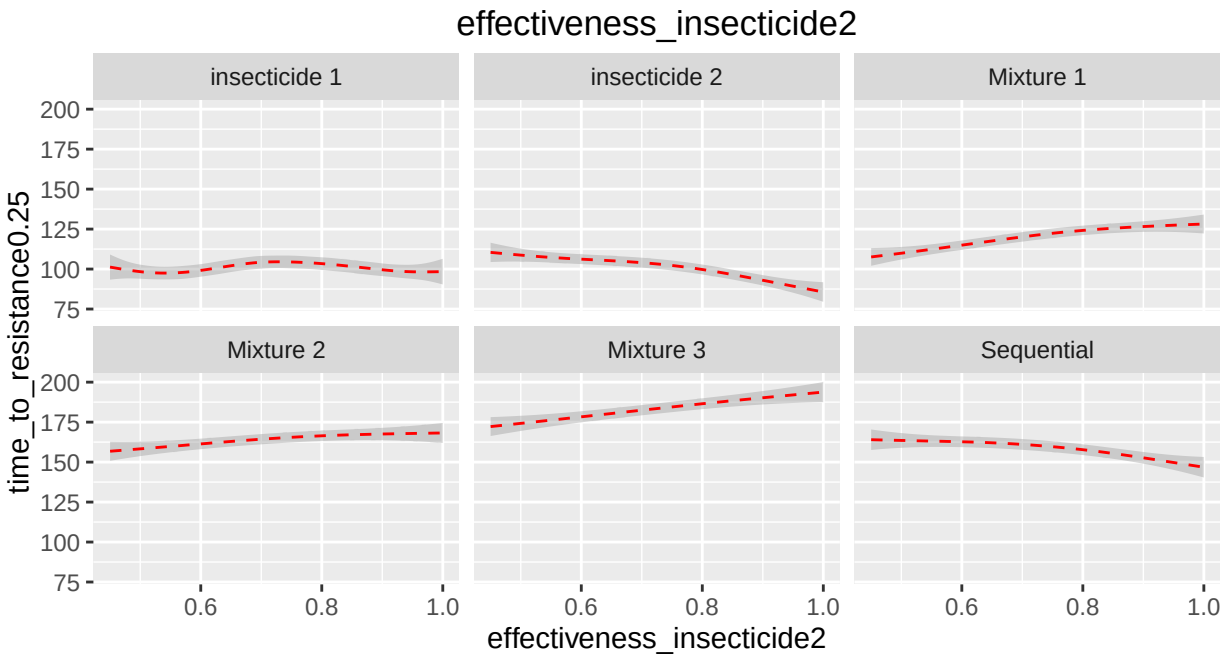
**response of resistance thresholds to individual inputs faceted by strategy**

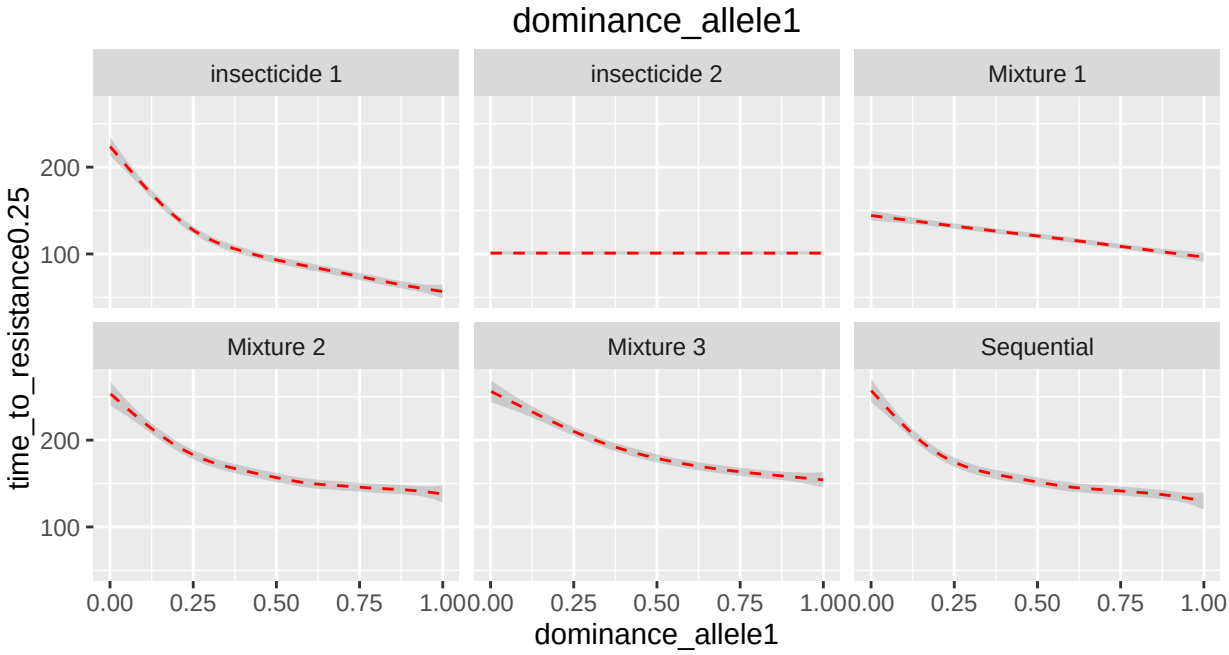


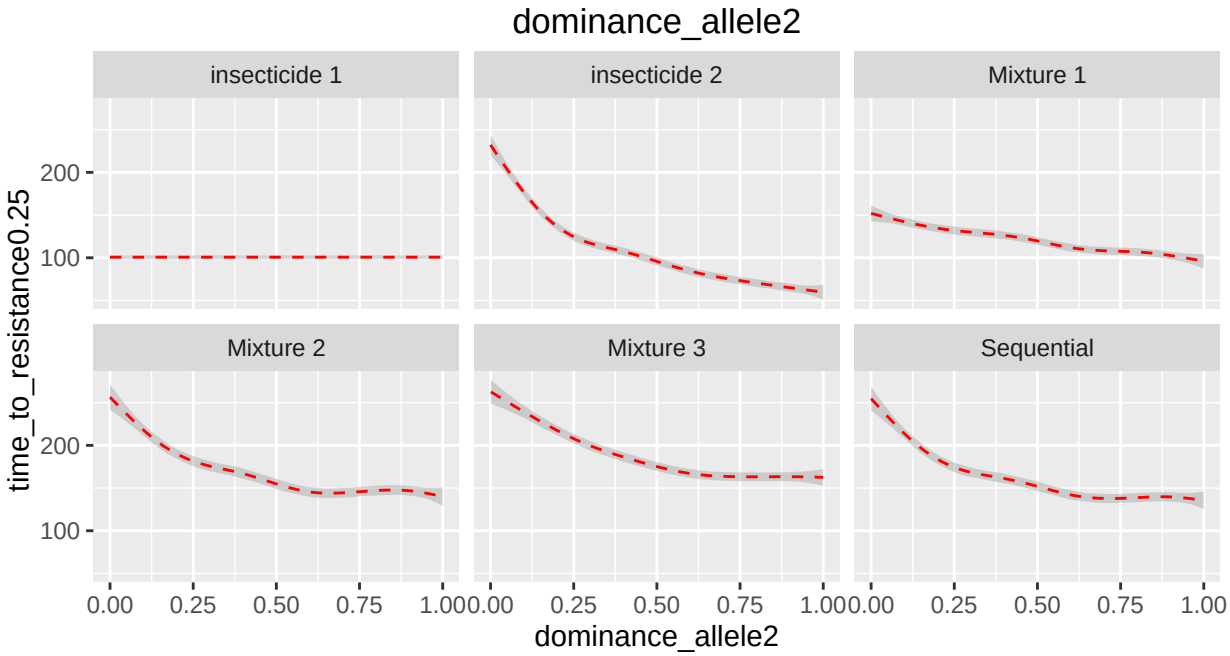



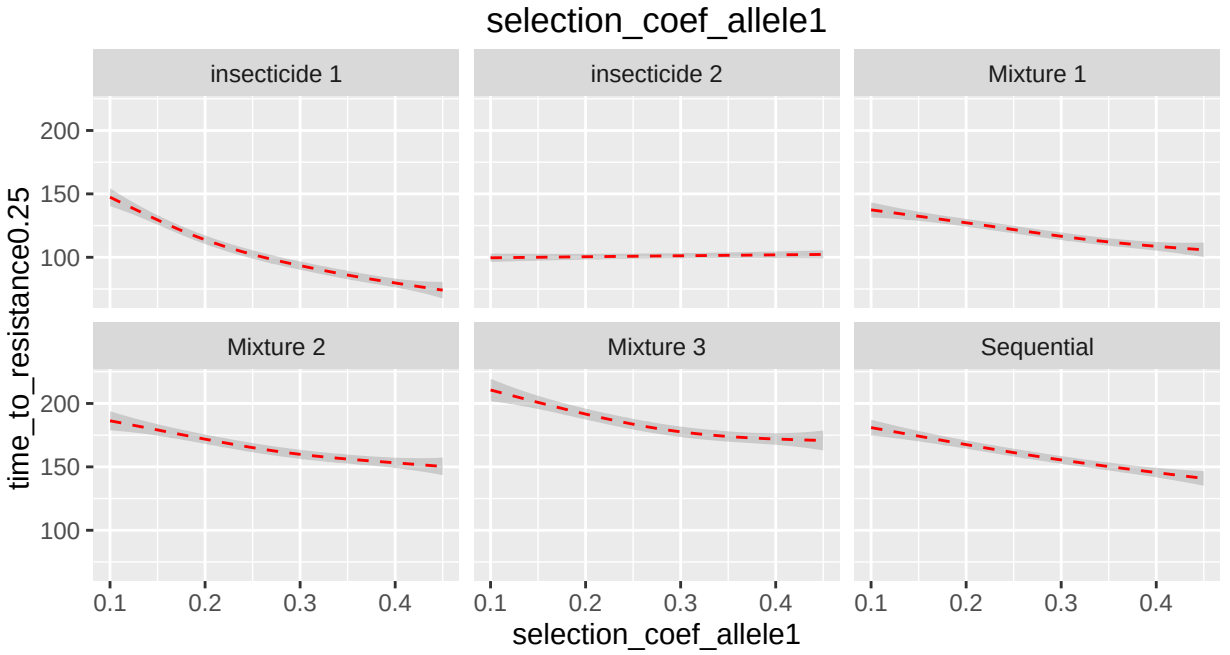

exposure
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
300
200
100
0.25
0.50
0.75
exposure

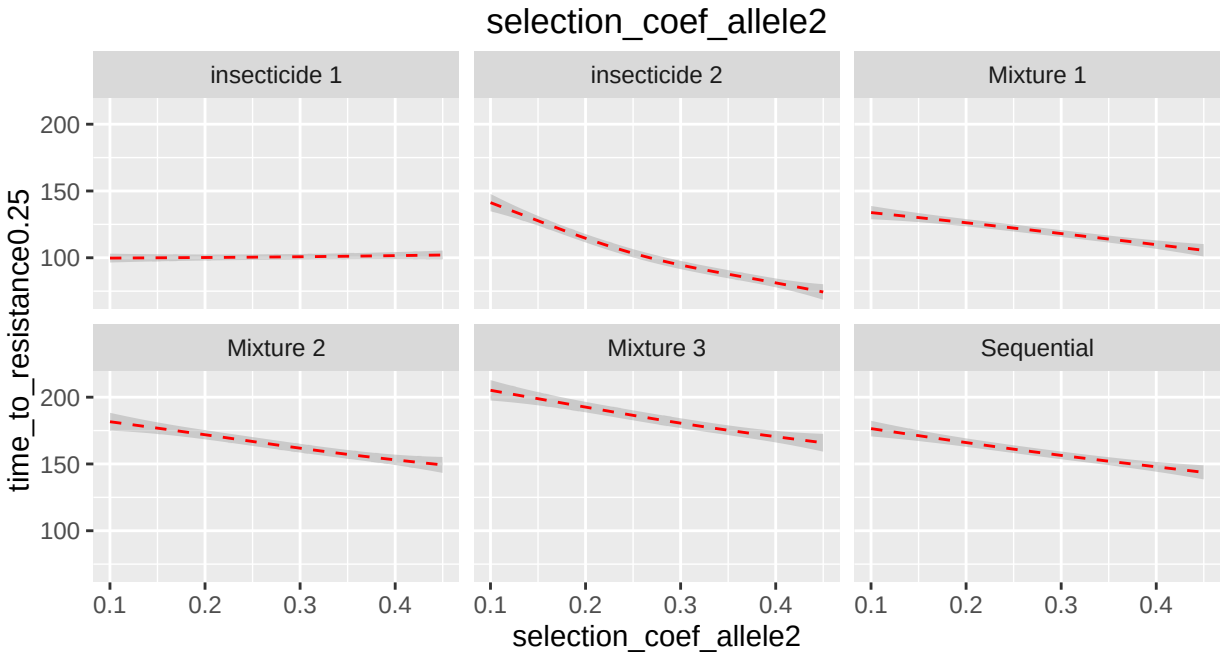

effectiveness_insecticide1
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
210
180
150
120
90
0.6
0.8
1.0
effectiveness_insecticide1

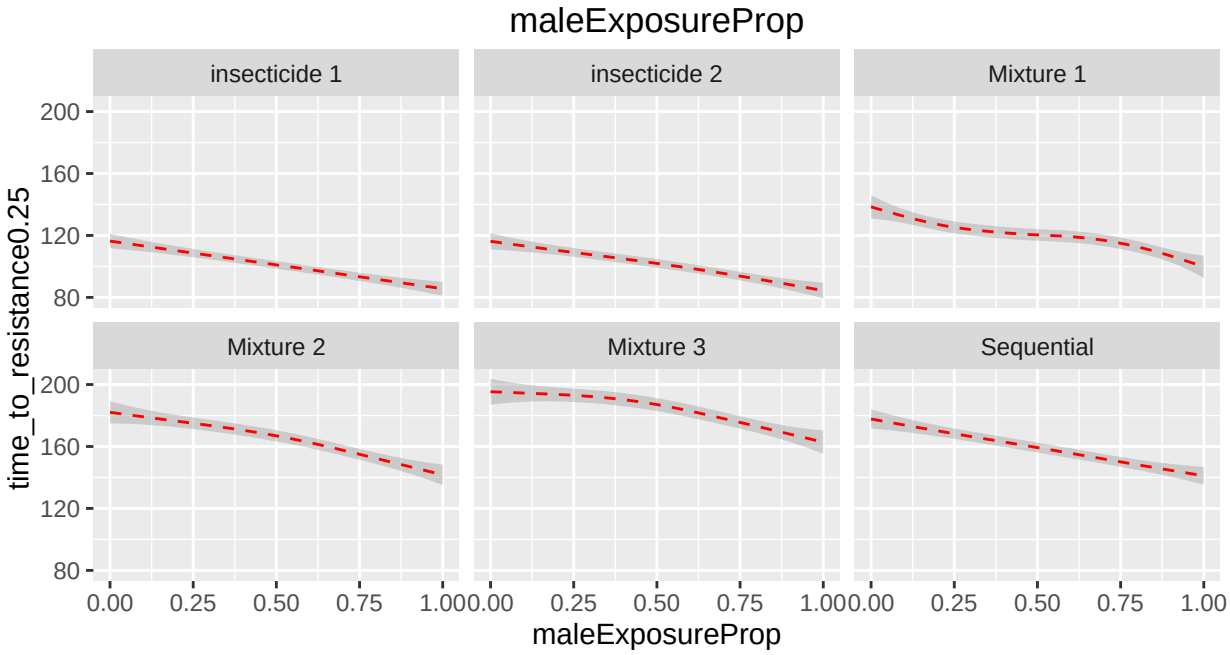

effectiveness_insecticide2
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
200
175
150
125
100
75
0.6
0.8
1.0
effectiveness_insecticide2

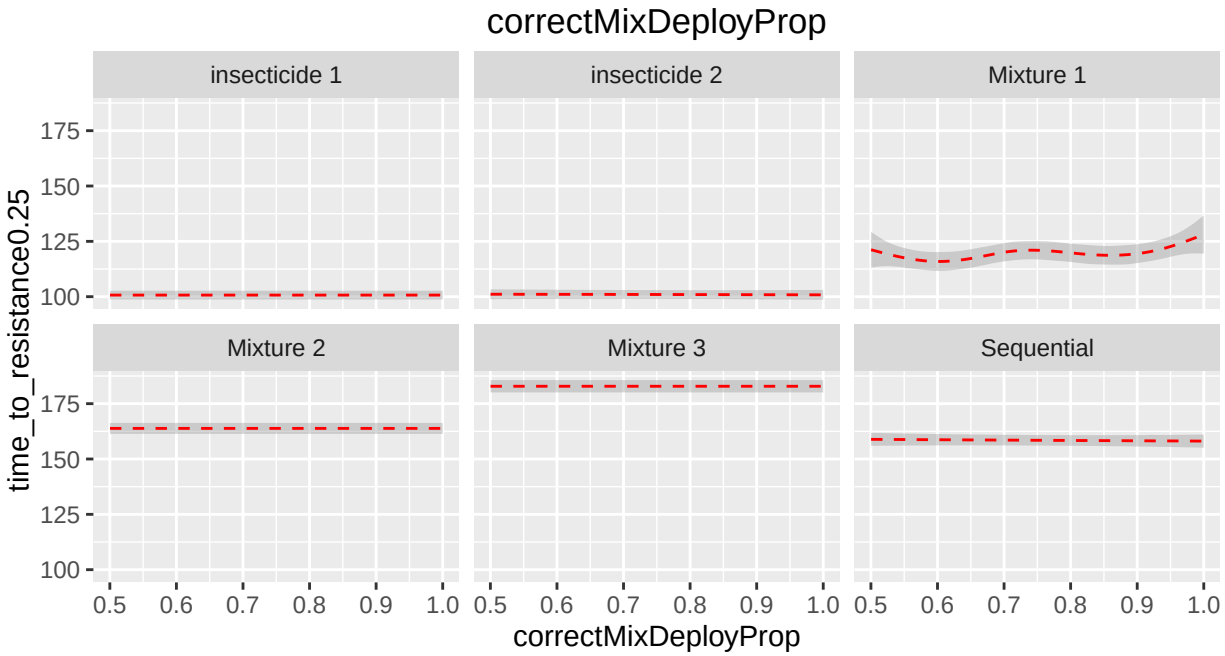

dominance_allele1
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
200
100
0.00
0.25
0.50
0.75
1.00
dominance_allele1

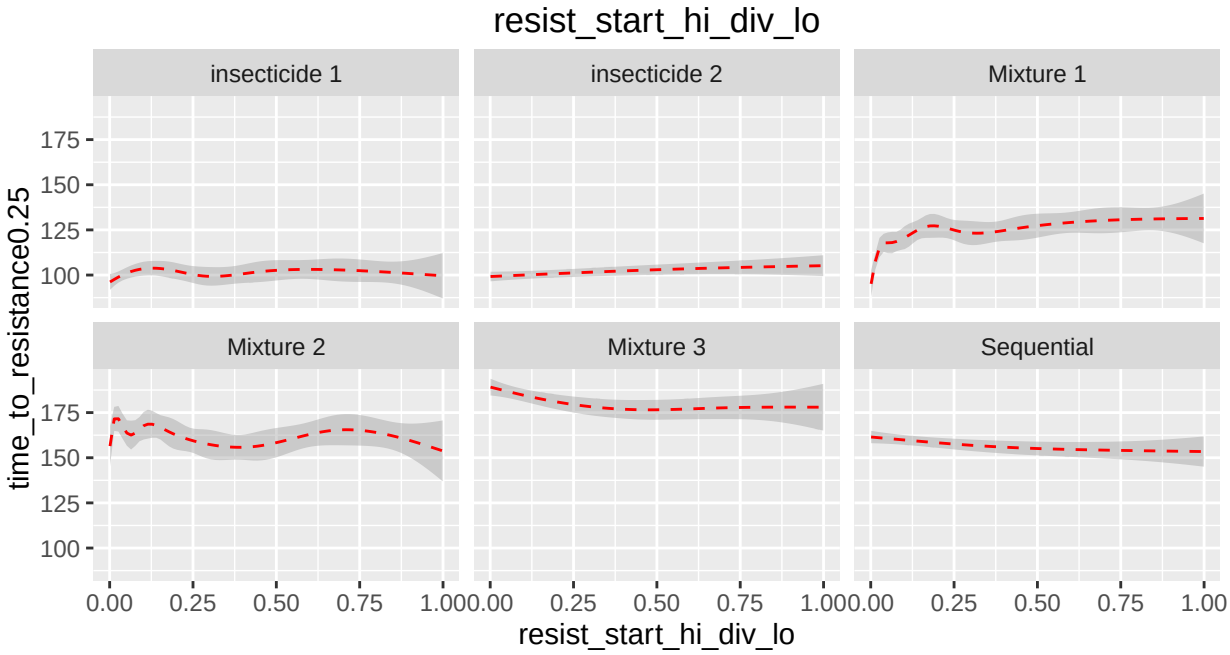

dominance_allele2
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
200
100
0.00
0.25
0.50
0.75
1.00
dominance_allele2

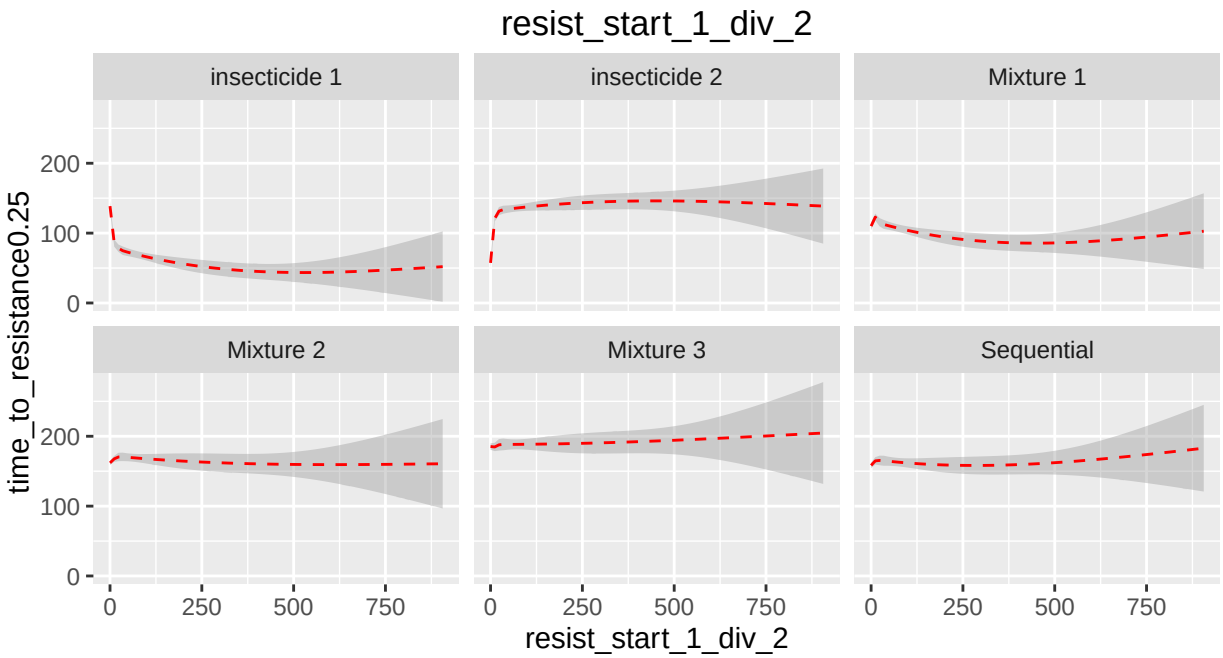

selection_coef_allele1
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
200
150
100
0.1
0.2
0.3
0.4
selection_coef_allele1


selection_coef_allele2
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
200
150
100
0.1
0.2
0.3
0.4
selection_coef_allele2


maleExposureProp
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
200
160
120
80
0.00
0.25
0.50
0.75
1.00
maleExposureProp


correctMixDeployProp
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
175
150
125
100
0.5
0.6
0.7
0.8
0.9
1.0
correctMixDeployProp


resist_start_hi_div_lo
insecticide 1
insecticide 2
Mixture 1
Mixture 2
Mixture 3
Sequential
time_to_resistance0.25
175
150
125
100
0.00
0.25
0.50
0.75
1.00
resist_start_hi_div_lo




**Looking more closely at ratio between the level of resistance to the first insecticide divided by that of the second one. Restricting the x axis to lower values.**

**?not very useful**