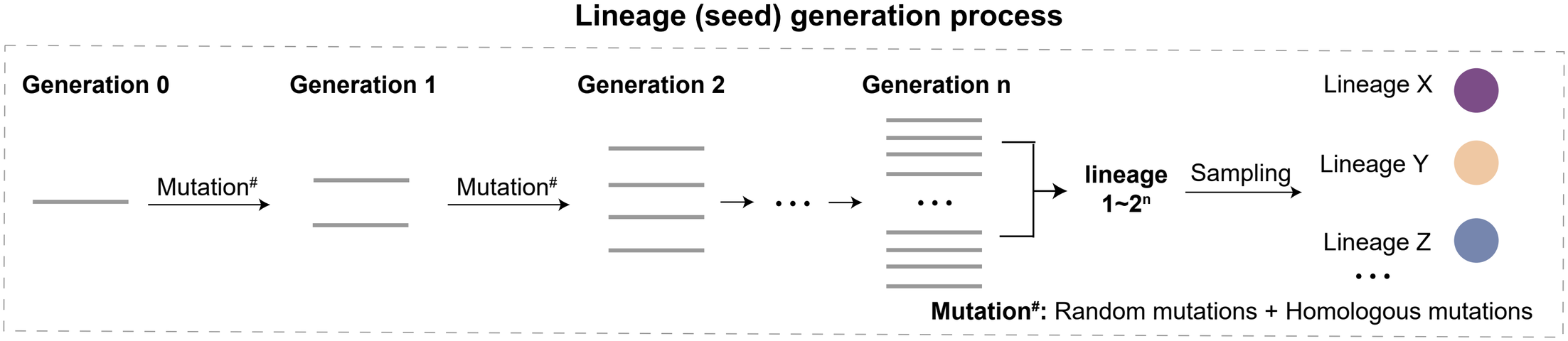
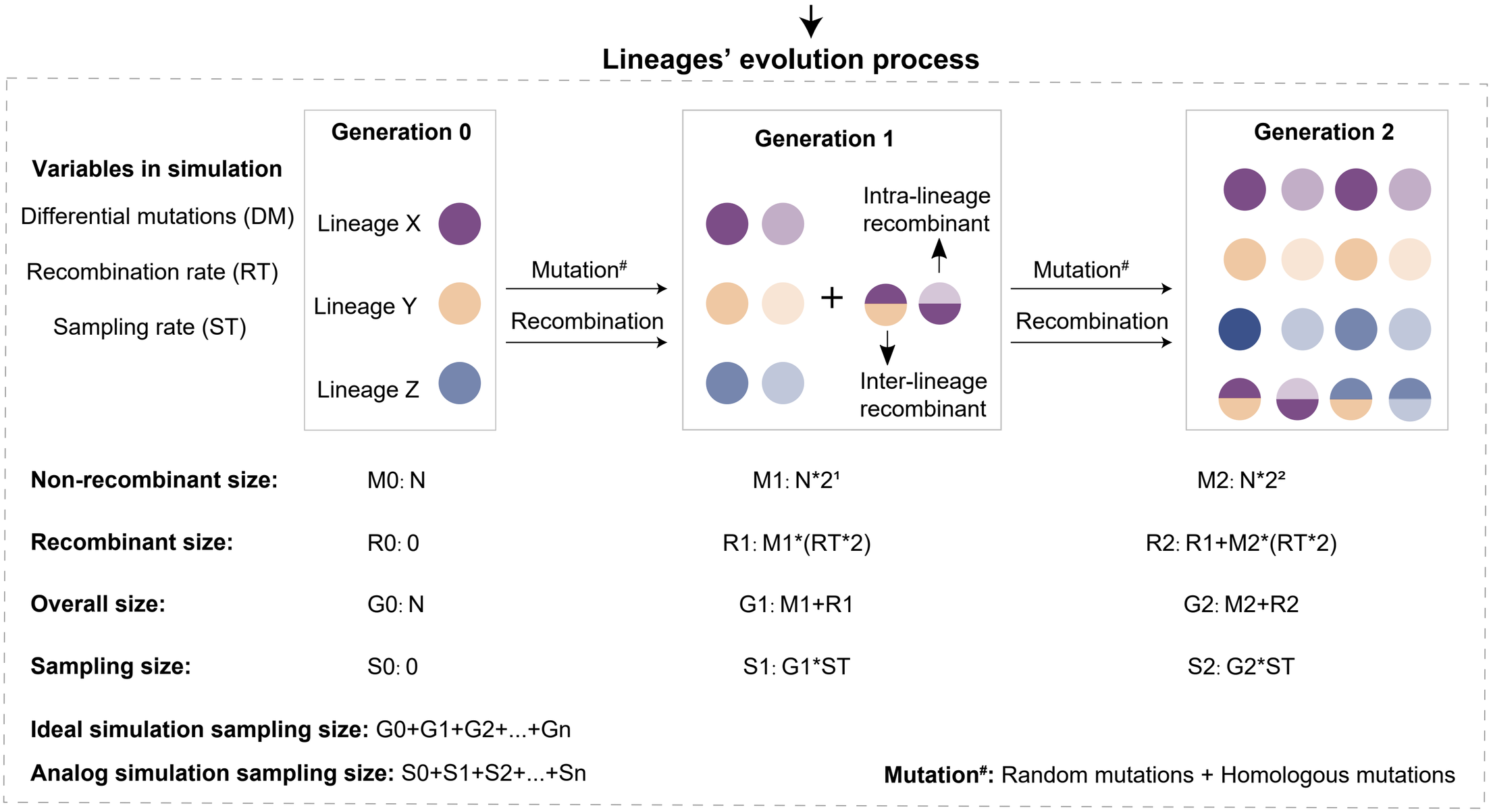
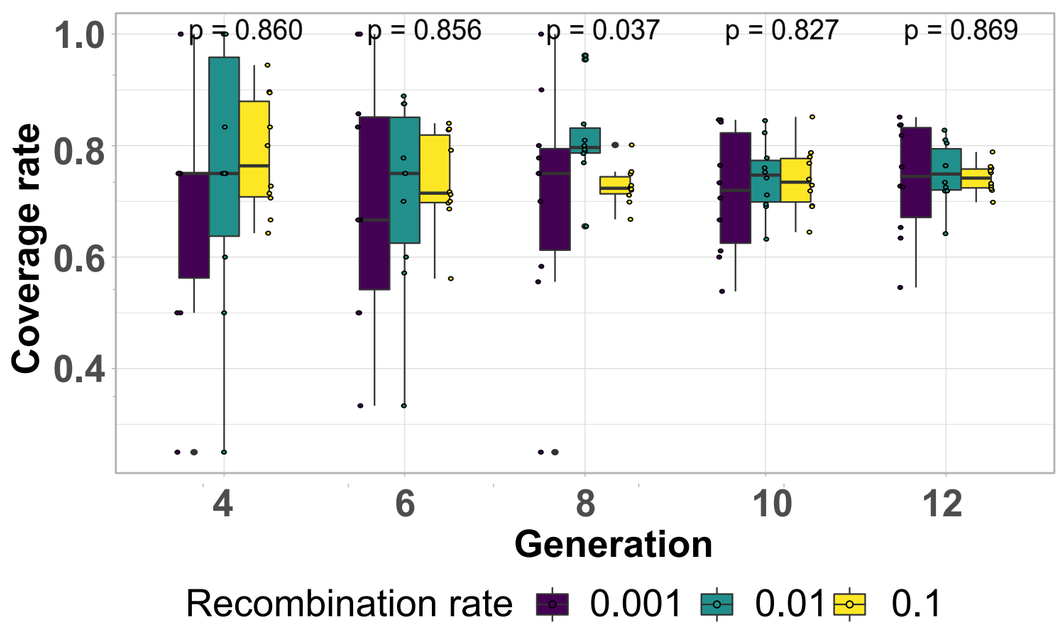
A

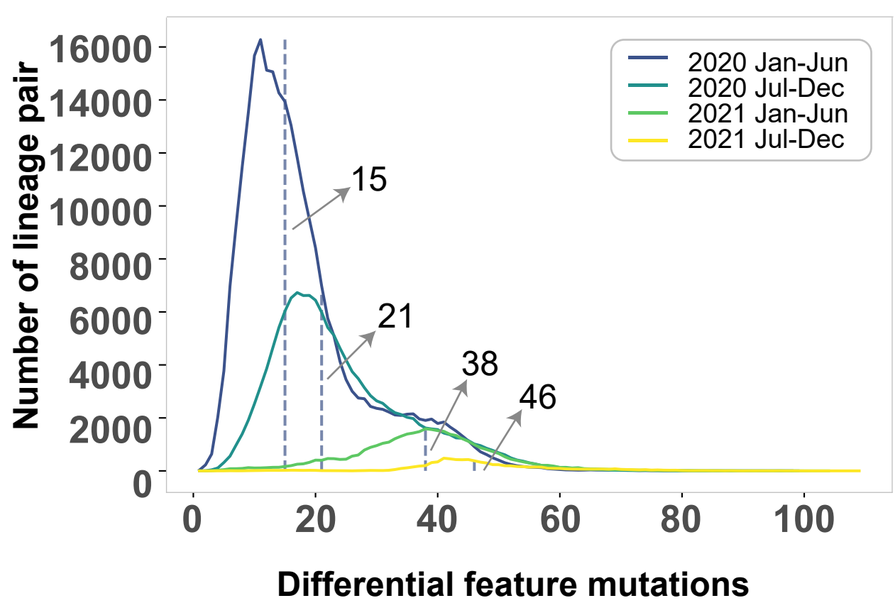

Lineage (seed) generation process
Generation 0
Generation 1
Generation 2
Generation n
Mutation#
Mutation#
lineage 1~2^n
Sampling
Lineage X
Lineage Y
Lineage Z
Mutation#: Random mutations + Homologous mutations


Lineages' evolution process
Variables in simulation
Differential mutations (DM)
Recombination rate (RT)
Sampling rate (ST)
Generation 0
Lineage X
Lineage Y
Lineage Z
Mutation#
Recombination
Generation 1
Intra-lineage recombinant
Inter-lineage recombinant
Mutation#
Recombination
Generation 2
Non-recombinant size: M0: N M1: N*2¹ M2: N*2²
Recombinant size: R0: 0 R1: M1*(RT*2) R2: R1+M2*(RT*2)
Overall size: G0: N G1: M1+R1 G2: M2+R2
Sampling size: S0: 0 S1: G1*ST S2: G2*ST
Ideal simulation sampling size: G0+G1+G2+...+Gn
Analog simulation sampling size: S0+S1+S2+...+Sn
Mutation#: Random mutations + Homologous mutations

B


p = 0.860
p = 0.856
p = 0.037
p = 0.827
p = 0.869
Coverage rate
1.0
0.8
0.6
0.4
4
6
8
10
12
Generation
Recombination rate 0.001 0.01 0.1

C


Number of lineage pair
16000
14000
12000
10000
8000
6000
4000
2000
0
2020 Jan-Jun
2020 Jul-Dec
2021 Jan-Jun
2021 Jul-Dec
15
21
38
46
0
20
40
60
80
100
Differential feature mutations