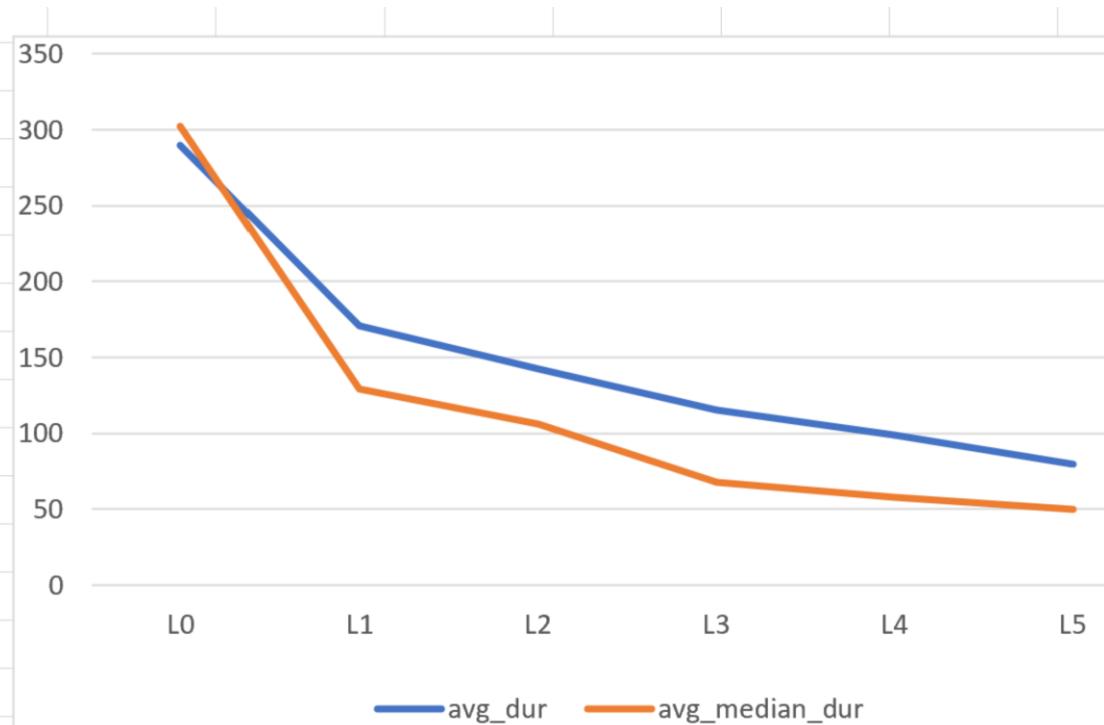


Simulation experiments were done using **100** human agents over **400** days when **no drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model)

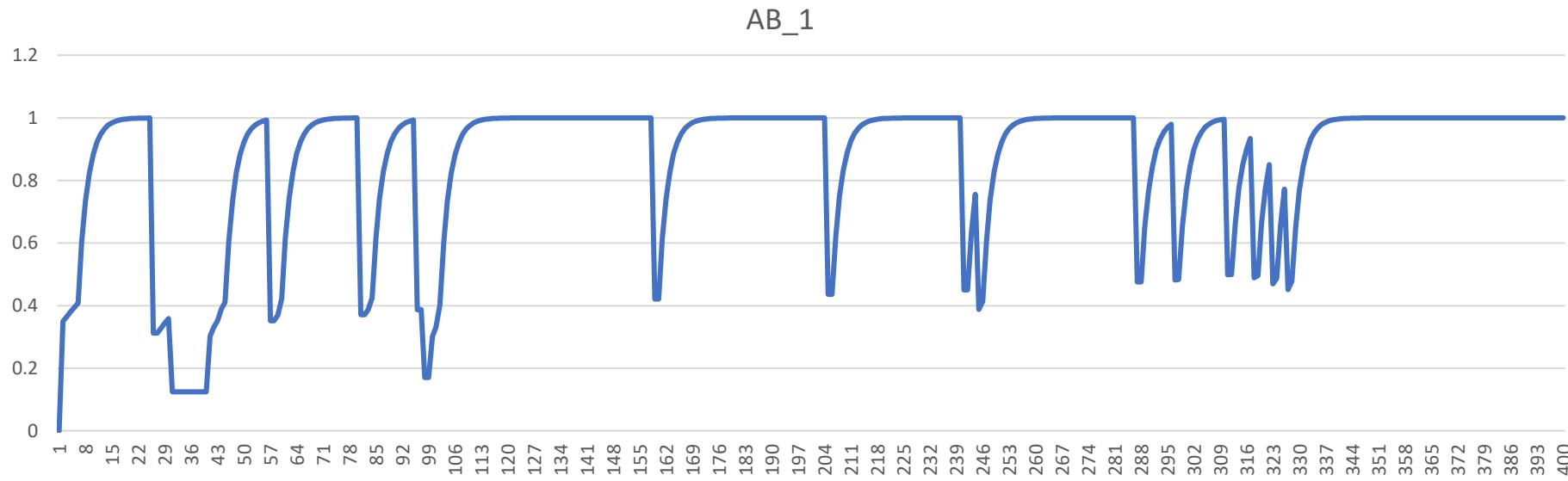
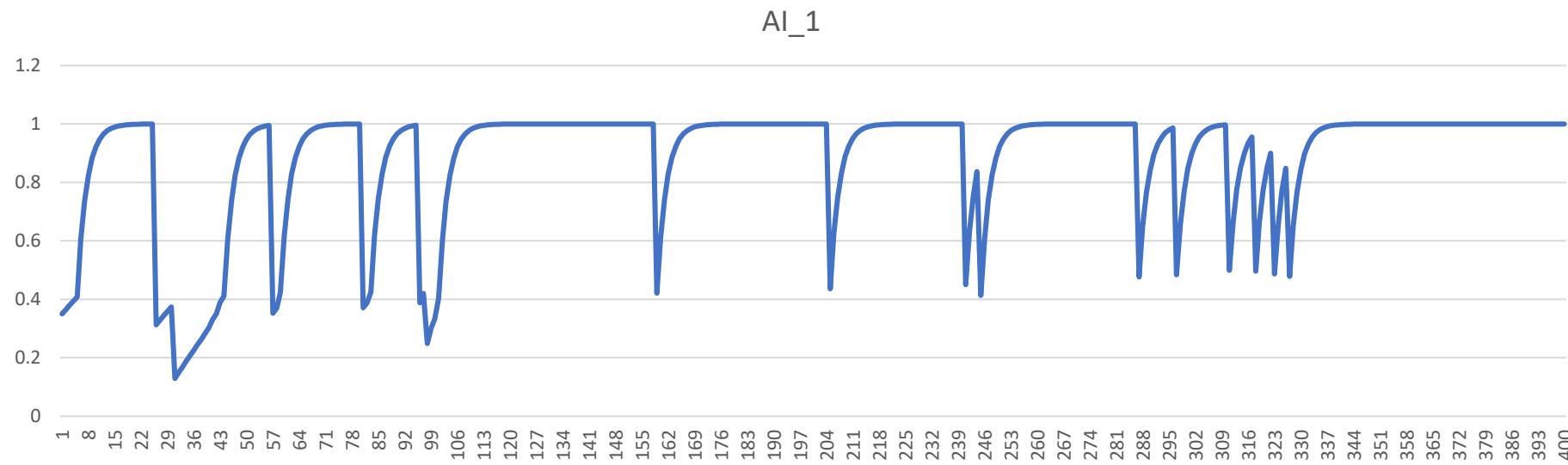
C++ model

	avg_dur	avg_median_dur
L0	289.72	302
L1	170.64	129
L2	142.5	106
L3	115.64	68
L4	98.9	58
L5	79.86	50



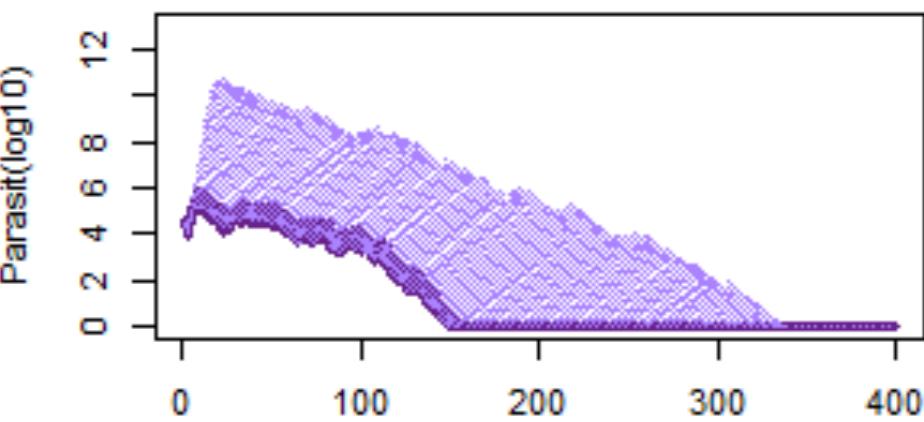
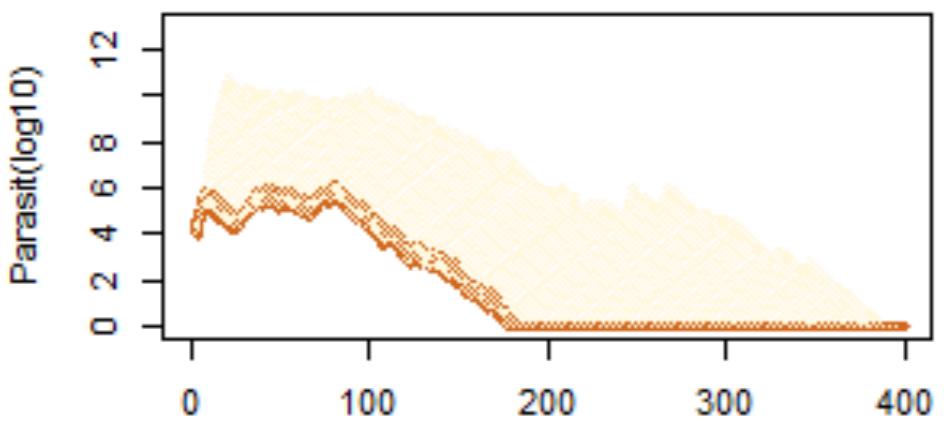
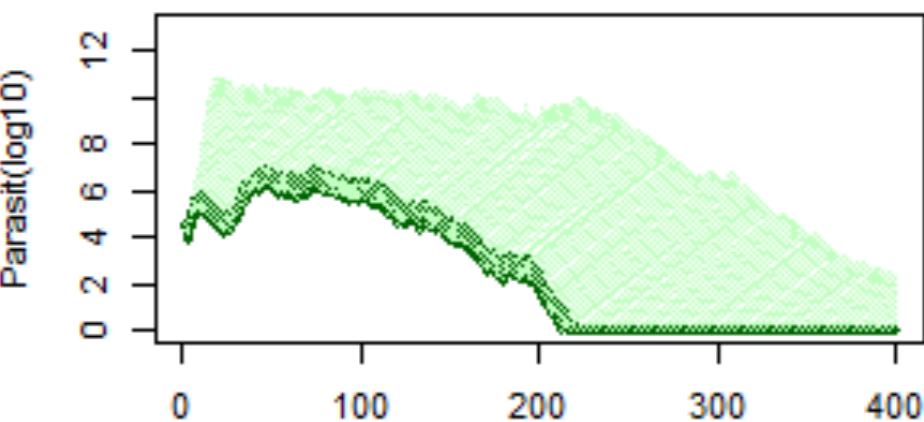
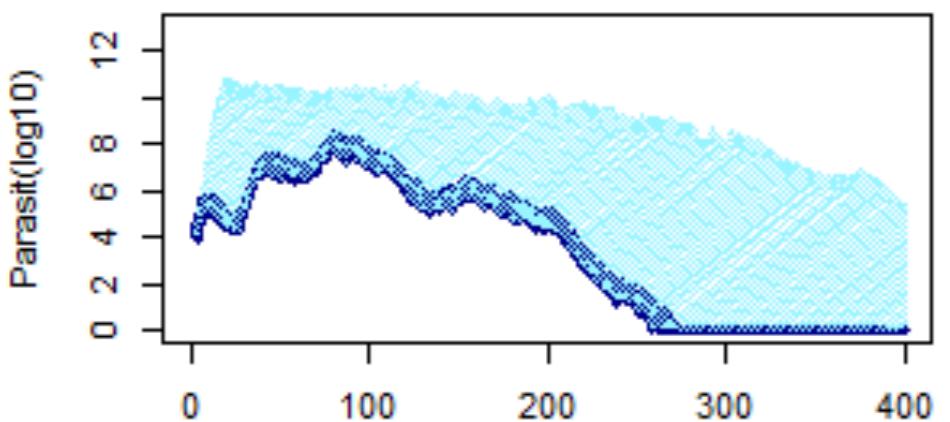
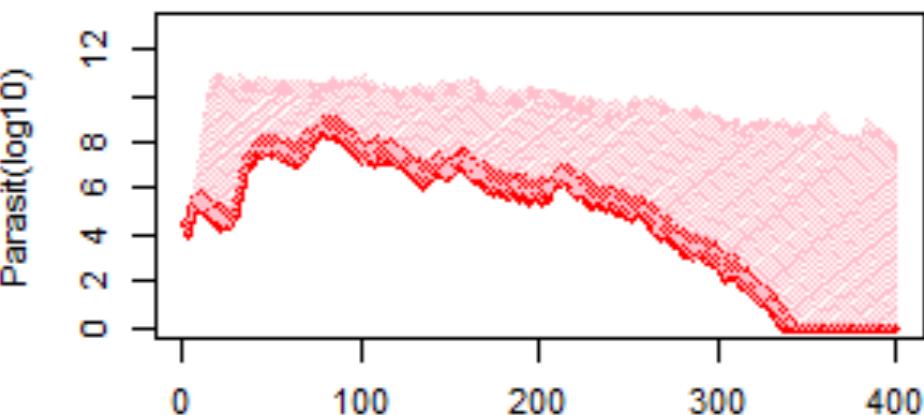
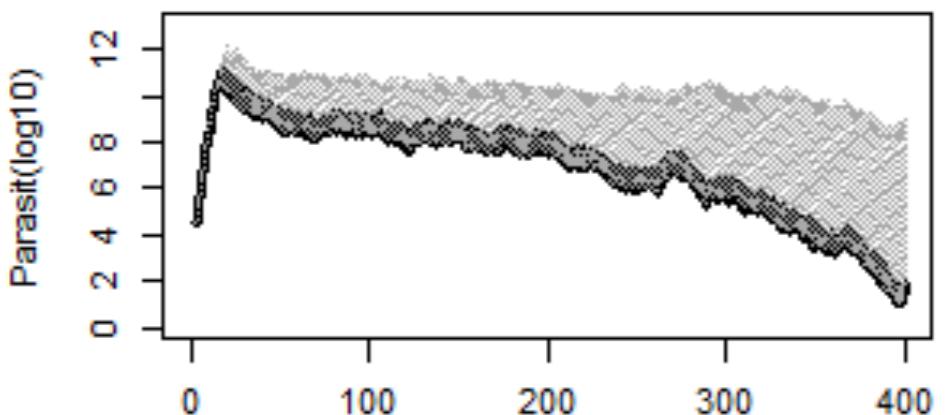
Example of AI and AB parameter outputs for a single agent (#1)

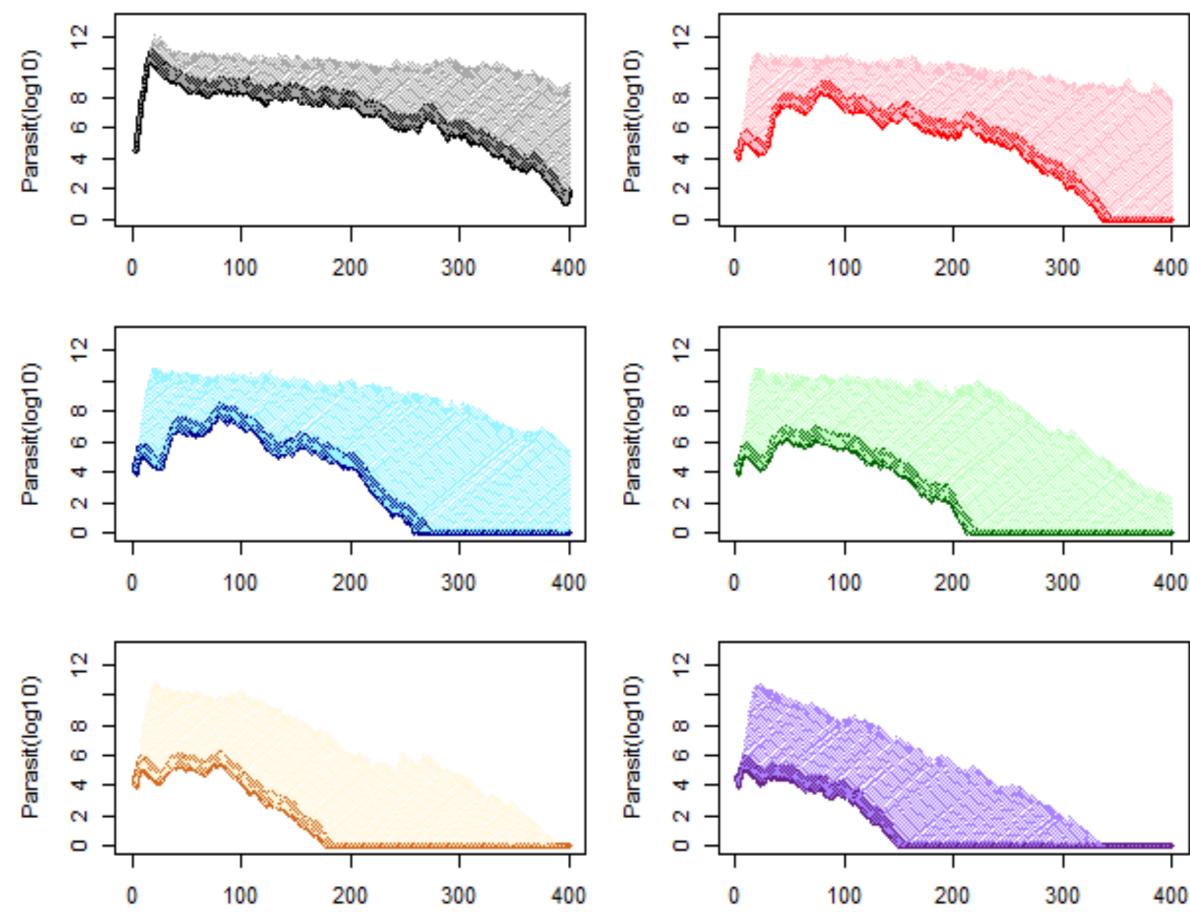
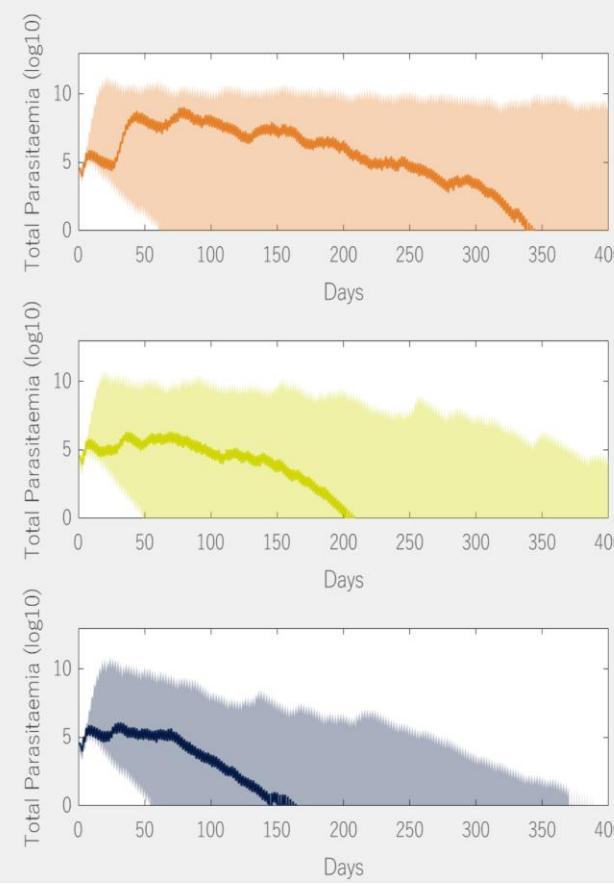
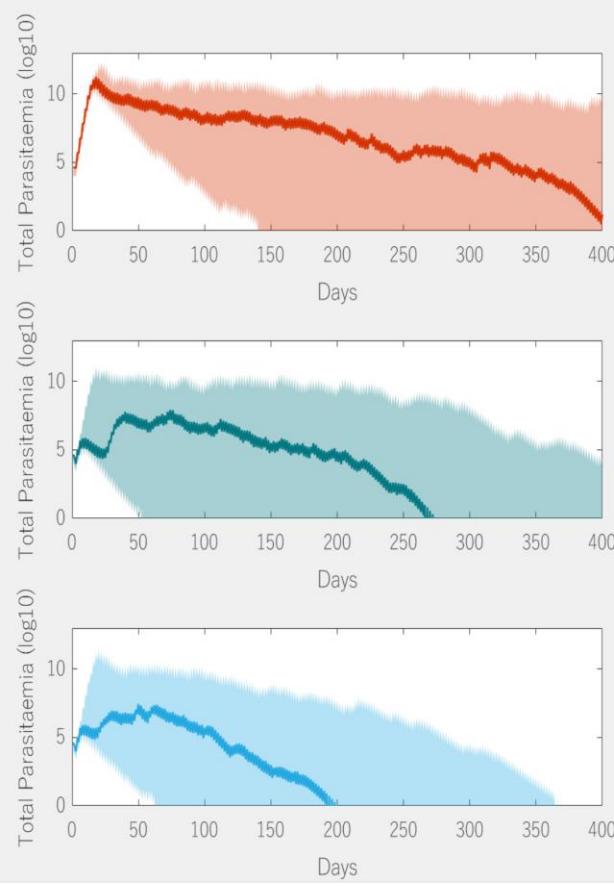
C++ model



C++ model

Showing for each
immunity level (0 to 5)





Matlab model

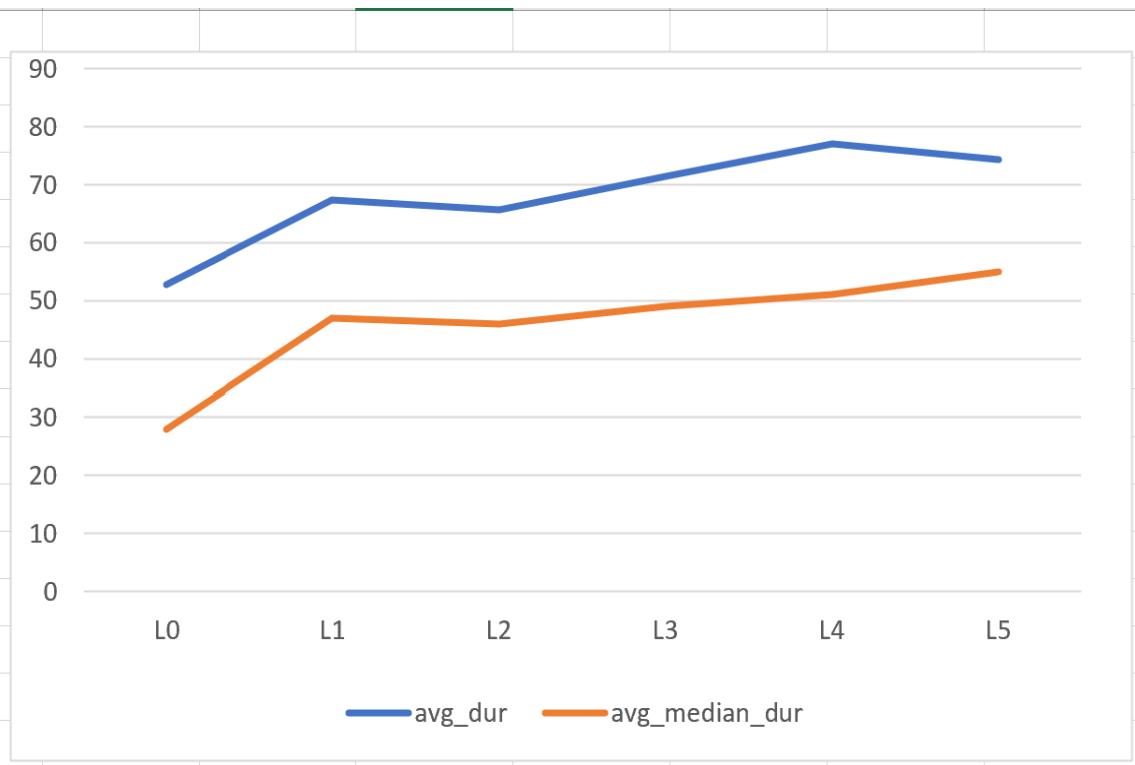
Fig 32

C++ model

Simulation experiments were done using **100** human agents over **400** days when **drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model)

C++ model

	avg_dur	avg_median_dur
L0	52.7	28
L1	67.34	47
L2	65.7	46
L3	71.5	49
L4	77.04	51
L5	74.26	55

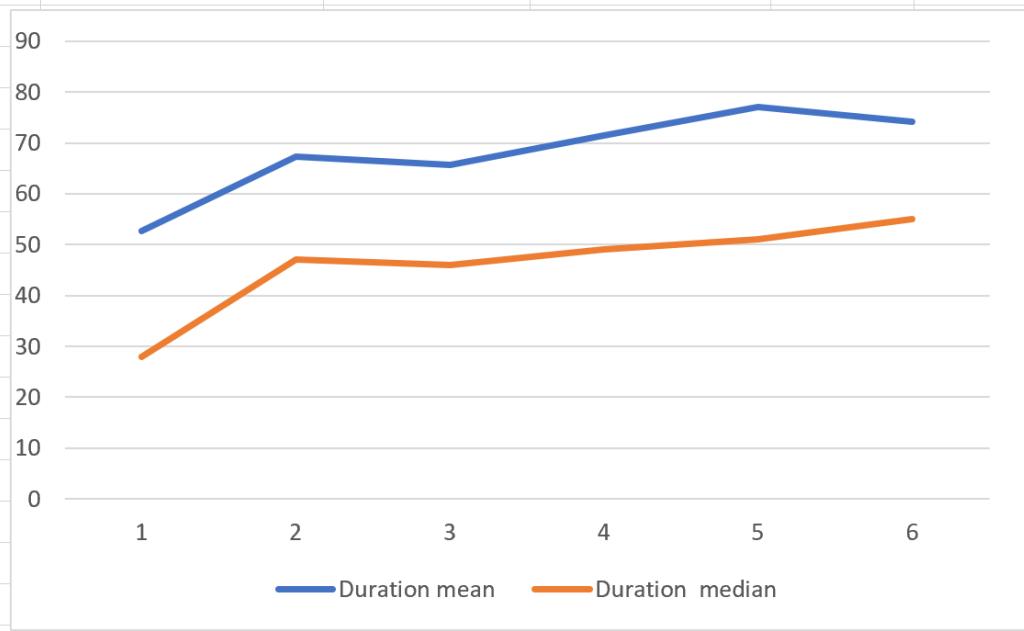


Simulation experiments were done using **100** human agents over **400** days when **drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model): [More detailed](#)

immunity level	# infections	#humans	# clinical	#clinical/ #infections	Duration mean	Duration median	
1 (0)	100	100	100	1.00	52.7	28	
2 (1)	100	100	81	0.81	67.34	47	
3 (2)	100	100	75	0.75	65.7	46	
4 (3)	100	100	65	0.65	71.5	49	
5 (4)	100	100	45	0.45	77.04	51	
6 (5)	100	100	34	0.34	74.26	55	
Total:	600	600	400	4.000	408.54	276.00	
Avg:	100.00	100.00	66.67	0.67	68.09	46.00	

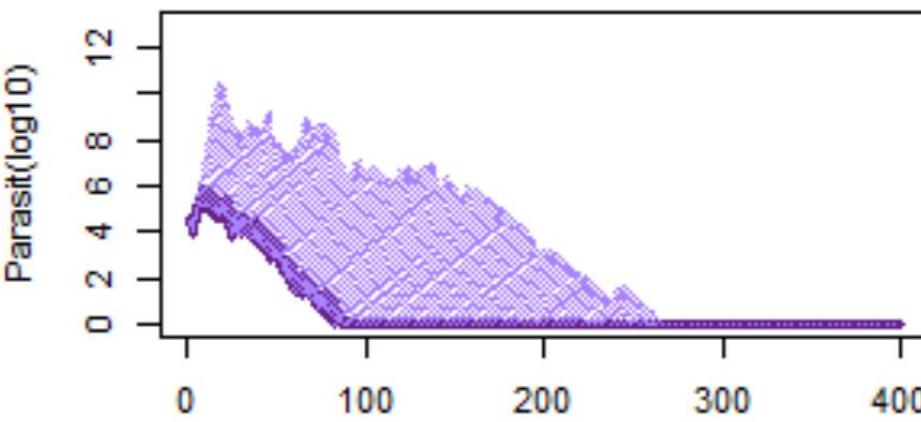
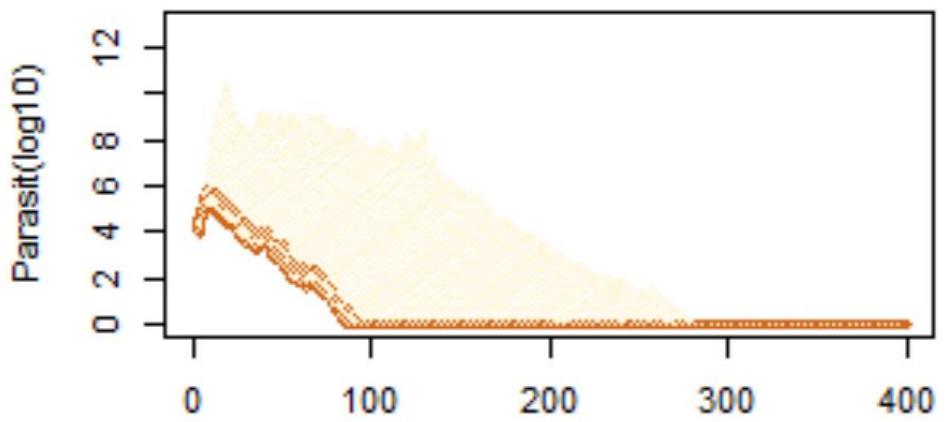
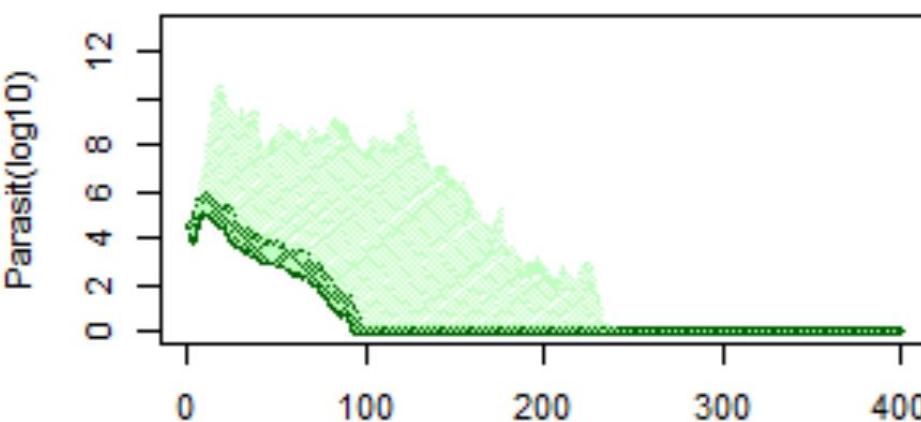
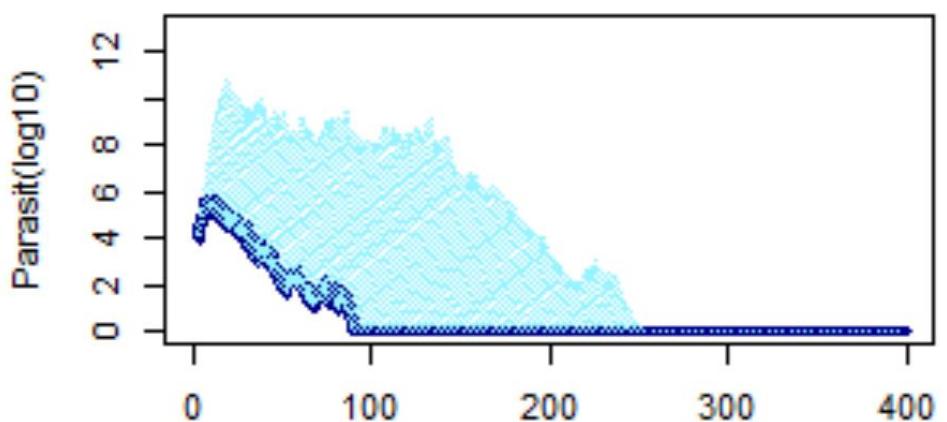
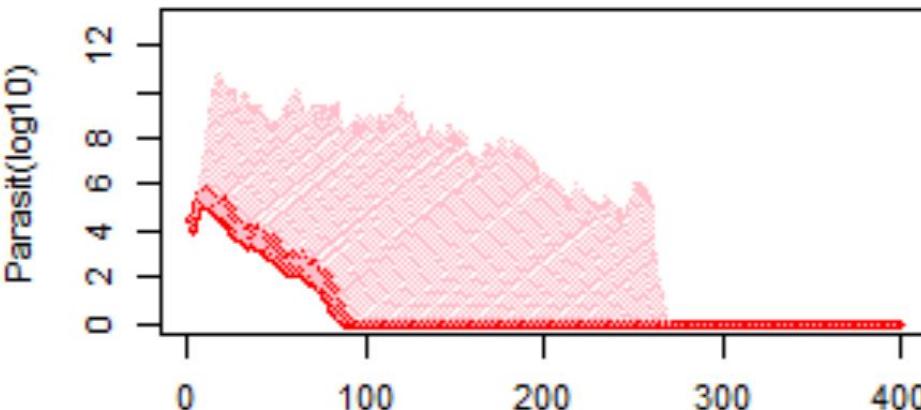
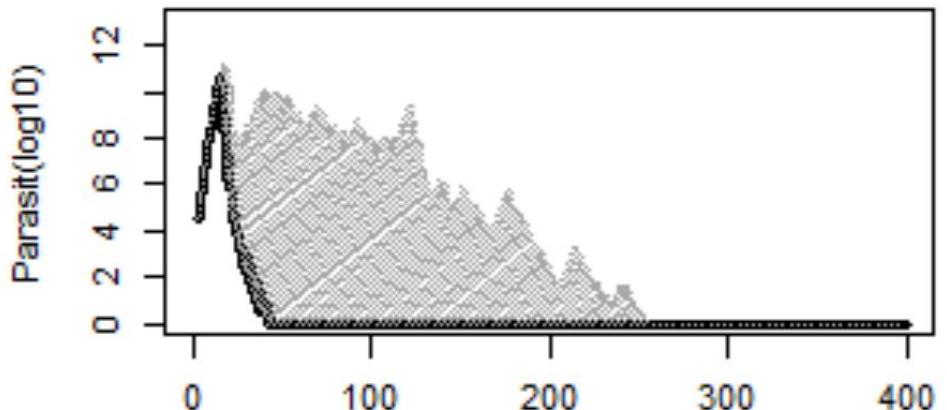
C++ model

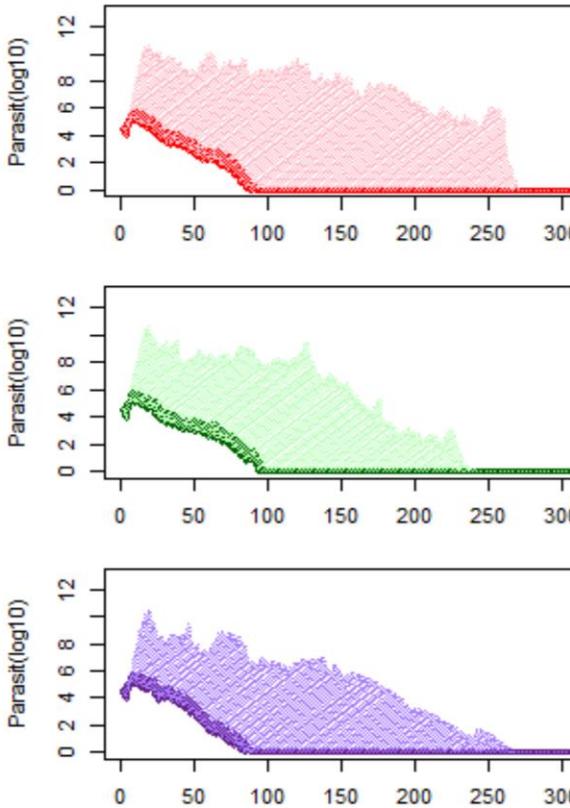
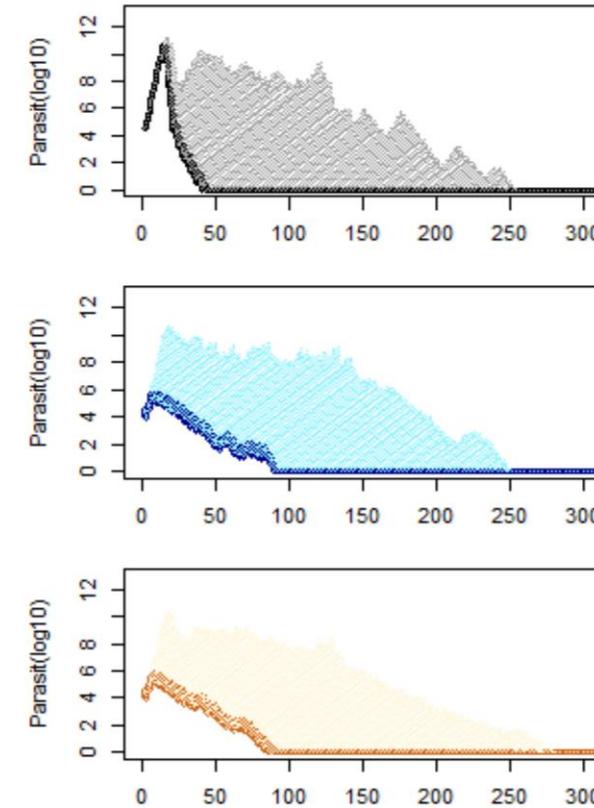
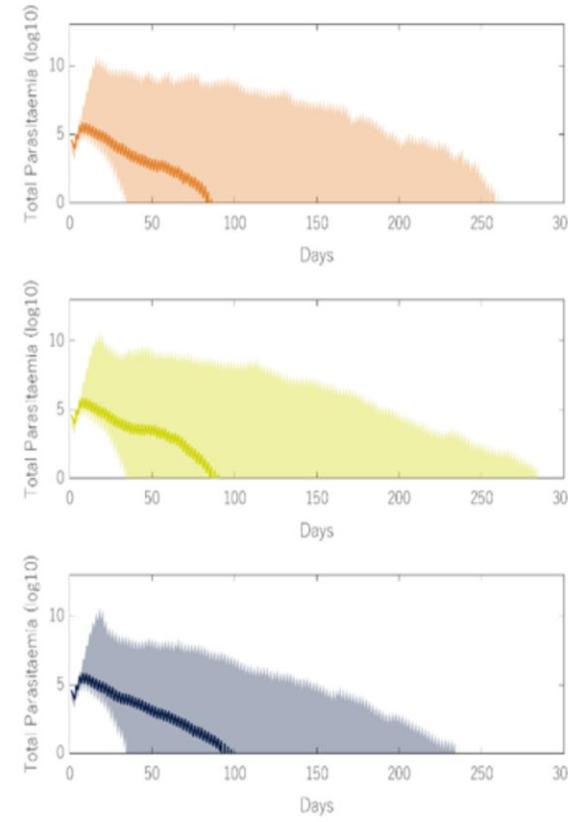
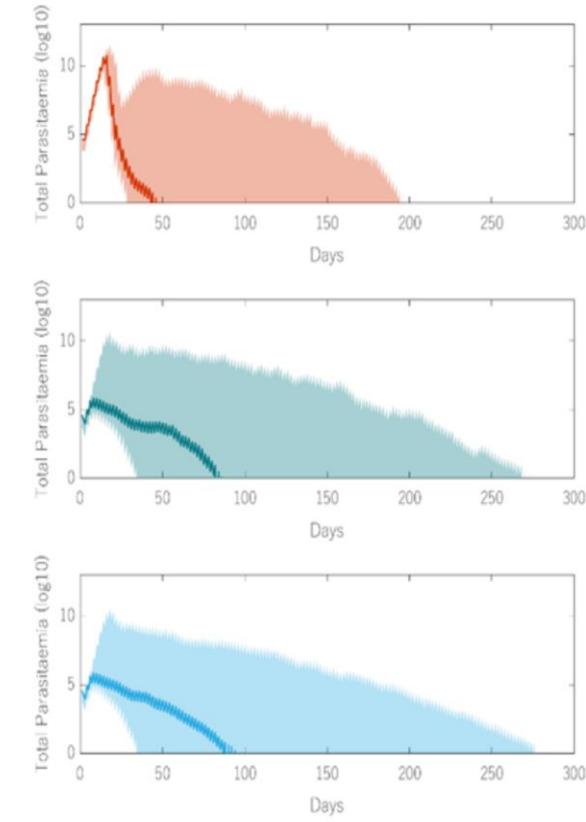
total pop:	100	
not infected:	0	0.00
infected:	100	1.00



C++ model

showing for each
immunity level (0 to 5)





Matlab model

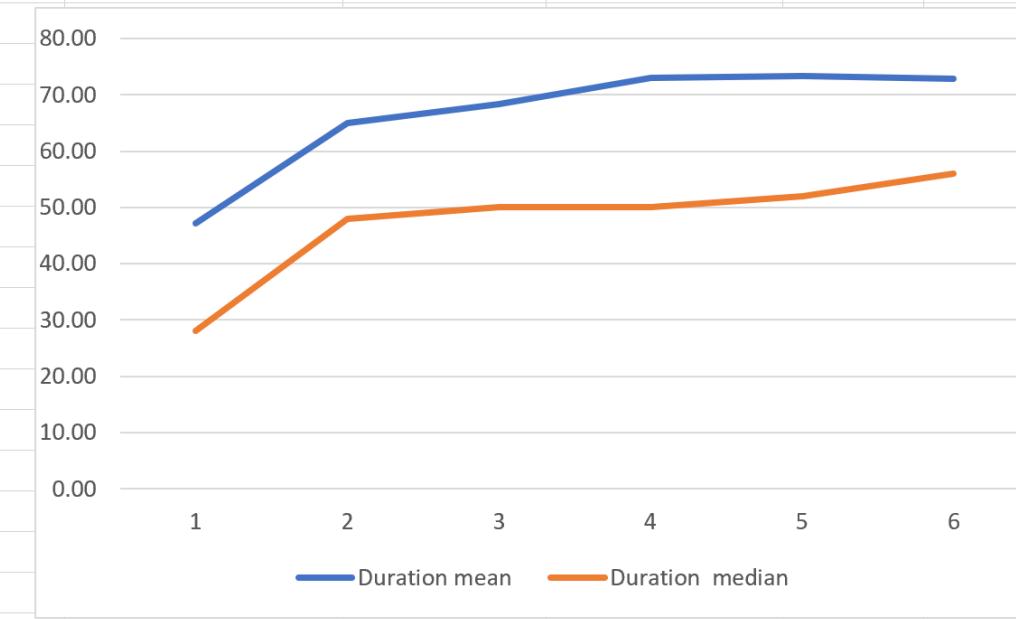
fig 32

C++ model

Simulation experiments were done using **1195** human agents over **400** days when **drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model): [More detailed](#)

immunity level	# infections	#humans	# clinical	#clinical/ #infections	Duration mean	Duration median	
1 (0)	1195	1195	1195	1.00	47.14	28	
2 (1)	1195	1195	971	0.81	64.99	48	
3 (2)	1195	1195	889	0.74	68.29	50	
4 (3)	1195	1195	734	0.61	73.08	50	
5 (4)	1195	1195	552	0.46	73.42	52	
6 (5)	1195	1195	367	0.31	72.87	56	
Total:	7170	7170	4708	3.940	399.79	284.00	
Avg:	1195.00	1195.00	784.67	0.66	66.63	47.33	

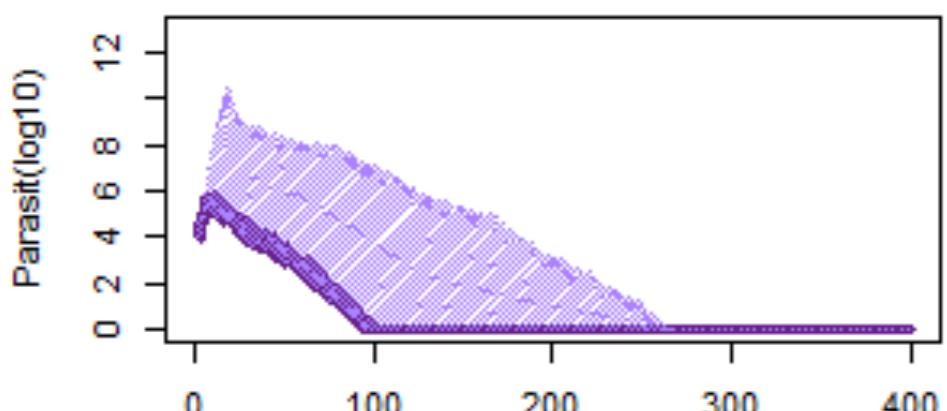
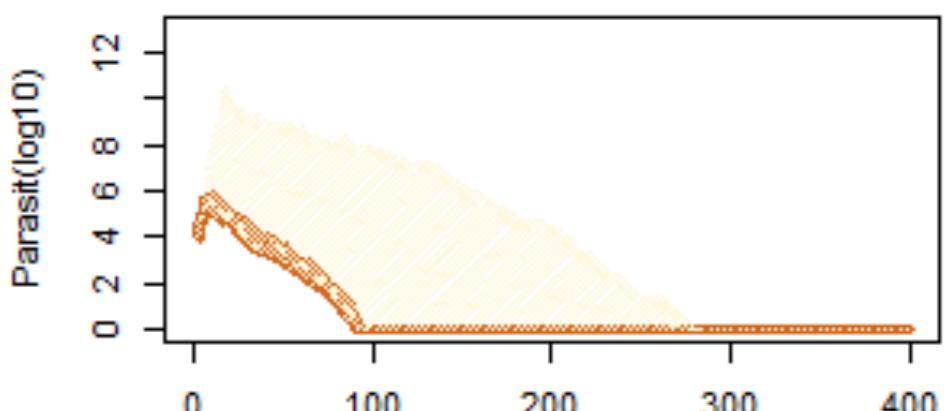
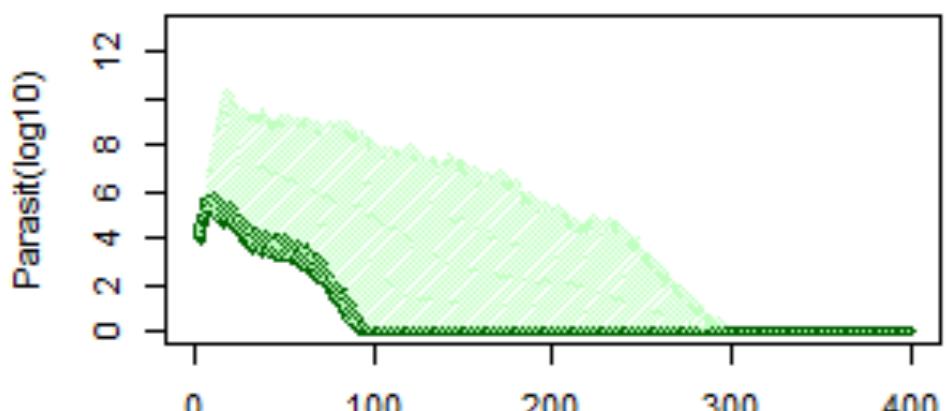
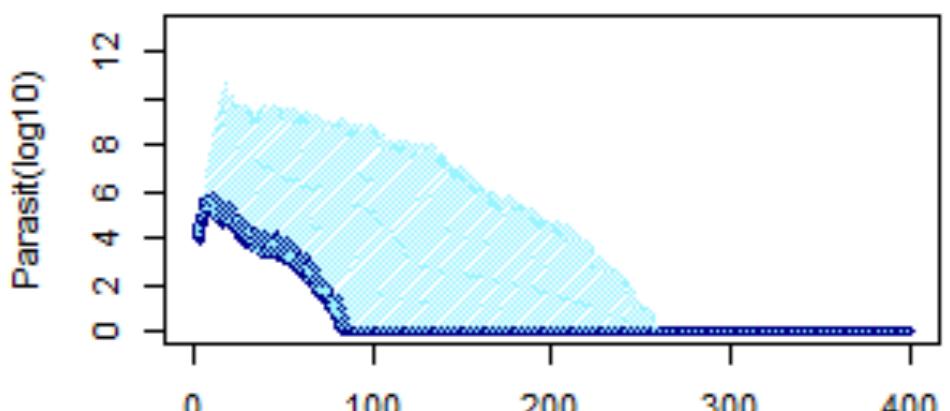
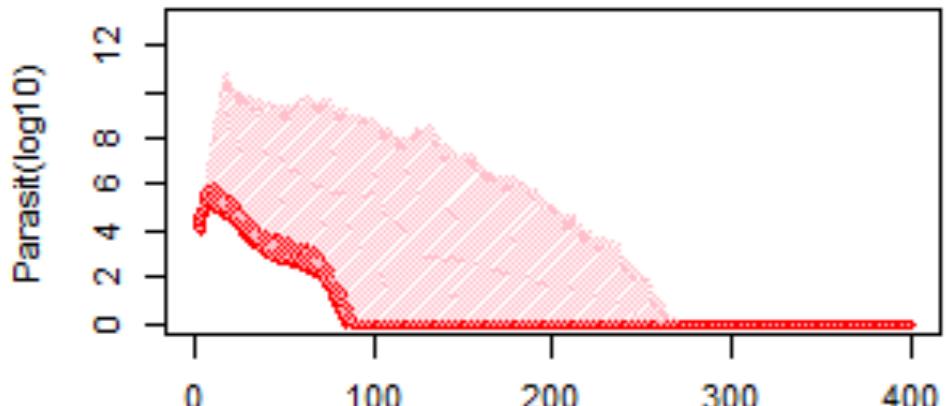
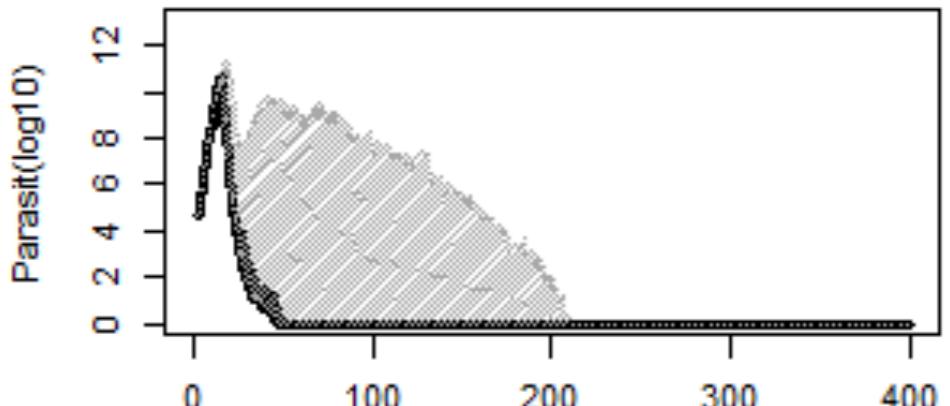
total pop:	1195
not infected:	0 0.00
infected:	1195 1.00

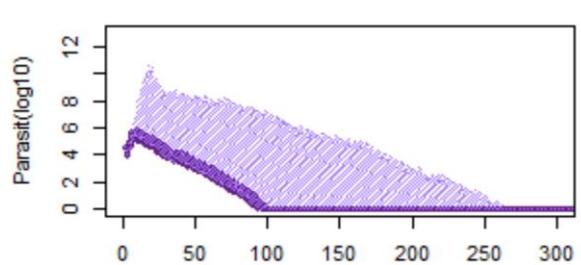
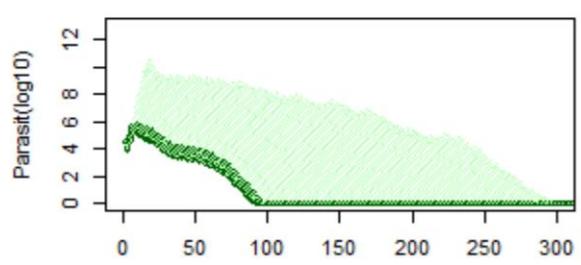
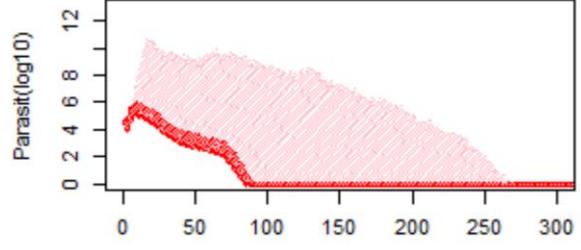
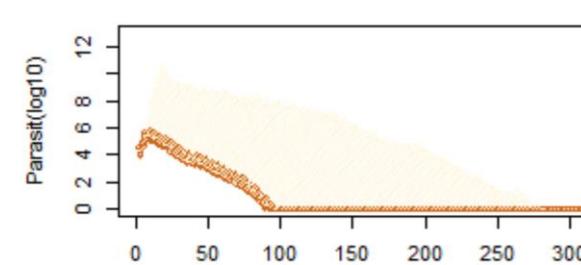
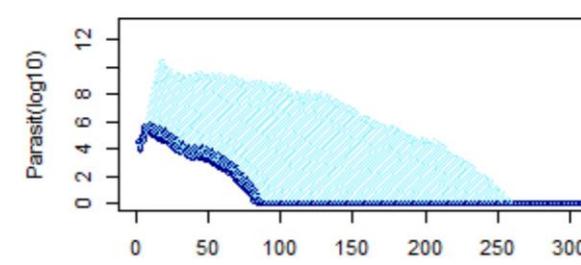
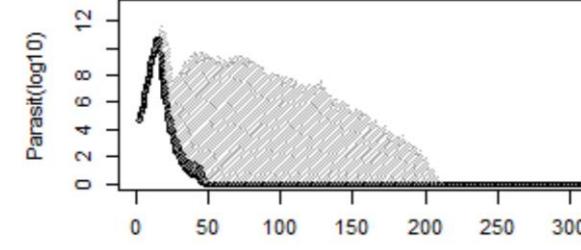
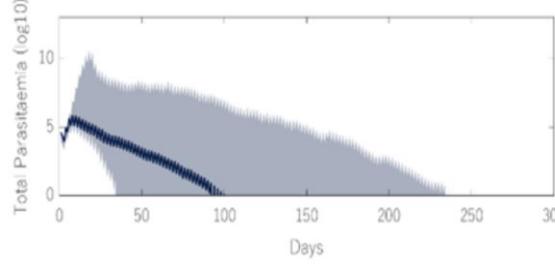
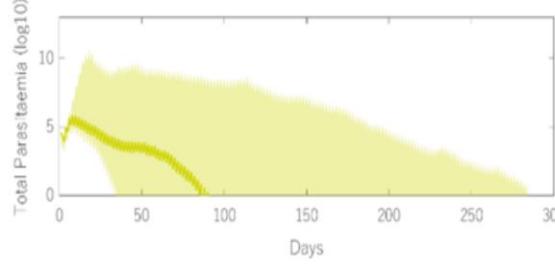
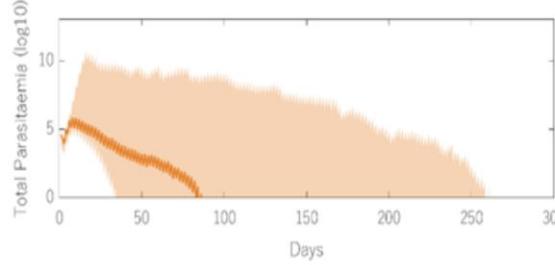
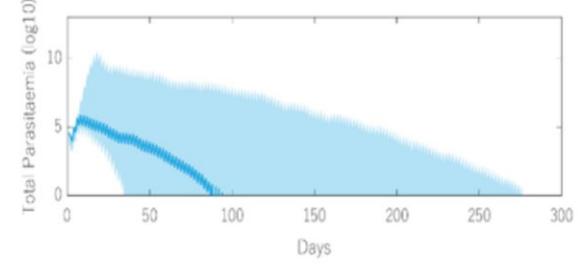
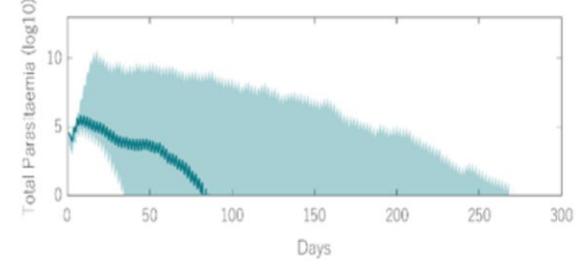
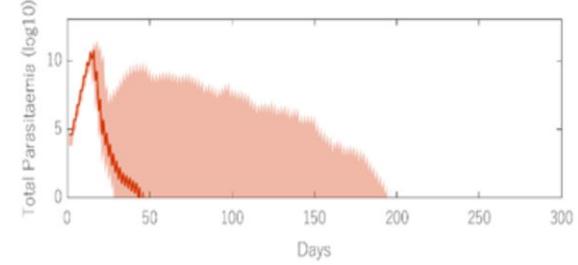


C++ model

C++ model

showing for each
immunity level (0 to 5)
with **1195 agents**





Matlab model

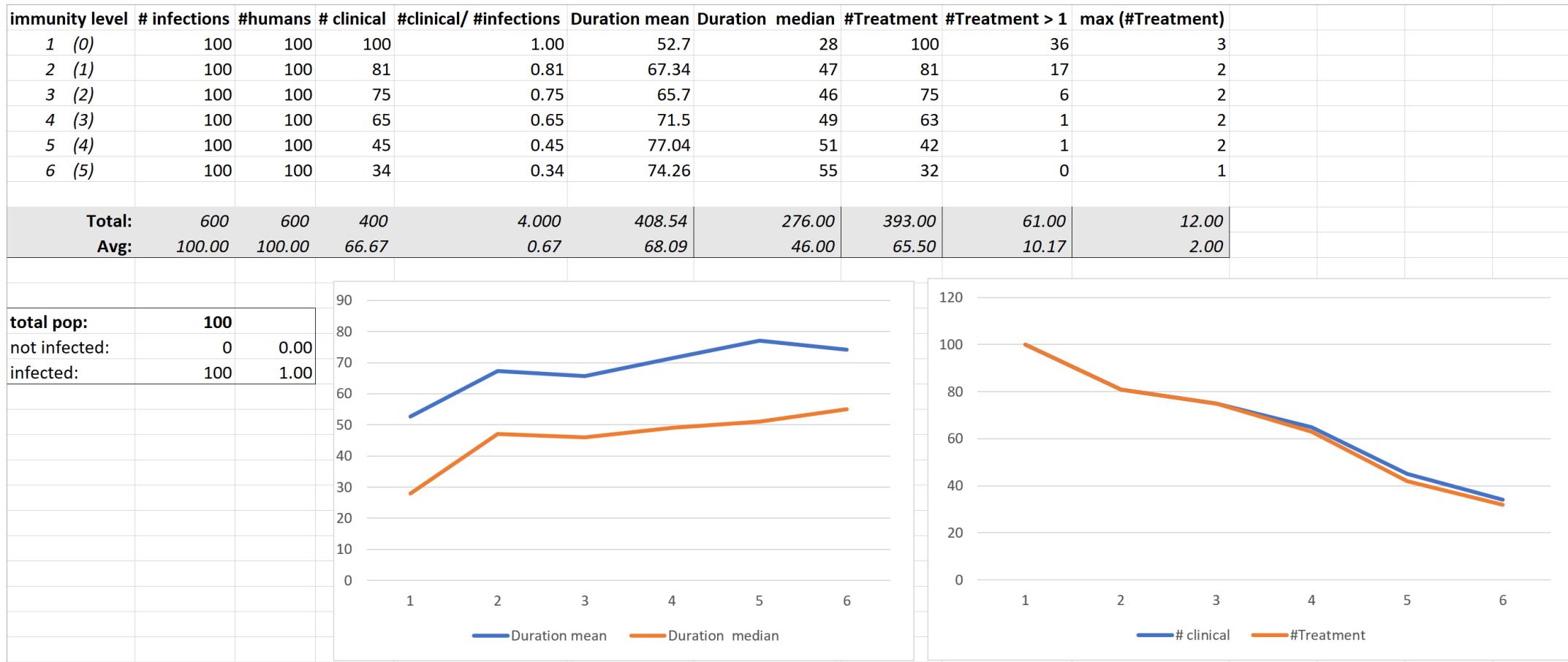
fig 32

C++ model

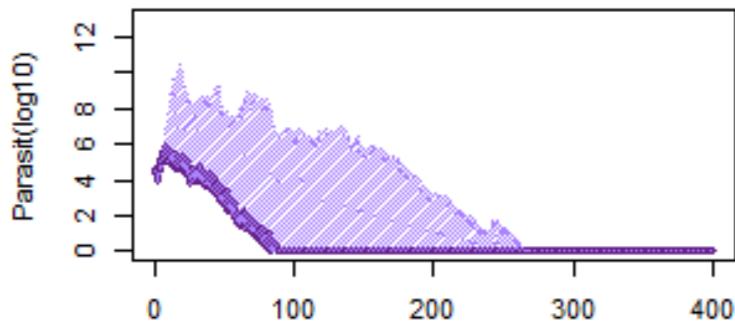
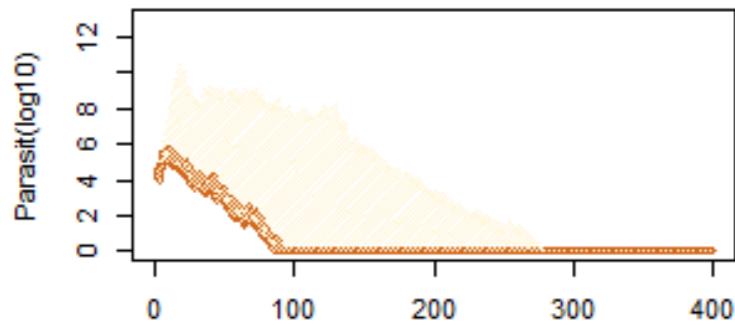
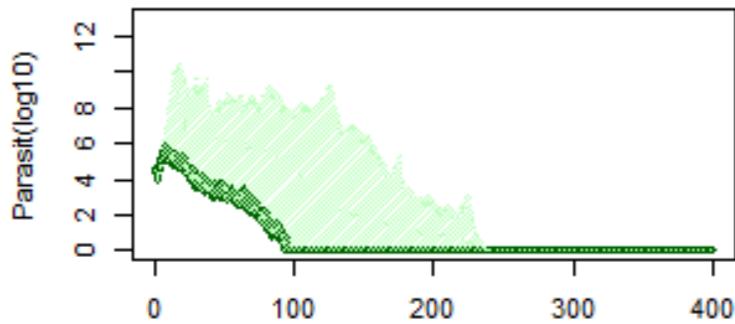
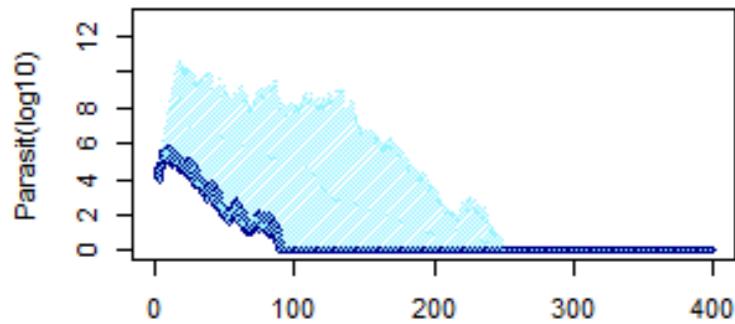
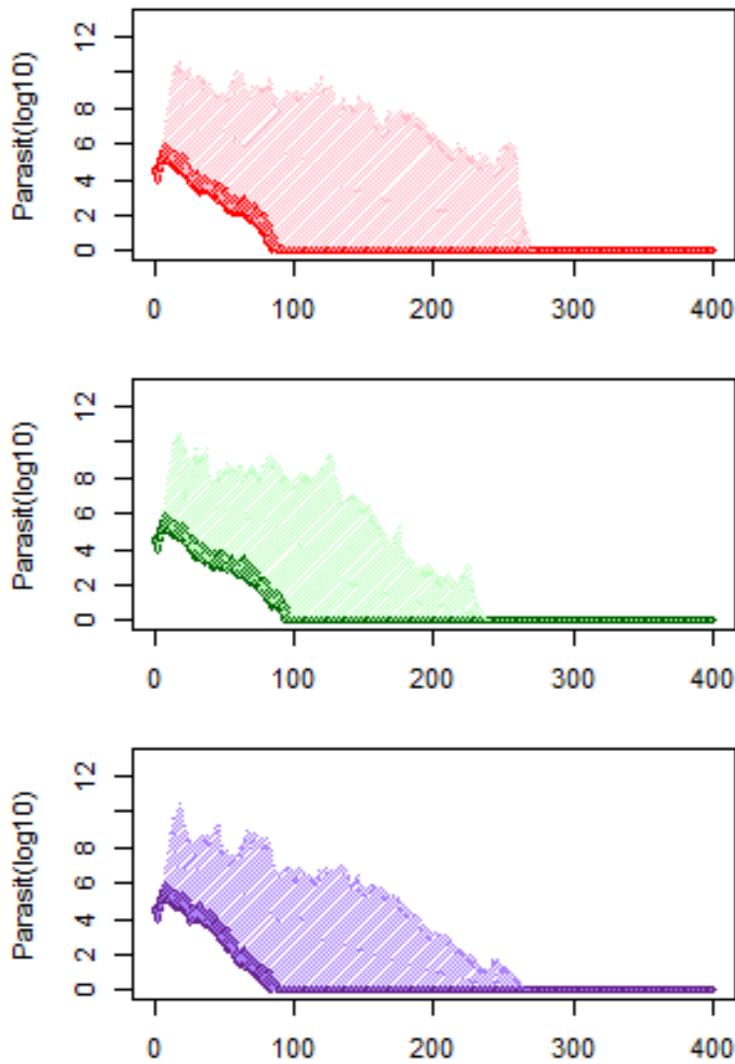
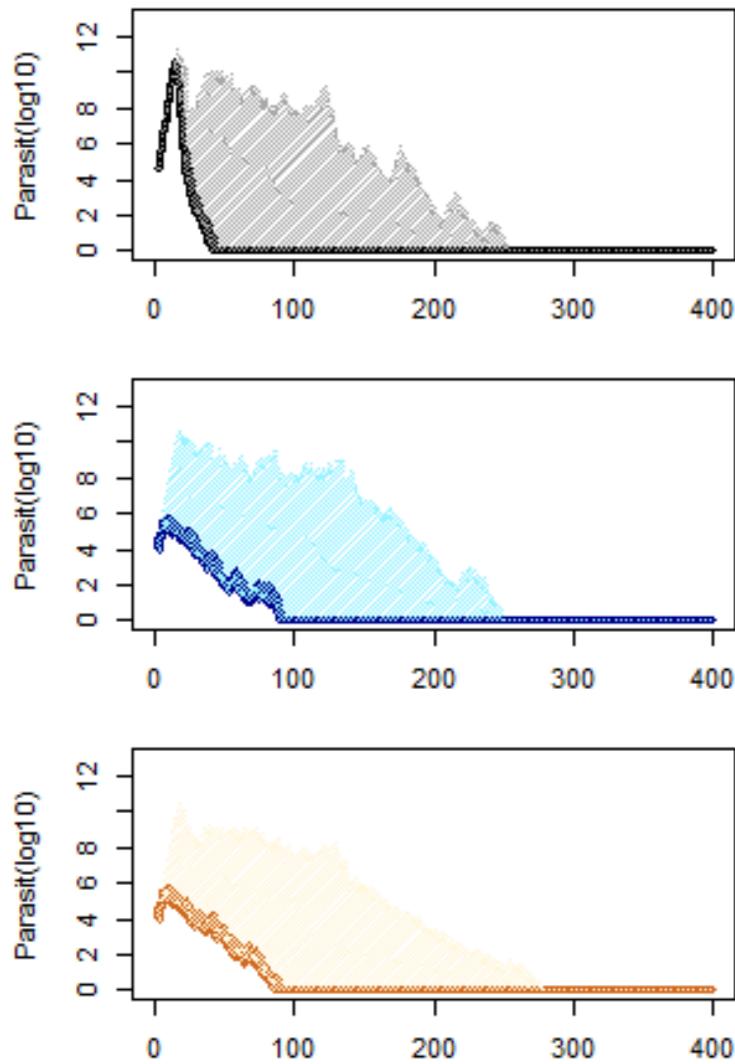
with 1195 agents

Simulation experiments were done using **100** human agents over **400** days when **drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model): **include #treatments**

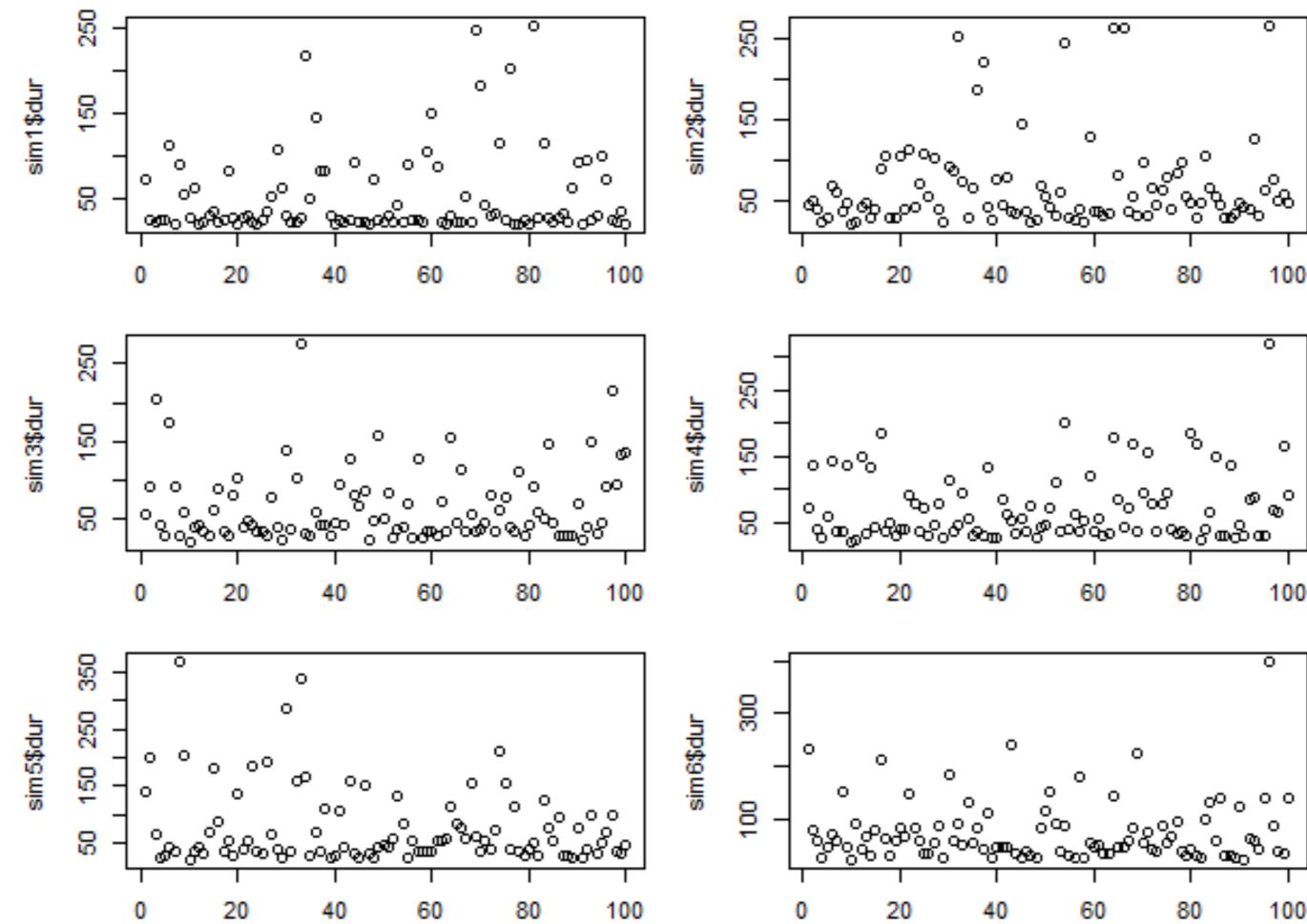
C++ model



C++ model



C++ model

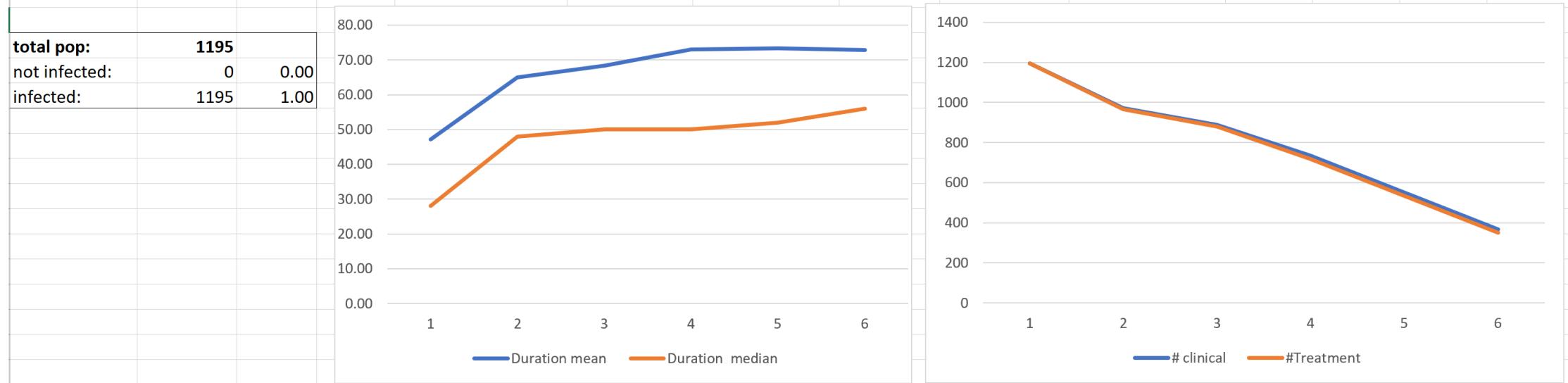


Infection durations for different immunity levels

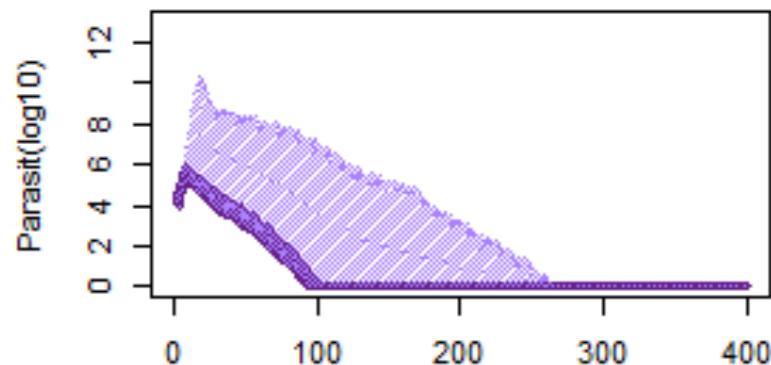
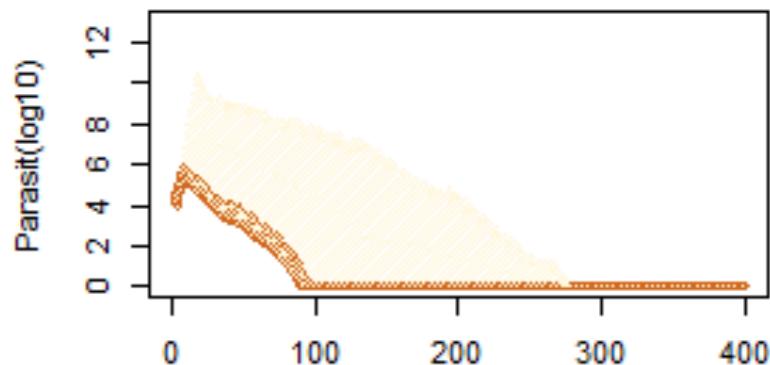
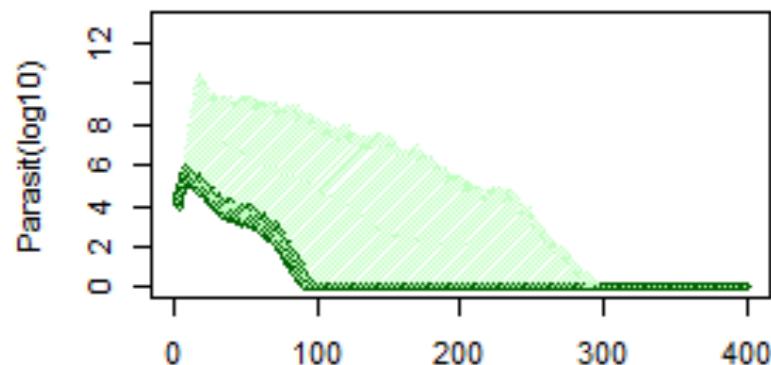
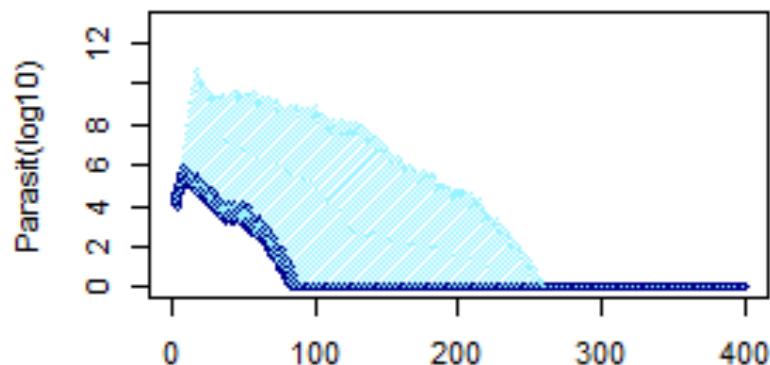
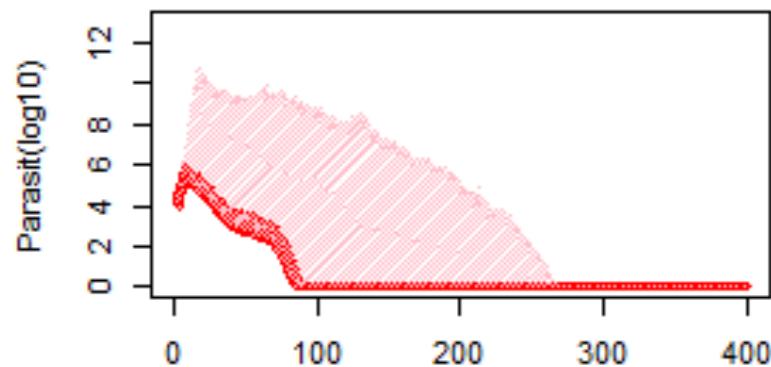
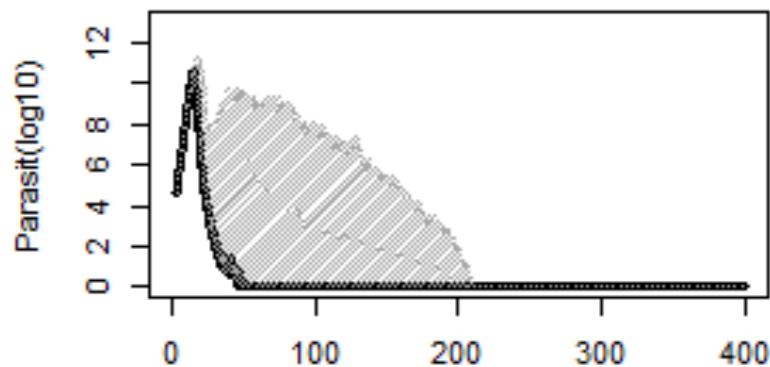
Simulation experiments were done using **1195** human agents over **400** days when **drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model): **include #treatments**

C++ model

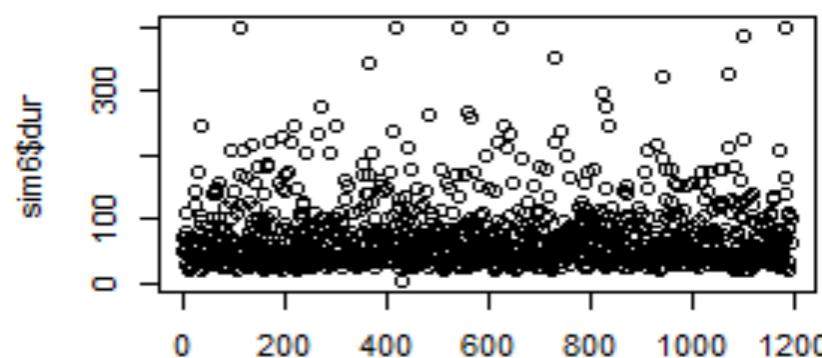
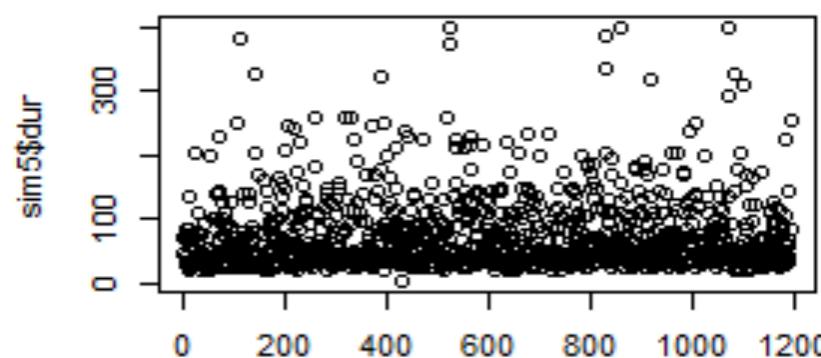
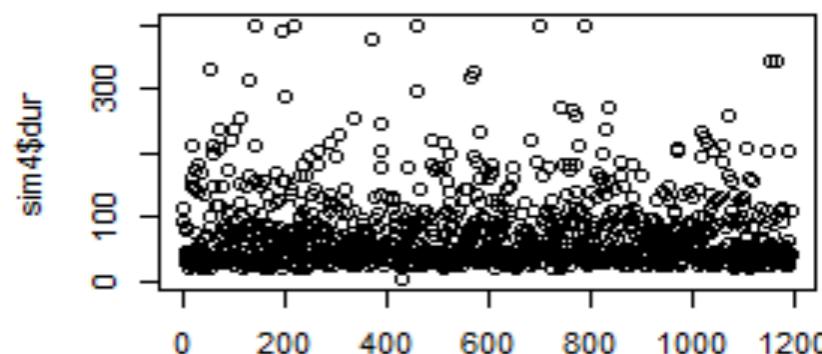
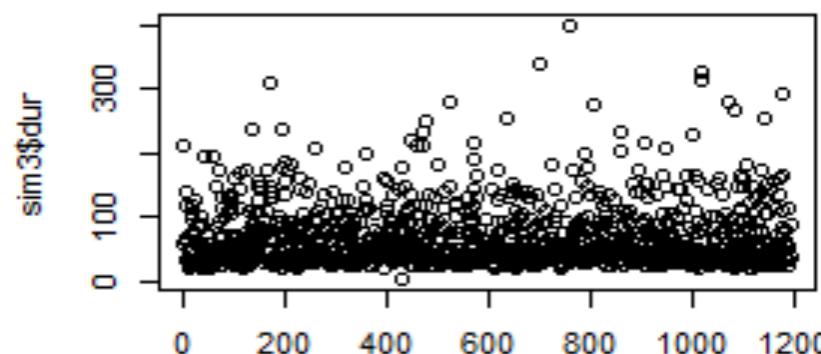
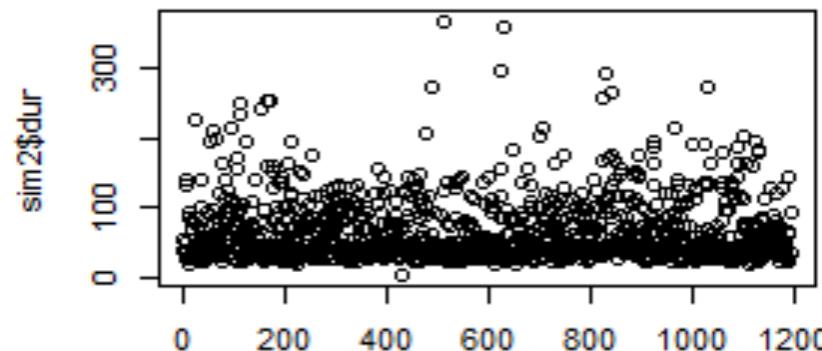
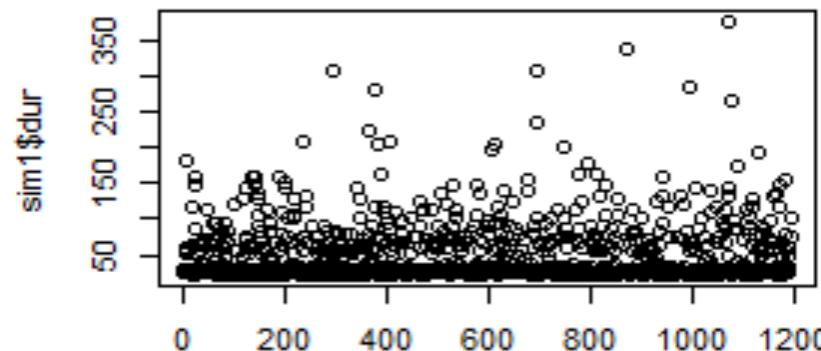
immunity level	# infections	#humans	# clinical	#clinical/ #infections	Duration mean	Duration median	#Treatment	#Treatment > 1	max (#Treatment)
1 (0)	1195	1195	1195	1.00	47.14	28	1194	433	3
2 (1)	1195	1195	971	0.81	64.99	48	966	158	3
3 (2)	1195	1195	889	0.74	68.29	50	879	73	3
4 (3)	1195	1195	734	0.61	73.08	50	717	31	2
5 (4)	1195	1195	552	0.46	73.42	52	533	12	2
6 (5)	1195	1195	367	0.31	72.87	56	351	2	2
Total:	7170	7170	4708	3.940	399.79	284.00	4640.00	709.00	15.00
Avg:	1195.00	1195.00	784.67	0.66	66.63	47.33	773.33	118.17	2.50



C++ model



C++ model

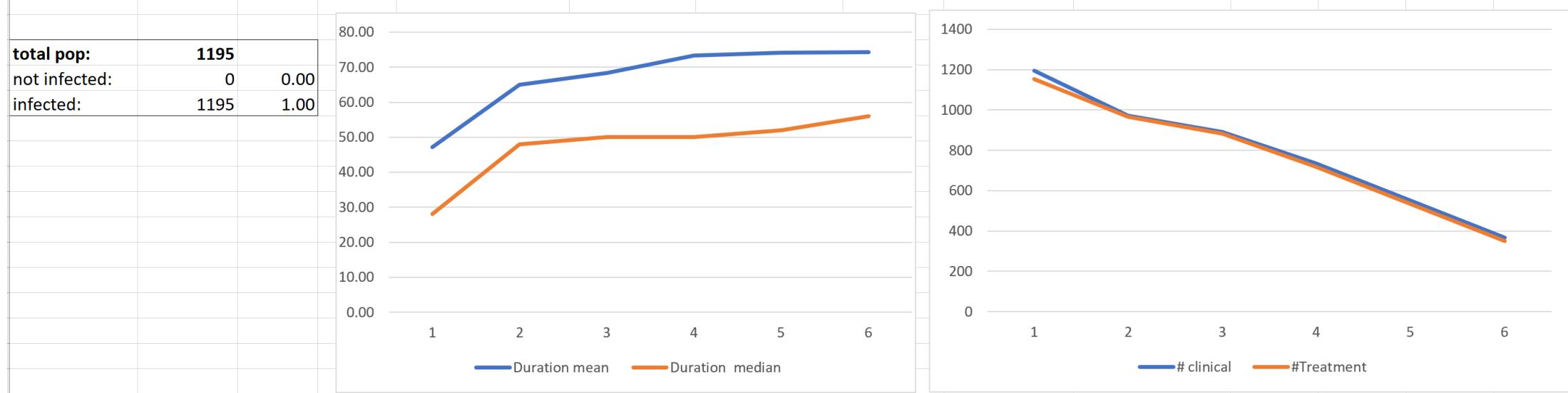


Infection durations for different immunity levels

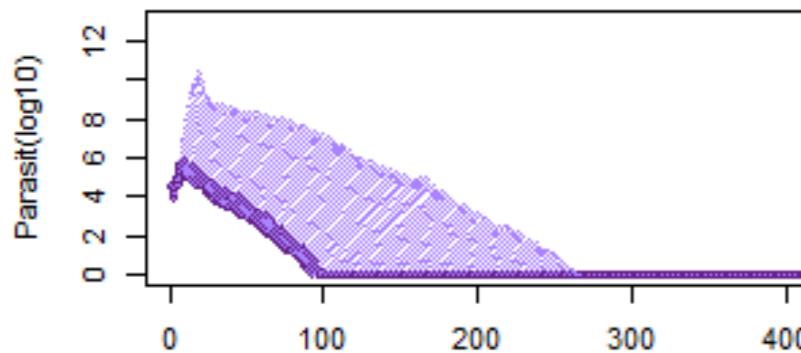
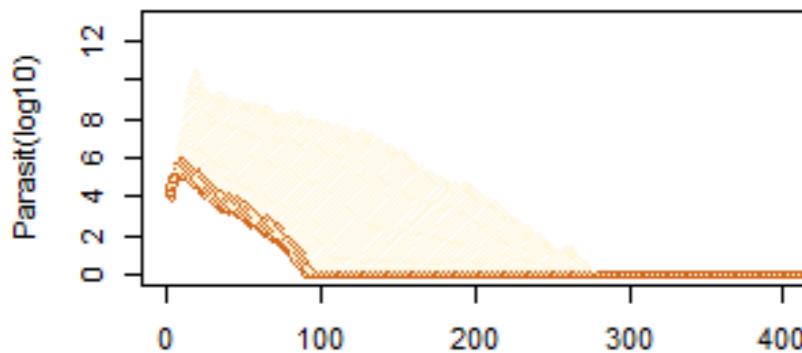
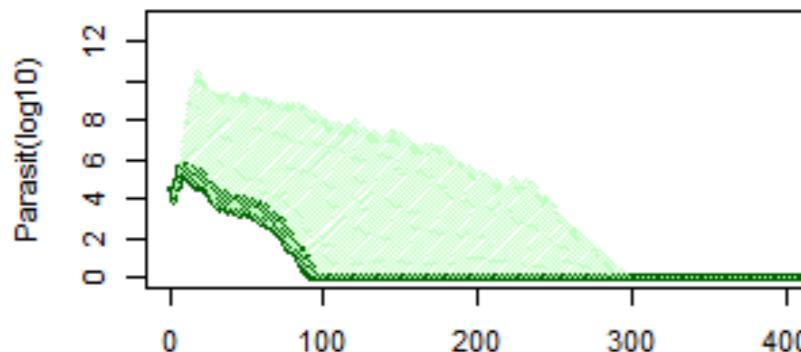
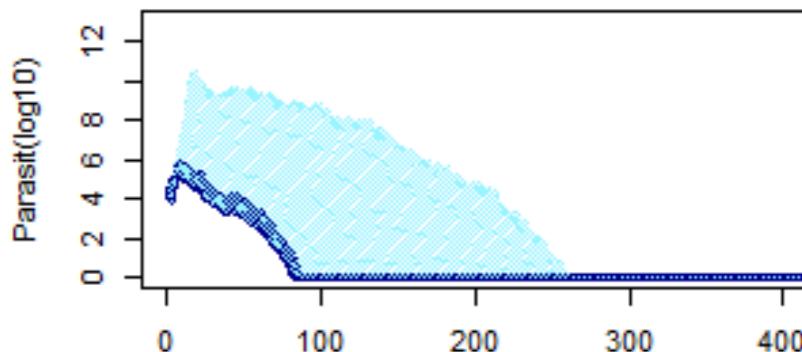
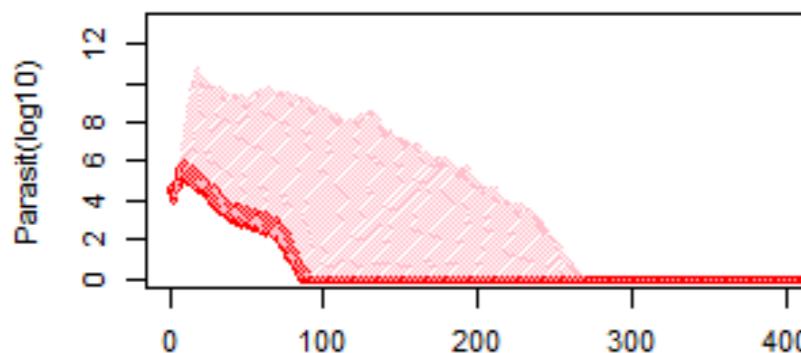
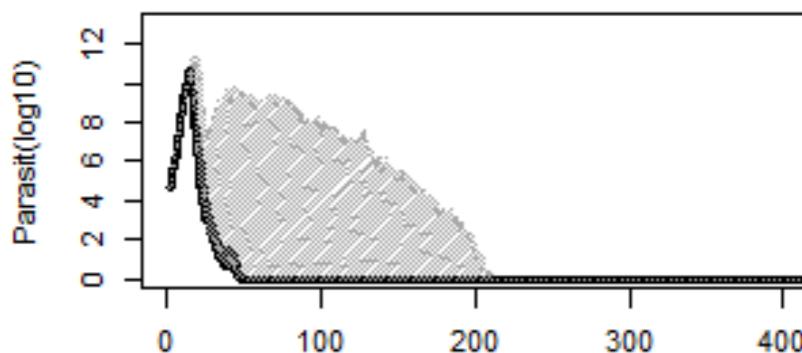
Simulation experiments were done using **1195** human agents over **1100** days when **drug** was used. Each simulation was repeated for different immunity levels (from 0 to 5, equivalent to 1- 6 in Matlab model): **include #treatments**

C++ model

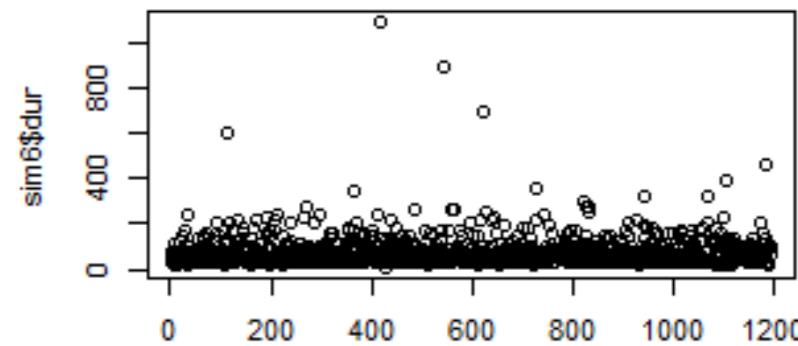
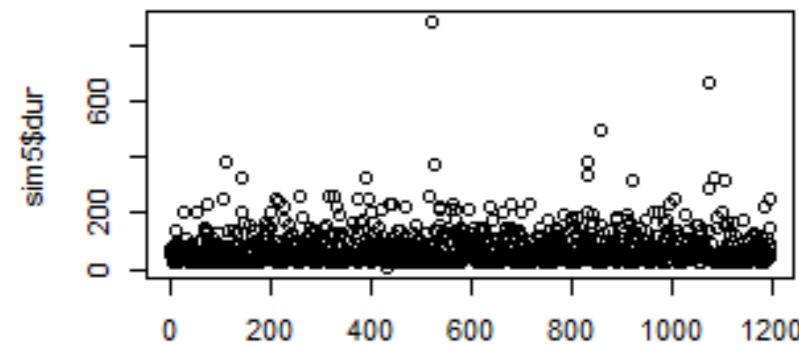
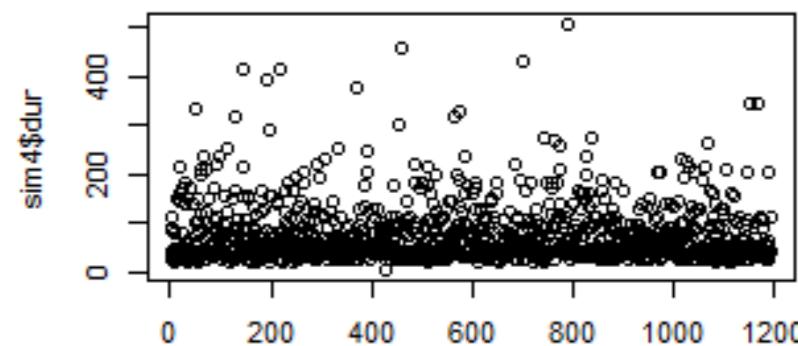
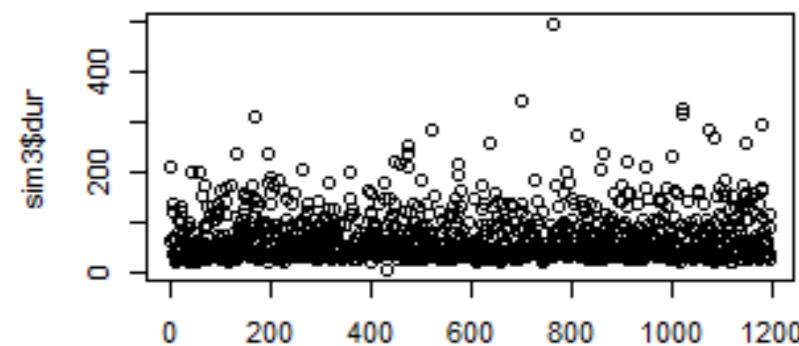
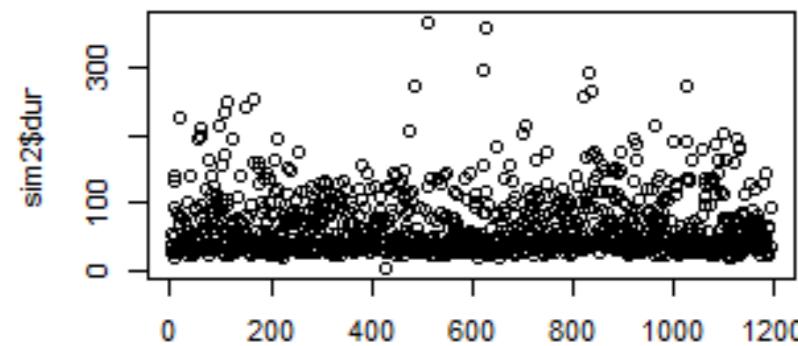
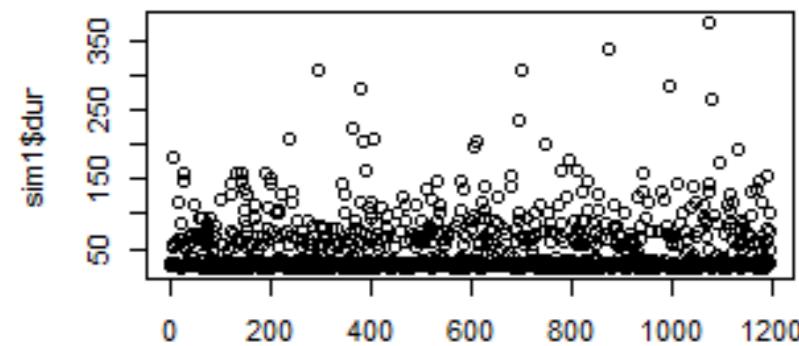
immunity level	# infections	#humans	# clinical	#clinical/ #infections	Duration mean	Duration median	#Treatment	#Treatment > 1	max (#Treatment)
1 (0)	1195	1195	1195	1.00	47.14	28	1154	433	3
2 (1)	1195	1195	972	0.81	64.99	48	967	158	3
3 (2)	1195	1195	890	0.74	68.37	50	881	74	3
4 (3)	1195	1195	734	0.61	73.27	50	717	31	2
5 (4)	1195	1195	552	0.46	74.13	52	533	12	2
6 (5)	1195	1195	367	0.31	74.35	56	351	2	2
Total:	7170	7170	4710	3.941	402.25	284.00	4603.00	710.00	15.00
Avg:	1195.00	1195.00	785.00	0.66	67.04	47.33	767.17	118.33	2.50



C++ model

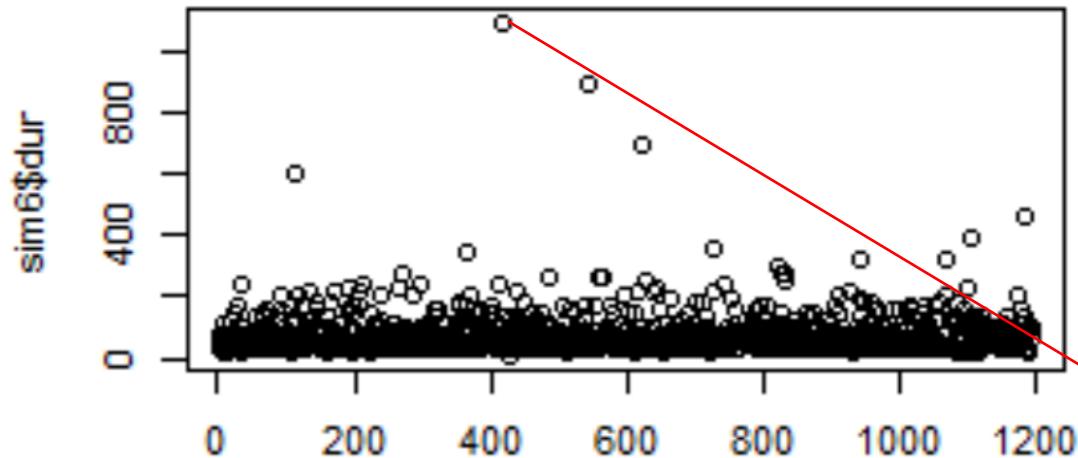


C++ model



Infection durations for different immunity levels

There are some outliers (long infection durations) as can be seen, for example, here below for when the immunity level was set to 6:



	agentID	dur	treatment_count	clinical_count
418	418	1100	0	0
543	543	902	0	0
625	625	704	0	0
113	113	600	0	0
1185	1185	468	0	3
1104	1104	388	0	0
729	729	354	0	0
368	368	342	1	4
1072	1072	328	0	4
943	943	324	0	0
824	824	296	0	0
269	269	278	0	0
830	830	278	0	0
831	831	274	0	0
558	558	268	0	0
484	484	262	0	0
566	566	260	0	0
630	630	248	0	0
835	835	248	0	0

There are some outliers (long infection durations) as can be seen, for example, here for when the immunity level was set at 6:

The reason for majority of these cases is because the parasite amount has not passed the fever (clinical) threshold, so the agents have not received any treatment (drug): see for example, the case of agent 418 with infection of 1100 days with no clinical day recorded and no treatment received

On the other hands, there are cases where agents have become clinical (parasite amount passed fever threshold), but because of stochasticity involved to prescribe drug, they did not get a chance to receive treatment (drug).

In certain cases, (such as agent #368), the agent has received one treatment (3 doses) but missed the second treatment

	agentID	dur	treatment_count	clinical_count
418	418	1100	0	0
543	543	902	0	0
625	625	704	0	0
113	113	600	0	0
1185	1185	468	0	3
1104	1104	388	0	0
729	729	354	0	0
368	368	342	1	4
1072	1072	328	0	4
943	943	324	0	0
824	824	296	0	0
269	269	278	0	0
830	830	278	0	0
831	831	274	0	0
558	558	268	0	0
484	484	262	0	0
566	566	260	0	0
630	630	248	0	0
835	835	248	0	0

Time of missed drugs (along with P0 value and cause):

agentID	time	p0	rand_caused
1185	65	4336867124	1
1185	67	4559950210	1
1185	69	4138880710	1

Time of received drugs

agentID	time	p0	rand_caused
368	327	4075810955	1
368	329	4469285955	1
368	331	4347749565	1

a_368
335
336
337

agentID	time	p0	rand_caused
1072	45	4455494637	1
1072	47	5660091435	1
1072	49	5312224512	1
1072	51	4471978107	1

In this example (immunity-level 6), majority of 828 infected agents (~ 69%) out of 1195, have not exceeded the clinical threshold and therefore never received any treatment.

Of 367 (~31%) remaining infected agents who become clinical , only 351 agents (~29%) received treatment, meaning 16 agents (~ 1%) did not receive any treatment although they were clinical.

Clinical agents who did not receive treatment:

agentID	dur	treatment_count	clinical_count
21	21	122	0
105	105	38	0
136	136	216	0
169	169	222	0
396	396	142	0
449	449	178	0
645	645	232	0
687	687	98	0
786	786	126	0
848	848	34	0
970	970	154	0
1040	1040	174	0
1042	1042	48	0
1071	1071	210	0
1072	1072	328	0
1185	1185	468	0

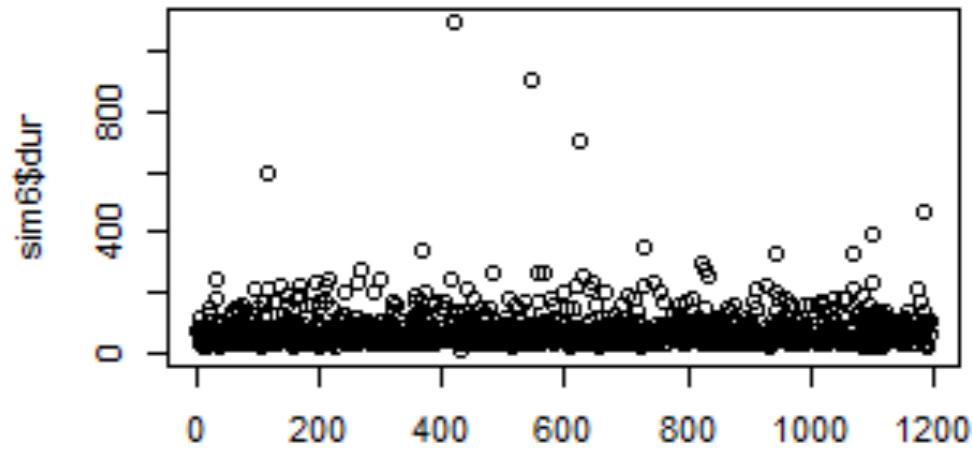
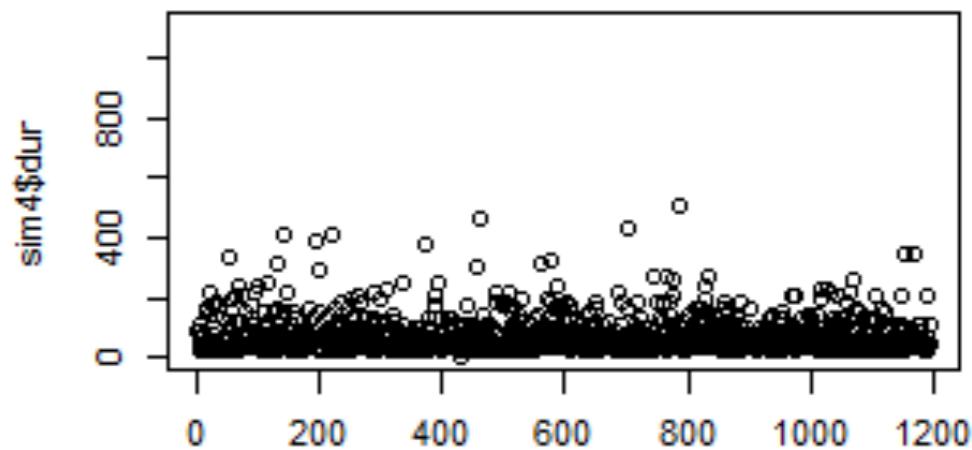
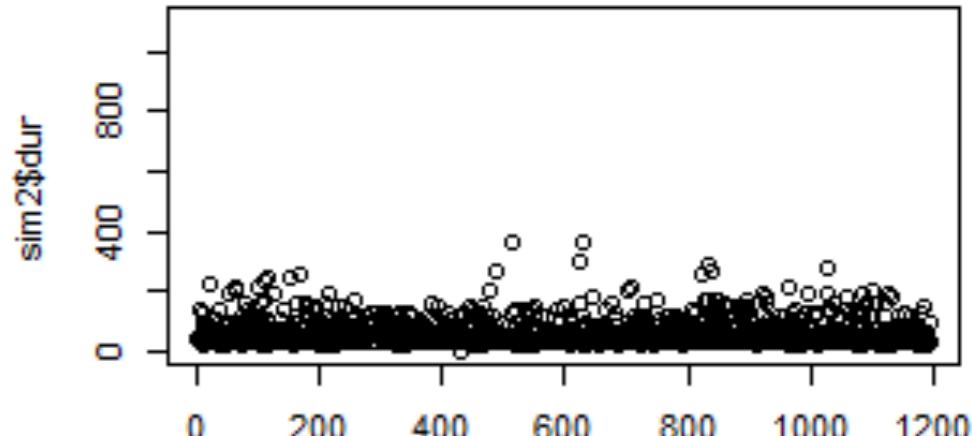
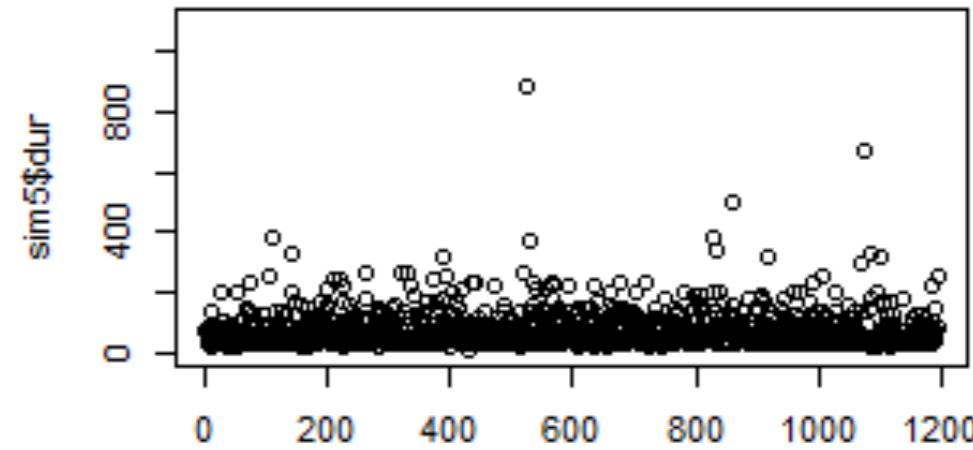
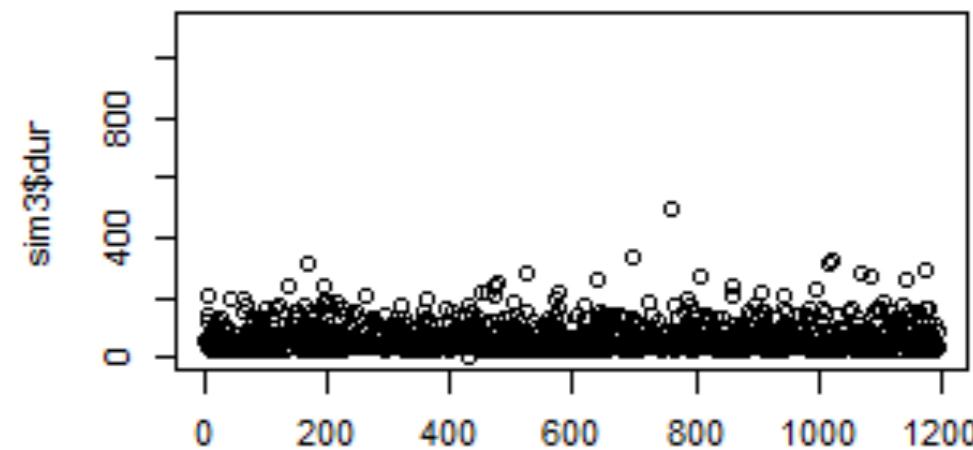
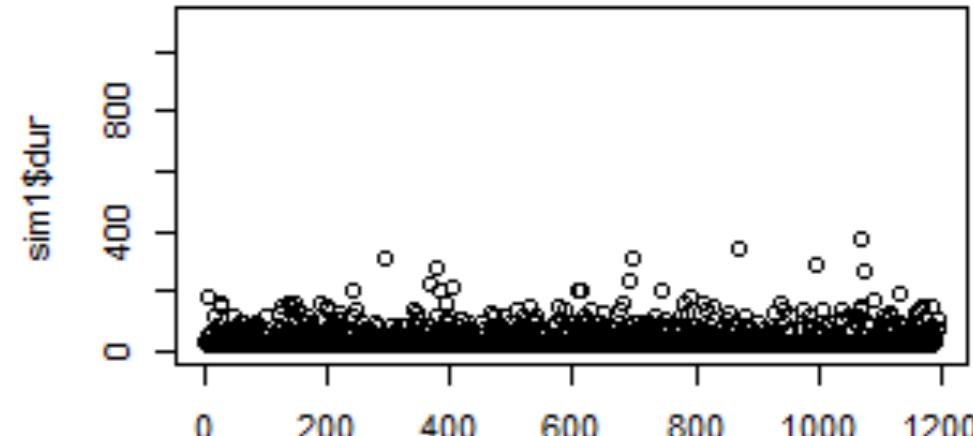
There were 1192 record of agents missing a drug at specific time when they were clinical (above fever threshold) at the time they were eligible to receive the doses of drugs.

Among these records, 1041 (~87%) missed the drug because of stochastic condition not being met ($\text{if } (\text{rand(r_engin}) < 0.33)$) while other 151 (~13%) missed the drug because the other condition ($\text{if } ((\text{mda1} == 0) \text{ || } ((\text{i}-\text{mda1}) > 30))$).

These 1192 records belong to 365 (unique) agents, so about 31% of agents (among 1195 agents) were affected by the missed drug issue.

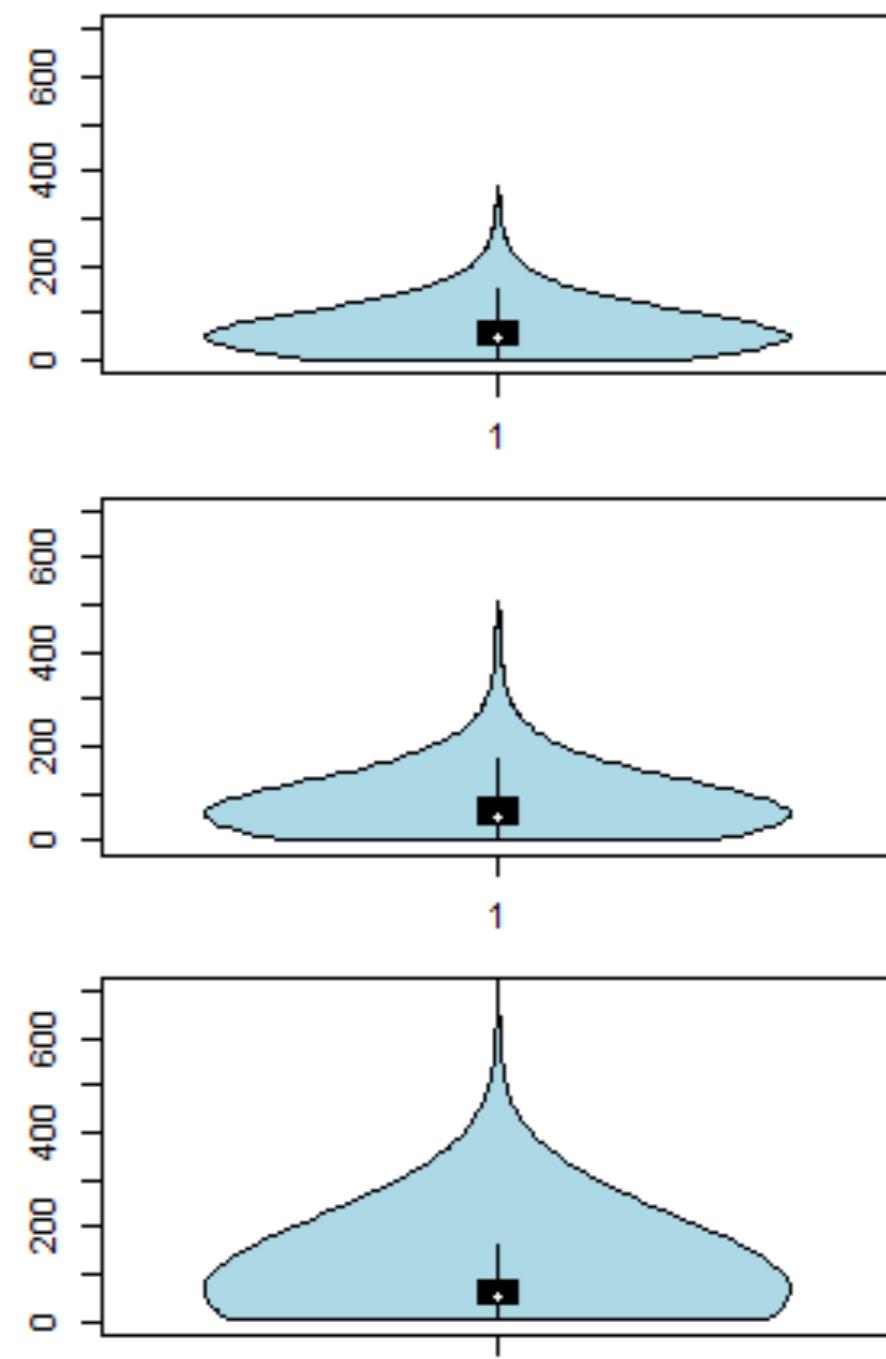
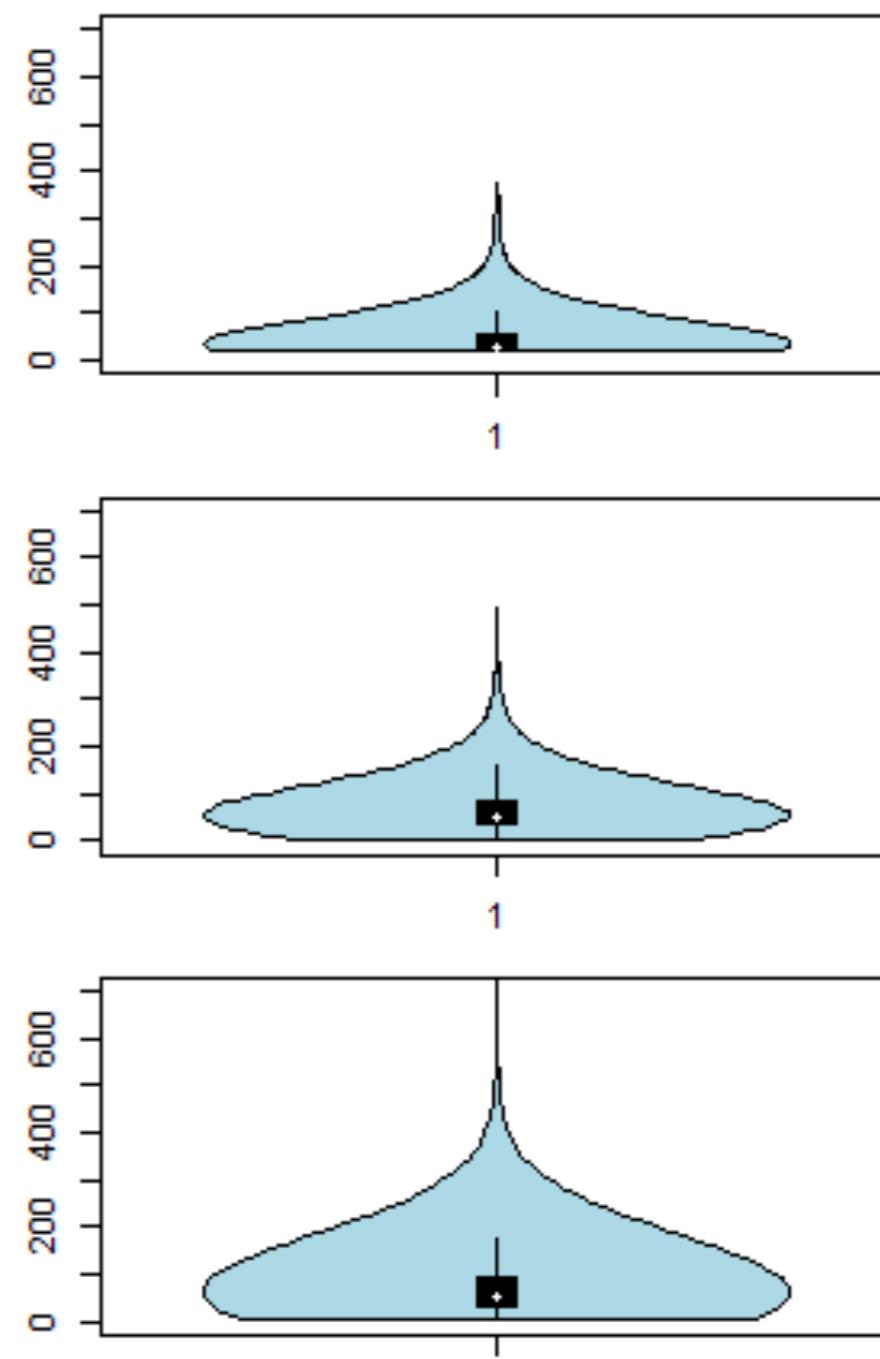
In other words, almost all 365 agents (but two) who received drug, were at one point or other missed at least one treatment or more.

Infection durations at different immunity levels



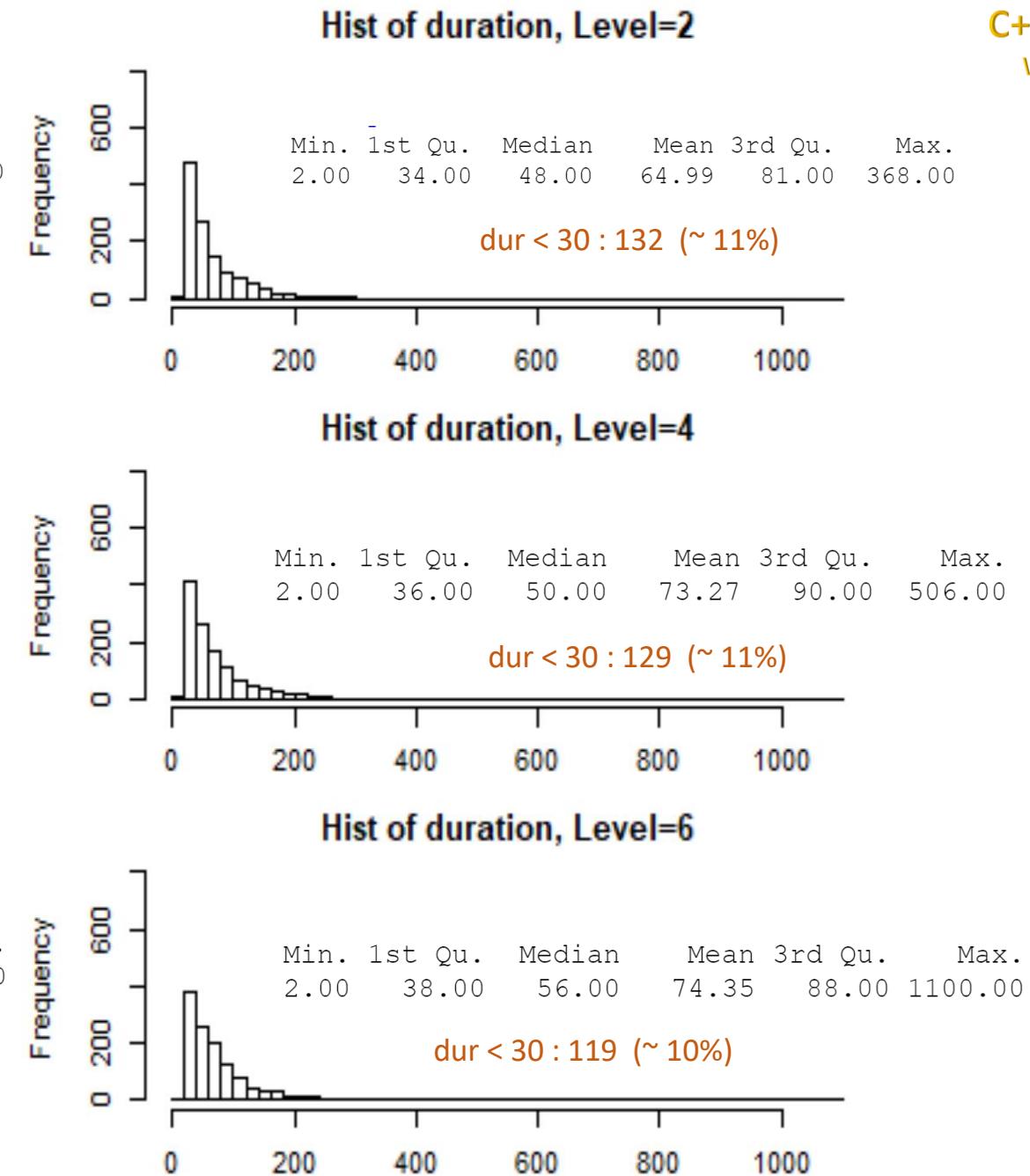
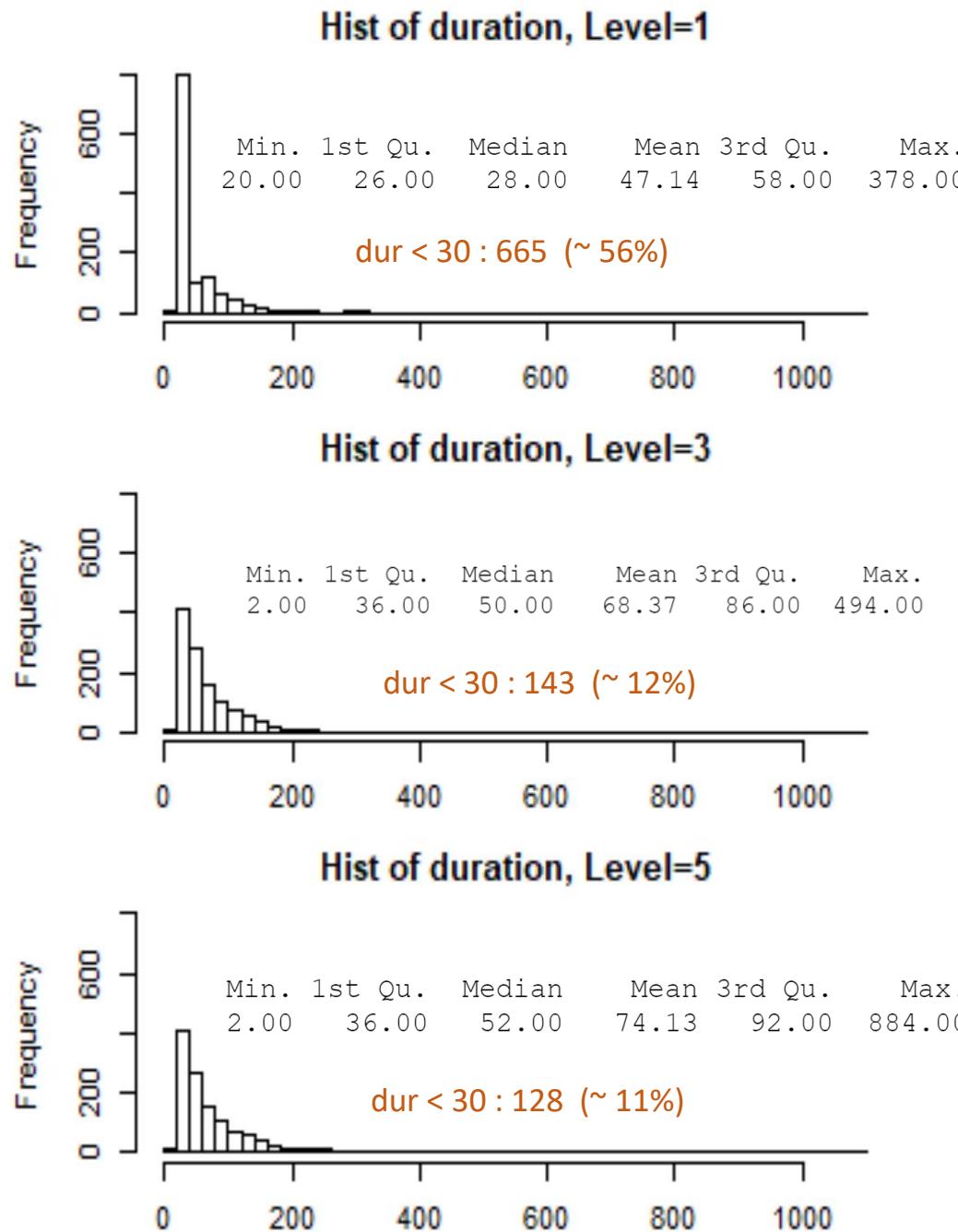
C++ model
With drug
~3Y

Infection durations at different immunity levels



C++ model
With drug
~3Y

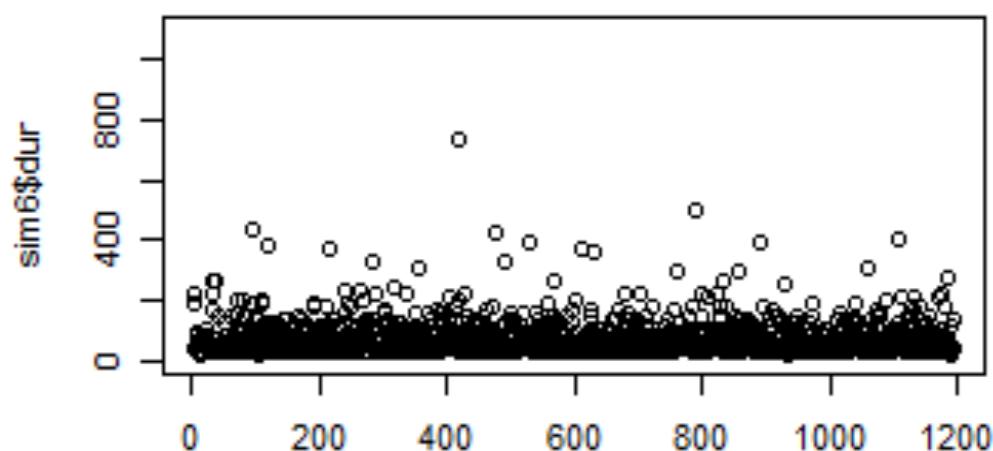
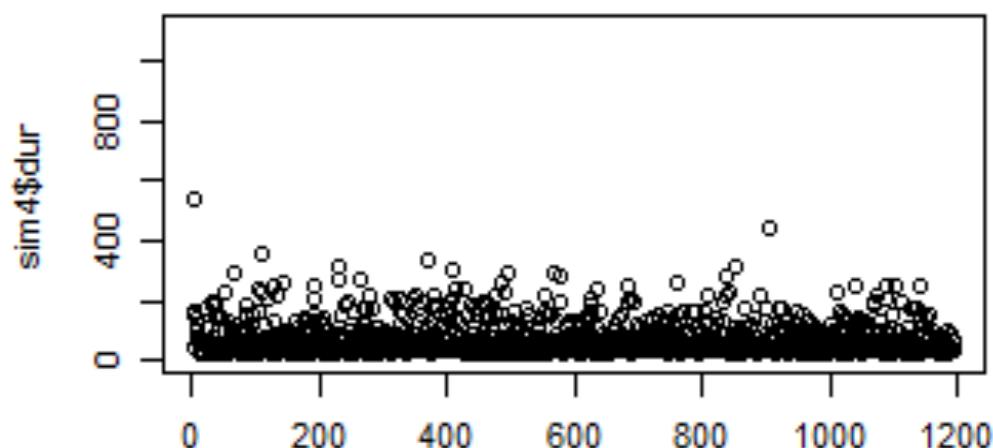
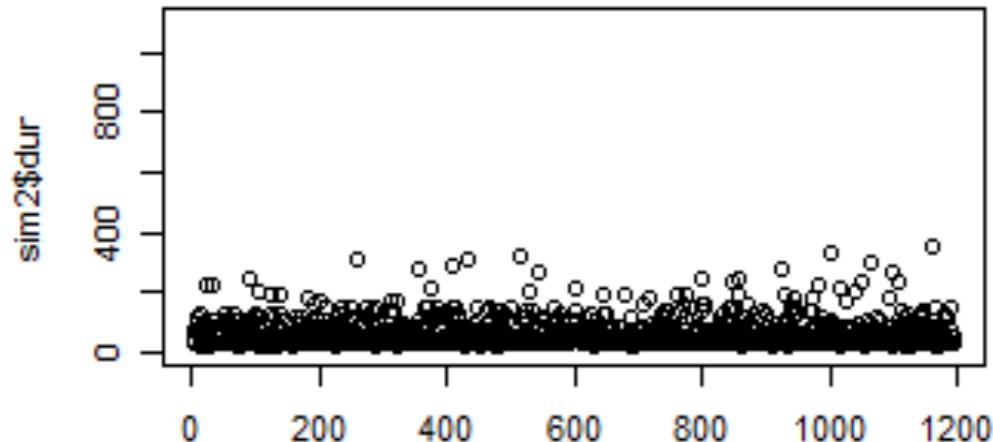
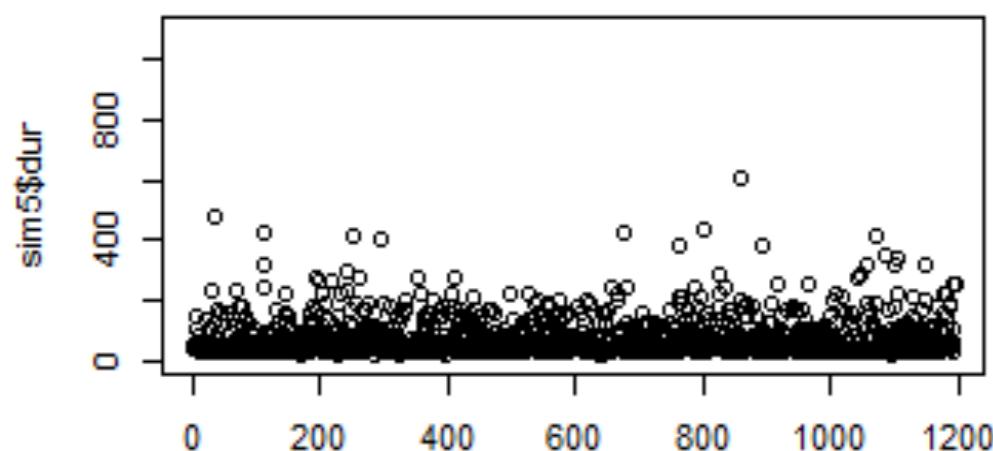
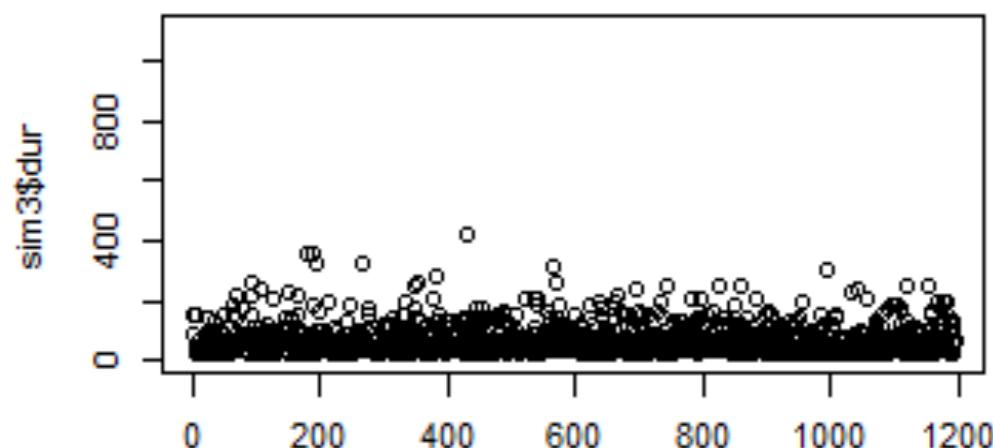
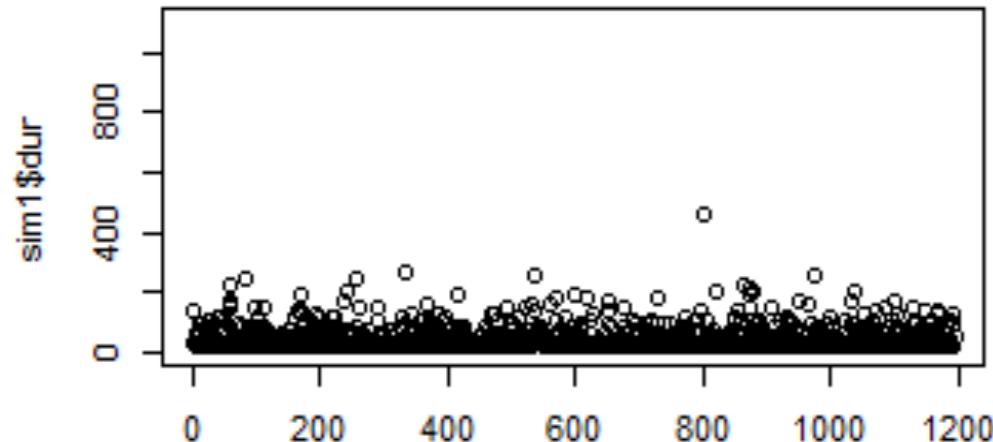
Infection durations at different immunity levels



C++ model
With drug
~3Y

When P0 initialization uses 10^3
(instead of original 10^2)

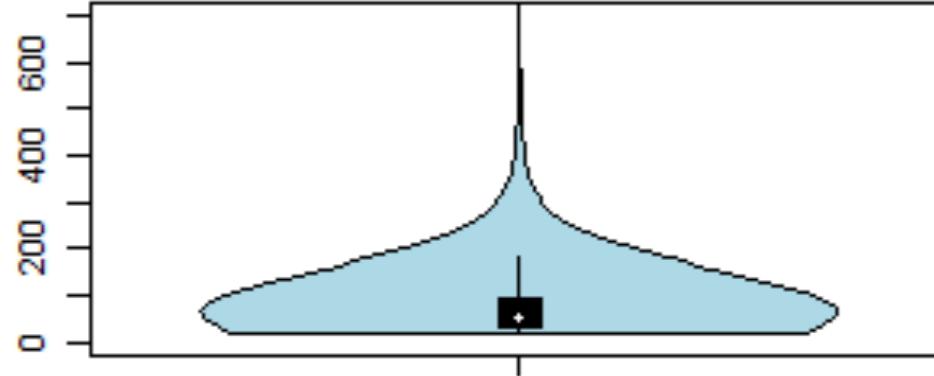
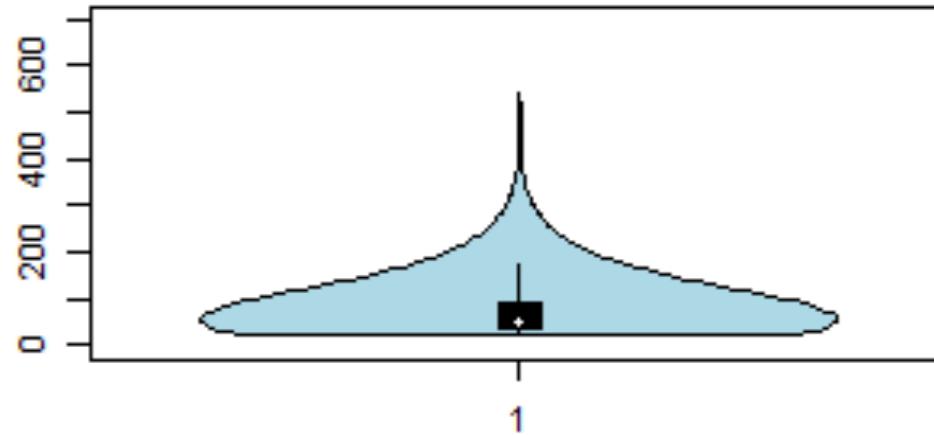
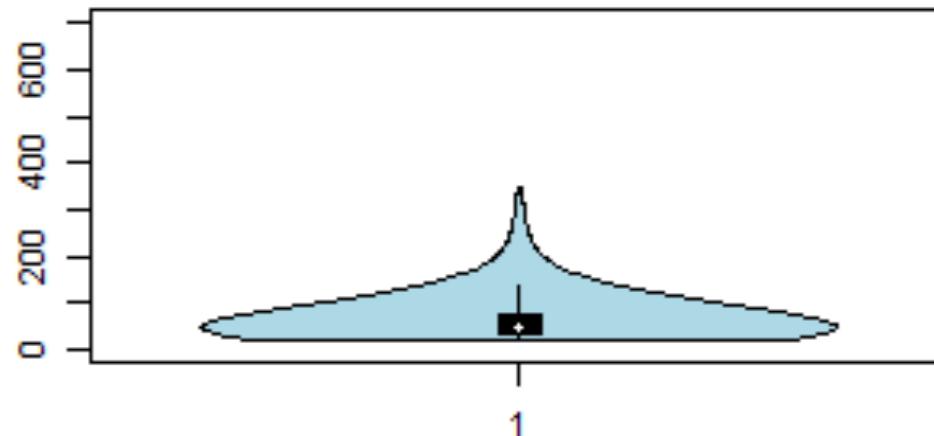
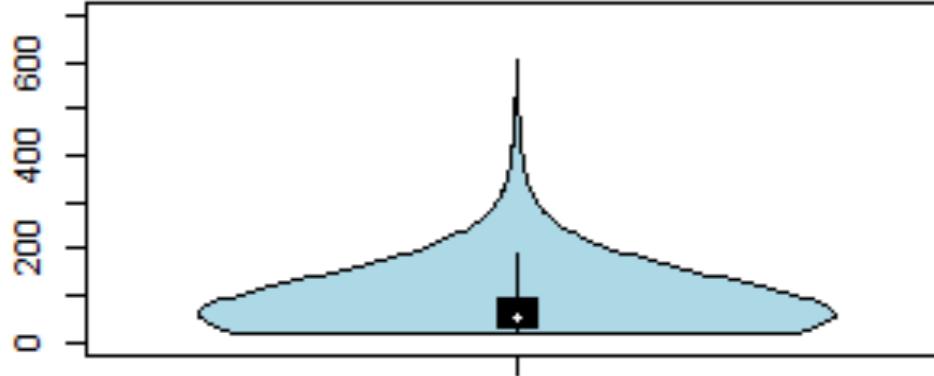
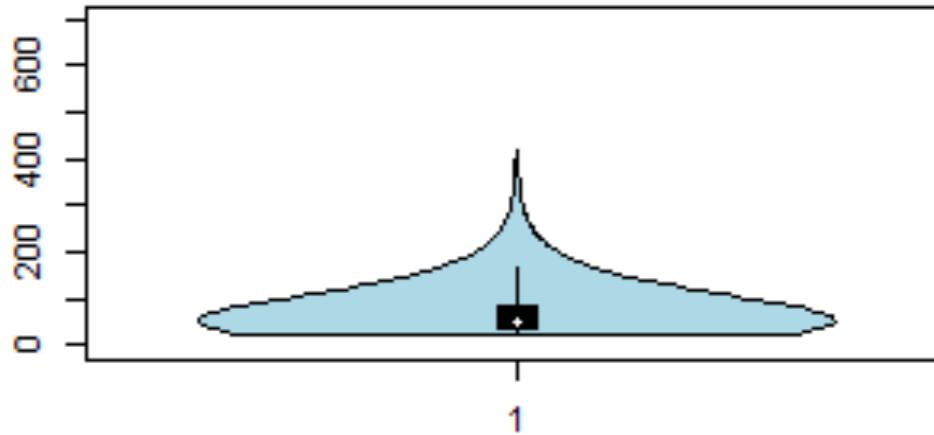
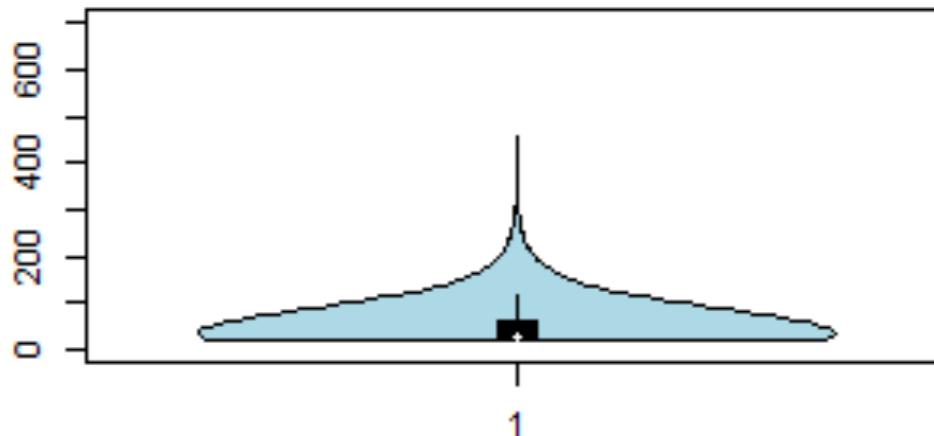
Infection durations at different immunity levels



C++ model
With drug
~3Y

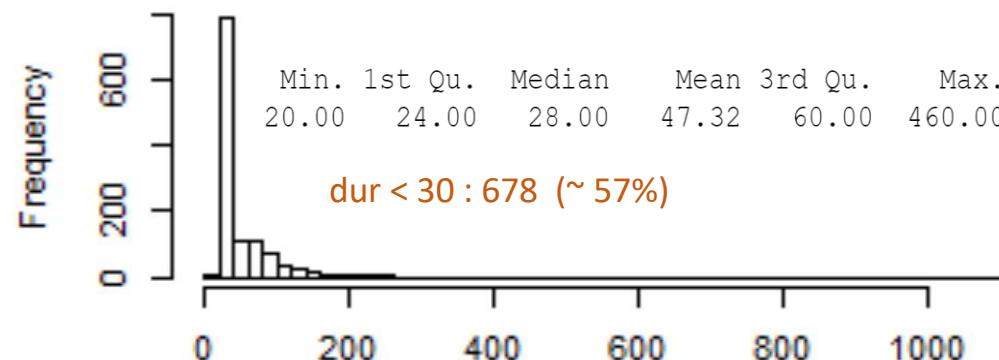
C++ model
With drug
~3Y

Infection durations at different immunity levels

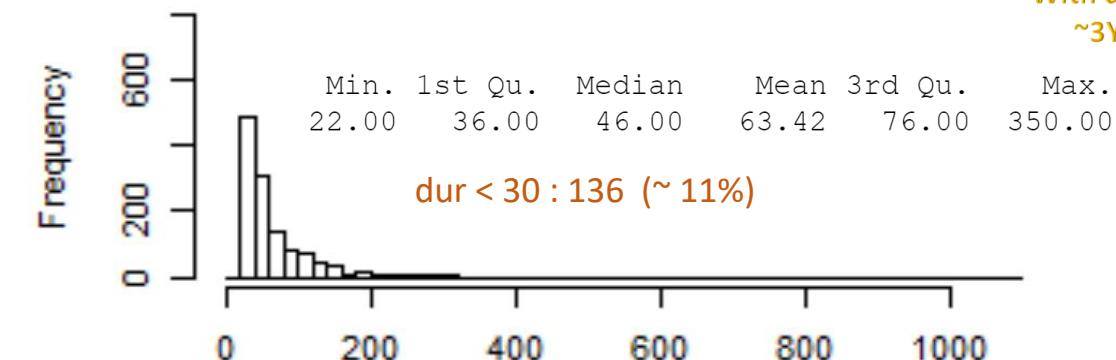


Infection durations at different immunity levels

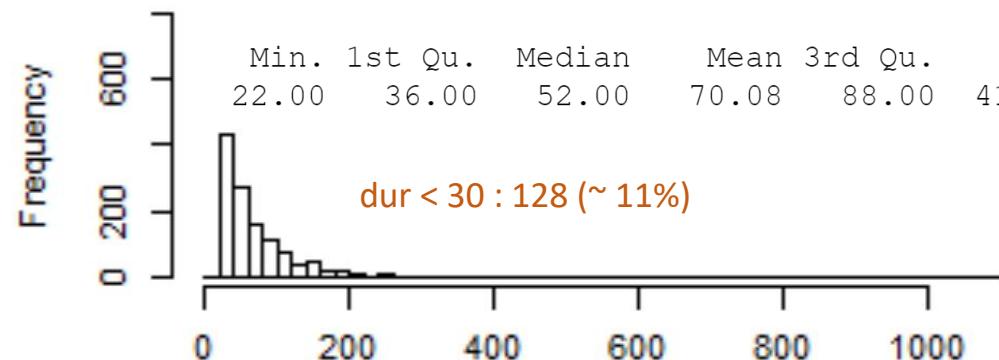
Hist of duration, Level=1



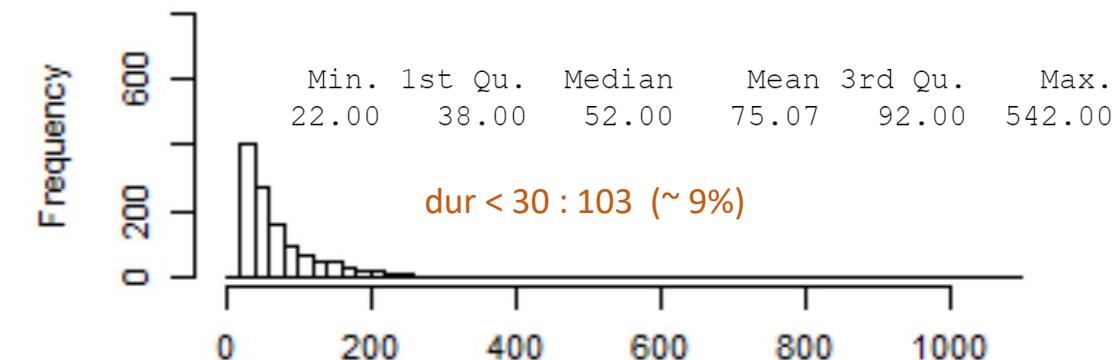
Hist of duration, Level=2



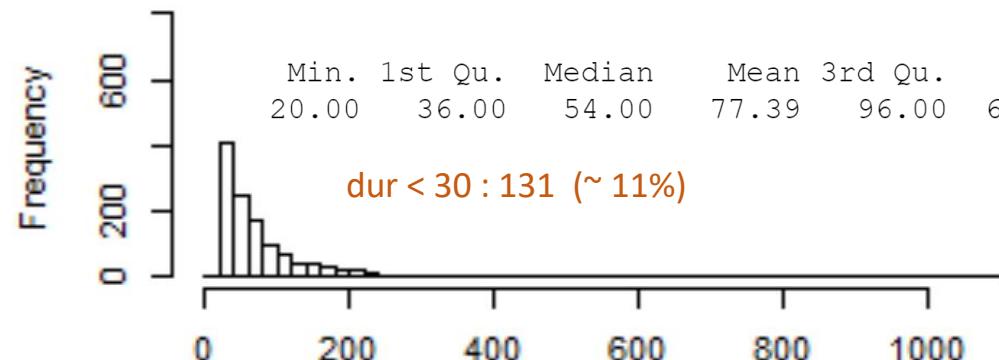
Hist of duration, Level=3



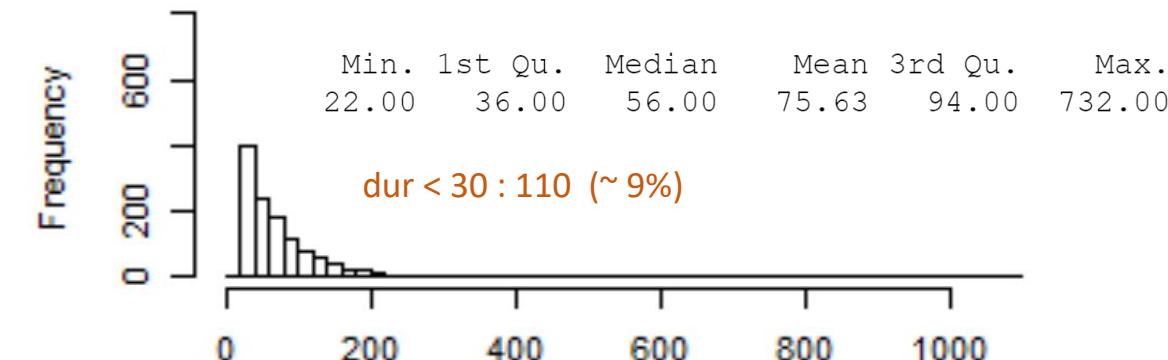
Hist of duration, Level=4



Hist of duration, Level=5



Hist of duration, Level=6

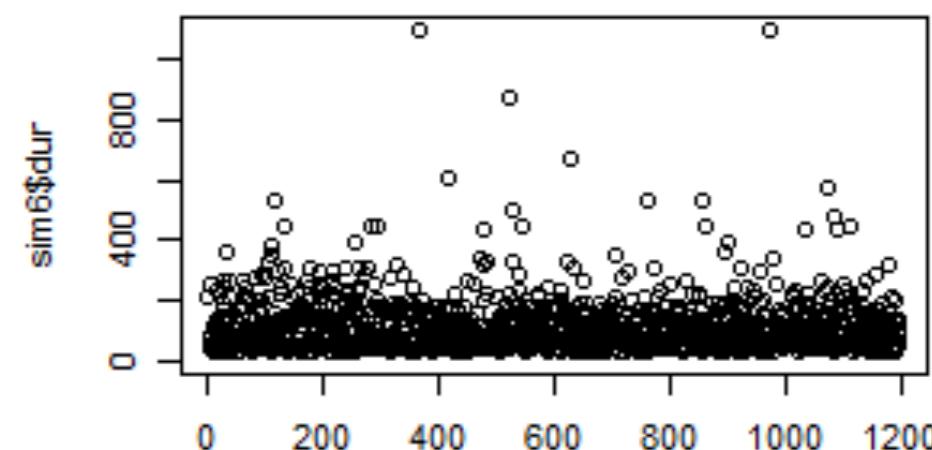
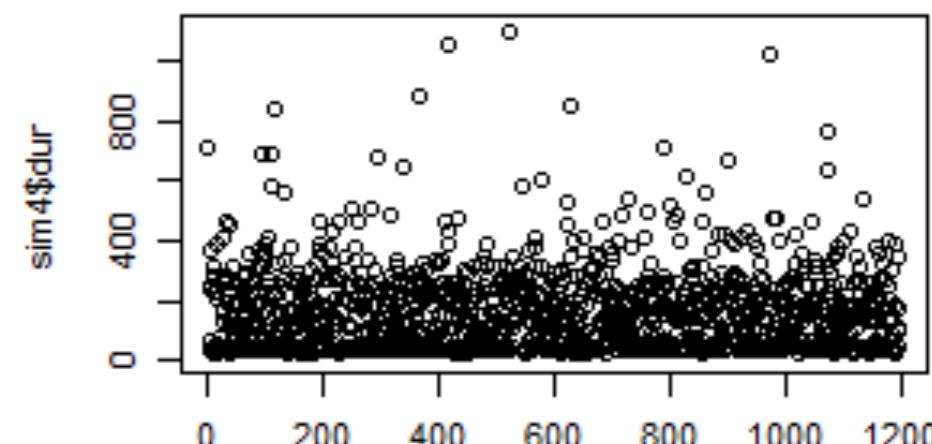
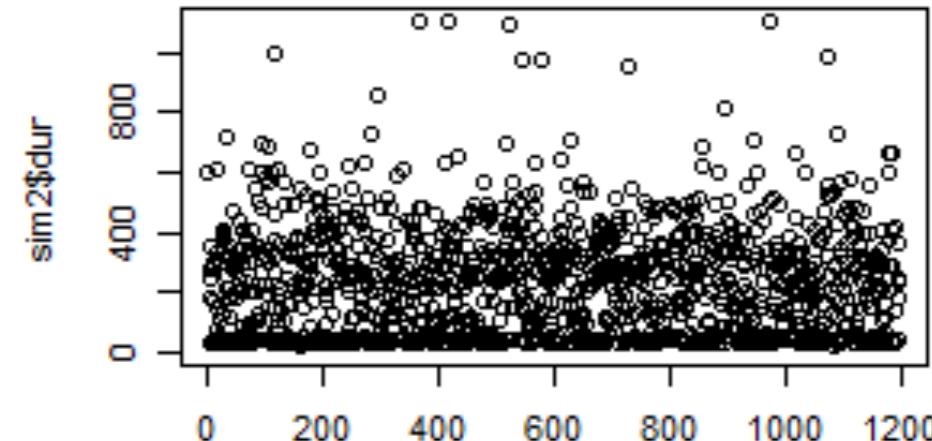
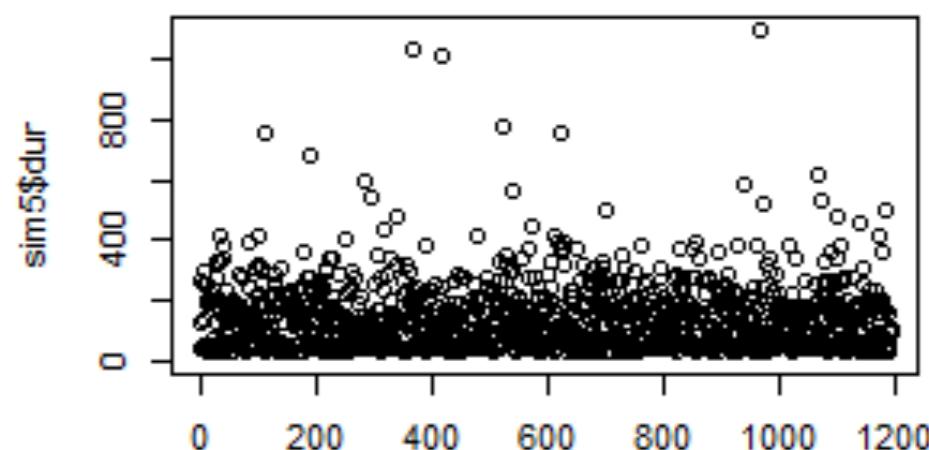
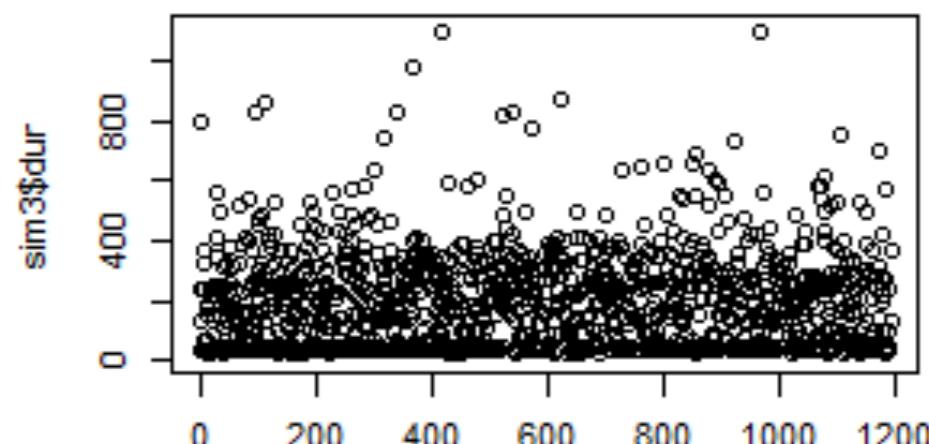
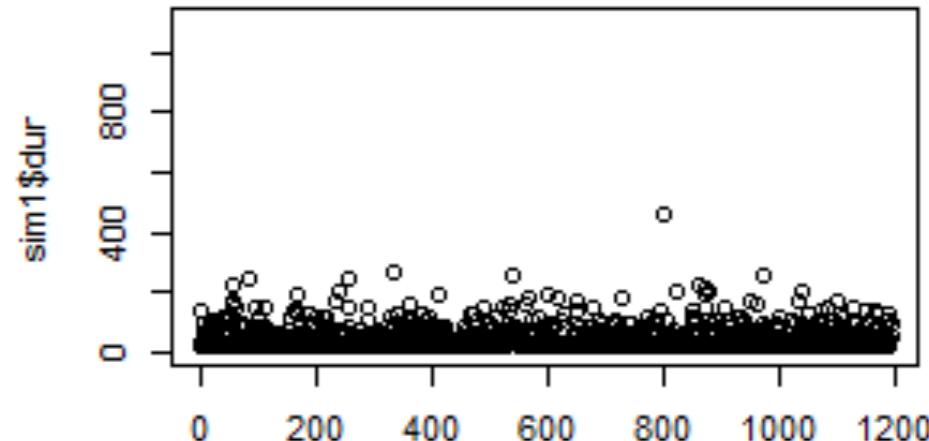


C++ model
With drug
~3Y

With No Treatment (no Drug)

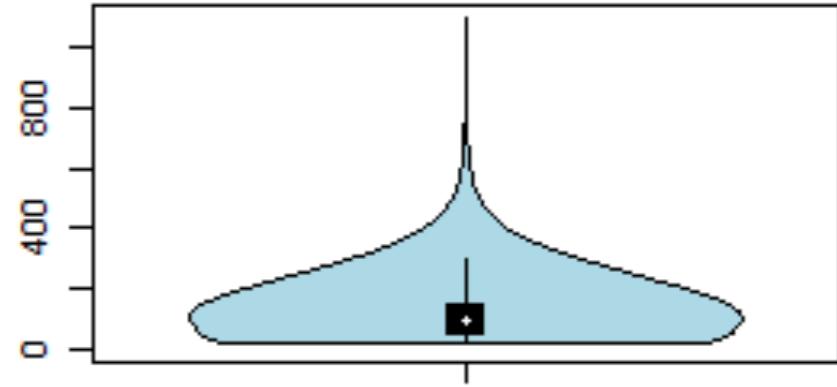
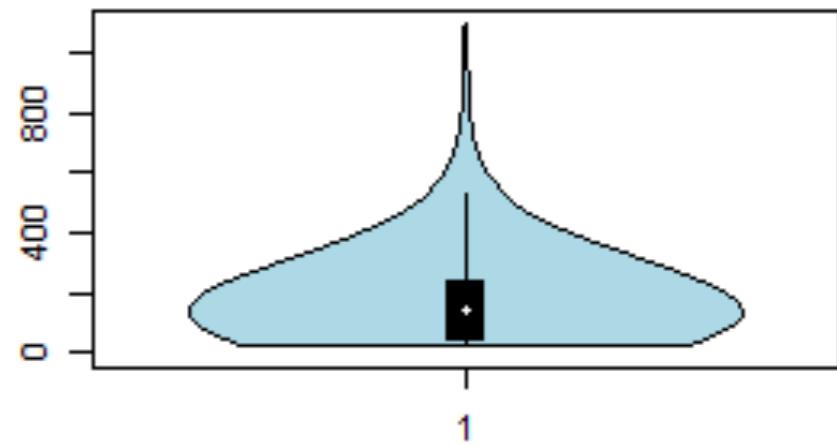
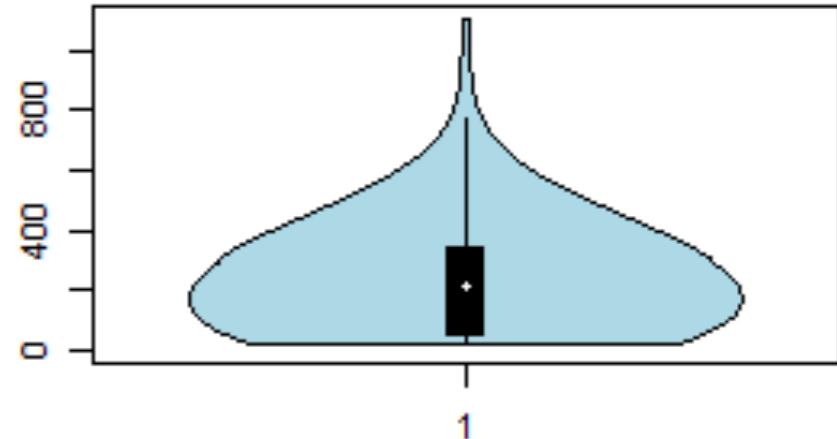
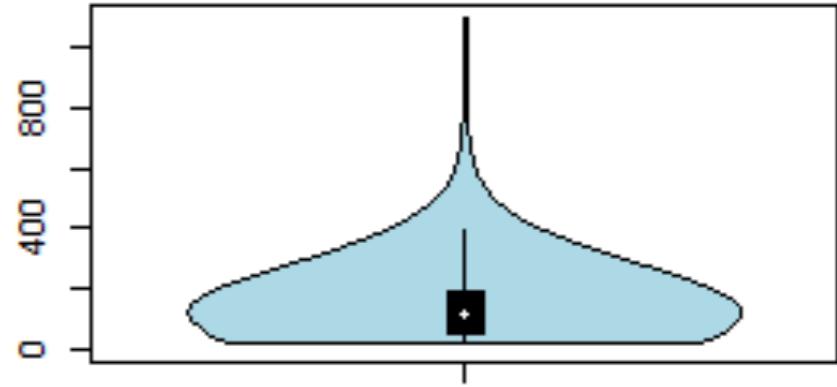
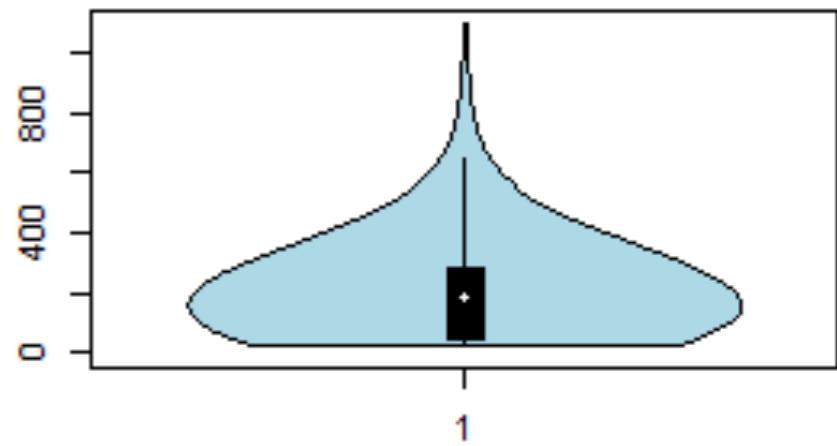
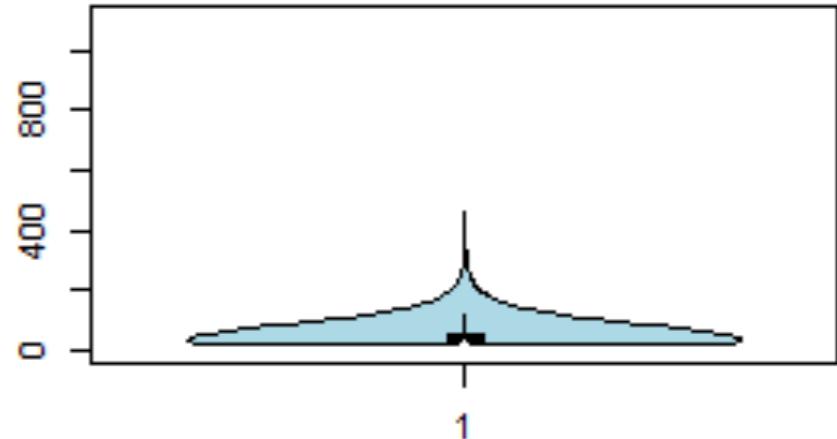
When P0 initialization uses 10^3 (instead of original 10^2)

Infection durations at different immunity levels



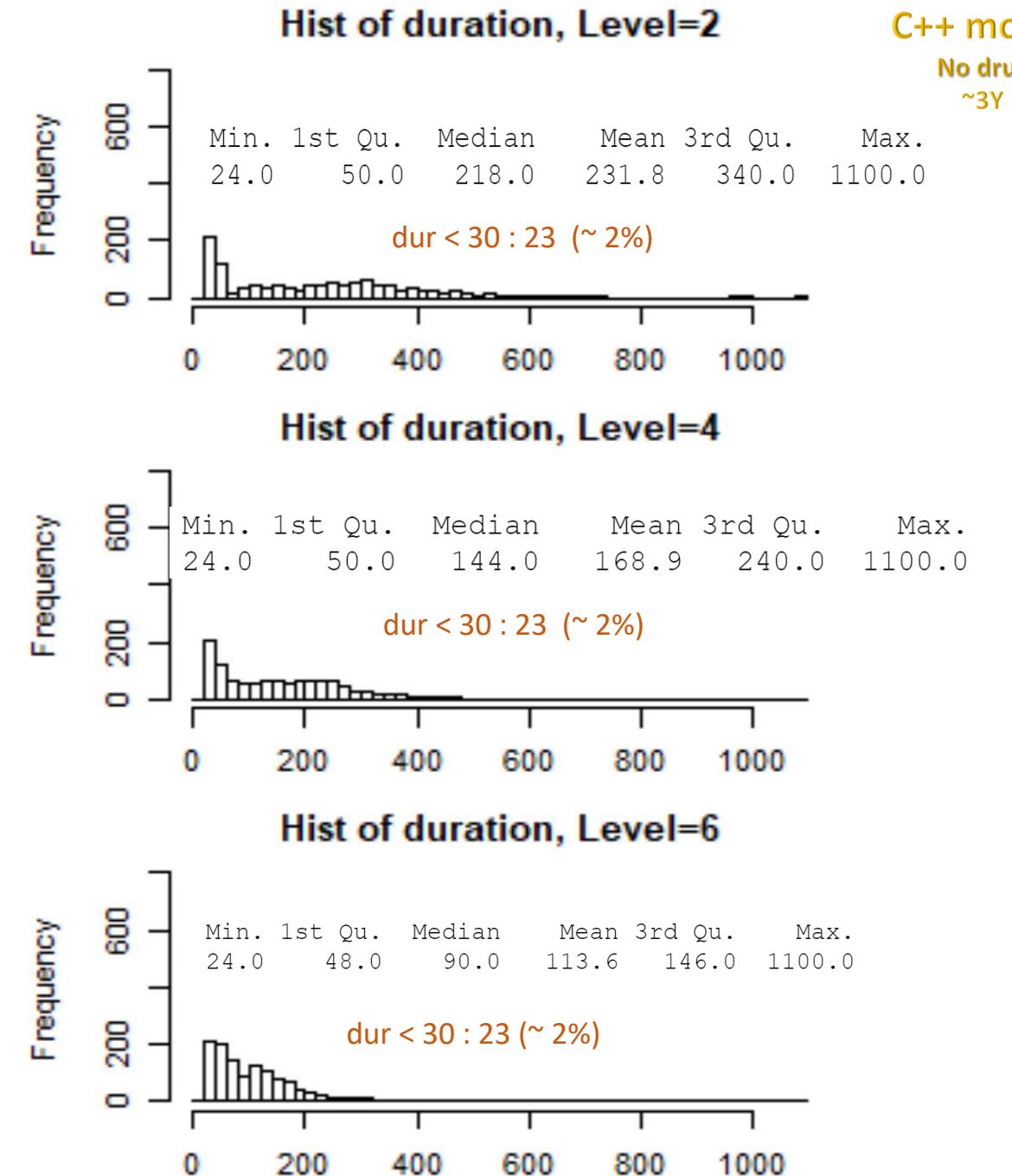
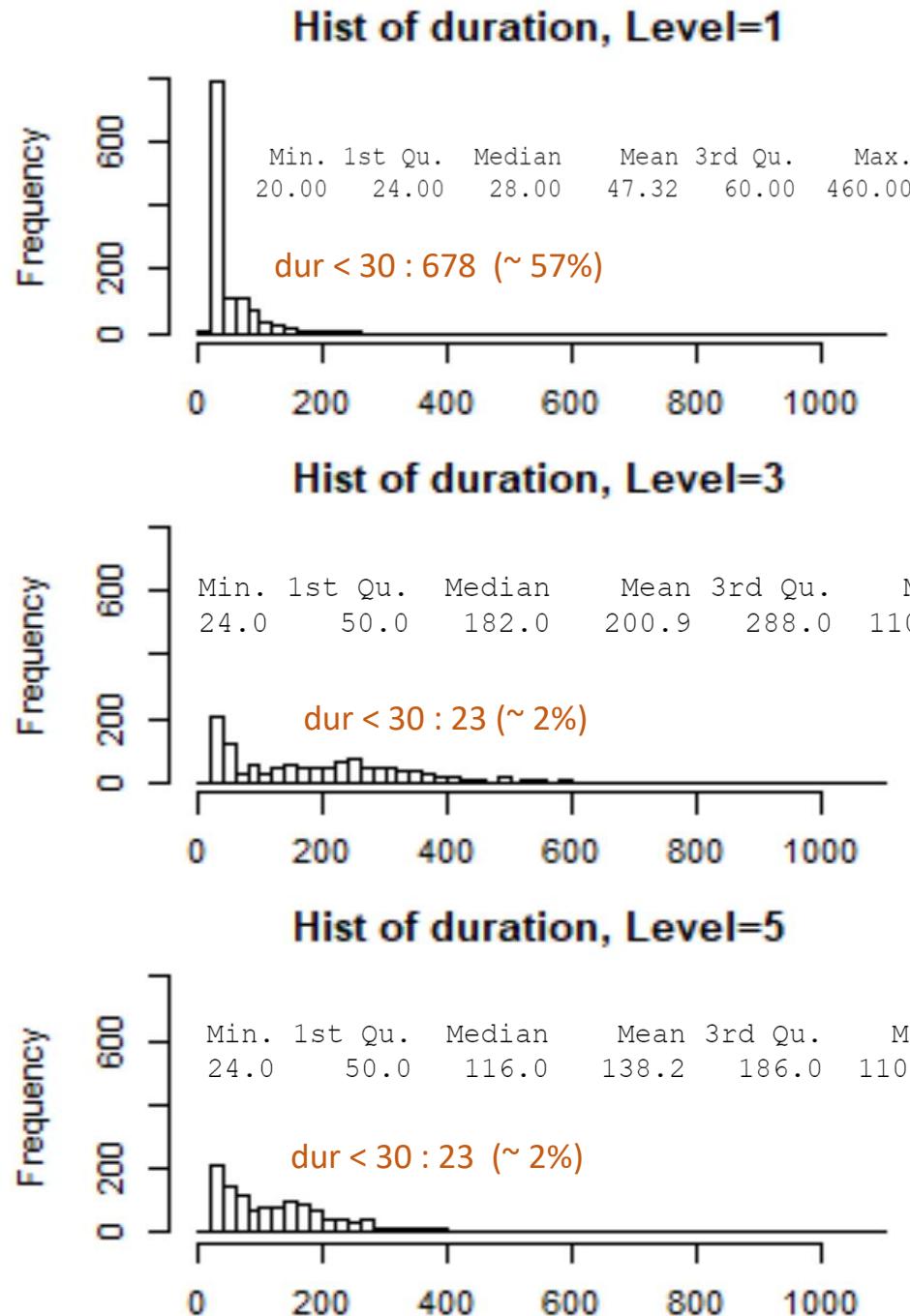
C++ model
No drug
~3Y

Infection durations at different immunity levels



C++ model
No drug
~3Y

Infection durations at different immunity levels

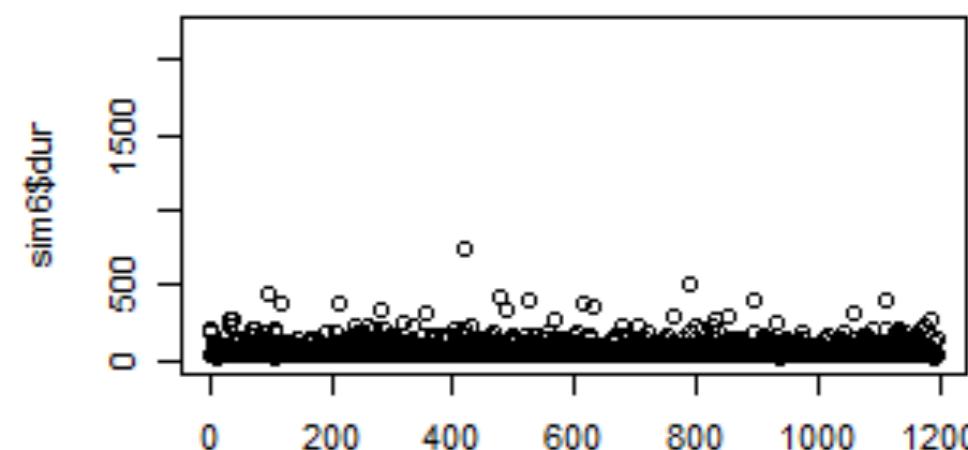
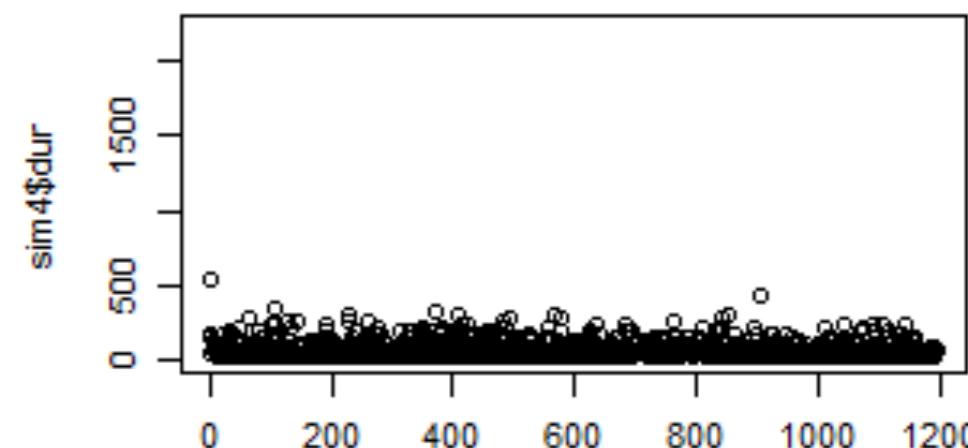
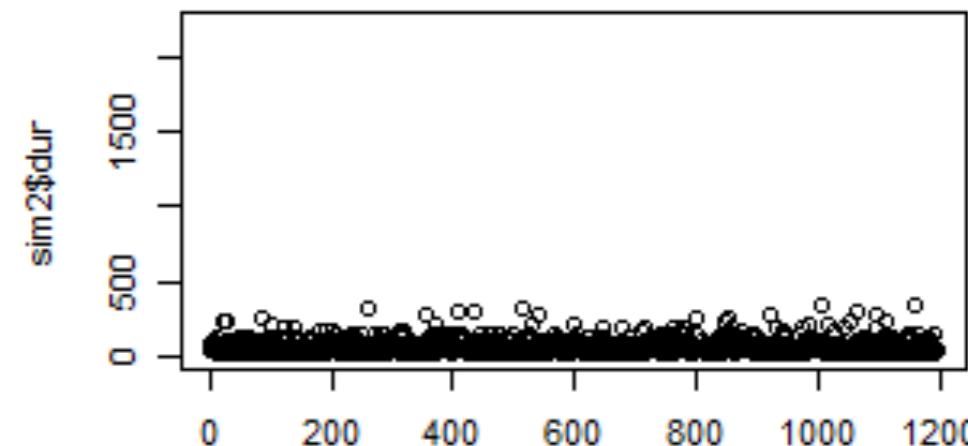
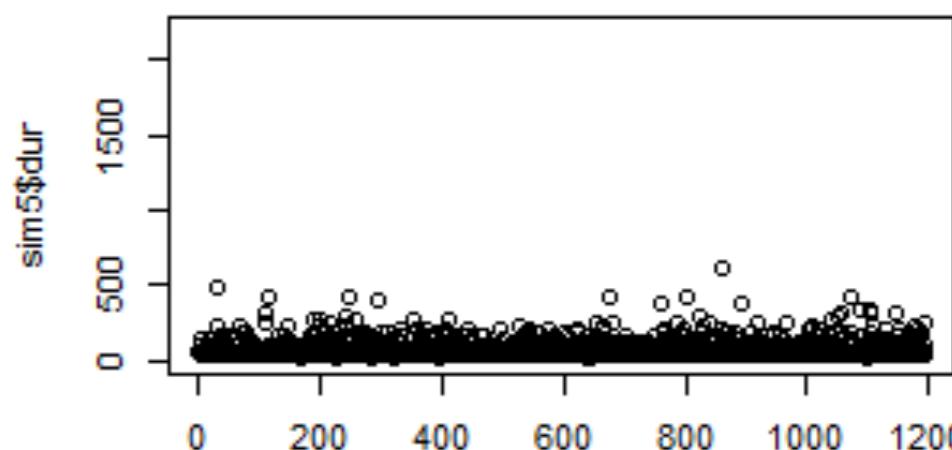
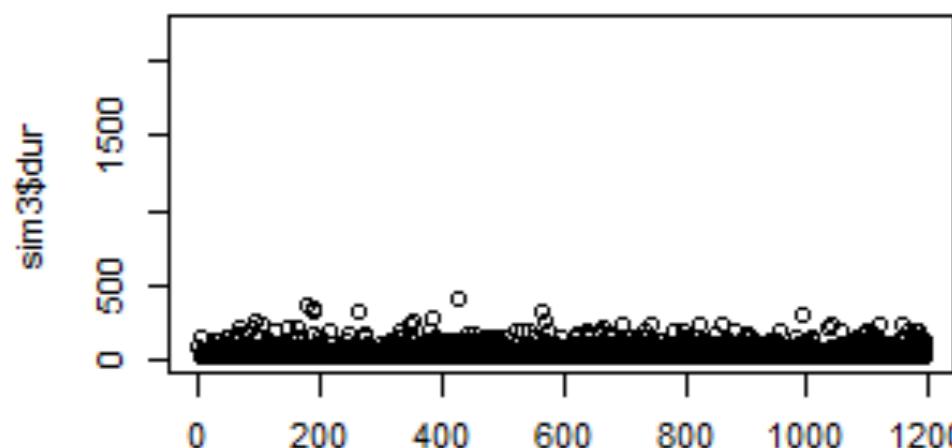
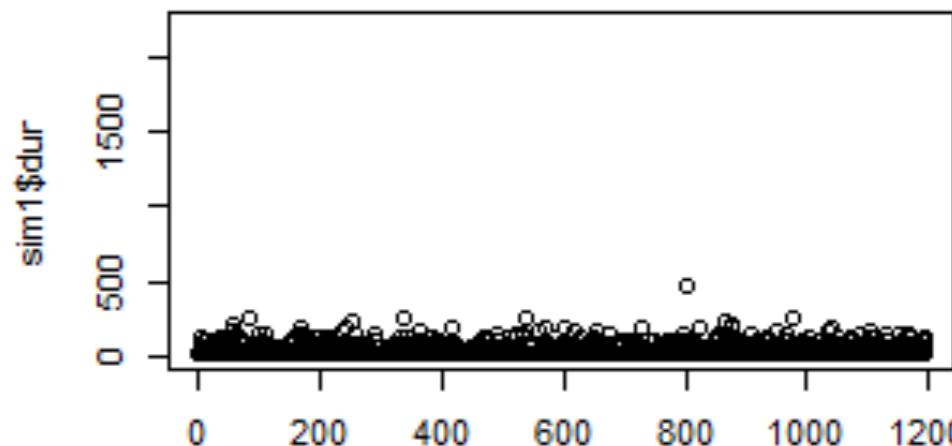


C++ model
No drug
~3Y

When P0 initialization uses 10^3
(instead of original 10^2)

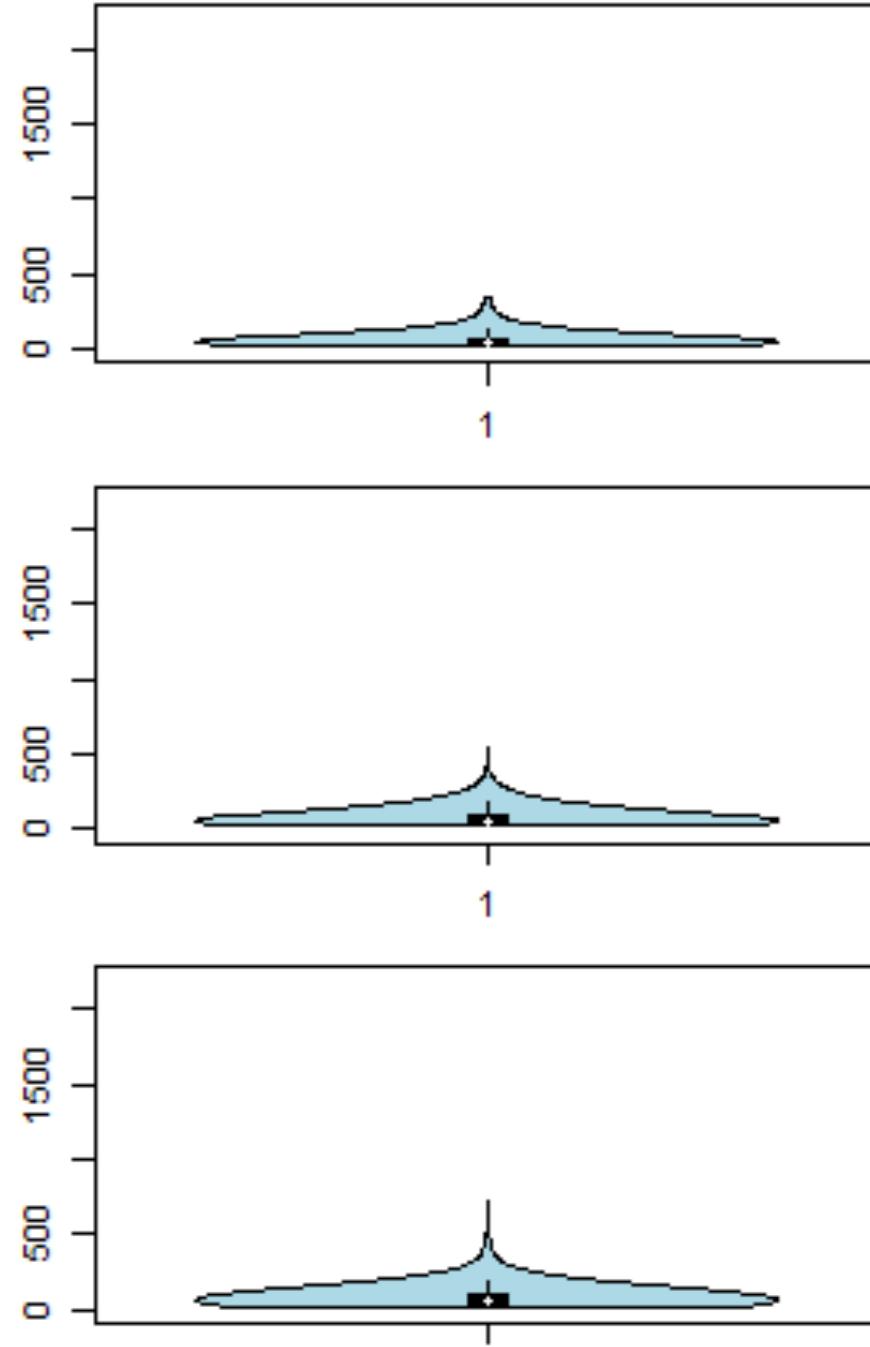
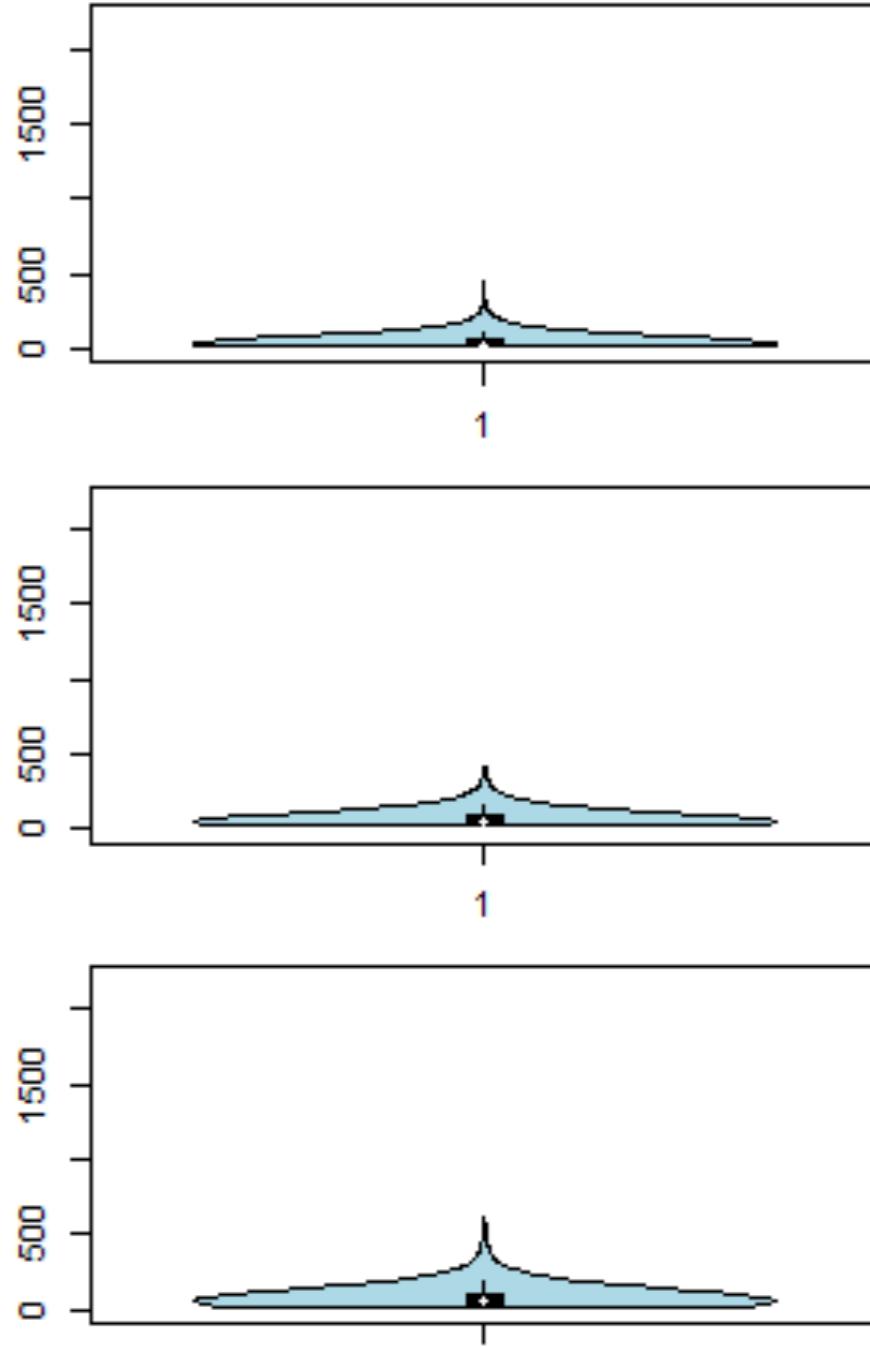
6Y (with Drug)

Infection durations at different immunity levels



C++ model
With drug
~6Y

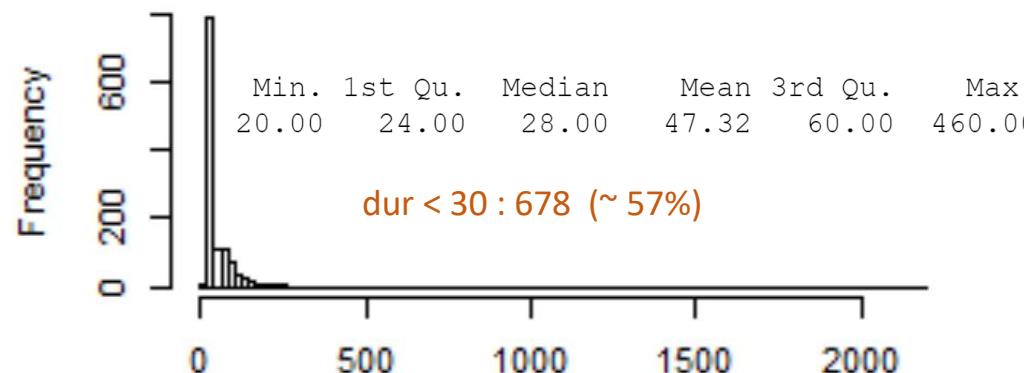
Infection durations at different immunity levels



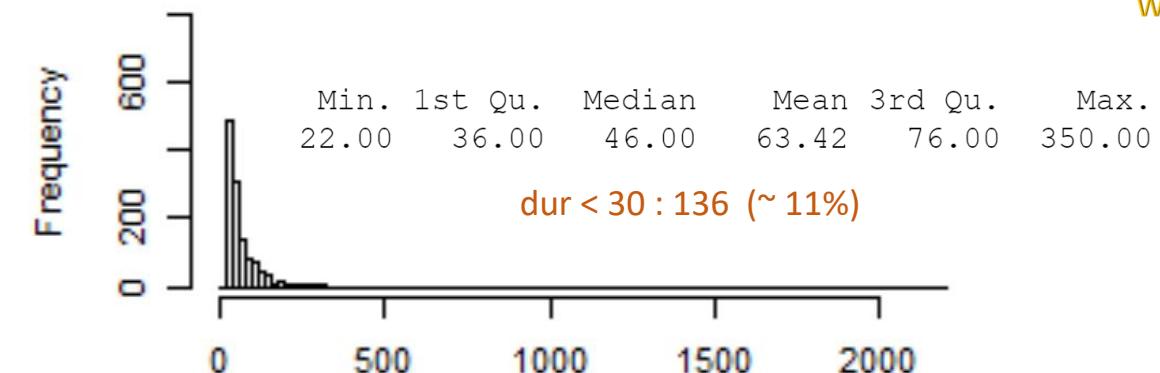
C++ model
With drug
~6Y

Infection durations at different immunity levels

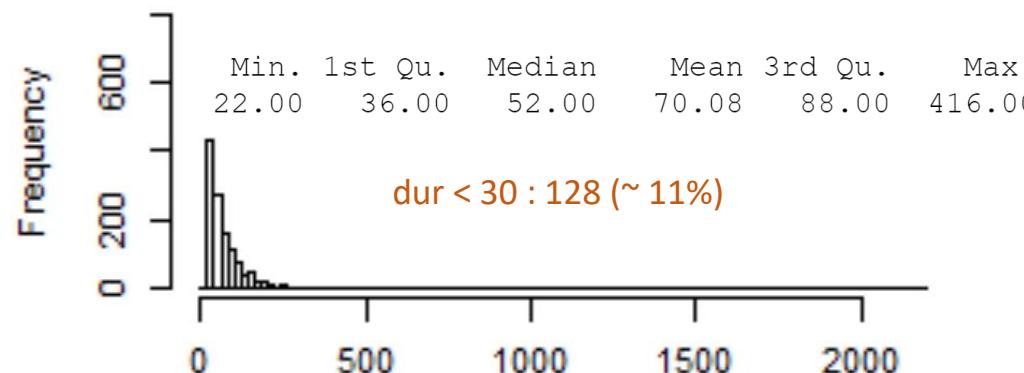
Hist of duration, Level=1



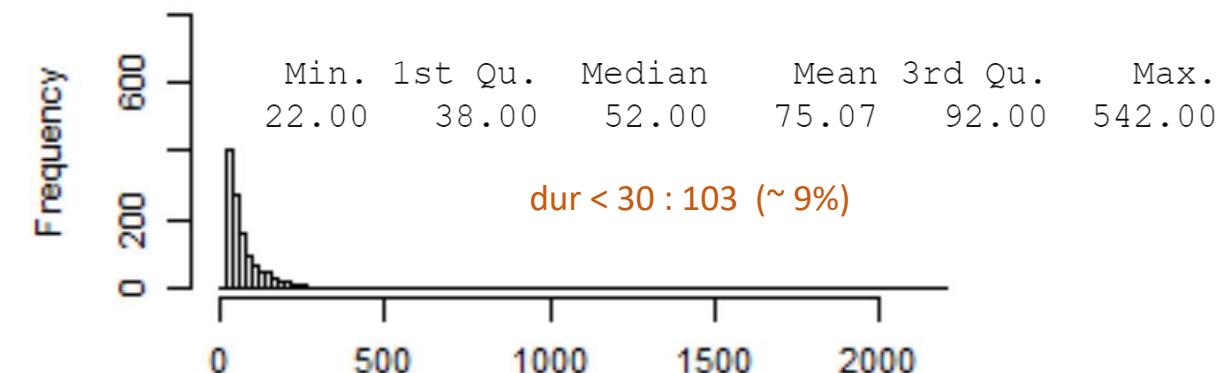
Hist of duration, Level=2



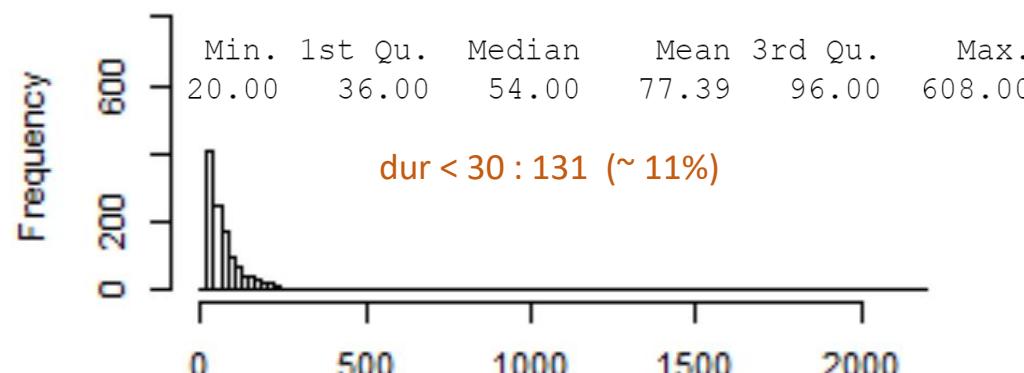
Hist of duration, Level=3



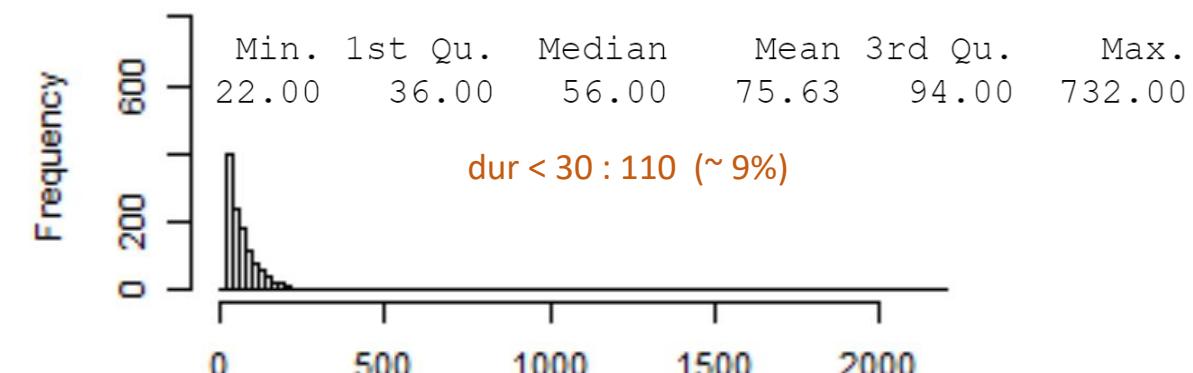
Hist of duration, Level=4



Hist of duration, Level=5



Hist of duration, Level=6



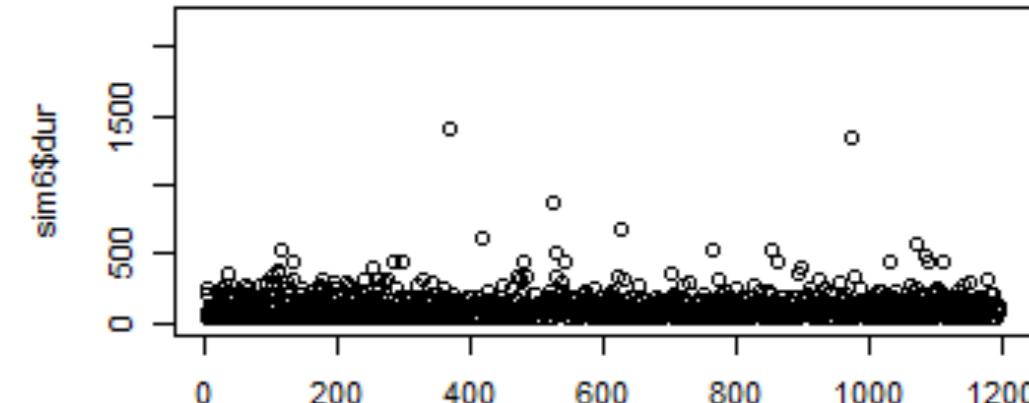
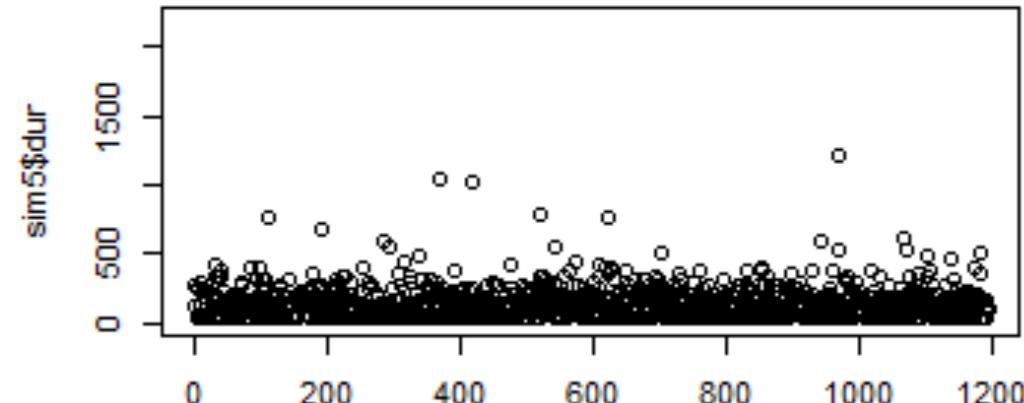
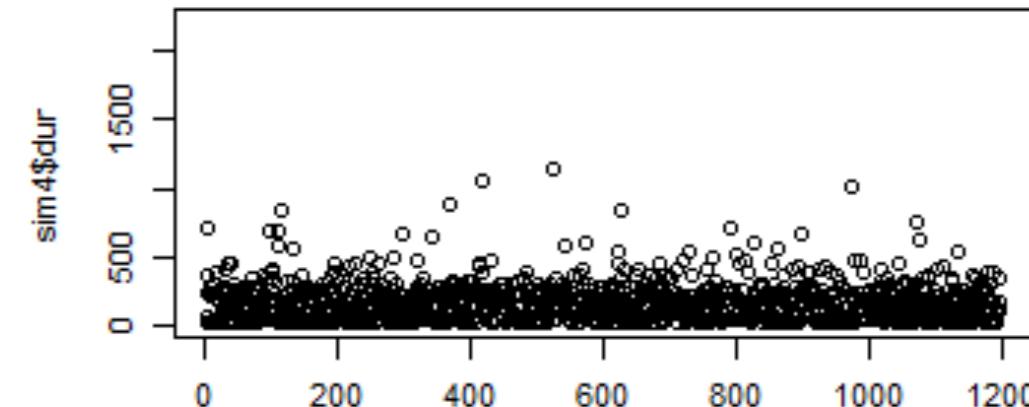
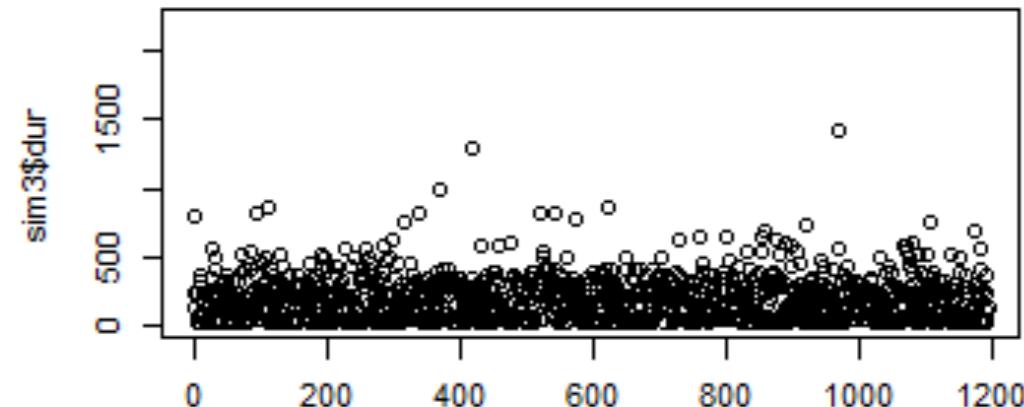
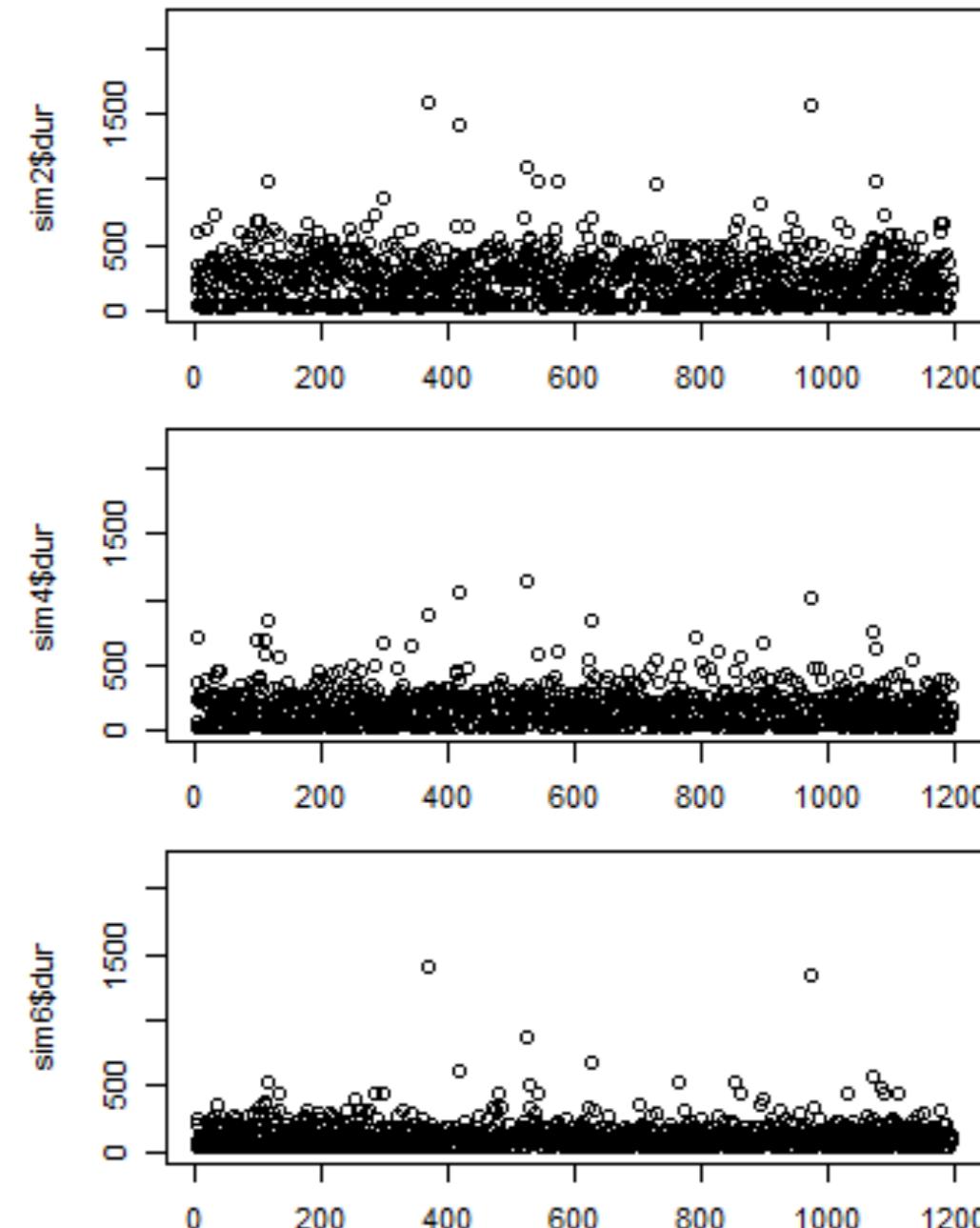
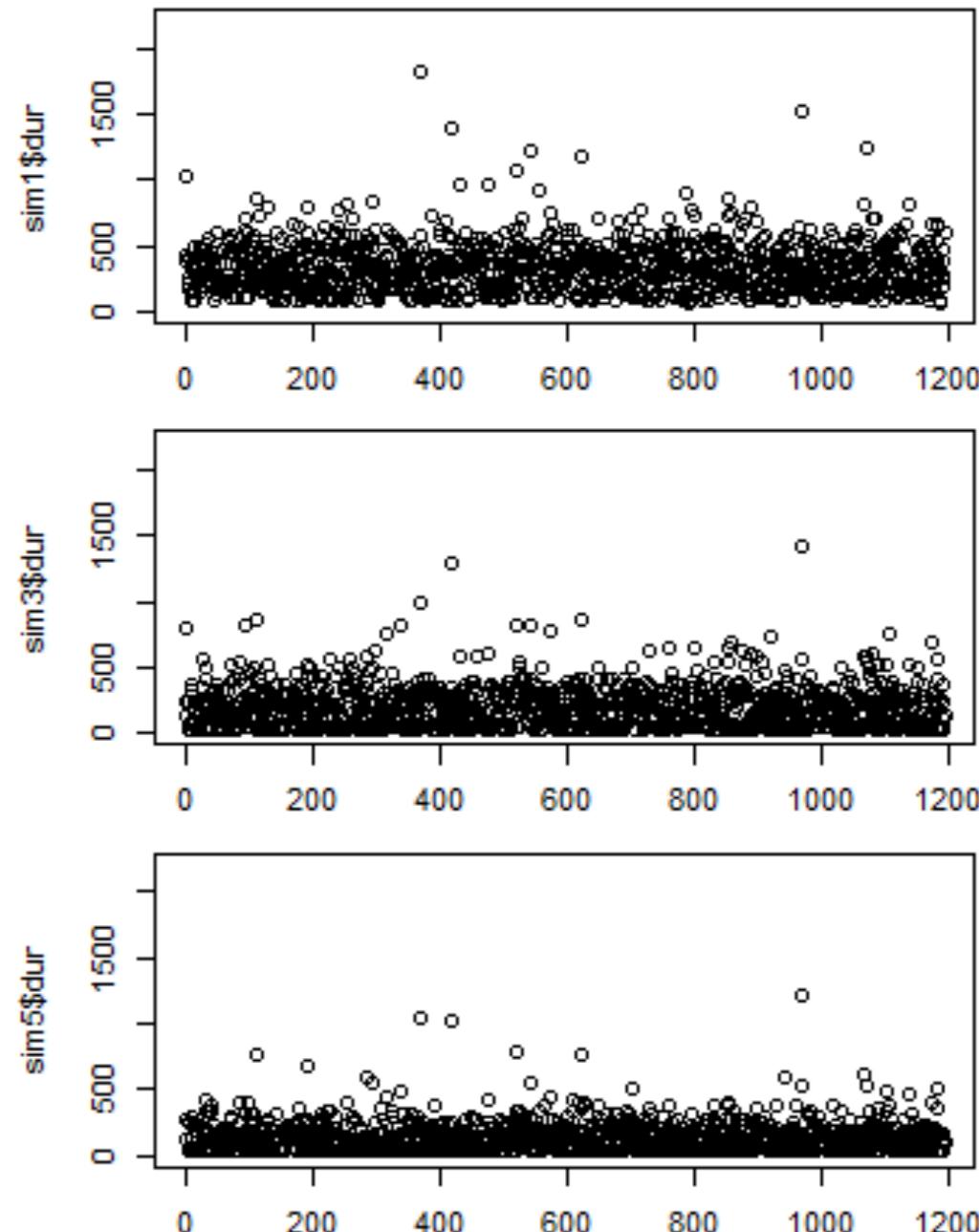
C++ model
With drug
~6Y

With No Treatment (no Drug)

When P0 initialization uses 10^3 (instead of original 10^2)

6Y

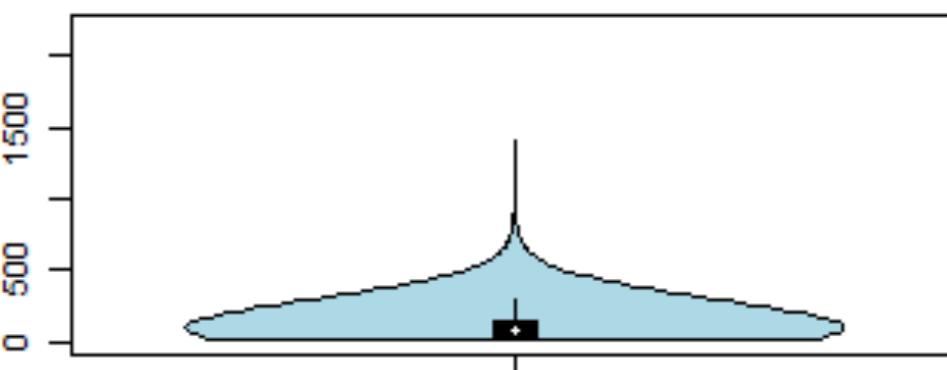
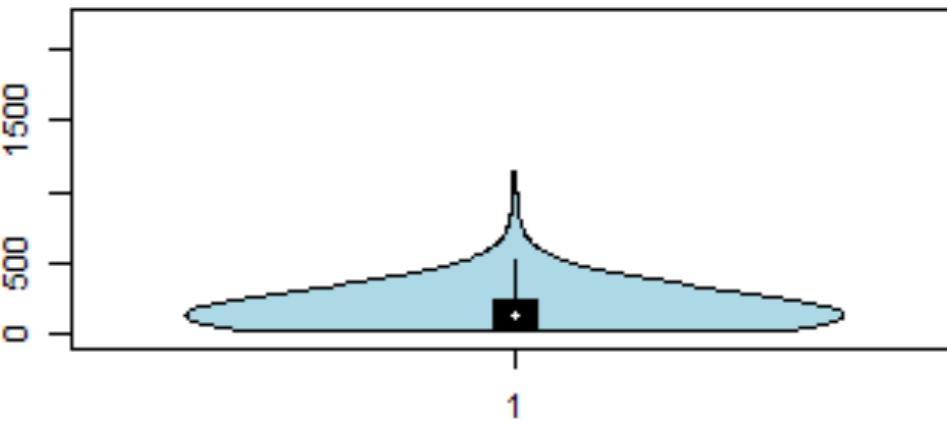
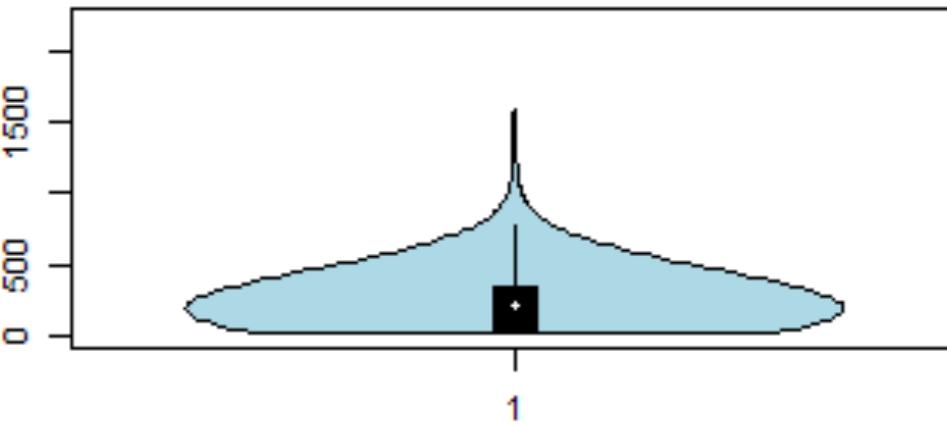
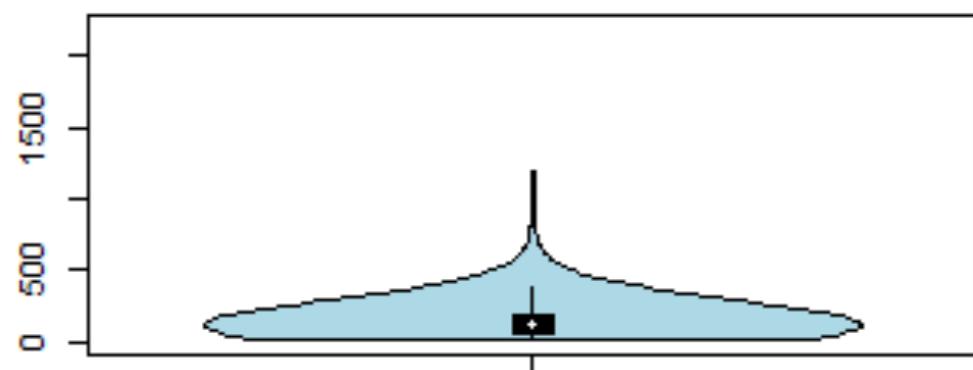
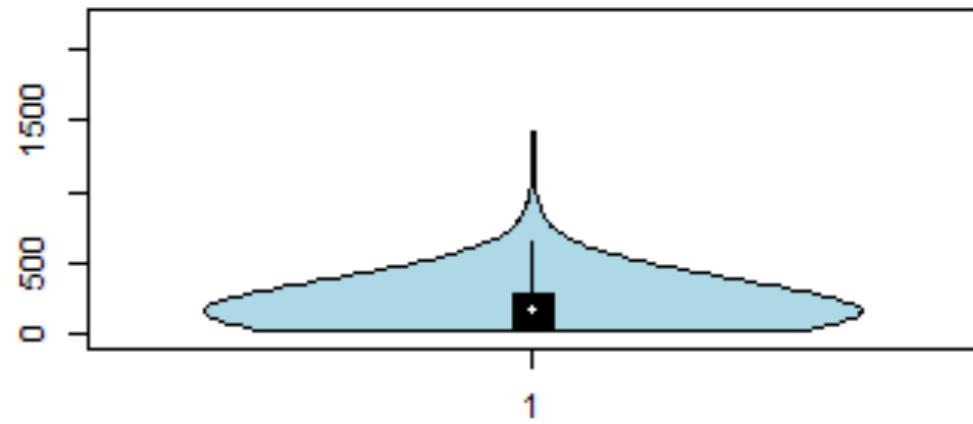
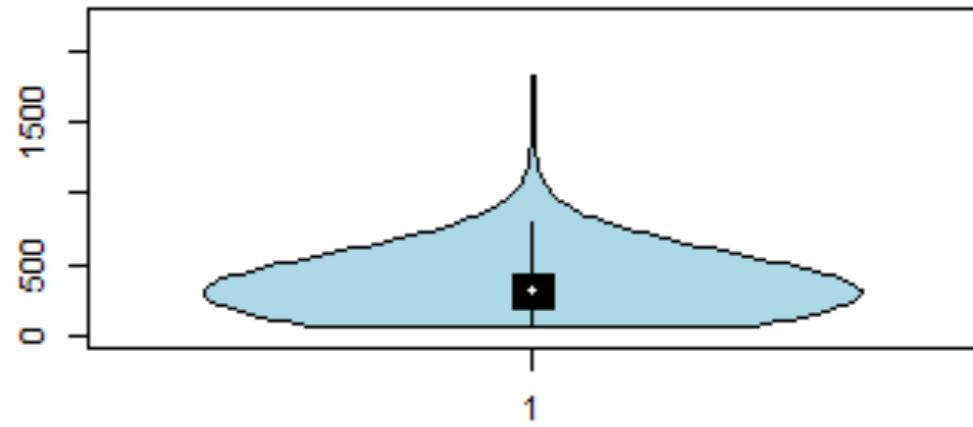
Infection durations at different immunity levels



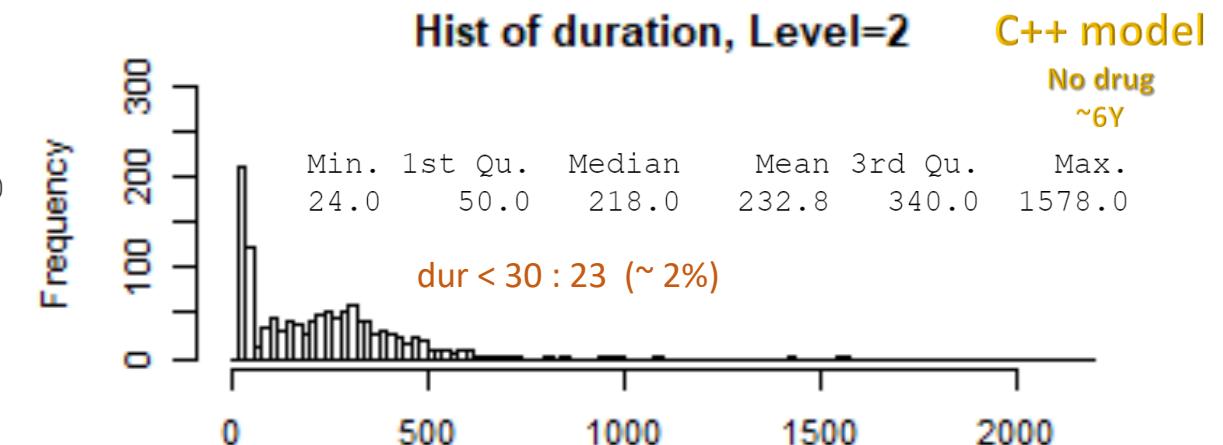
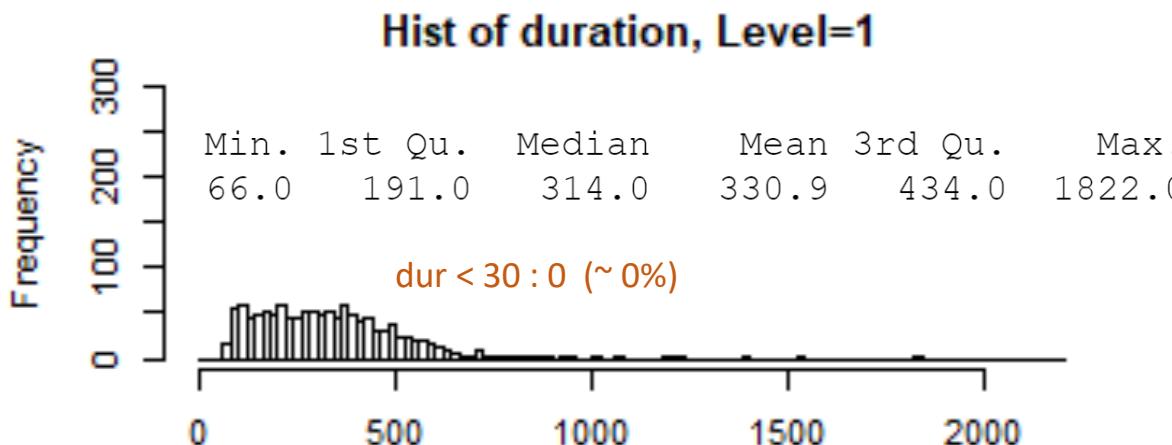
C++ model
No drug
~6Y

C++ model
No drug
~6Y

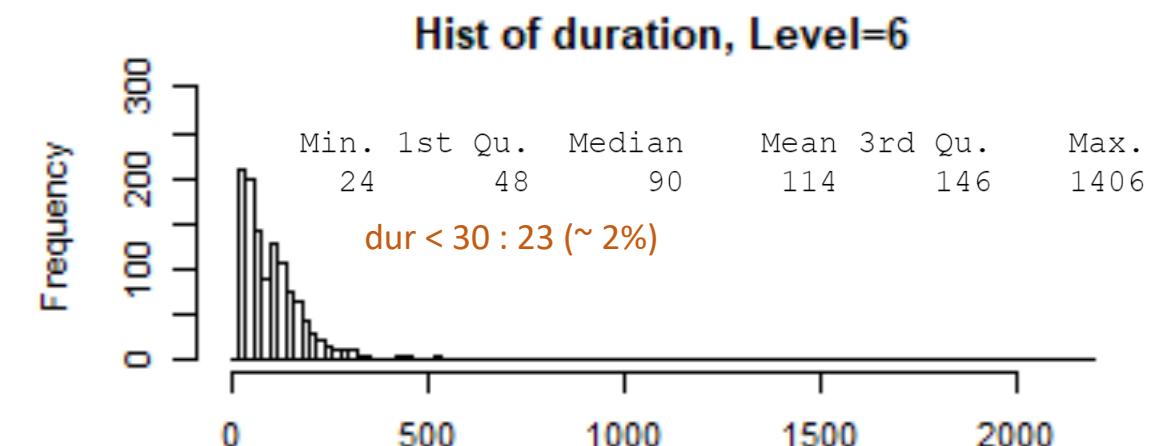
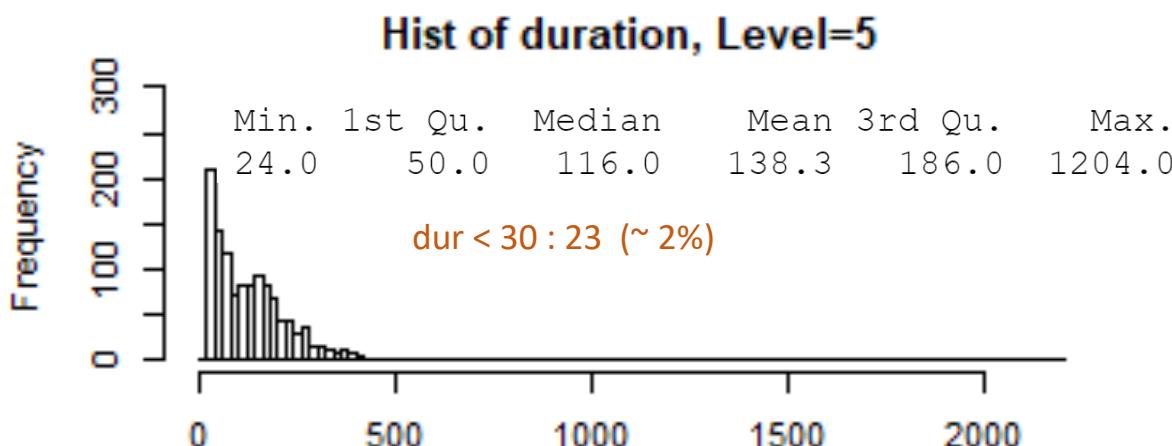
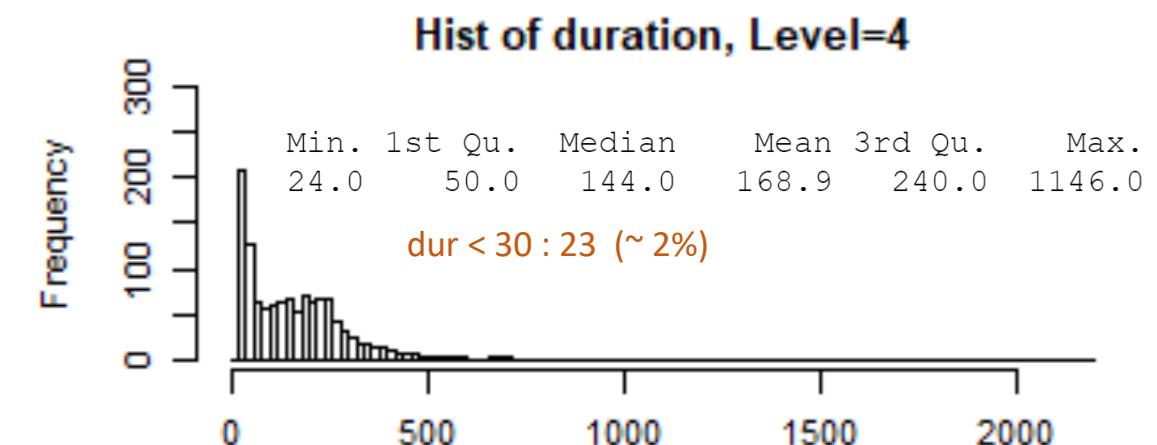
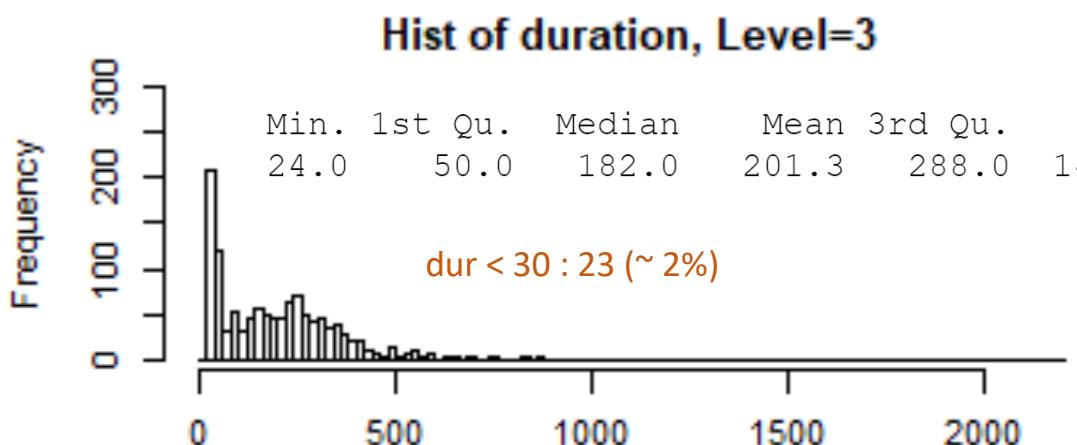
Infection durations at different immunity levels



Infection durations at different immunity levels



C++ model
No drug
~6Y



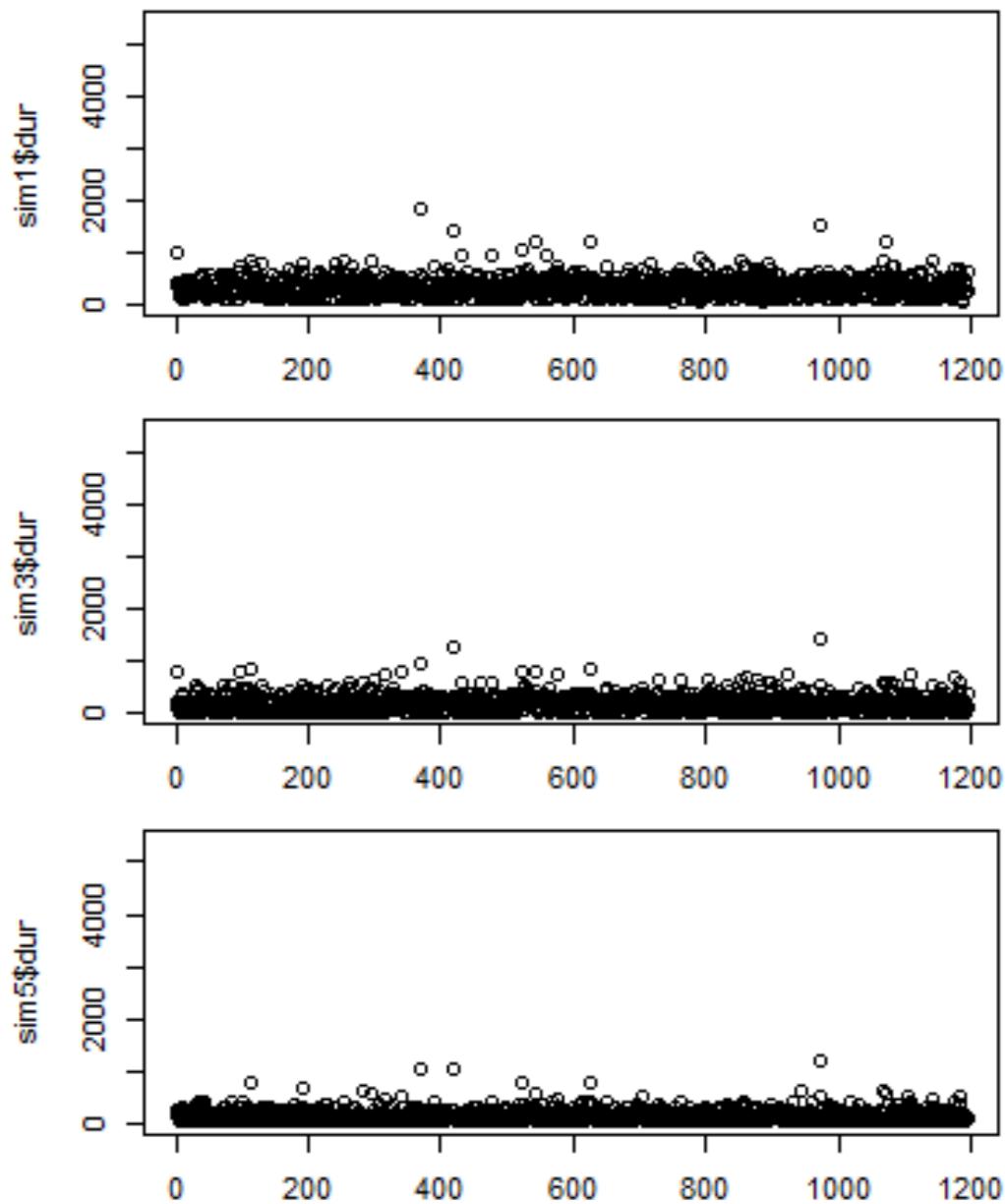
With No Treatment (no Drug)

When P0 initialization uses 10^3 (instead of original 10^2)

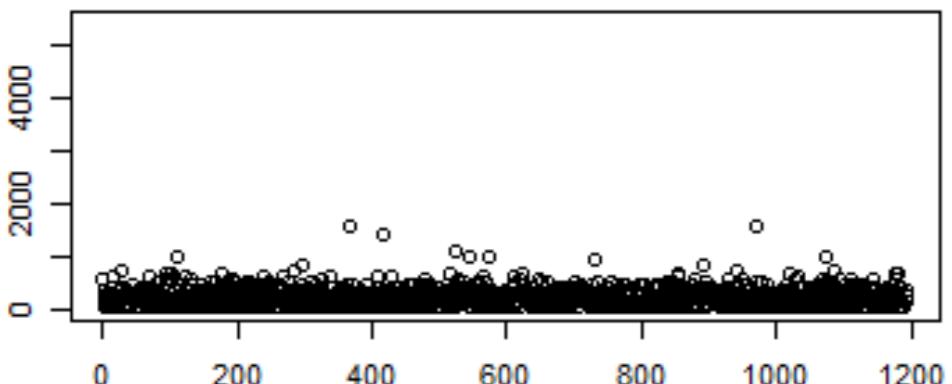
15Y

C++ model
No drug
~15Y

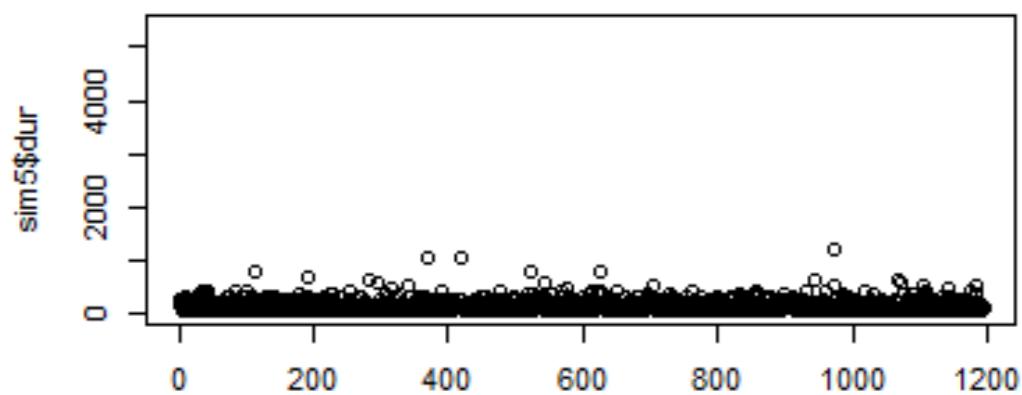
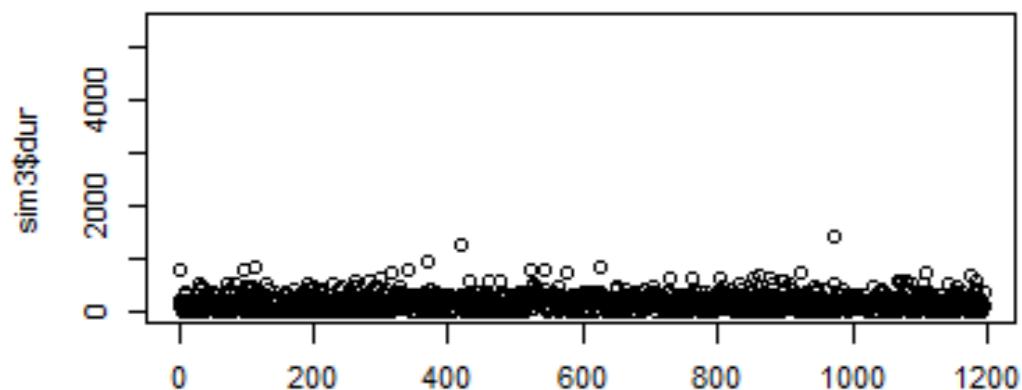
Infection durations at different immunity levels



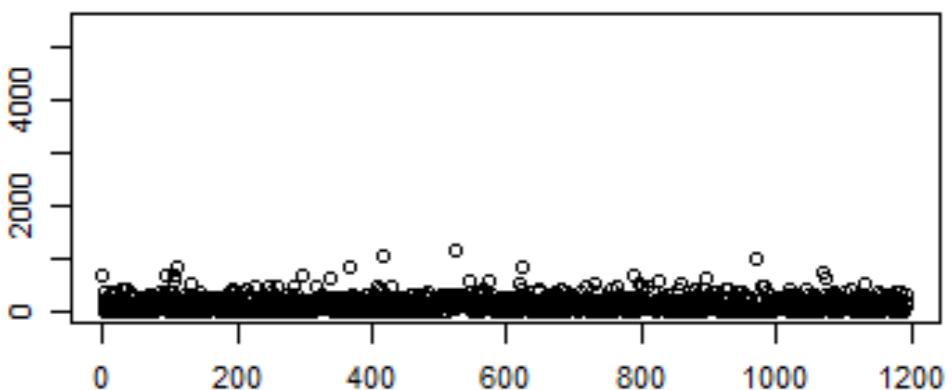
sim1\$dur



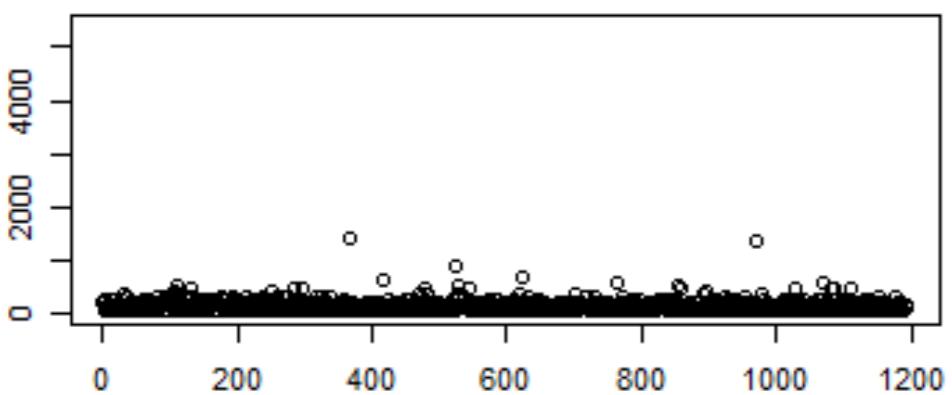
sim2\$dur



sim5\$dur



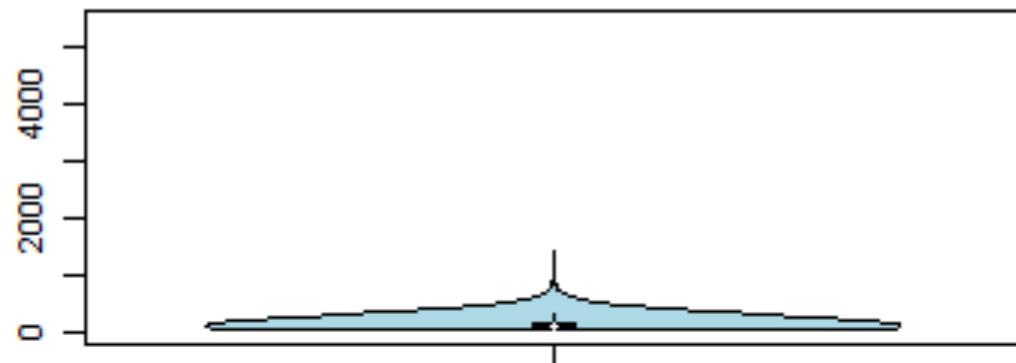
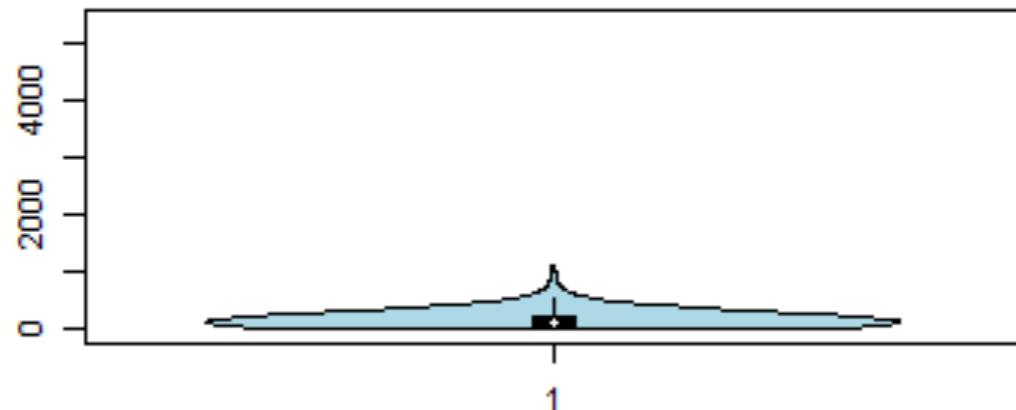
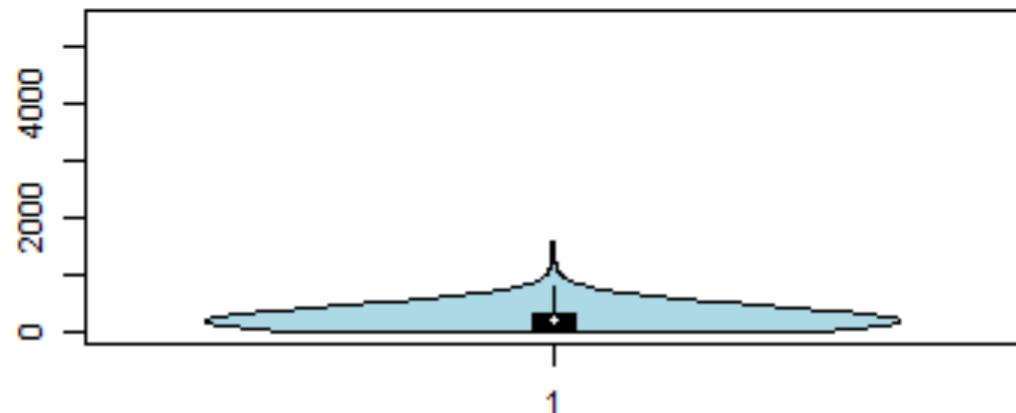
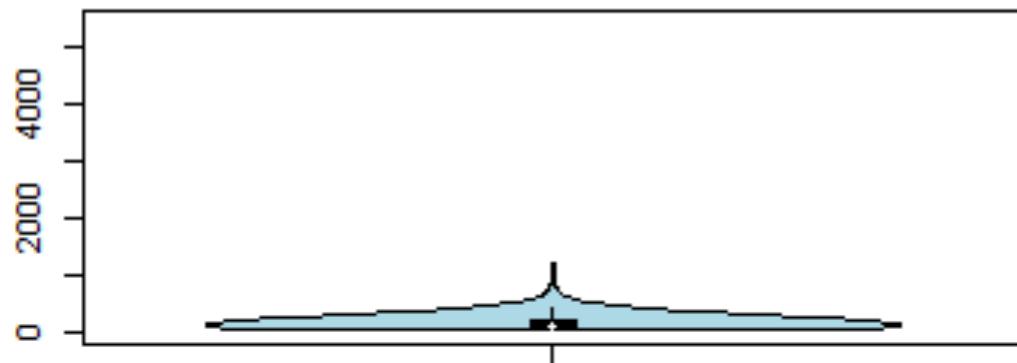
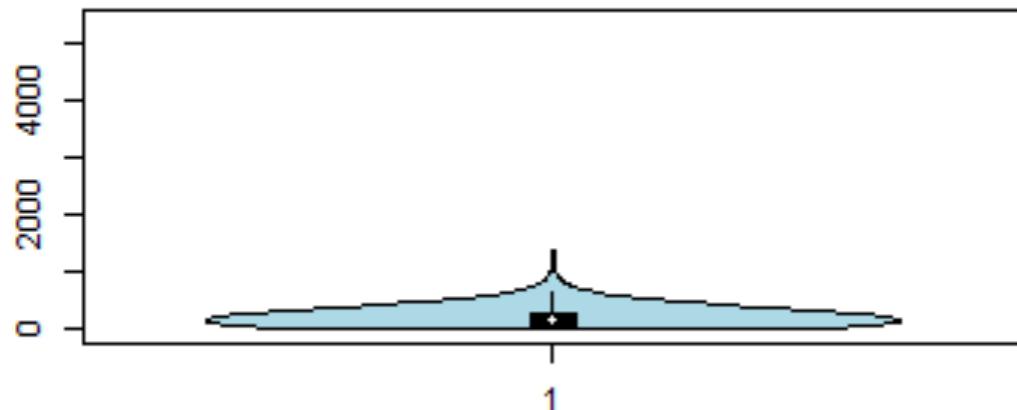
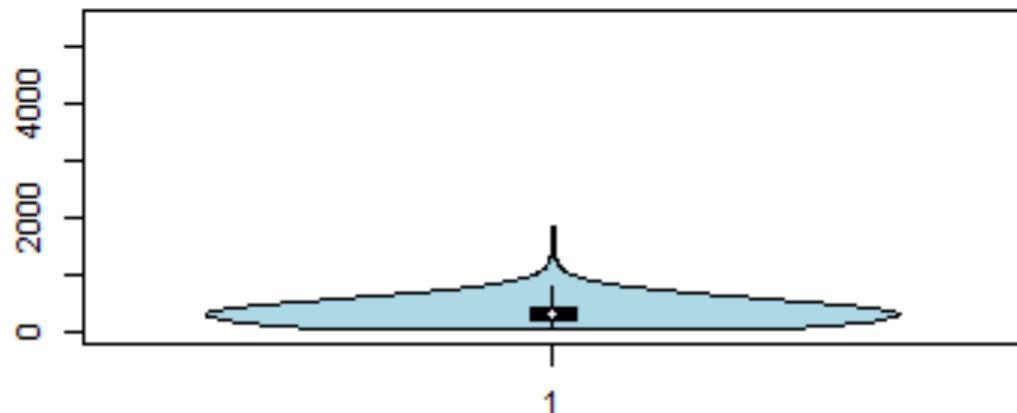
sim4\$dur



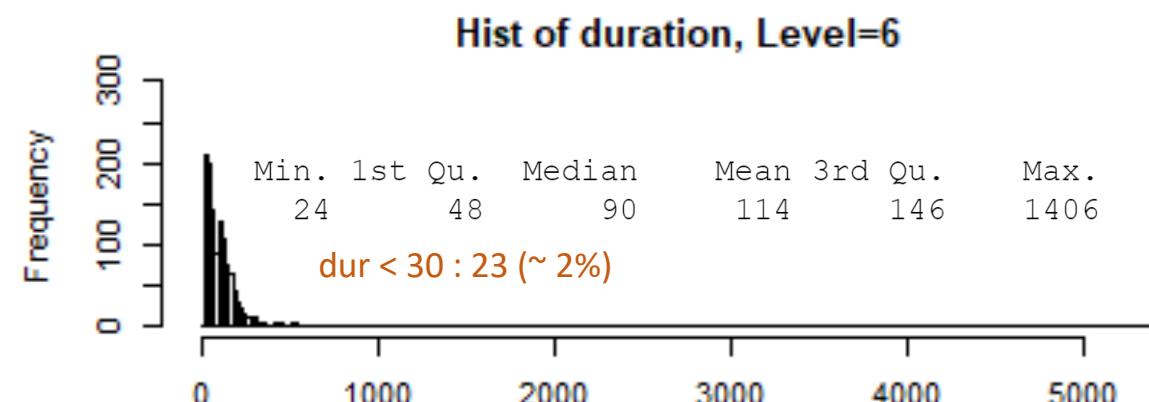
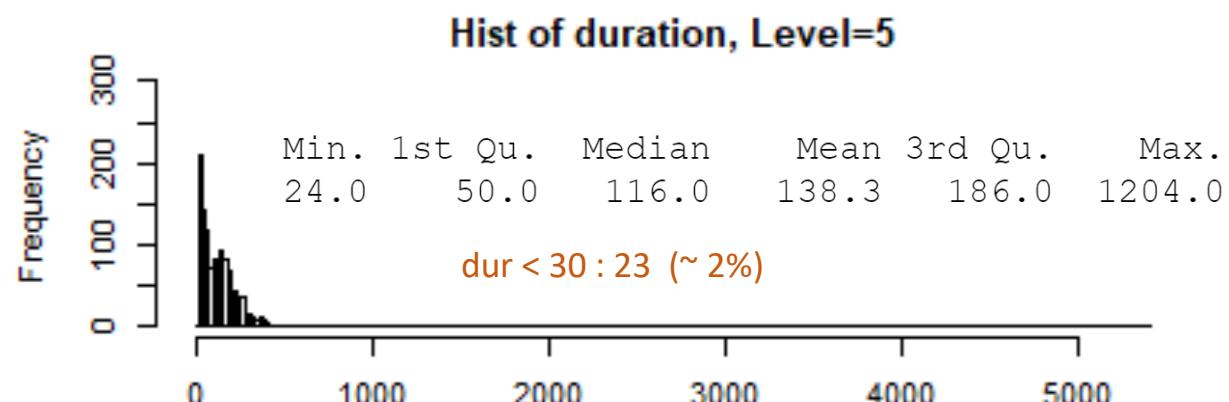
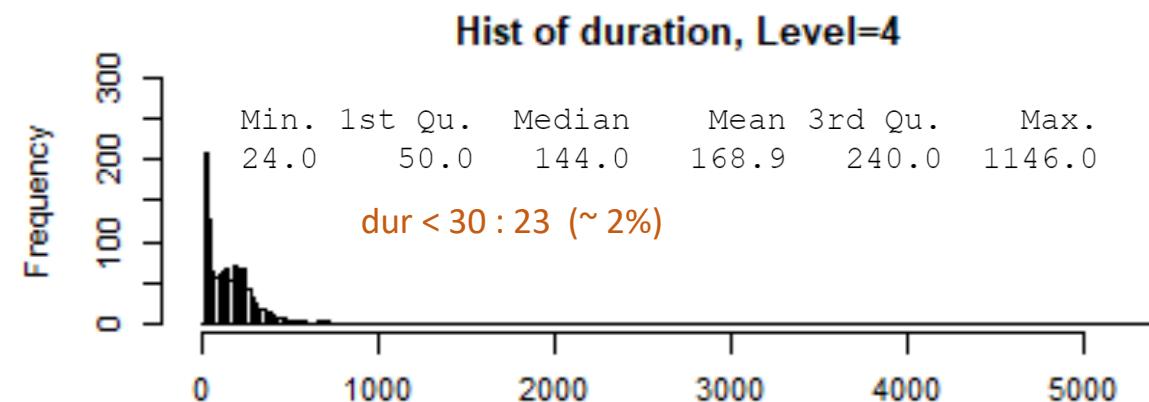
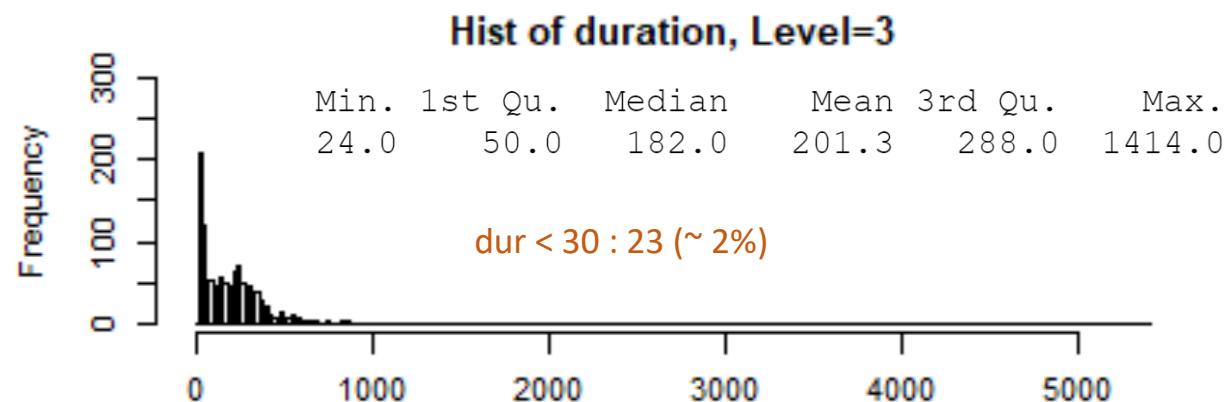
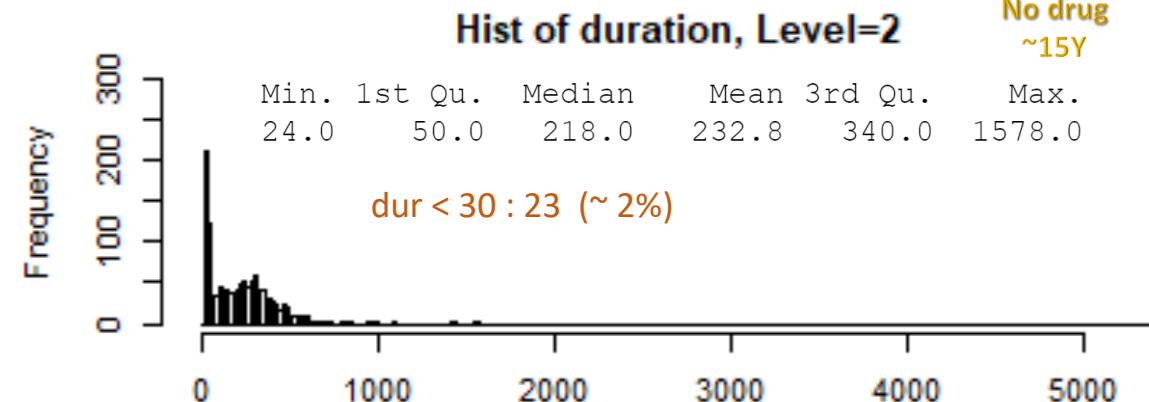
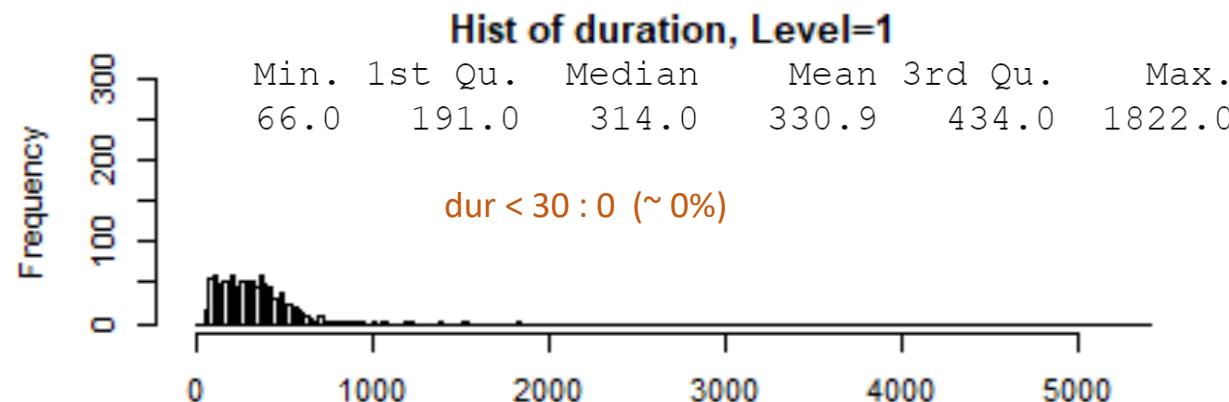
Infection durations for different immunity levels

C++ model
No drug
~15Y

Infection durations at different immunity levels



Infection durations at different immunity levels

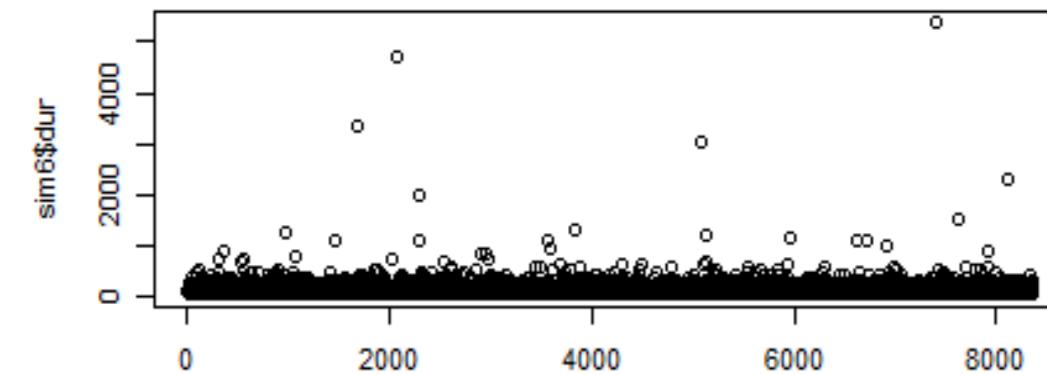
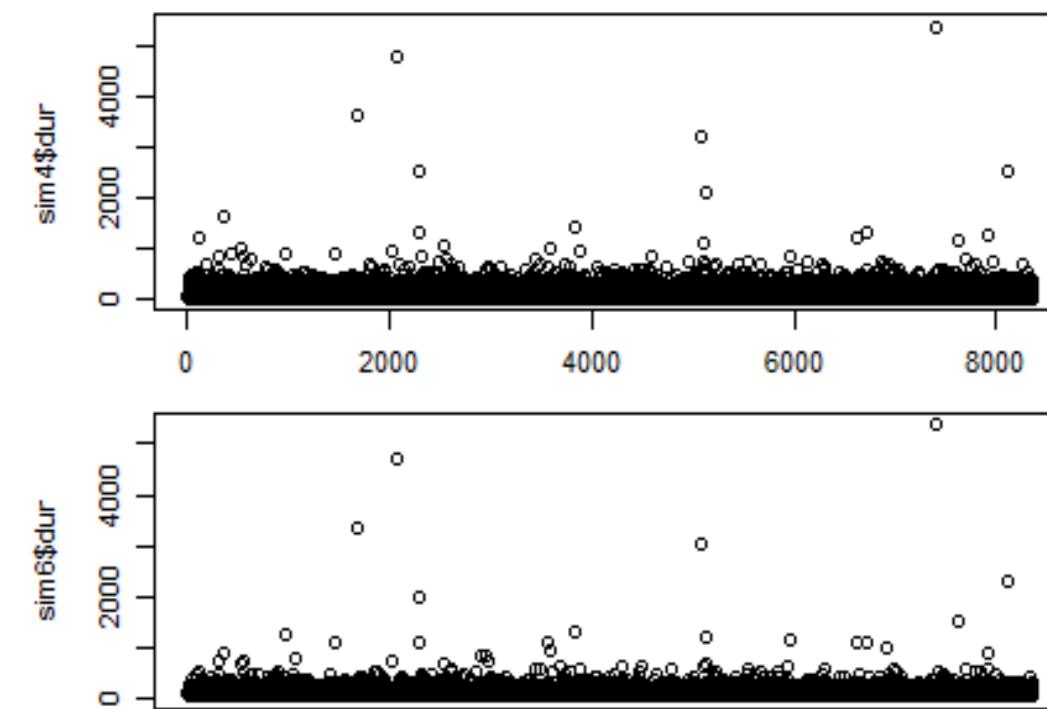
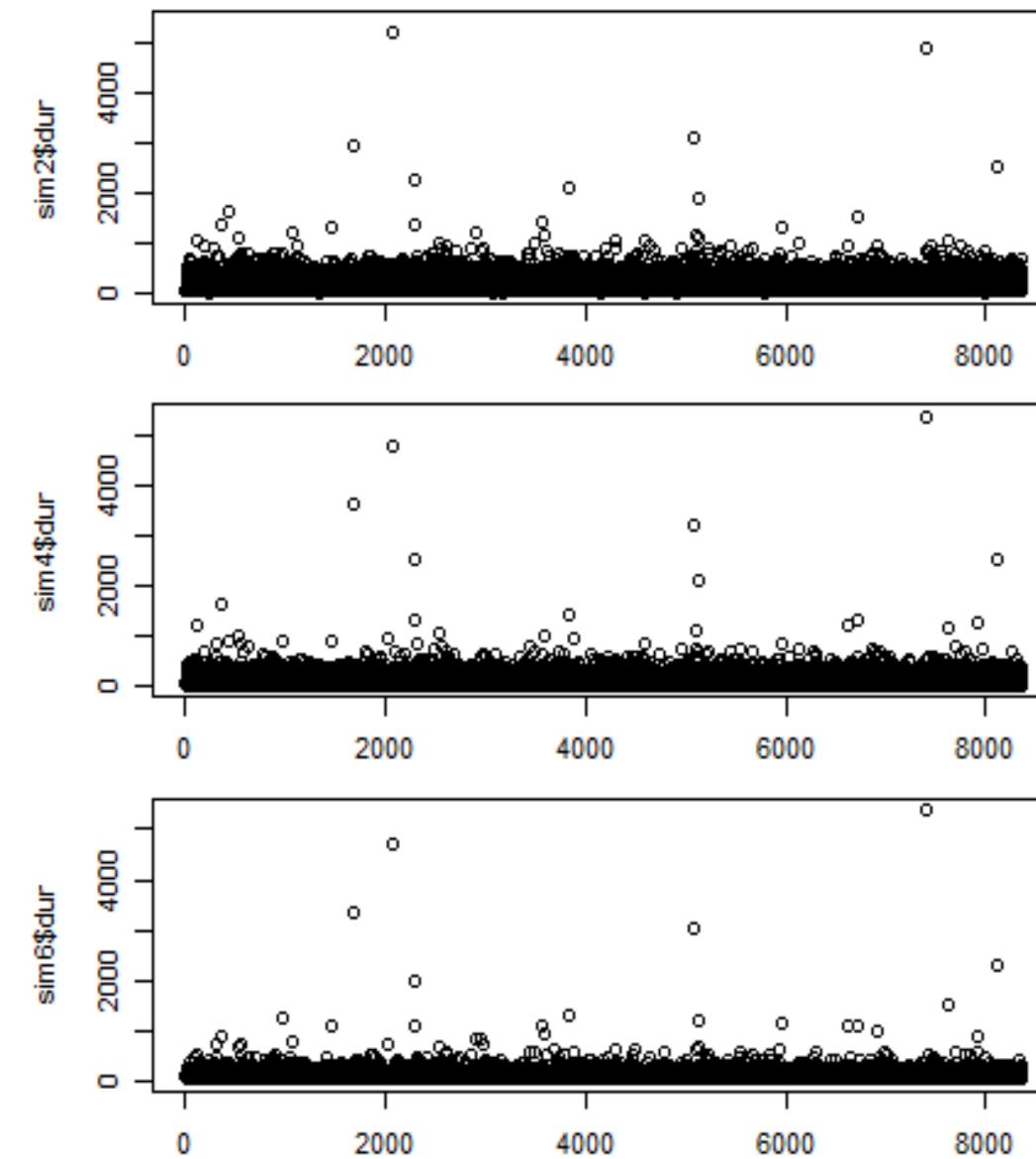
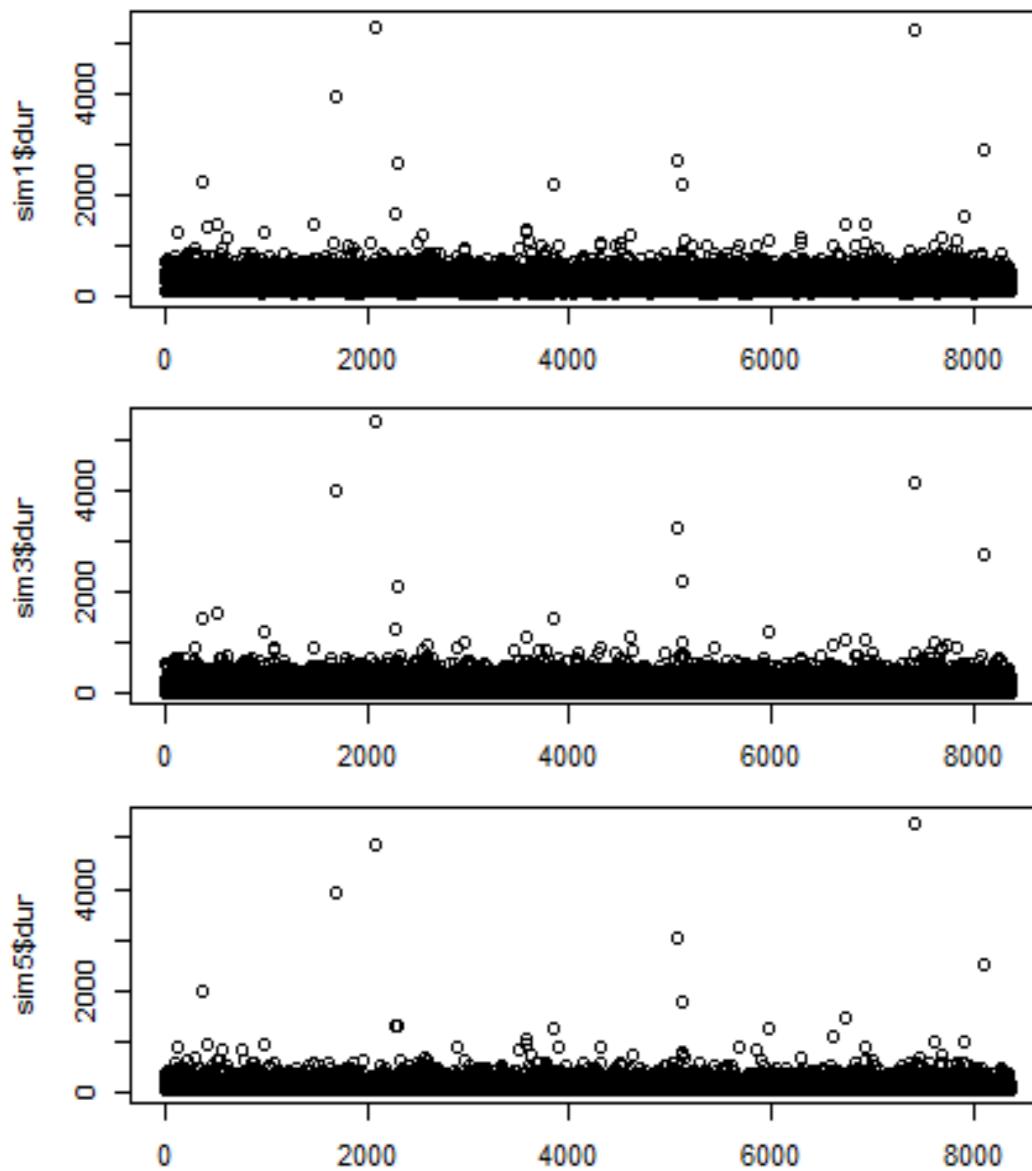


With No Treatment (no Drug)

When P0 initialization uses 10^3 (instead of original 10^2)

15Y, 8365 Agents (instead of 1195)

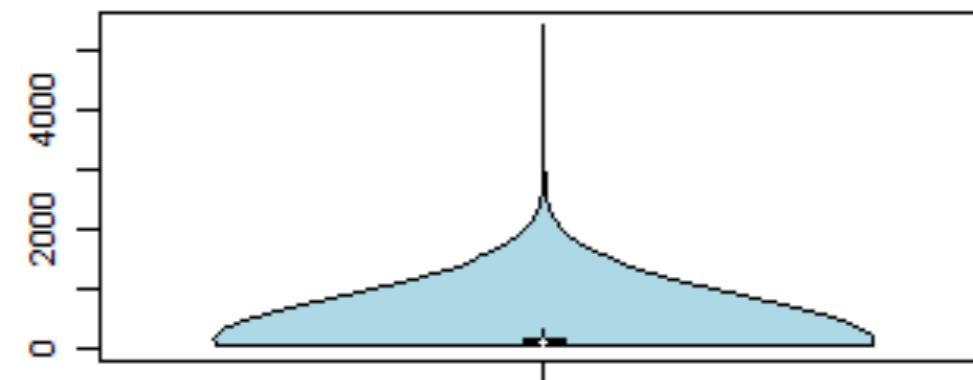
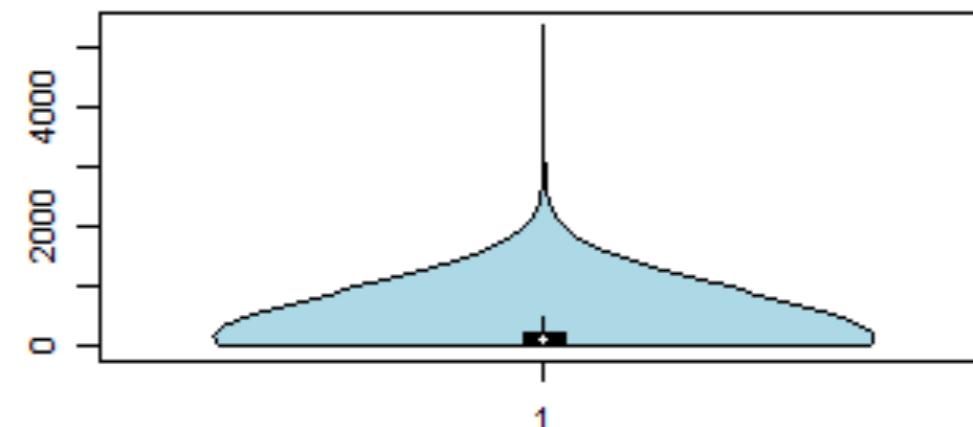
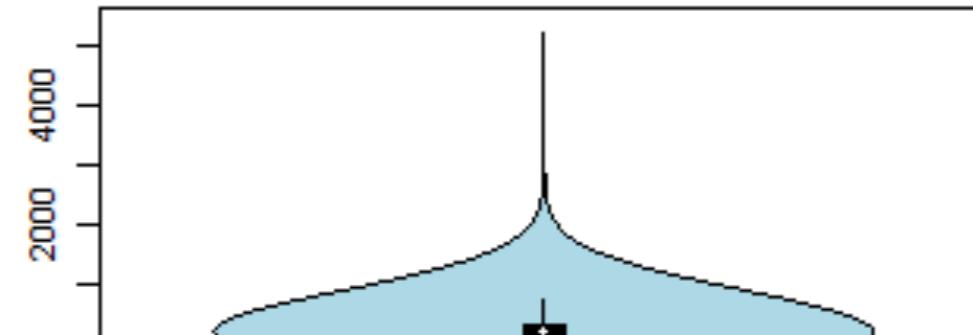
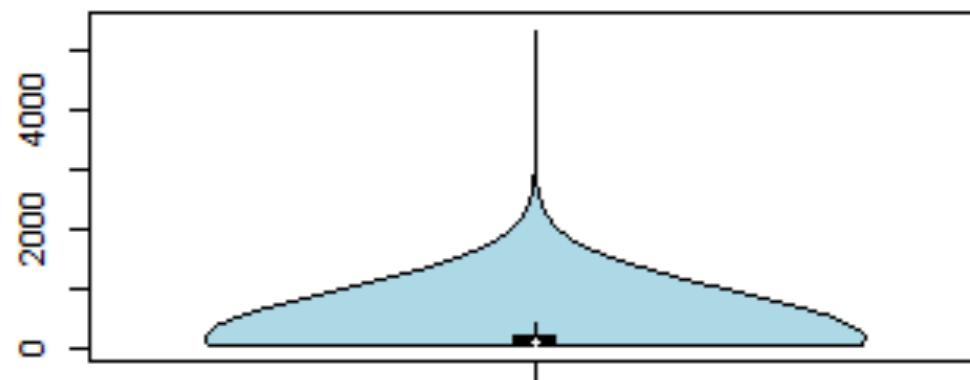
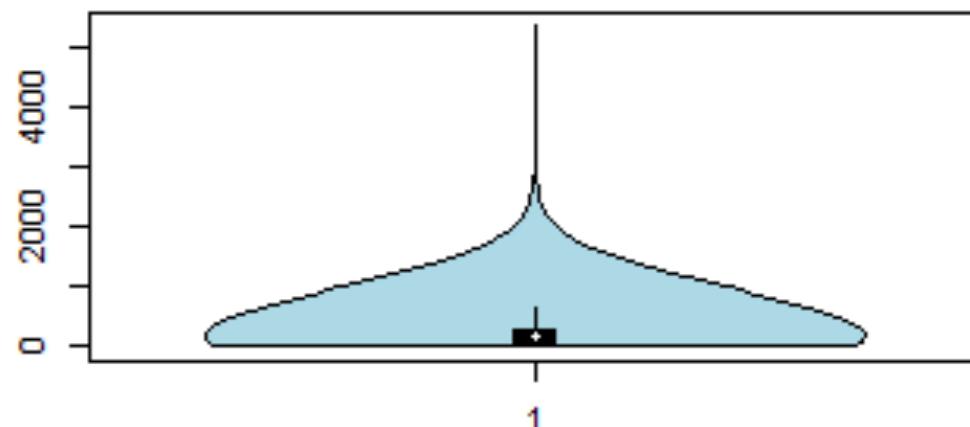
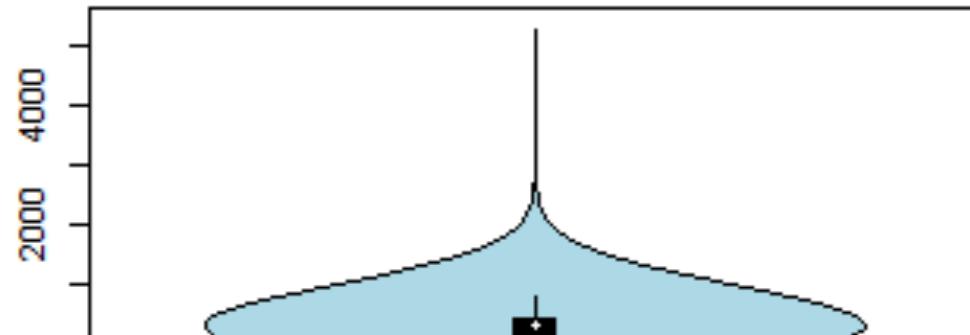
Infection durations at different immunity levels



Infection durations for different immunity levels

C++ model
No drug
~15Y

Infection durations at different immunity levels



C++ model
No drug
~15Y

Infection durations at different immunity levels

