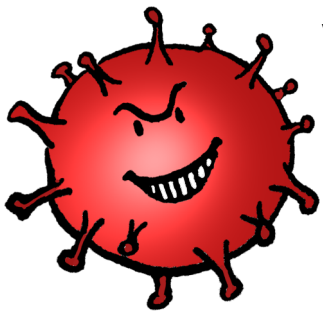
The Disease Detectives Epidemic Dice Game

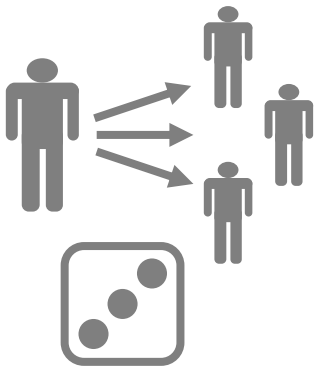


You will need a lot of six-sided dice (D6), at least 15

The epidemic spread of an infectious disease is a series of random events: was the person you just met infectious? She coughed, but maybe it was just an allergic reaction? The guy over there looks healthy, but he might already be shedding viruses and get symptoms tomorrow. How long have you two been in contact? Are his droplets already on their way to your mucosal membranes? You will never know!

However, you can simulate the epidemic spread of an infectious disease with this dice game. Like all models, it greatly simplifies reality. The basic mechanism in this game is that the number of new infections in the next generation cycle caused by one infectious person in the current generation cycle is rolled by a six-sided die (D6). But here is the twist: you subtract a number from the die roll, depending on your effective reproductive number R.

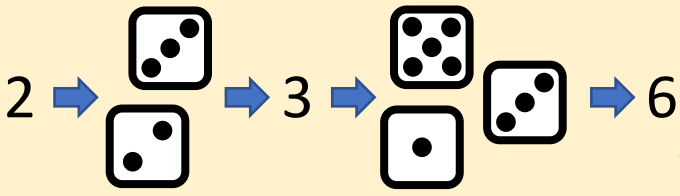
You might have heard about "R" "R0" (R nought) or "Rt" (R tee) before. Simply put, R0 is the average number of people one infectious person will infect in a totally susceptible population. Rt is the effective reproductive number at timepoint t, which also takes into account other factors like population immunity or intervention measures like treatments that reduce the duration of infectiousness or physical distancing to reduce the contact rate. As long as Rt is greater than one, the epidemic will spread exponentially, meaning quite fast. If you manage to push Rt below one, the epidemic will eventually die out.



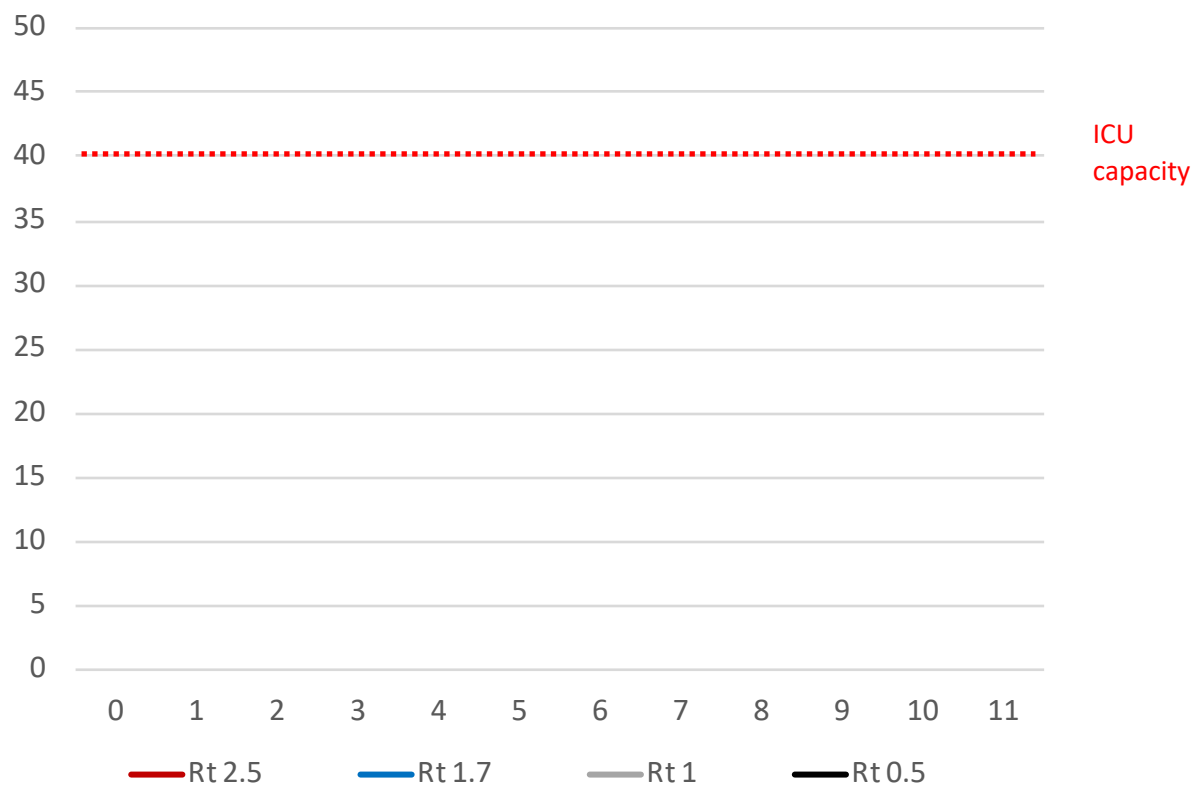
As it happens for rolling a D6, the expected value is 3.5: one sixth the probability of a "one" plus one sixth the probability of a "two" plus one sixth the probability of a "three" and so on.
1/6 * (1+2+3+4+5+6) =3.5

So for a Rt of 3.5 you just roll an unmodified die for each case in generation one and add up the results to get the total of infected persons in generation two. If we want a Rt of 2.5 for our epidemic, we subtract one from each die result (D6-1). What we get is 1/6 * (0+1+2+3+4+5) = 2.5. Using the same method, we get an Rt of 1.7 for D6-2 (counting numbers below zero as zero), or rather: 1/6 * (0+0+1+2+3+4) = 1.666… D6-3 gives an Rt of 1 (1/6 * (0+0+0+1+2+3). Yes, that means equilibrium - with theoretically no gain or loss of infected persons per generation. Play the game and find out what this means in practice!
Using D6-4 gives us a Rt below one. Calculate it yourself! (answer on the next page).

Example: you play with Rt=2.5, using D6-1 and start with two infected persons (two dice).

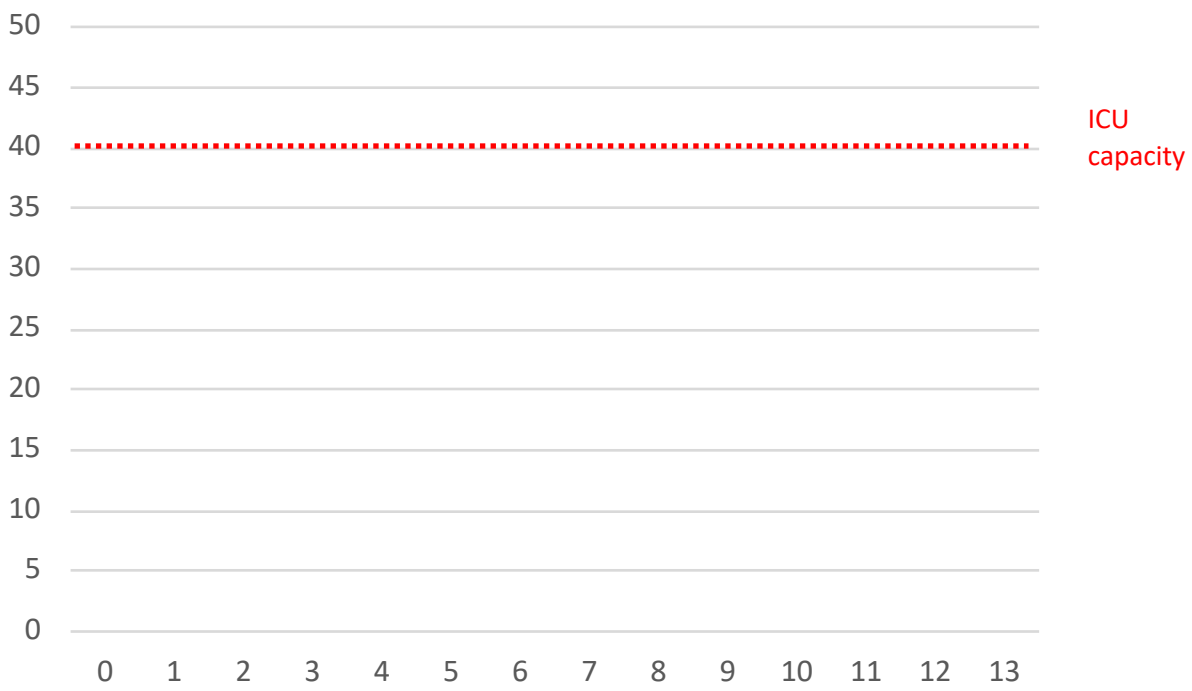


Generation cycle	**Rt 2.5** For each infected person in the current infectious cycle, roll one D6-1	**Rt 1.7** For each infected person in the current infectious cycle, roll one D6-2	**Rt 1** For each infected person in the current infectious cycle, roll one D6-3	**Rt 0.5** For each infected person in the current infectious cycle, roll one D6-4
Zero	2	2	10	35
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				



Use this sheet together with the cards. After each dice roll, draw a card and apply the text for next roll. Game ends if zero newly infected persons.

Generation cycle	**Rt 2.5** For each infected person in the current infectious cycle, roll one D6-1	**Rt 1.7** For each infected person in the current infectious cycle, roll one D6-2	**Rt 1** For each infected person in the current infectious cycle, roll one D6-3	**Rt 0.5** For each infected person in the current infectious cycle, roll one D6-4
Zero	3			
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				



Bad Batch

Your lab tests had serious quality issues and produced false negatives.

Add 3 dice to the next cycle.

Bad Batch

Your lab tests had serious quality issues and produced false negatives.

Add 2 dice to the next cycle.

Not enough PPE Supply!

Your government was totally unprepared for this and PPE is missing at hospitals. Add 3 dice to the next cycle.

Keep this card. It counts as passing the ICU-threshold once.

Social Tipping Point

Reshuffle card before cycle 6. If the ICU threshold has been surpassed 3 or more times: Welcome to the Quarantine State where social freedom was replaced by health security. Make sure to always keep your electronic health tag with you to avoid deportation.

You failed. Game over.

Inconvincible Idiots

You are about to uncover a secret government plot: the so-called virus is a hoax!

Keep this card face up. Roll one die more in any future cycle.

(game still ends if a cycle has 0 new cases)

Back from Holidays

These holiday returnees brought an unwanted guest. Add 3 dice to the next cycle.

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Megachurch of Mental Oblivion

Ignore card after cycle 6. Only trust OneAlpha, your spiritual leader and come to his congregation!

Add 2 dice to the next cycle. They use D6 as multiplier in the next cycle.

Megachurch of Mental Oblivion

Ignore card after cycle 6. Only trust OneAlpha, your spiritual leader and come to his congregation!

Add 2 dice to the next cycle. They use D6-1 as multiplier in the next cycle.

Party Time

Life is short anyway! Let's have some fun together!

Add one to each rolled die in addition to other modifiers in the next cycle.

Unreported Cases

Vulnerable populations stayed away from health services for lack of health insurance or fear of deportation.

Add two dice to the next cycle.

Steadfast Stalwarts

This group really sticks to the rules. For the next cycle, take out 3 dice and roll them with a D6-5 modifier instead of the current modifier.

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School Closure

Schools will be closed for a limited time. Subtract one from each die in addition to other modifiers in the next two cycles. Modifier cannot be less than D6-4 except for „Steadfast Stalwarts".

Iron Discipline

Everyone is sticking to physical distance measures and crowd avoidance. Subtract one from each die in addition to other modifiers in the next cycle.

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Herd Immunity

Reshuffle this card if it is drawn before cycle 5.

Herd immunity is building up.

Keep this card. Roll one die less in any future cycle.

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Experimental Drugs

Reshuffle this card if it is drawn before cycle 3.

A limited batch of novel drugs is available for the seriously ill.

Roll 4 dice less in the next cycle.

Experimental Drugs

Reshuffle this card if it is drawn before cycle 3.

A limited batch of novel drugs is available for the seriously ill.

Roll 3 dice less in the next cycle.

Enhanced Contact Tracing

Reshuffle this card before cycle 3. An EFF and CCC-endorsed privacy aware contact tracing app is widely used.

Keep this card. Roll two dice less in any future cycle.

Experimental Vaccines

Reshuffle this card if it is drawn before cycle 4.

A limited batch of highly efficient vaccine is available.

Keep this card. Roll three dice less in any future cycle.

You can play with varying Rt. Make sure to include „zero new infected cases“ in your tables.

Rt = 2,0

Die result :	counts as
1 :	0
2 :	1
3 :	2
4 :	2
5 :	3
6 :	4

Rt = 1,5

Die result :	counts as
1 :	0
2 :	1
3 :	1
4 :	2
5 :	2
6 :	3

Rt = 1,32

Die result :	counts as
1 :	0
2 :	1
3 :	1
4 :	2
5 :	2
6 :	2

Rt = 1,17

Die result :	counts as
1 :	0
2 :	1
3 :	1
4 :	1
5 :	2
6 :	2

Rt = 0,83

Die result :	counts as
1 :	0
2 :	0
3 :	1
4 :	1
5 :	1
6 :	2

Rt = 0,67

Die result :	counts as
1 :	0
2 :	0
3 :	0
4 :	1
5 :	1
6 :	2

Pro Version (additional documentation nedded)