

A model for the spread of disease

Suppose we want to model the spread of an infectious disease.

Simplifying assumptions:

- Nobody dies from it!
- Recovery always takes 14 days.
- You're contagious during those 14 days.
- You cannot get it twice.

Notation:

I = # of infected people.

R = # of recovered people (i.e., already had it).

S = # of susceptible people (i.e., haven't had it yet).

Rates of change: I' , R' , S' .

Units: _____ per day.

Q: If I people are currently infected, how many of them do you expect will recover today? _____.

So,

$$R' =$$

True or false?

I' = # of people who get infected per day.

S' = -(# of people who get infected per day).

To write an equation for S' , first note that on any given day, the number of people who get infected depends on the number of susceptible people who come into contact with infected people:

-If everything else was the same except there were twice as many *susceptible* people, how would this affect the number of people who *become infected*?

So,

$$S' \propto$$

-If everything else was the same except there were twice as many *infected* people, how would this affect the number of people who *become infected*?

So,

$$S' \propto$$

These combine to give

$$S' =$$

What about I' ? It should equal

(# of people who get infected per day) - (# of people who _____).

So,

$$I' =$$

Thus, **the S-I-R Epidemic Model** is:

$$S' =$$

$$I' =$$

$$R' =$$