Pandemic Flu Spread. Consider a classroom of 61 elementary school kids. 60 of the kids are healthy (and susceptible to flu) on Day 1. Tommy (the 61st kid) walks in with the flu and starts interacting with his potential victims. To keep things simple, let's suppose that Tommy comes to school every day (whether or not he's sick) and will be infectious for 3 days. Thus, there are 3 chances for Tommy to infect the other kids — Days 1, 2, and 3. Suppose that the probability that he infects any individual susceptible kid on any of the three days is $p = 0.01$; and suppose that all kids and days are independent (so that you have i.i.d. Bern(p) trials). If a kid gets infected by Tommy, he will then become infectious for 3 days as well, starting on the next day.

(a) What is the distribution of the number of kids that Tommy infects on Day 1?
(b) What is the expected number of kids that Tommy infects on Day 1?
(c) What is the expected number of kids that are infected by Day 2 (you can count Tommy if you want)?
(d) Simulate the number of kids that are infected on Days 1,2,. . . . Do this many times. What are the (estimated) expected numbers of kids that are infected by Day i, i = 1, 2, . . .? Produce a histogram detailing how long the "epidemic" will last.
(e) What if each kid has a 50–50 chance of already being immunized (and the immunization works perfectly)?