

A Logistic Harvest Model for Lyme Disease on Nantucket

- About 16,000 cases of Lyme Disease are reported to the CDC each year. The national rate is 3.9 cases per 100,000 people. On Nantucket, the rate is 449.1 cases per 100,000 people.
- We will create a logistic harvest model that fits the data given here.
- According to this website:
[Johnson, G. \(2003\). *Exploding Deer Populations*. Available online at <http://www.txtwriter.com/onscience/Articles/deerpops.html>](http://www.txtwriter.com/onscience/Articles/deerpops.html) "A deer population that has plenty to eat and is not hunted by humans or other predators will double every three years." This corresponds to a rate of increase $r = \ln(2)/3 = 0.2311$.
- Nantucket is 47.8 square miles
- Biologists estimate that there are 50 – 60 deer per square mile (between 2500 - 3000 total deer). Consider this to be the carrying capacity for Nantucket.
- It is believed that a deer density of about 15 deer per square mile (about 750 total deer) would reduce the risk of infection by 80%.
- Biologists came up with a model for the deer population on Nantucket if there was a multi-year hunt. They predicted that if 100 deer were taken each year, the deer density would be reduced from 60 deer/square mile down to 30 deer/square mile within 7 years. Can you come up with a logistic harvest model that would give these same results?
- In addition to a regular hunting season, in February 2005 Nantucket had an open hunt for one week – no limit on permits. This hunt took 246 deer. Biologists suggested that a revised model taking this number into account would show that a multi-year hunt could reach the desired deer density goal in 4 years. How would you modify your model to demonstrate this?