

LYME DISEASE

Lyme disease is an infection caused by a corkscrew-shaped bacterium, *Borrelia burgdorferi*. It is transmitted by the bite of the blacklegged tick, *Ixodes scapularis* (commonly known as the deer tick). This disease was first recognized in a group of pediatric arthritis patients from the area of Lyme, Connecticut in 1975 and the awareness of this disease has increased greatly since that time. The emergence of Lyme disease is associated with reforestation and increased populations of white-tail deer and small animal hosts. Deer are the principal hosts for adult *Ixodes scapularis*. White footed mice, chipmunks and birds are important hosts for the larval and nymphal stages. Humans are incidental hosts in the ticks life cycle.

In Connecticut, the number of reported cases of Lyme disease is about 106 cases per 100,000 population with about one third of the cases reported from Fairfield County.¹

Stamford compares very closely with all of Fairfield County in incidence of reported Lyme Disease, having an average of a little over a tenth of the cases and showing a similar increase in the number of cases reported over the last 10 years. It is estimated that the total number of reported cases may represent only 10 to 20% of the **diagnosed** cases.

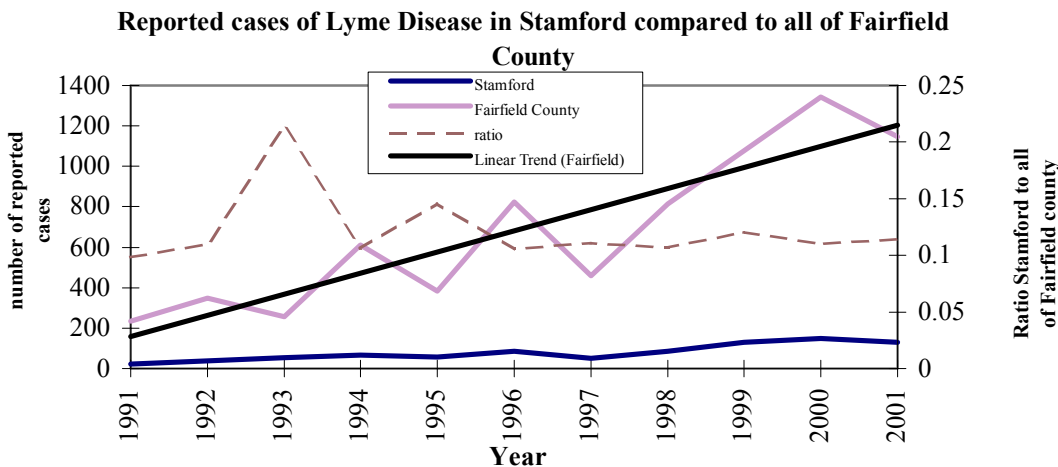


Figure 1

In 1989, Stamford, in conjunction with the Connecticut Agricultural Experiment Station, established a program to monitor the incidence of Lyme disease in ticks. By monitoring ticks which only bit people, it was hoped that a correlation could be made to the risk a person would have of contracting Lyme disease when bitten by an *Ixodes scapularis* (deer tick). The time it takes (from the time the tick is submitted to the completion of the test), does not allow this program to be used in the diagnosis and treatment of Lyme Disease in people, but does help monitor the prevalence of the disease in the environment. The rates of infection found in the ticks submitted to this program are virtually identical to that found by the Connecticut Agricultural Station sampling nymphs per hectare over a ten year period.²

¹ Stafford, K. C., III, Ph.D., Tick Associated Diseases, Connecticut Agricultural Experiment Station, Oct 2002

² Stafford, K. C., III, M. L. Cartter, L. A. Magnarelli, S. Ertel and P.A. MsHar, 1989, Temporal Correlation's between Tick Abundance and Prevalence of Ticks Infected with *Borrelia burgdorferi* and Increasing Incidence of Lyme Disease, J. of Clinical Microbiology 36(5) 1240-1244

The number of cases of Lyme disease reported and the number of ticks infected with Lyme disease in Stamford appears to be similar. This may not be directly related, but shows monitoring for infected ticks is a useful surveillance tool.

Positive Ticks and Incidence of Lyme Disease
Stamford, CT 1991 - 2001

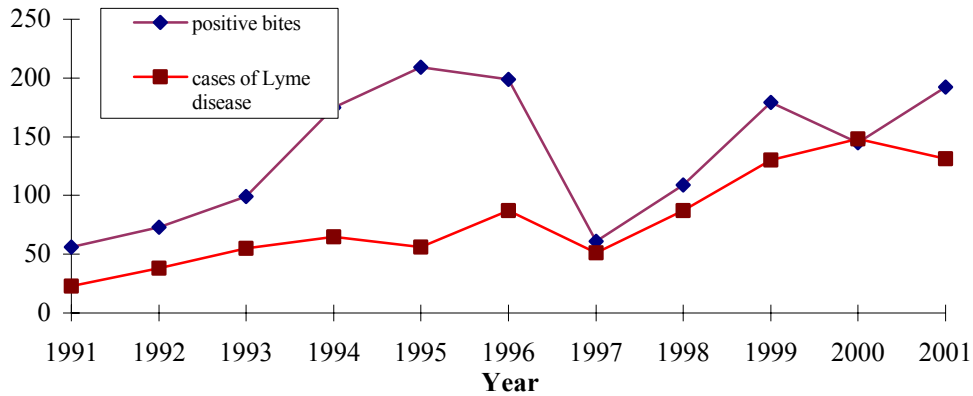


Figure 2

The public response to this program has been strong with Stamford residents submitting more ticks for testing than most other towns and cities in Connecticut.³

Tick Submissions of Ixodes Scapularis

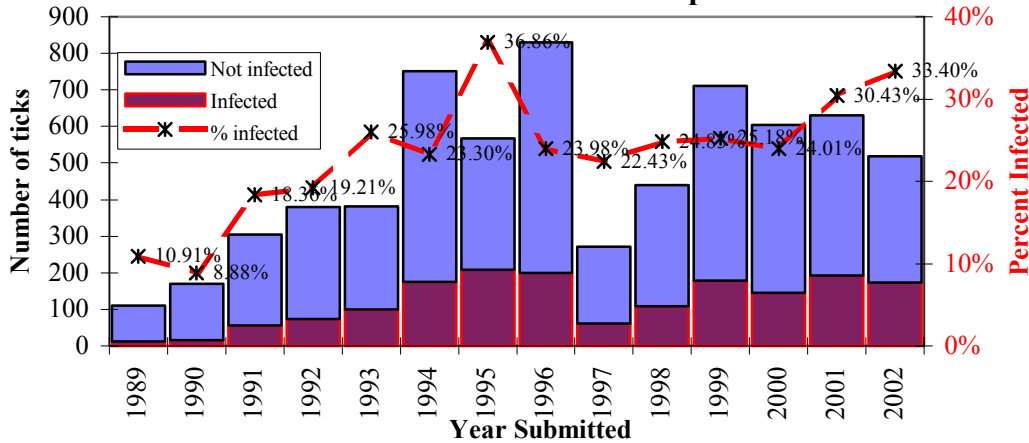


Figure 3

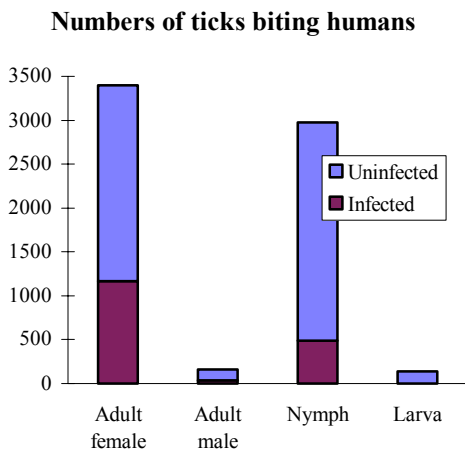
Table 1 Number(percent) of *Ixodes scapularis* ticks infected with *Borrelia burgdorferi* submitted by Stamford residents 1989 - 2002

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
uninfected	98	154	249	307	282	576	358	631	211	330	532	459	439	345
Infected	12	15	56	73	99	175	209	199	61	109	179	145	192	173
Total	110	169	305	380	381	751	567	830	272	439	711	604	631	518
infected	10.91%	8.88%	18.36%	19.21%	25.98%	23.30%	36.86%	23.98%	22.43%	24.83%	25.18%	24.01%	30.43%	33.40%

As the number of tick submissions grow, the understanding of the risks of contracting Lyme Disease from a tick bite also increases. While there is some variation in tick infection rates by year(Figure #3 and table 1), the average rate is between 25 to 33%. The risk of humans

³The CT Agricultural Experiment Station Website: <http://www.caes.state.ct.us>

acquiring Lyme disease from a tick bite varies according to the length of time the tick has fed on its host, the life stage of the tick and the sex of the tick. Since ticks feed three to four times in a normal life span, the longer a tick lives the greater chance it has of contracting Lyme disease. Consequently, the adult female, which has fed before its transition from larva to nymph and again from nymph to adult, will feed before it becomes inactive for the winter and before it lays eggs, thus has the highest risk of carrying and transmitting Lyme disease. The larva, which has not had any previous feedings is not considered a risk for carrying or transmitting Lyme disease.



Both the adult female and the nymph tick are more likely to feed on humans. The adult female *Ixodes scapularis* presents the greatest risk of transmitting Lyme disease to humans. Over one third are infected and more than half of the ticks submitted as biting humans are the adult female.

Table 2 Numbers of Submitted Ticks and Percent infected

	Adult female	Adult male	Nymph	Larva
Uninfected	2228	123	2484	136
Infected	1170	37	491	2
totals	3398	160	2975	138
% Infected	34.43%	23.13%	16.50%	1.45%
% of ticks biting	50.94%	2.40%	44.60%	2.07%

Figure 4

Of the ticks submitted, nymphs may be under reported because the nymph is smaller and harder to detect unless it is engorged. Studies show in the environment, nymphs are the most prevalent.⁴

The risk of being bitten by a tick and being infected with Lyme disease also has a seasonal component. This is primarily due to ticks feeding habit. The adult female is most active two time during the year. As the weather begins to warm in March or April, the adult ticks become active to feed, mate, lay their eggs and then die. This continues into June, but there are fewer adult ticks from July through September. Beginning in October, new adults become active, feeding primarily to survive the winter, lasting until the end of November. Nymphs are active May through August as they feed to turn into adults.⁵

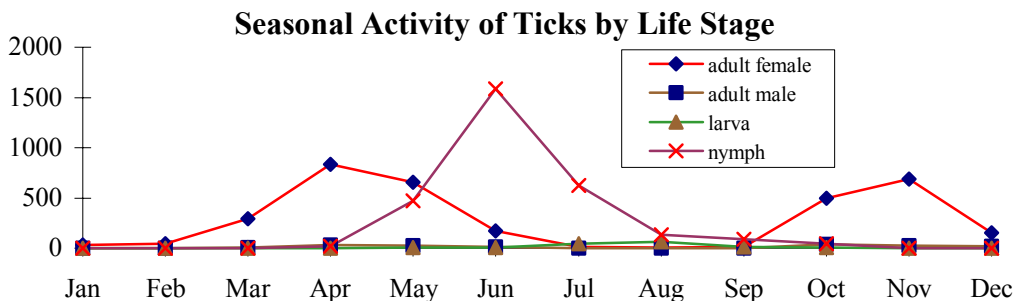


Figure 5

Table 3 Numbers of Ticks Submitted by Month and Life Stage

⁴ Daniels, T.J., T.M. Boccia, S. Varde, J. Marcus, J. Le, D. J. Bucher, R. C. Falco and I. Schwartz, Dec 1998. Geographic Risk for Lyme Disease and Human Granulocytic Ehrlichiosis in Southern New York State, Applied and Environmental Microbiology, Vol. 64, No. 12:4663-4669.

⁵ A Homeowner's Guide to the Ecology and Environmental Management of Lyme Disease, American Lyme Disease Foundation, Inc., pamphlet.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
larva	0	0	0	0	4	7	43	65	14	4	1	0
nymph	0	0	0	17	473	1586	626	134	88	44	2	2
adult male	1	0	6	33	23	11	0	1	3	37	26	19
adult female	30	46	294	835	655	172	12	5	11	494	689	156
totals	31	46	300	885	1155	1776	681	205	116	579	718	177

On average, ticks are most active in May and June, followed by April and November are the next most active months. As would be expected, in the coldest months, January and February, ticks are inactive. Ticks are also not very active in August and September. Figure 6 shows the two year life cycle and may help explain this lack of activity.

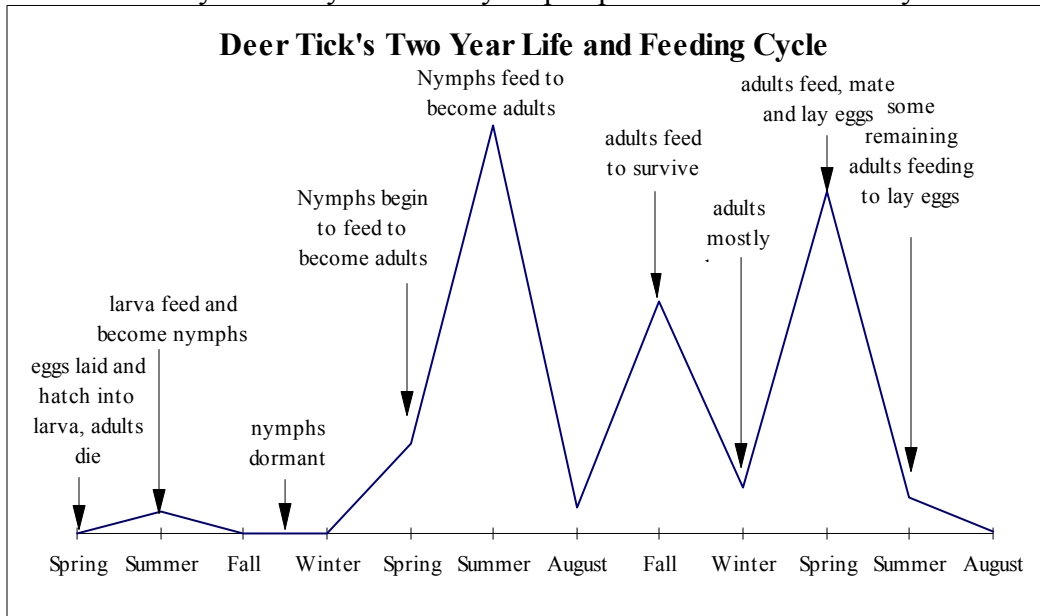


Figure 6

The infection rate in of ticks also varies seasonally, largely due to the dominance of one life stage in a particular season. In June when the nymphs are most active, only about 15% are infected with Lyme disease, however the adult female, which is less active than the previous three months, has a 40% infection rate.

Relative Risk of being Bitten by a Tick Infected with Lyme Disease by Month

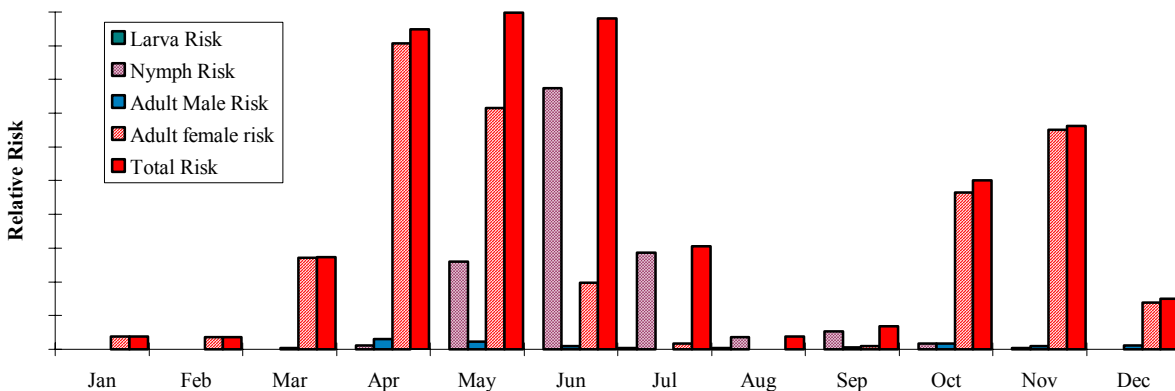
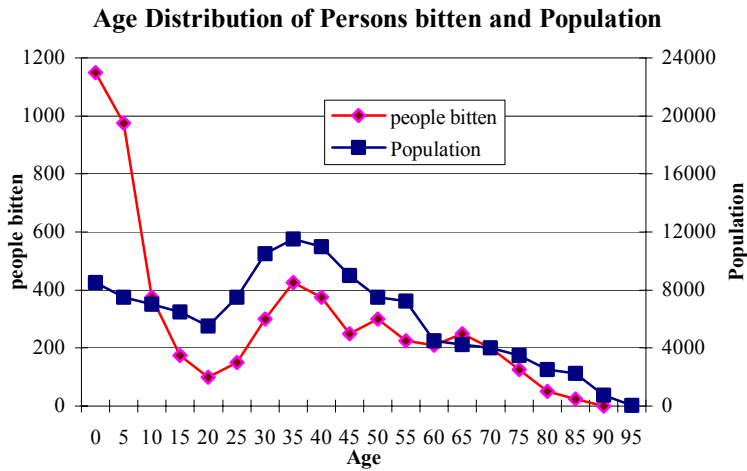


Figure 7

The relative risk(over the course of a year) of being bitten by an infected tick in each month is shown in Figure #7. It takes into account the activity of the different life stages and the

percentage of those ticks infected. This shows the risk of a tick carrying Lyme disease biting a human host is greatest in April, May and June.



Young children are bitten at a higher rate than other age groups. This might be because children are more likely to engage in outdoor activities for longer periods of time than are adults.

Figure 8

Both ticks submitted and cases of Lyme disease show a fairly even distribution throughout all areas of Stamford.

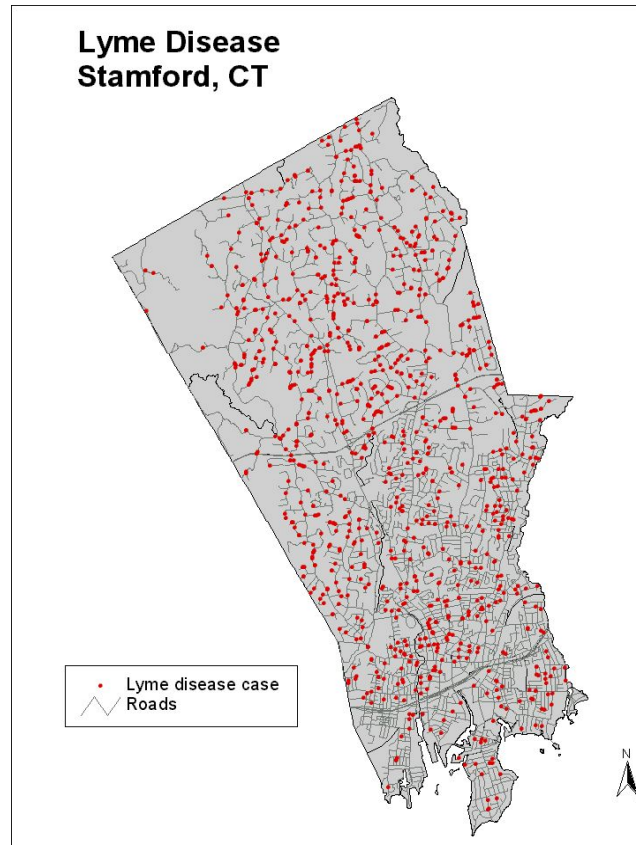


Figure 9

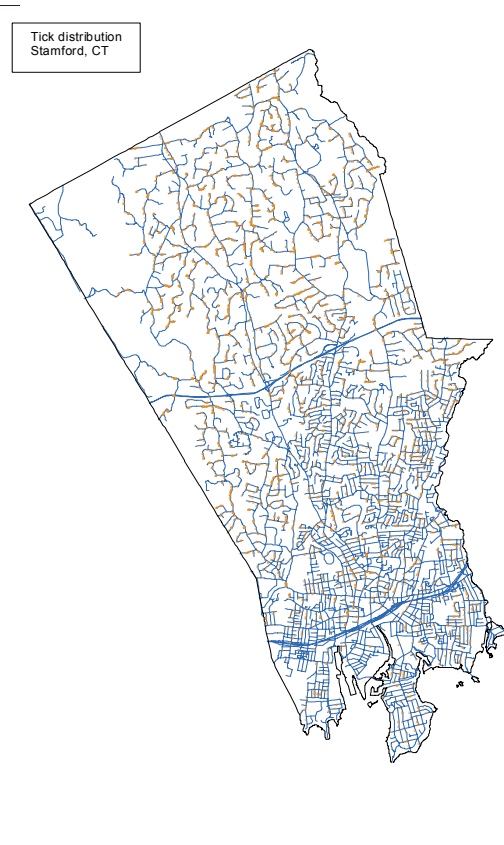


Figure 10

Tick populations of all life stages did not appear to be significantly influenced by yearly or seasonal rainfall. There appears to be a fluctuation of nymph populations every other year, but the cause of that has not been determined.

Most ticks bites are reported to happen at home, while the person is outdoors, playing , gardening or doing yard work.

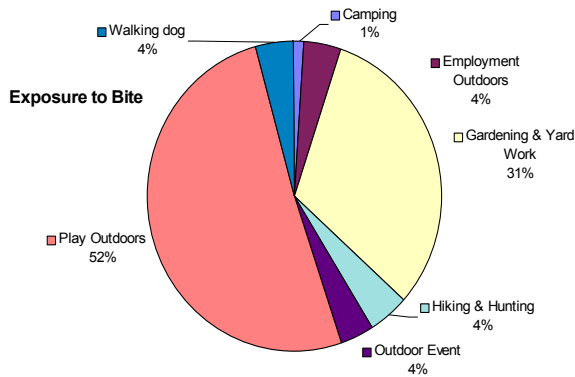


Figure 11

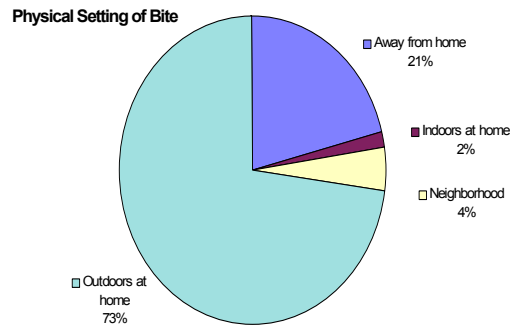


Figure 12

Since ticks primarily reside in tall grass or bushes, the predominant site for a tick bite is on the legs or feet. However ticks will crawl to find a suitable site for feeding, so are found on all parts of the body.

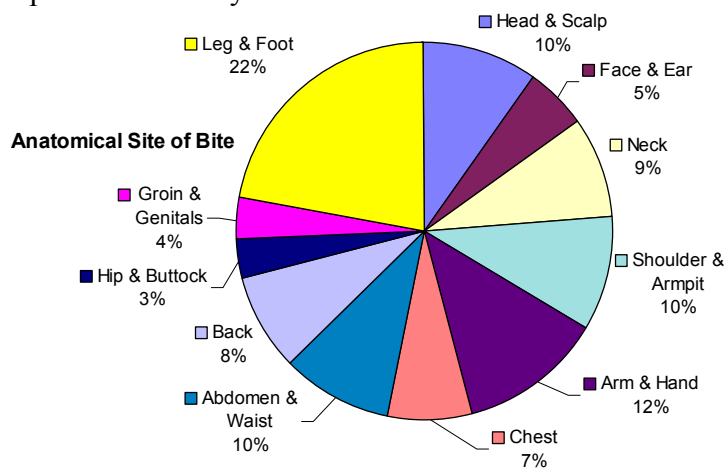


Figure 13

While the information contained in this report closely follows general trends found in the state and recorded by the Connecticut Agricultural Experiment Station, two years, 1997 and 1998 depart from that consistency, due to personnel changes in the program. While the program began in 1989, public awareness and utilization of the program was limited until 1992, when a strong public awareness campaign began.

Lyme disease is a very significant illness in the Stamford area. The vector for the disease is the *Ixodes scapularis* which does fluctuate by season. Residents should be particularly aware of the risk in April, May, June, October and November, but should understand that there is a risk in every month. Parents should be especially vigilant with their children when they are outdoors. Everyone should be aware when working or playing outdoors and take precautions, such as the application of a DEET based insect repellent and wearing light colored clothes with socks covering the bottoms of pants.