# Surveillance to Assess Human Risk for Tick-Borne Disease (TBD)

University of Pittsburgh | School of Public Health

Nicholos Harrell, Katerina Bryan, Emily Bache, Bridget Kelly, Danielle M. Tufts

## Background

As climate change continues to be a global issue, the east coast of the United States has experienced an increase in the tick population and tick-borne diseases such as Lyme disease, Alpha-Gal Syndrome, and Rocky Mountain Spotted Fever. Since Western Pennsylvania has not been looked at, the Tufts' lab aims to monitor the prevalence of tick-borne disease in Western Pennsylvania and understand the mechanisms used to spread them.

## Objective

Using surveillance methods, the Tufts' lab aims to enhance understanding of tick-borne diseases and their mechanisms throughout Western Pennsylvania.

## The Deer Tick

- Scientific Name: *Ixodes scapularis*
- Native to North America
- Also known as the black legged tick
- Established vector of *Borrelia burgdorferi*, a causative agent of Lyme disease
- Inhabits woodland areas
- Has a 2-year life cycle (**Fig. 1**)
- The nymph stage is when they are primary transmitters of diseases
- Responsible for about 85% of tick-borne illnesses in humans


Figure 1. Life stages of the *Ixodes scapularis* tick. From TickEncounters.

## Public Health Significance

- Surveillance across Western PA has been lacking in recent years
- Ticks and their spread of Lyme disease pose a major threat to human health.
- Climate change contributes to the distribution of tick populations across the United States
- This study emphasizes a One Health approach in controlling the spread of TBD

## Results

- 3,742 ticks were collected across 11 counties in Western PA
- Nymph counts in 2025 increased slightly between 2024 and 2025
- Allegheny, Westmorland, Washington, and Butler counties have the highest proportion of ticks collected

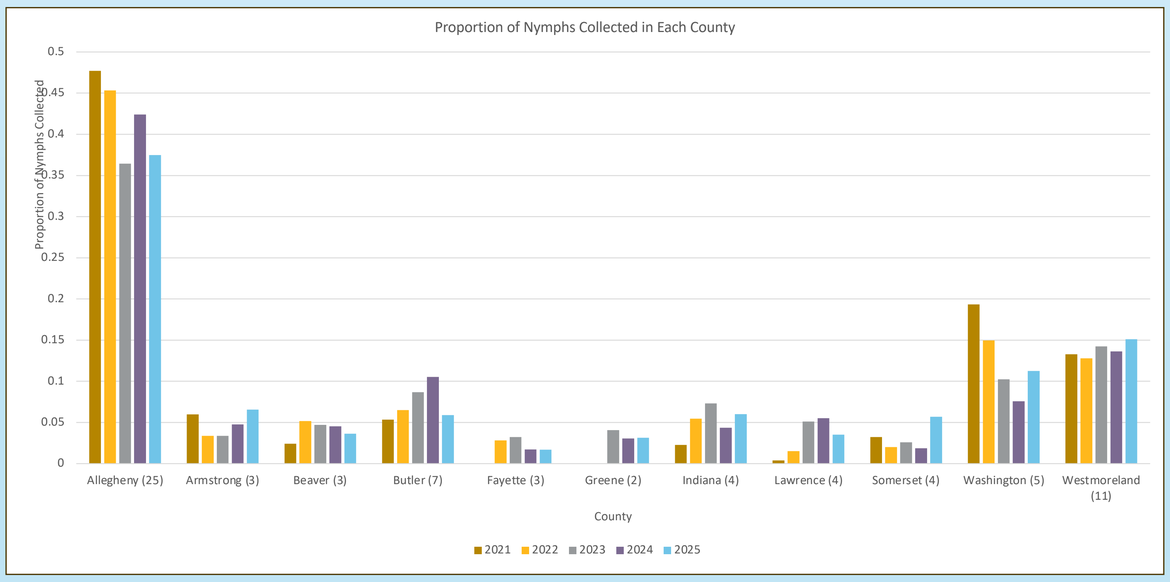


**Figure 5.** Proportion of Nymphs Collected in 11 counties of Western Pennsylvania between 2021 and 2025. Each county is marked with the number of sites visited within the county.

## Conclusion

- As a result of climate change the populations of ticks are increasing across Western Pennsylvania
- Rural areas have a much higher risk of exposure to ticks compared to more urban areas

**Figure 3.** Images detailing fieldwork practices. Includes tick collection and mammal trapping.

**Figure 4.** Images detailing lab practices. Includes DNA electrophoresis, micro pipetting, and crushing ticks using a mortar and liquid nitrogen.

## Methods

The Tufts' lab maintains surveillance of tick-borne diseases and their mechanisms through four projects. The transects team focuses on the collection of the *Ixodes scapularis* tick. The rodent targeted vaccine and mammal teams collects ticks from rodents to determine the effectivity of vaccines and prevalence of ticks in the area. The livestock and *Haemaphysalis longicornus* (HL) collects ticks from livestock and studies their impact on livestock populations.

## The Asian Longhorn Tick

- Scientific Name: *Haemaphysalis longicornus*
- Invasive to North America
- Negatively affects livestock health including reduced reproductive success
- Associated with displacement of native tick species in inhabited areas
- Research is ongoing to assess ecological impacts, vector potential, and management strategies


**Figure 2.** Life stages of *Haemaphysalis longicornus*. From TickSafety.

## Acknowledgements

A great thank you to Pitt's PHUSP program, Dr. Danielle M. Tufts, Emily, Kat, Bridget, and the CDC for making this program possible and this great opportunity.

## References