Epidemiologists find bed bug hotspots in Philadelphia, identify seasonal trends

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A new study from Penn Medicine epidemiologists that looked at four years of bed bug reports to the city of Philadelphia found that infestations have been increasing and were at their highest in August and lowest in February. Credit: Robert Press/Penn Medicine

A new study from Penn Medicine epidemiologists that looked at four years of bed bug reports to the city of Philadelphia found that infestations have been increasing and were at their highest in August and lowest in February. The findings, published ahead of print on January 8

in the *Journal of Medical Entomology*, point to two possible peak times to strike and eliminate the bugs.

"There is surprisingly very little known about seasonal trends among bed bug populations," said Michael Z. Levy, PhD, assistant professor in the Center for Clinical Epidemiology and Biostatistics (CCEB), who mapped the bed bug hotspots in Philadelphia in an effort to find more effective and cost-prohibitive ways to control them. "We found a steep and significant seasonal cycle in bed bug reporting, and suspect that bed bugs have different levels of mobility depending on the season, and that their population size may fluctuate throughout the year."

Warm weather could be a driver for migration to other homes and breeding, he said. "We may be able to exploit this cycle: These seasonal trends could guide control programs to help reduce a city's growing bug population," he added.

To track the spatial and temporal patterns of the bugs, Levy and colleagues, including first author Tarub S. Mabud, analyzed calls to the Philadelphia Department of Public Health's Vector Control Services between 2008 and 2012. They then mapped the phone calls to get a clearer picture of the problem—when and where it was happening.

Reports came from all across the city, though south Philadelphia was the most affected by the bugs.

Overall, bed bug reports in the city steadily increased by 4.5 percent per month from 2008 to 2011, an almost 70 percent increase year to year. Nearly half of all pest infestations reported to the city over that time period were for bed bugs, a total of 382. From September 2011 to June 2012, Philadelphia residents made 236 reports of bed bug infestations, according to the study.

Infestations peaked in August and reached a low in February, the team found.

They most likely move more frequently during warmer months, with increased development and reproduction happening as well, the team surmises.

The next question is to determine if people should strike when the iron is hot—or cold.

"We know the bug reports fluctuate over the year—what we need to figure out now is whether to treat when they are at their worst, in the summer months, or whether to wait until their numbers are down in the winter." Levy said. "Seasonality, we noticed, is just one attribute that can eventually aid control measures, but it is one of many attributes we hope to uncover."

While bed bugs likely migrate actively (i.e. crawl) over short distances, perhaps between adjacent rooms or houses, we think they are starting new infestation hotspots throughout the city by riding on people or personal effects over longer distances, said Mabud.

The study is part of a larger, ongoing pilot study in Philadelphia aiming to come up with safer, cheaper and more effective ways to control bed bugs in an urban setting. These findings have led Levy and his team to south Philadelphia, where surveillance, tracking and treatment methods have begun.

Levy is also looking to his ongoing work in Peru, where the triatomine bug, a giant, often deadly insect has pervaded major cities. The bug carries the parasite Trypanosoma cruzi that causes Chagas disease, which can lead to fatal heart failure. Penn, along with its partner institution in Peru, Universidad Peruana Cayetano Heredia, was recently awarded $3

million by the National Institute of Allergy and Infectious Disease to conduct a five-year study to improve the control of Chagas disease in the city of Arequipa.

"In Peru, the Ministry of Health has been able to eliminate the insects from tens of thousands of people's homes," Levy said. "Bed bugs are different, and in many ways more difficult to control. Still, my team is hoping to translate what works there for Philadelphia."

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