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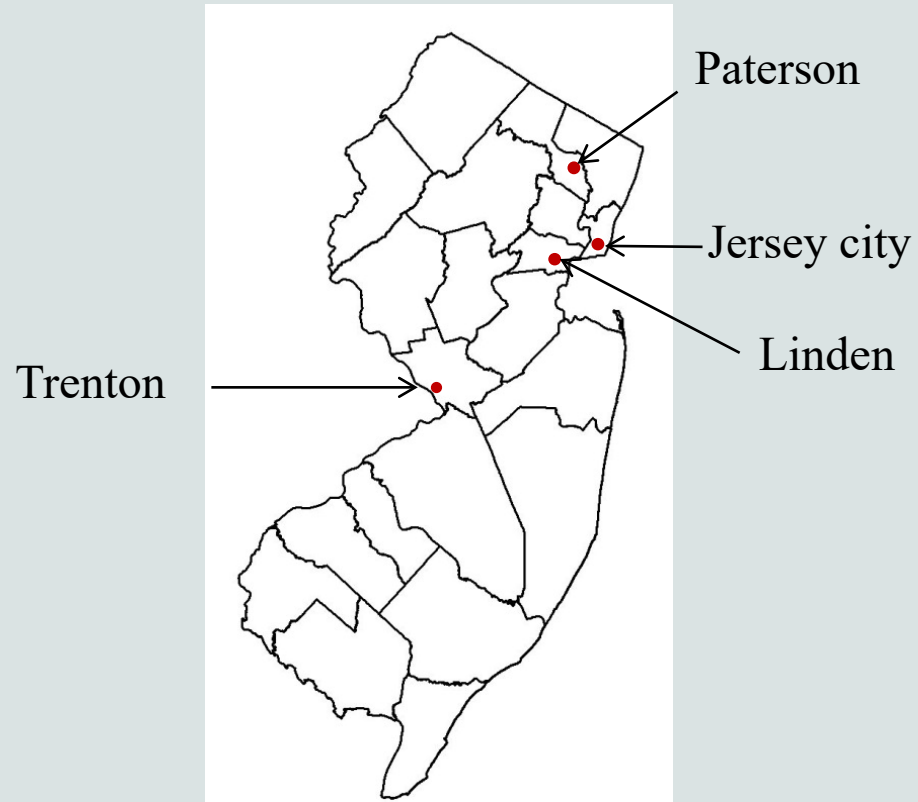


Reducing Pest Infestations in Low-income Housing

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Survey of Pest Infestations in New Jersey (2018)



1,753 low-income apartments

Survey Results

- 78% of the apartments had at least one pest (roaches, bed bugs, or rodents)
- Prevalence of different pests
 - Cockroaches- 37%, house mice- 20%, bed bugs- 9%



German cockroach



Health risks of cockroaches

- Contaminate food and equipment
- Produce allergens



Cockroaches on a door frame

Health risks of rodents

- Rodent urine and dander contain allergens
- Mouse and rat allergens are associated with asthma morbidity
- Ectoparasites
- Vector disease pathogens



Mouse droppings and urine under a bathroom sink



A dead mouse on the floor



House mouse mite, a disease carrier

Health risks of bed bugs



Typical symptoms of bed bug bites



Systemic reaction from bed bug bites



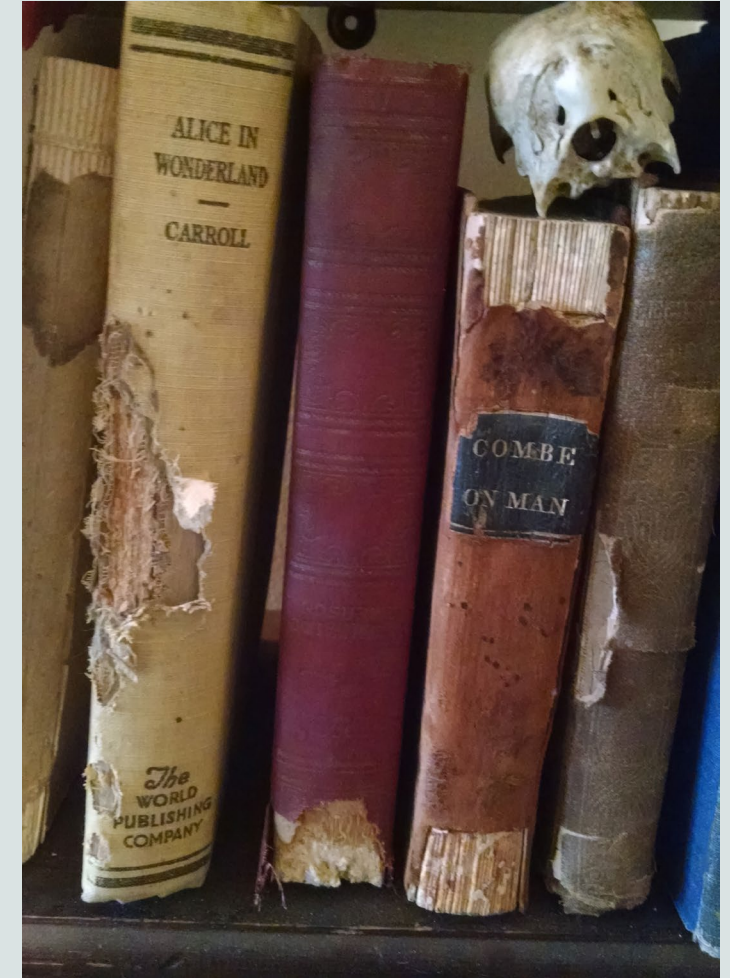
An adult bed bug feeding

Economic importance

- Property damage
- Food loss
 - Billions of dollars annually (Pimentel 2005)



Damage to a car



Damage to books

Economic importance

- Cost of pest control
- Loss of furniture



Insecticides found in an apartment



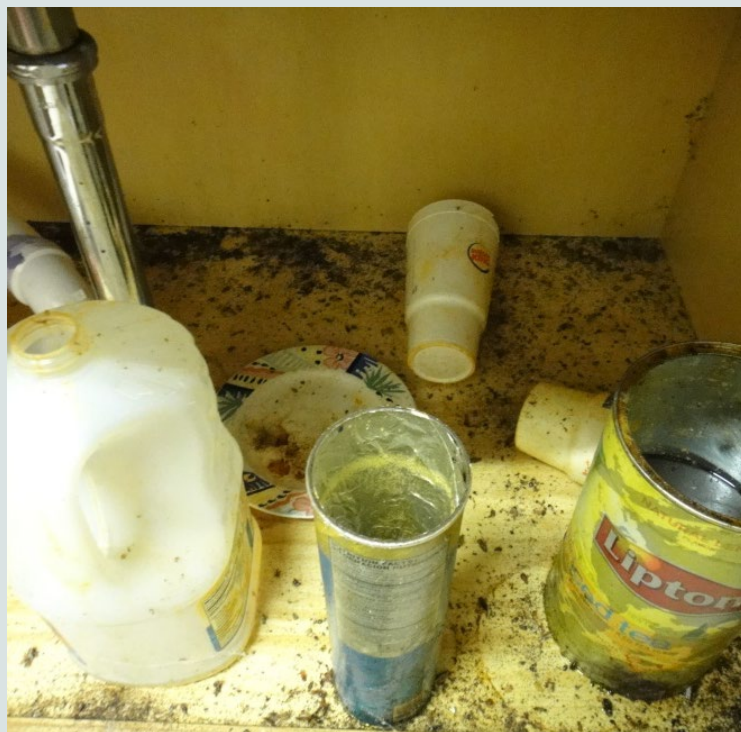
Discarded mattress and box spring

Why Pest Infestations Are Common in Low-income Communities?

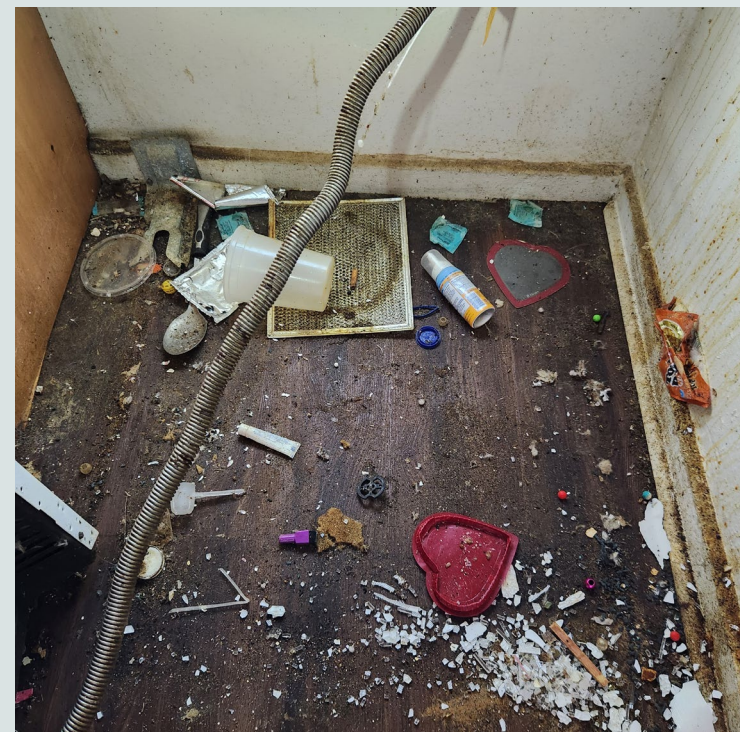
- Poor sanitation conditions



Unwashed utensils



Under the kitchen sink



Under the stove

- Clutter



- Poor pest control methods and ineffective pest control contracts

- Self-control

- From most common to least common: insecticides, glue traps, electronic device, fogger
- Among insecticides, Raid and Hotshot are the two most popular brands



- Commercial pest control provider

- Low-bid, low quality contracts
- Skipping inspections if nobody at home or no complaints
- Very cursory service



Insecticides found in apartments

Integrated Pest Management (IPM)

- **Educate** the residents and staff on pest prevention and control
- Regular **monitoring** to determine if and when a treatment is needed
- Uses a **combination** of physical, mechanical, cultural, chemical, and educational programs to keep pest populations low
- **Evaluate** the success of the program

Methods to educate residents and staff

- Brochures
- Seminars
- Posters
- Free pest control materials



Monitoring German cockroaches

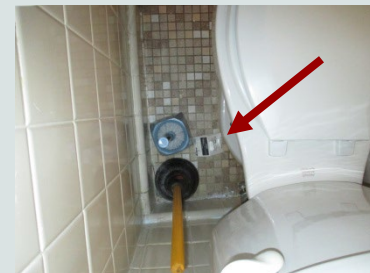
Four traps per apartment :

1. Under kitchen sink (in cabinet)

2. Beside stove

3. Beside refrigerator

4. In bathroom behind toilet

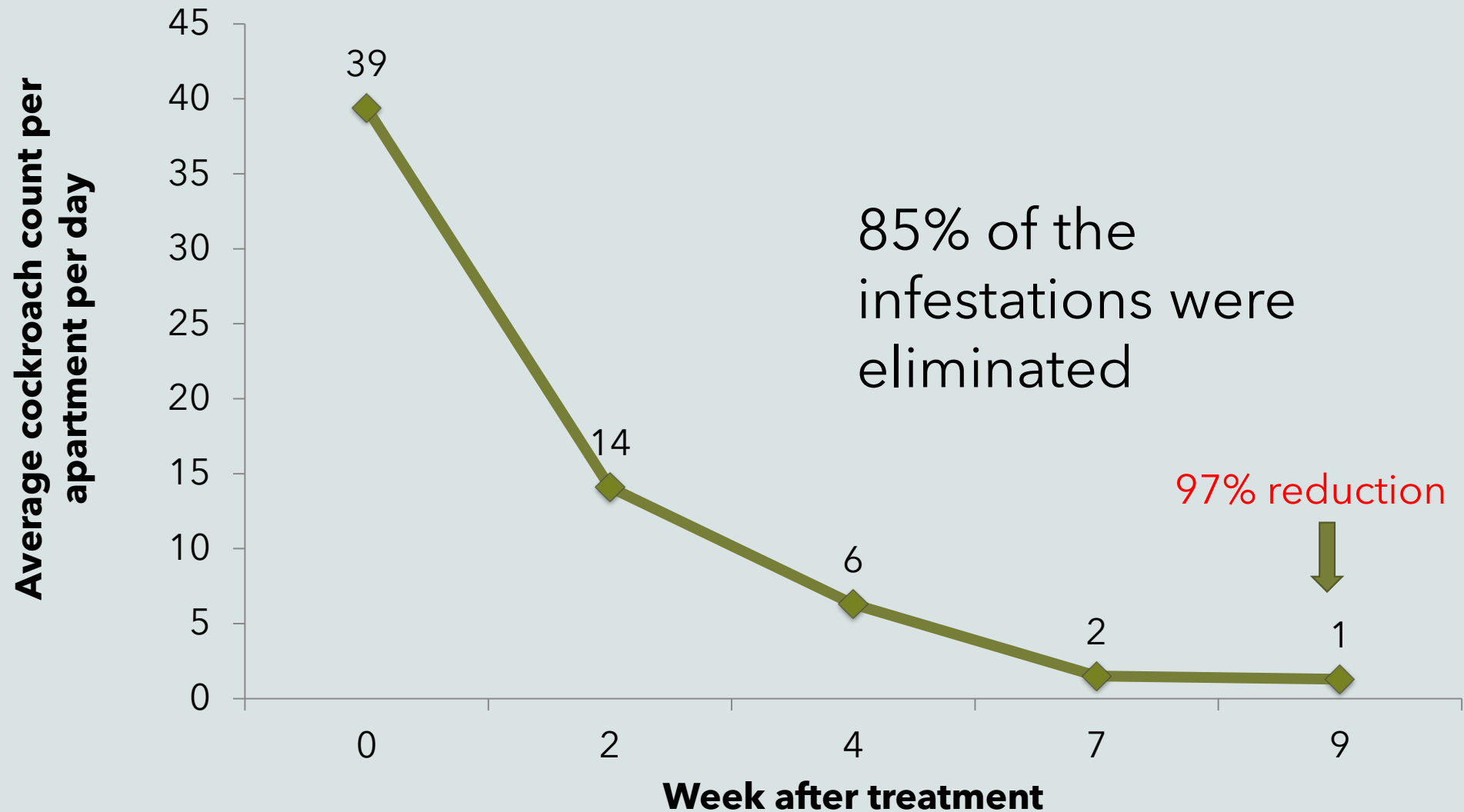


Cockroach IPM Implementation

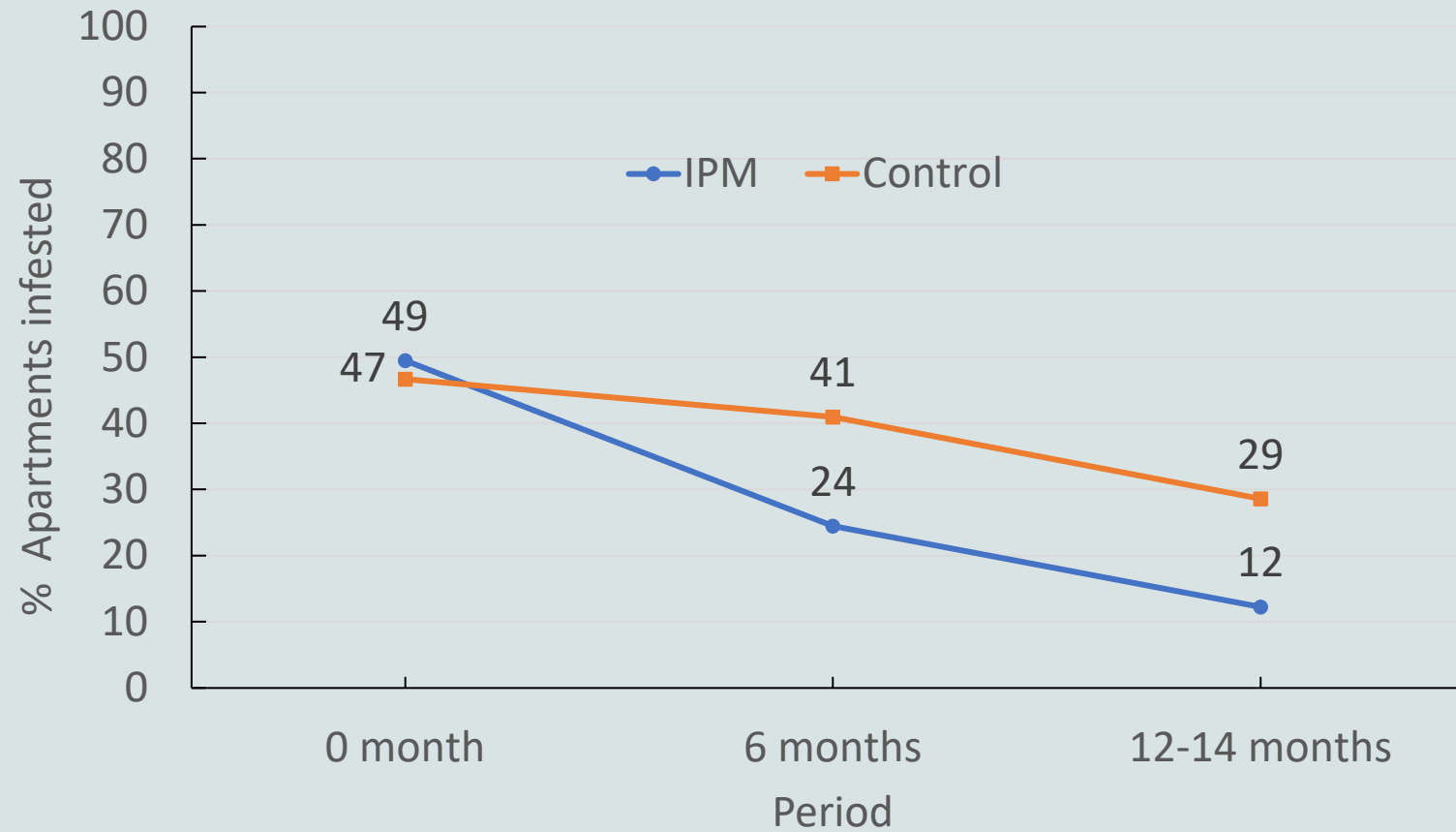
- Insecticide applications
 - Apply **gel baits** thoroughly, apply boric acid dust around perimeters and in cabinets
- Regular monitoring
 - Inspect the traps **every 2-4 weeks**, reapply bait if necessary
 - Stop visits when **zero cockroaches** are found in a month



Effect of IPM on cockroach count reduction (New Brunswick, NJ. 2016)



Effectiveness of Building-wide IPM Implementation on German Cockroach Reduction (Patterson, NJ. 2016-2017)



Control group: monthly service by an existing contractor

Wang et al. 2019.

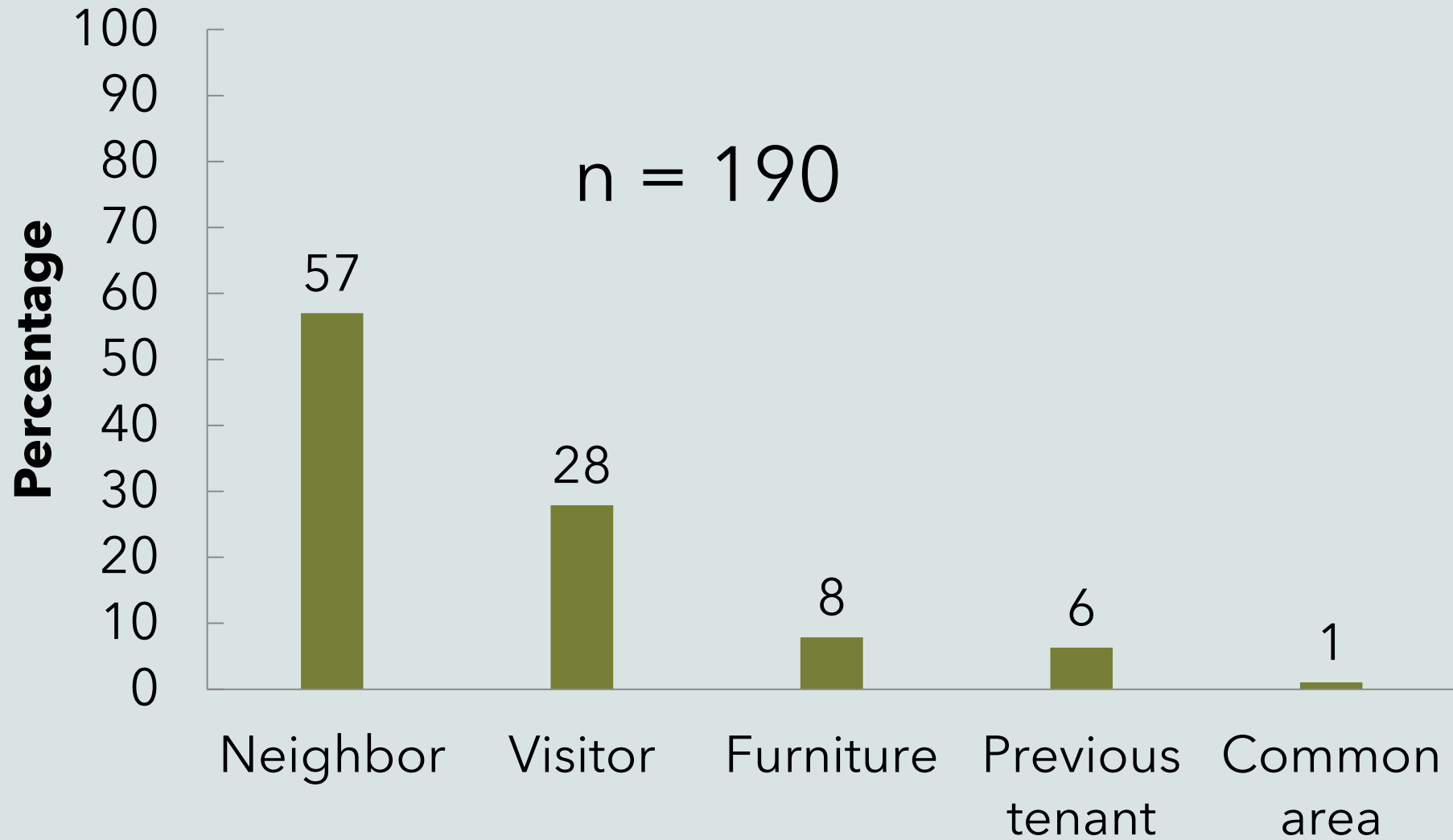
Cockroach elimination is not difficult

- Only one of the 93 units still had cockroaches after 1 year.



An apartment that had cockroaches for more than 12 months due to abundant food sources

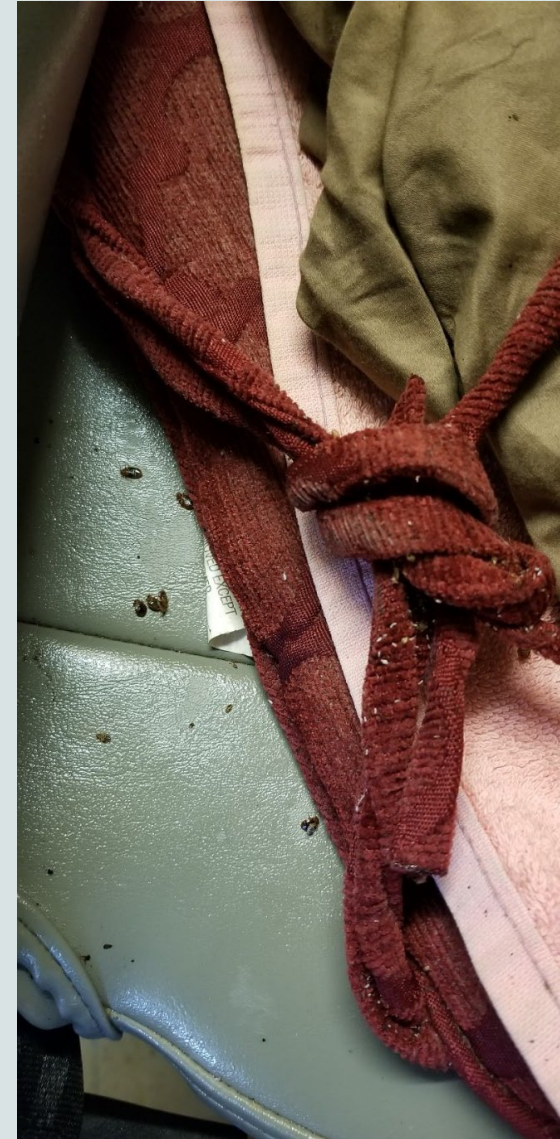
Sources of Bed Bug Infestation





Bed bugs can spread to neighbors through hallway or common walls or ceilings





Bed bugs may be spread by the use of infested wheelchairs



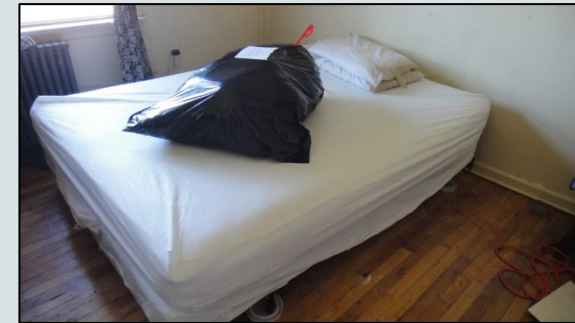
Bed bugs may be spread by infested shopping bags



Bed bugs may be spread by infested shoes

Non-Chemical Methods to Control Bed Bugs

- Install zippered mattress encasement
- Install bed bug monitors under furniture legs
- Declutter around beds and sofas
- Apply steam



Mattress encasement and hot laundering of bed linens weekly



Place clutter in plastic containers



Apply steam



Interceptors under furniture legs

Chemical Methods to Control Bed Bugs

- Phantom aerosol
- Transport GHP spray
- Diatomaceous earth dust



Follow-up Visits

- Inspect the interceptors and conduct visual inspection every 2 weeks
- Re-apply insecticides if necessary
- Stop only if no bed bugs are found in interceptors after 6 weeks

Building-wide bed bug control results (Jersey City, 2015)

Period	Number of apts with bed bugs	Infestation rate
Initial	55	15%
0-6 month	10	2.8%
12 month	8	2.2%

Methods to Overcome the Control Difficulties

- Management office assist residents
 - Provide mattress encasement
 - Provide metal bed frame
 - Discard clutter and difficult-to-treat furniture
- Social workers, relatives, home aids
 - Weekly laundering



Difficult-to-Treat Furniture

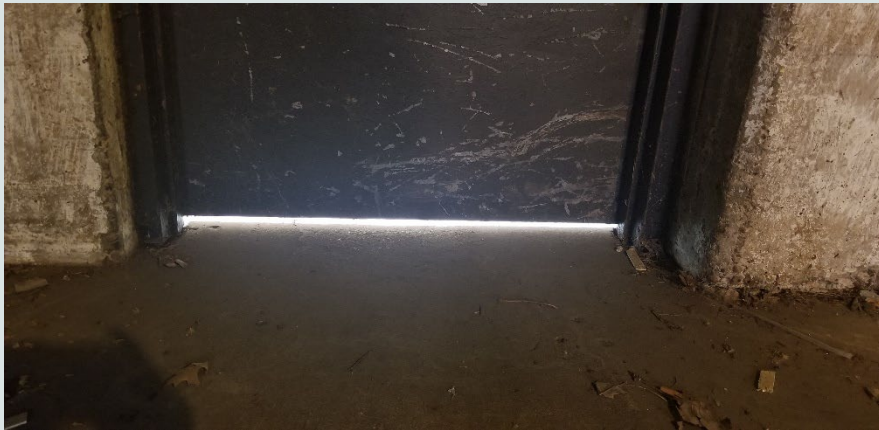


House mouse control



Exclusion is the most important long-term control method





Xcluder door sweep to
seal gap under exterior
door



Seal vents with $\frac{1}{4}$ inch
stainless steel fabric



Install escutcheon plates around pipes and seal with caulking



Gas pipe penetration behind the stove

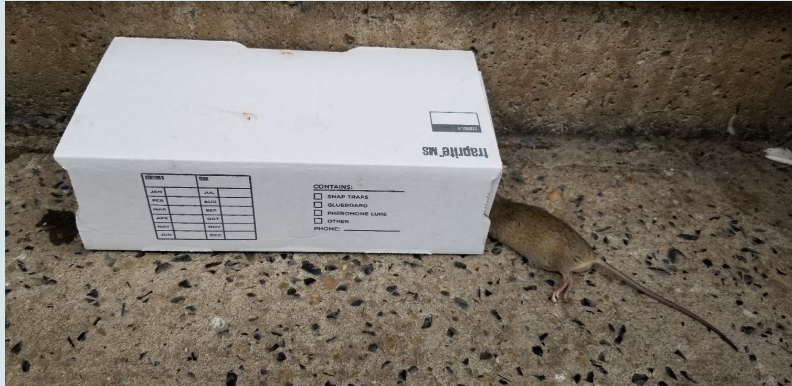


Xcluder stainless steel fill fabric

Baseboard heating



Non-chemical methods



Effective method

- Mice die at place and can be discarded



Ineffective methods

Place rodent stations in crawl space



Rodenticides

- Need a license
- Place in tamper proof mouse stations
- Less time consuming than using snap traps
- Dead mice produce foul odor



Dead house mice in basement



In-house pest control vs contracted service

IN-HOUSE LICENSED STAFF

- Flexible
- Familiar with the residents and the facility
- No travel time
- Less experienced to different types of facilities

CONTRACTOR

- Calander-based
- Technicians may change over time
- Extra cost due to travel time
- More experienced and with access to more diverse products and expertise

Setting up an effective pest control contract

- Specify the expected outcomes
 - Guarantee elimination of pests within 3-6 months
 - Maintain the number of infestations low (< 10% infestation rate)
 - No units should have high numbers of pests (< 5 count based on visual count or monitors)
- Have a log book at each facility
- Require the use of monitors to monitor the pest presence (sticky traps, mouse stations, bed bug monitors)
- Require the use a combination of control methods

Recommendations

- Request contractor to use a combination of non-chemical and chemical methods
 - Cockroaches: vacuuming, traps, various gel baits, boric acid
 - Bed bugs: Encasement, steam, interceptors, insecticide spray and/or dust
 - Rodents: snap traps, rodenticides
- Rodent proofing the building by housing staff
 - Exterior doors, vents, entry doors
 - Interior: escutcheon plates to all pipe penetrations, stainless wool to seal gaps
- Conduct periodic building-wide inspections and treatments of all infested units and common areas
 - Either request a quote or conduct inspection by housing staff
- QA by housing staff
 - Use monitors to determine elimination

Questions?

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