

# Turning Failure into Success: Bed Bug Management in Affordable Housing



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# Affordable housing communities



## **Disproportionately high pest infestation rates**

- Low bid pest control & poorly written contracts
- Poor quality pest management

# Concept of “assessment-based” pest management is essential

## **Traditional approach to pest management is flawed and designed to fail**

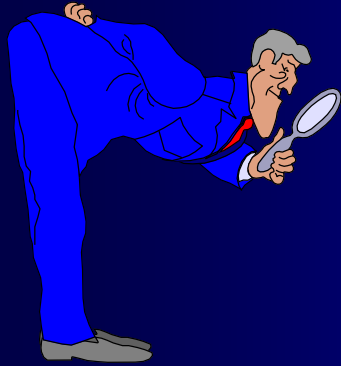
- Complaint-based programs or building-wide monthly treatments (“spray and pray”)
- Constantly putting out fires, doesn’t address spread

## **Assessment-based programs are geared for community-wide success**

- Identify unreported infestations
- Assess severity of infestations, obstacles, etc.
- Allows for proper allocation of resources

# Early detection of bed bugs is critical

Because the longer an infestation goes undetected...



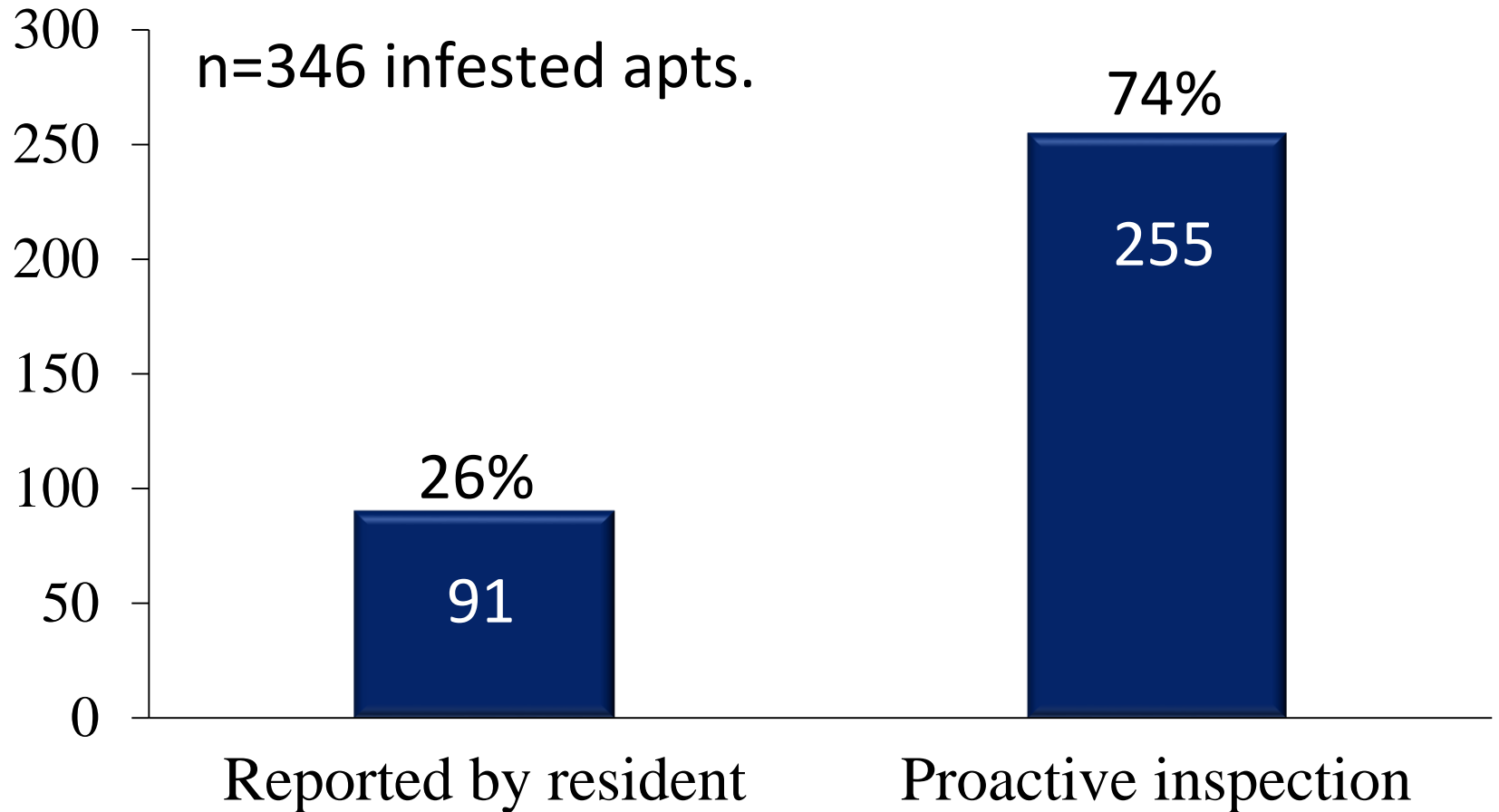
1. The more complex the problem becomes
2. The more difficult and costly it is to eliminate
3. The more likely it is to spread

It's the infestations you are not aware of that promote failure of community-wide control efforts and the escalation of costs

## **Poll Question #1:**

How do you identify apartments with bed bug activity?

# Most communities rely upon residents to report activity



*Cooper et al. 2015. Pest Management Science  
Wang et al. 2016. J. Medical Entomology*

# Why are so few infestations reported by residents?

## **1. Unwilling to report the problem**

- Apathy (nothing ever changes)
- Fear negative repercussions
- Trying to avoid attention from management
  - unauthorized occupants, illegal activities
- Ashamed or embarrassed

## **2. Unaware of bed bugs**

- Don't see bugs
- Not reacting to bites (especially the elderly)
- Mental disability

# Confirming bed bug activity

## Detection methods

- Visual inspection
- Monitors/traps
- Scent dogs



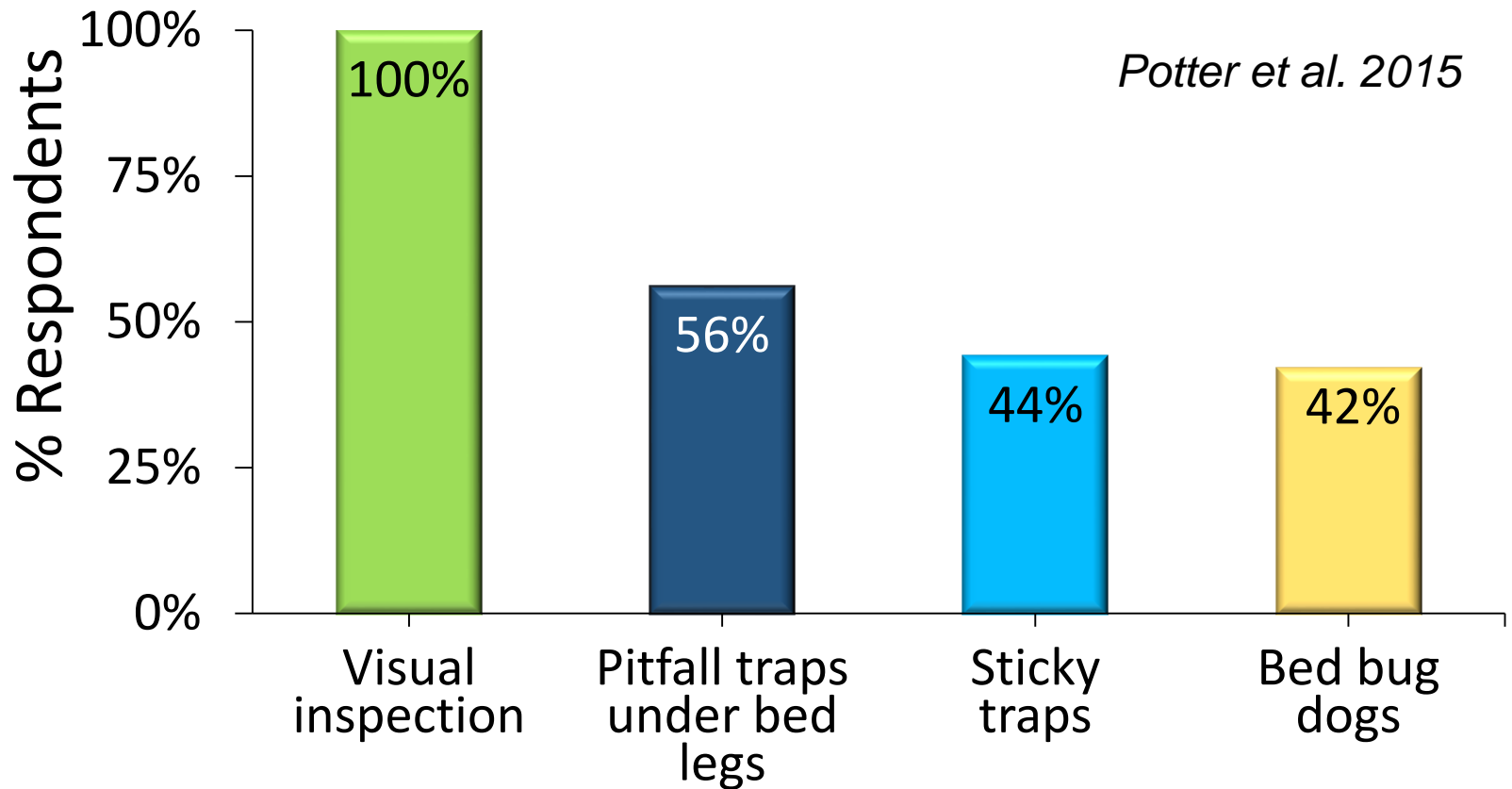


## Poll Question #2:

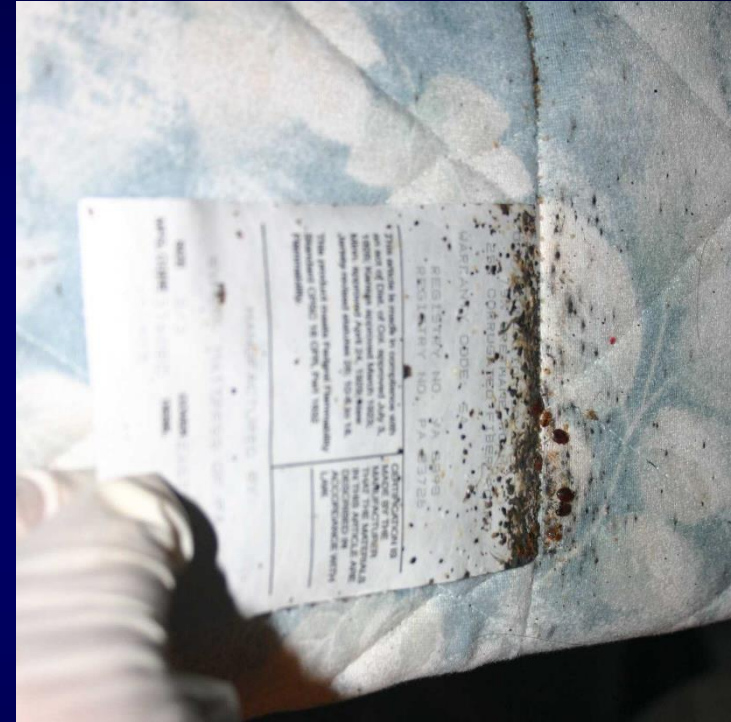
Which best describes how your apts. are typically inspected for bed bugs?

# Most pest management professionals rely upon visual inspection

Methods used by PMPs to detect bed bugs



# Visual inspections are fine for heavy bed bug infestations



# Most infestations are not severe

## Infestation rates

~ 10% severe infestations

~ 25% moderate infestations

~ 65% low-level infestations

*Wang et al. 2016. J. Medical Entomology*

Many low-level and some moderate level infestations will be missed during a visual inspection

# Place monitors to detect infestations



1. Intercepts bugs as they travel to and from beds and upholstered furniture
2. Very reliable for detection of low level populations

# Comparison of interview, visual inspection, and interceptor traps

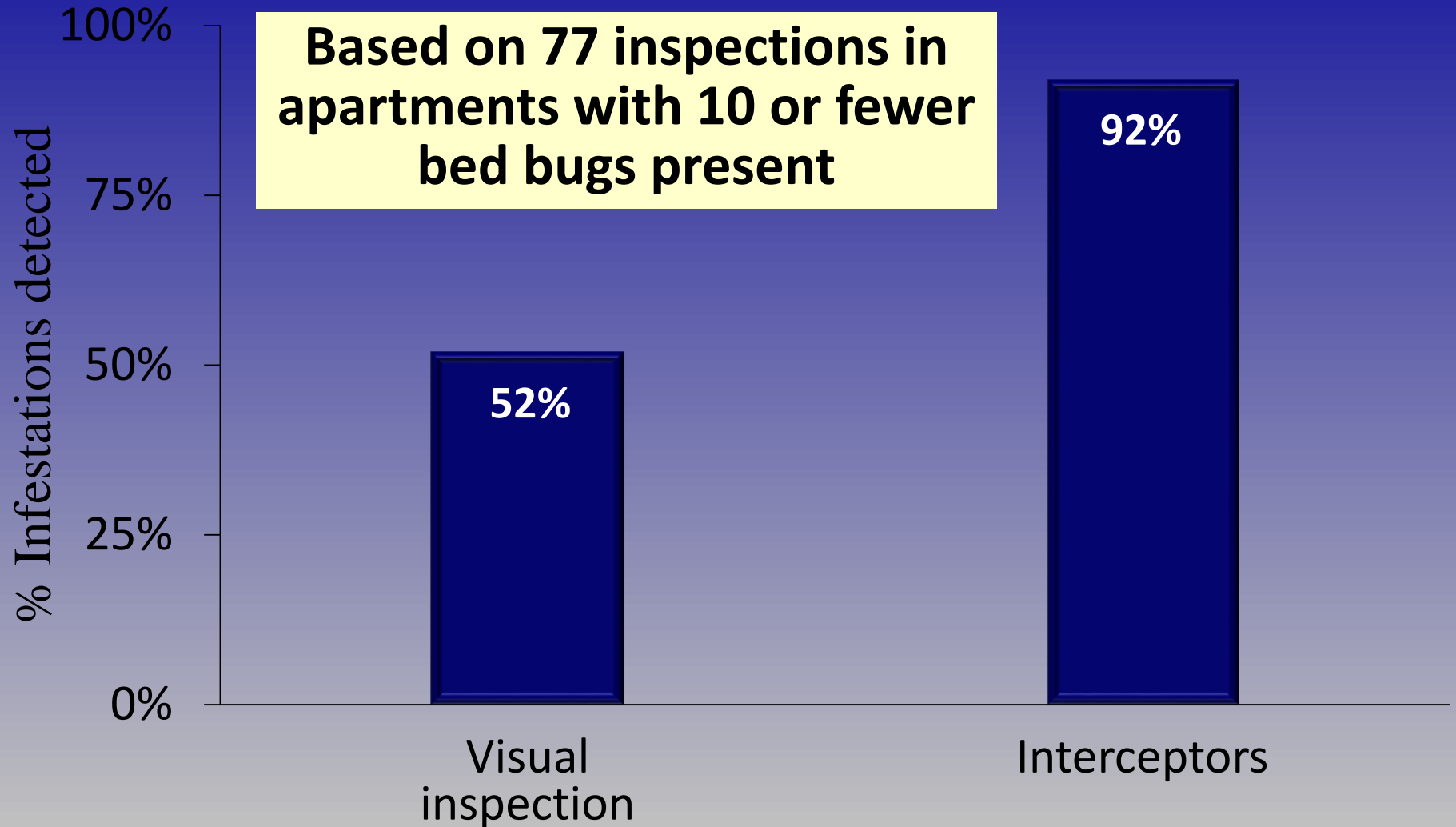
**358-unit apartment building (elderly residents)**

**71 infested apartments identified**

**Mixed infestations (low-level to severe)**

- 30% (21) identified through resident interview
- 69% (49) identified through visual inspection
- 96% (68) identified with pitfall traps under legs of beds and upholstered furniture (14d)

# Detection of low-level populations



*Cooper unpublished results*

# Comparison of scent dogs vs. interceptors



vs.



276 apartments inspected (67 w/ bed bug activity)

## **Dog teams were inconsistent**

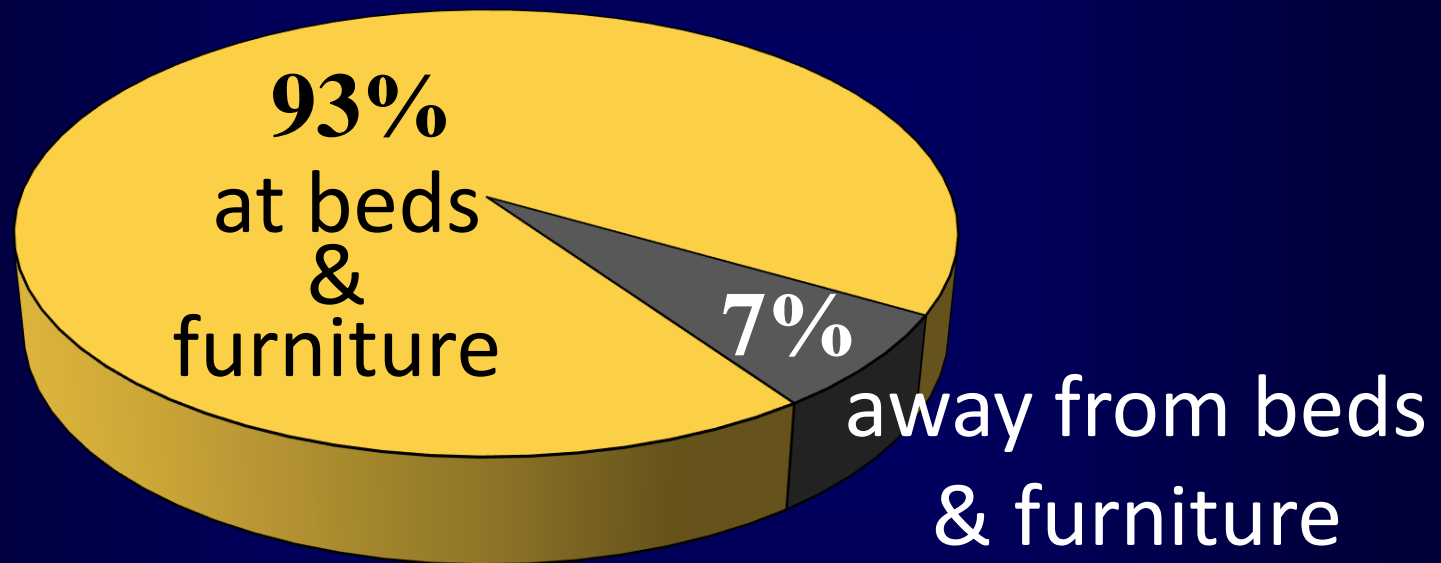
- mean detection rate 44% (range:10-80%)
- mean false positive rate 14% (range: 0-57%)

## **Interceptors (14 d)**

- 90% detection rate



# Treatments are often limited to the bedroom & living room



## **Poll Question #3**

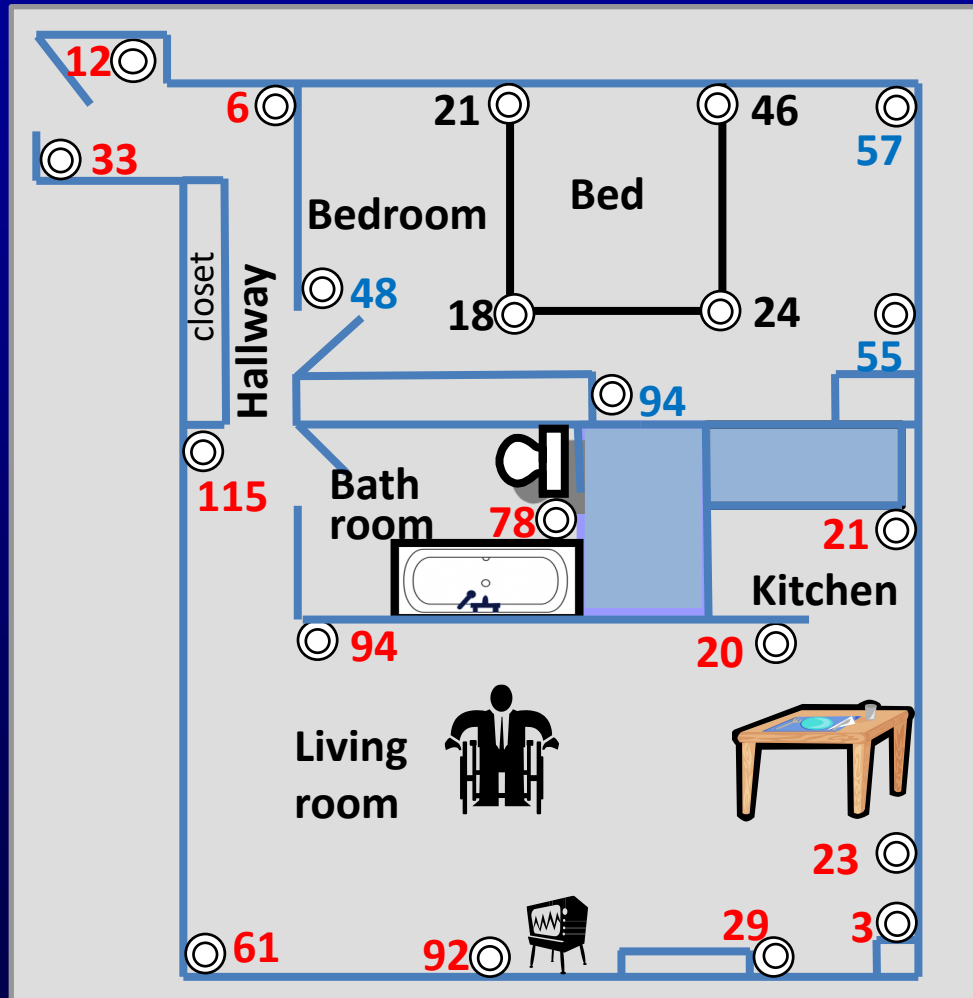
What rooms should be treated  
(sleeping/resting areas or whole apt.)

and

## **Poll Question #4**

How likely are bed bugs to travel to  
areas away from beds and sofas?

# Distribution of bed bugs based upon apartment-wide monitoring over 14d



Bed = 109 bugs  
Bedroom = 254 bugs  
Rest of apt. = 587 bugs

**88% captured  
away from bed**

## **Poll Question #5**

What type of resident preparation is required prior to treatment?

**Why do we ask?**

Because proper preparation is essential! (or is it?)

# Required preps are often over-burdensome and unrealistic

“Be ready for some very serious, exhausting, detailed, hard work! Get a friend or friends to help you, if possible, because the amount of preparation can sometimes be mind-boggling. Do it right the first time; do the necessary hard work. You can't skimp when it comes to preparing for bed bug treatment.”

Source: Pest management company website

# Typical preps include:

- Strip bed linens, remove mattresses & box springs and stand on end
  - Remove and bag any items under beds & upholstered furniture
  - Remove everything from dressers & closets, launder & bag all clothing and personal items
  - Remove hanging items from walls (pictures, clocks)
  - Remove and launder draperies
- And the list goes on and on ...**



# Are the typical preparation requirements **realistic** and are they **justified**?

Look in the  
mirror and  
ask yourself..



“Could I do what  
I’m asking my  
clients to do?”

# Same prep list for every treatment



Every infestation is unique, why aren't prep lists unique as well?



**Prep lists should not be “one size fits all”**

- Recent introduction of 1 or 2 bugs
- Well established infestation
- Isolated versus dispersed infestation...



# Preparations prior to an initial treatment can do more harm than good!

- Disrupts the infestation and alters the conditions
- Promotes dispersal of bed bugs
- Infested items are not properly addressed complicating the control effort

# Do we really want residents stripping and moving these beds?



# Is it a good idea to bag all this stuff under the bed?



Cannot launder these infested items

# Do you believe bagging items actually works?



- Bagged items often not sealed tightly
- Sealed bags get rips, tears, or holes (**heavy duty bags \$\$\$**)
- Bags are opened to access items (don't stay closed at least 6 months)

# What happens when residents fail to follow preps fully or correctly?

Insufficient prep = NO SERVICE

“We understand that appropriate preparation can be difficult to achieve in a short period of time and that senior citizens or handicapped individuals may have difficulty carrying out the necessary preparations.

**\*Please note: we will not provide treatment to any unit or property that has not met the preparations...”**

Source: Pest management company website

Is this OK? How does this help?  
And what does it accomplish?

# The alternative is a: “No Prep” approach

**The “No Prep” approach allows you to:**

1. Evaluate the true nature of the infestation without disrupting the infestation
2. Make **“site specific”** recommendations **after the initial service** based on:
  - Infested areas and,
  - Obstacles to successful control

# “No Prep” does not mean “No Cooperation”

**Instead it means we are:  
limiting requests for cooperation  
to actions that that have been  
positively identified as interfering  
ability to eliminate the infestation**

# Extensive preparation is not necessary to eliminate infestations



Infestations eliminated in hundreds of apartments with no resident preparation

*Wang et al. 2014 Pest Control Technology*

*Cooper et al. 2015. Pest Management Science*



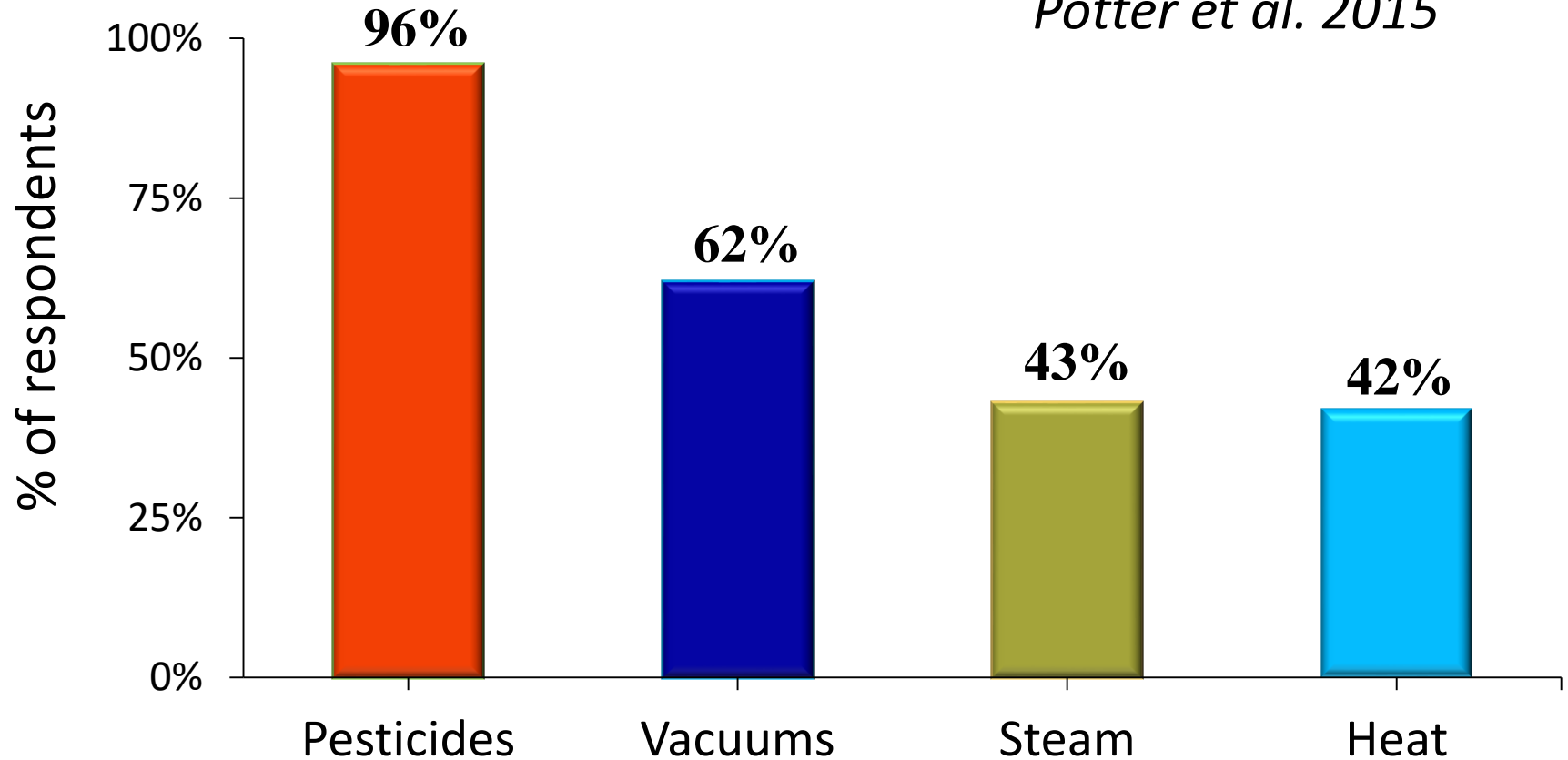
## **Poll Question #6**

What methods are used to treat your  
apts. for bed bugs?

# Most pest management professionals rely upon pesticides for control

Methods used by PMPs to treat bed bugs

*Potter et al. 2015*



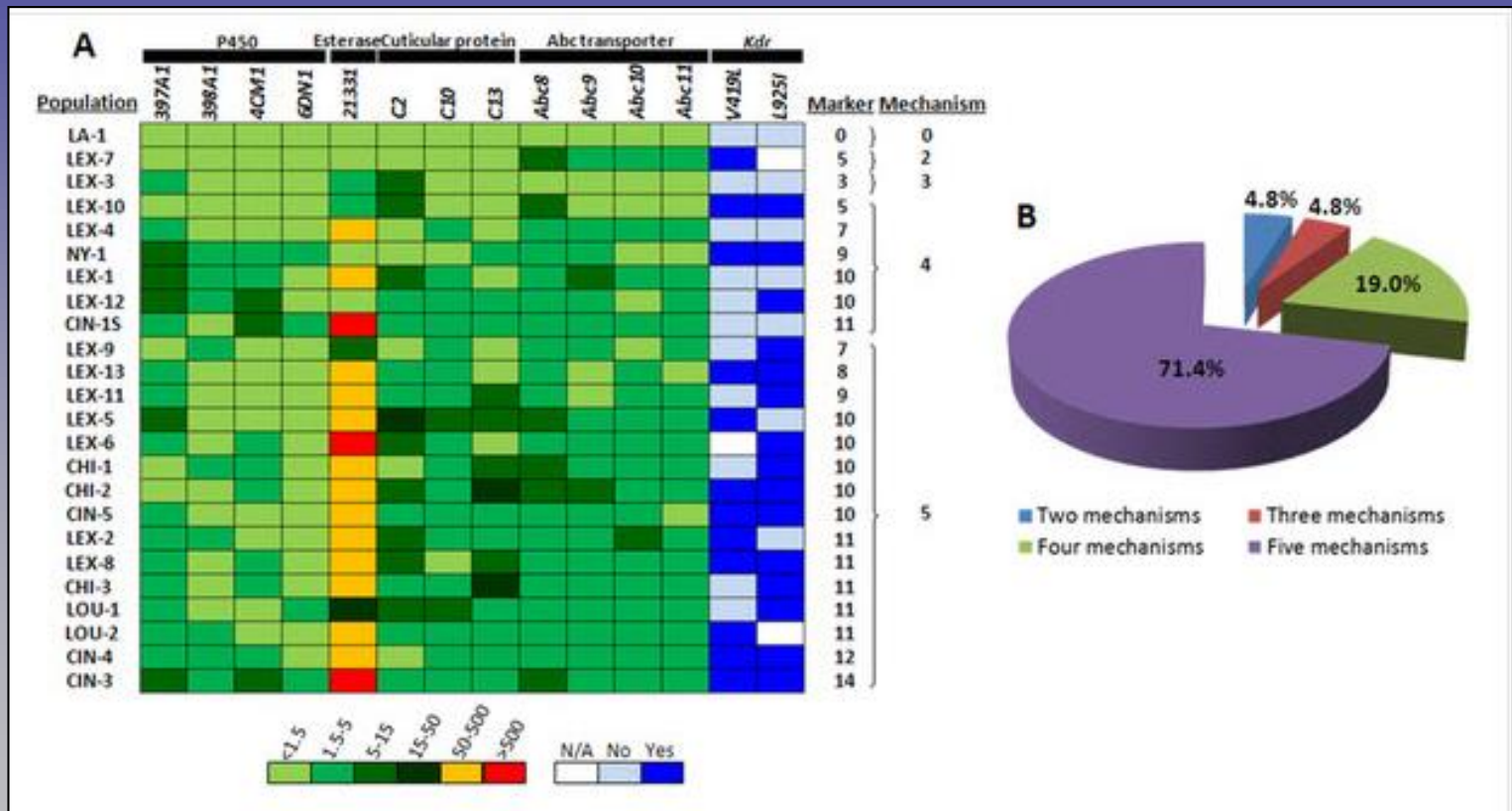
# Relying on pesticides for control is a big mistake!



88% of field tested bed bugs are highly resistant to commonly used pesticides

*Zhu et al. 2013. Scientific Reports*

# Multiple mechanisms of resistance in field-collected bed bug populations



Source: Fang et al. Nature, Scientific Reports 2013

# Encasement of Mattresses & Box Springs



# Encasements are both a pro-active and reactive tool

- 1. Proactive use for the early detection of bugs**
- 2. Protection of replacement beds**
- 3. Salvage infested beds**
- 4. Improving efficiencies during follow up visits**



# Interceptors, not just for detection: Reduce numbers contributing to control!



**Under legs in sleeping & resting areas**



**Away from sleeping areas**

## **Under legs of beds and furniture**

- Intercepts bugs traveling to sleeping and resting areas
- Intercepts bugs dispersing & laying eggs away from sleeping and resting areas

## **Away from sleeping & resting areas**

- Intercepts bugs traveling throughout apartment

# Volcano and Activ Volcano (lure)

- Small/discrete, can be placed anywhere
- Don't require labor to lift beds & furniture
- Require very little maintenance



Image Susannah Reese

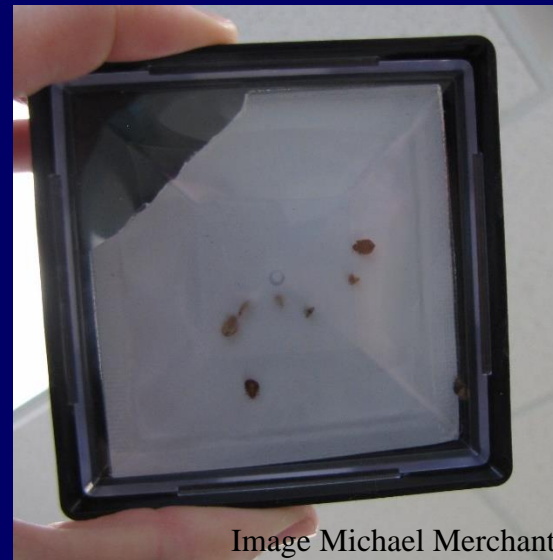


Image Michael Merchant



# Physical removal or destruction of bugs and eggs



**Vacuum  
visible bugs**



**Steam to destroy  
bugs & eggs**

# Vacuums can be used to quickly eliminate large numbers of bugs



# Steam is very effective and overcomes limitations of vacuums



Destroys all stages including eggs!

# Methods for addressing infested items and dealing with obstacles to control



# Infested items that can't be laundered



Bagged items to  
be discarded



Portable heat  
chamber



Household  
freezer (4 days)

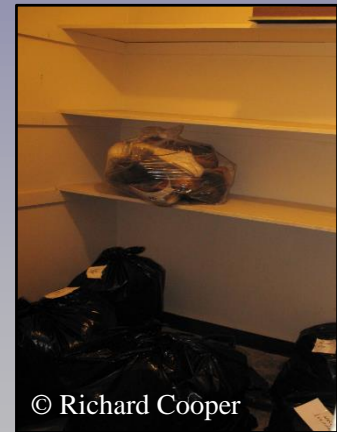
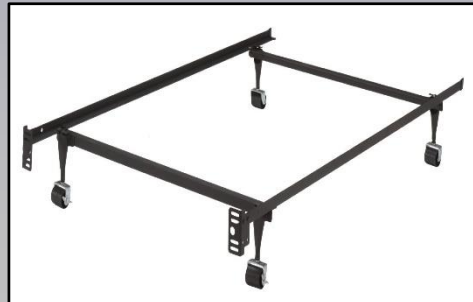
# Occasionally resident assistance may be required

- Laundering expense



- Sorting through infested items

- Getting beds off floor



# Pesticides:

Best used as the last line of defense



Relying on pesticides as the only method of control is a bad idea!

## **Poll Question #7**

How many times are your bed bug infested apartments treated?

and

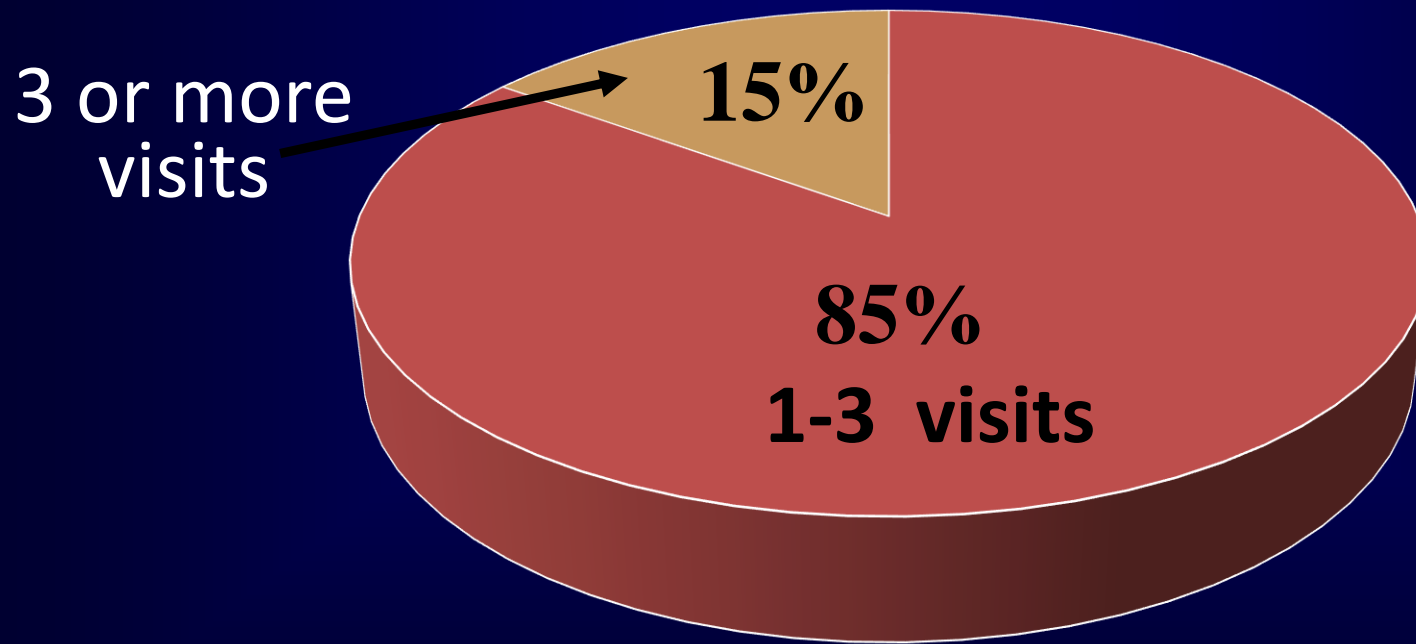
## **Poll Question #8**

How do you know when an infestation is eliminated?



# What do Pest Management Professionals think?

How many visits are needed to 'control' infestations?



# Number of visits required to eliminate infestations

## Well established infestations

- > 5 visits

## Newly introduced infestations (low-level)

- 1-2 visits

*Cooper et al. 2015 Pest Management Science*

# of follow-ups should not be pre-determined, but should continue until the infestation is eliminated

Confirming elimination is more difficult than detecting an infestation in the first place!

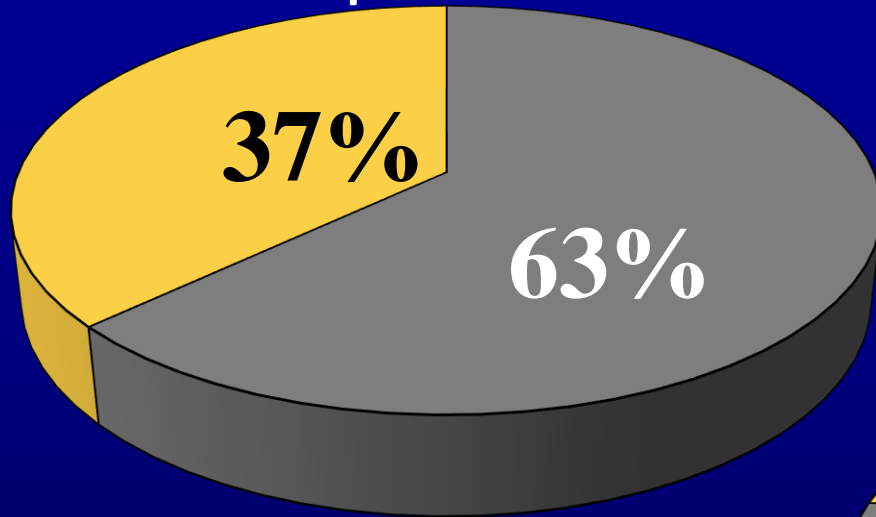


Just because you don't find them doesn't mean they aren't there!

# Distribution of bed bugs by area

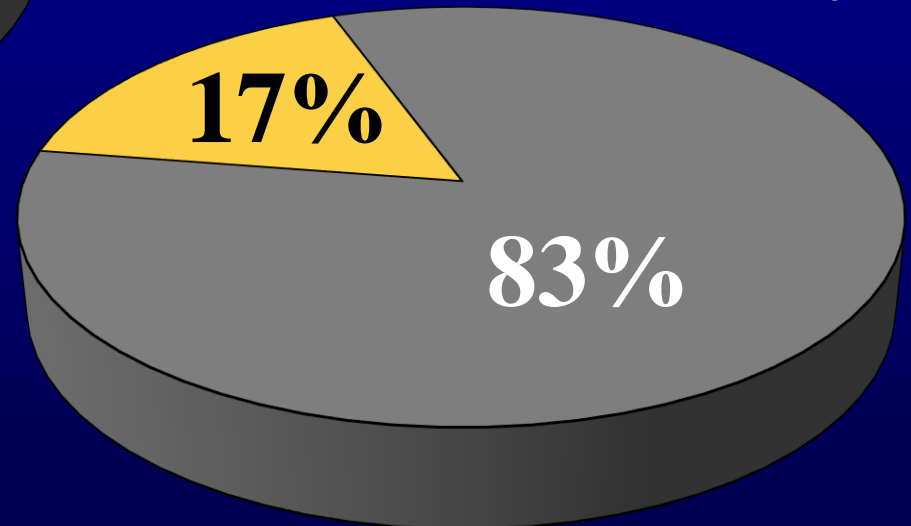
n = 101 apts.

- Bugs at beds & furniture
- Bugs away from beds & furniture



Prior to treatment

n = 43 apts.

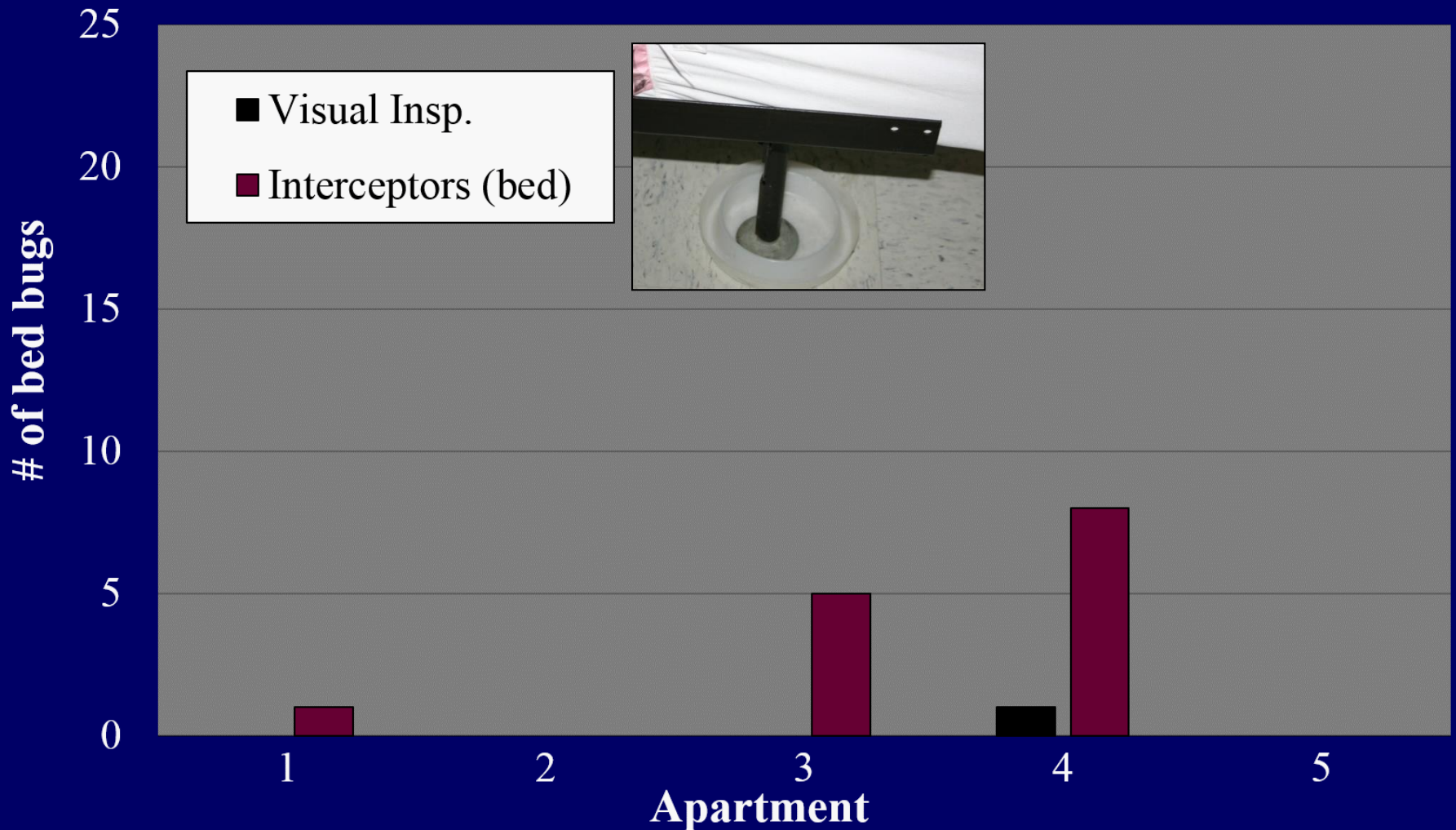


During treatment

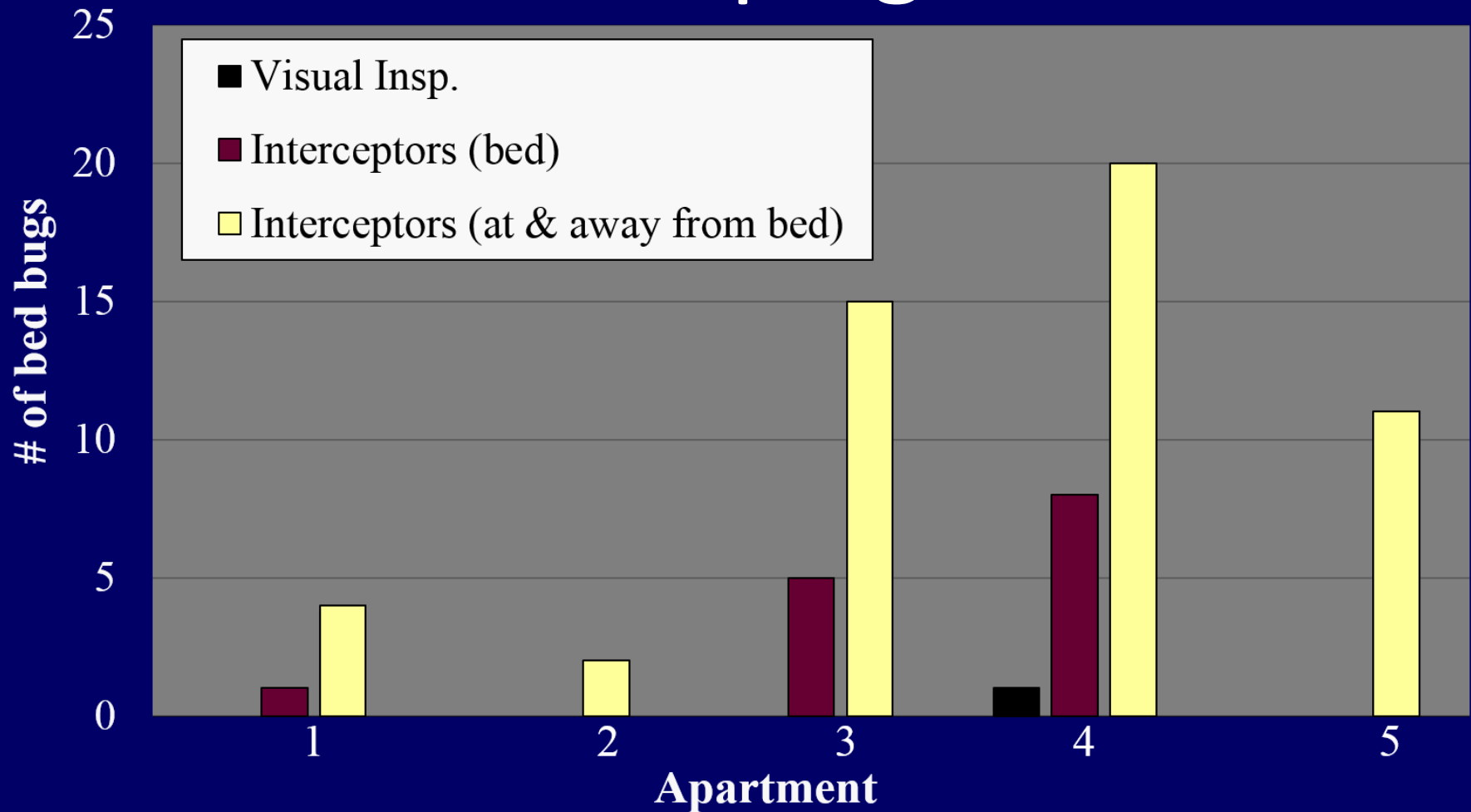
# Visual inspection (~20 min)



# Addition of interceptors at beds



# Addition of interceptors away from sleeping areas



# Bed bug activity following termination of treatment efforts

- 64% of apartments had activity after bugs were believed to be gone
- 54% of the time bugs only detected away from sleeping areas
- Activity was not detected during every trapping interval (3 consecutive visits)

*Cooper et al. J. Econ. Entomol. 2015*

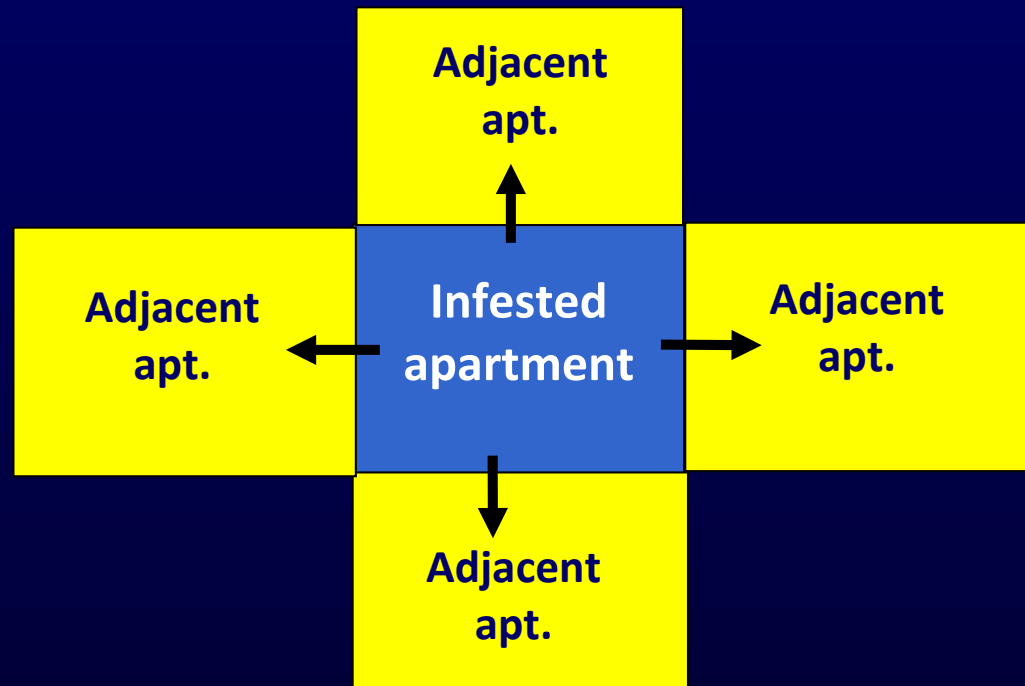


## **Poll Question #9**

Do you inspect apartments that  
neighbor infested units?

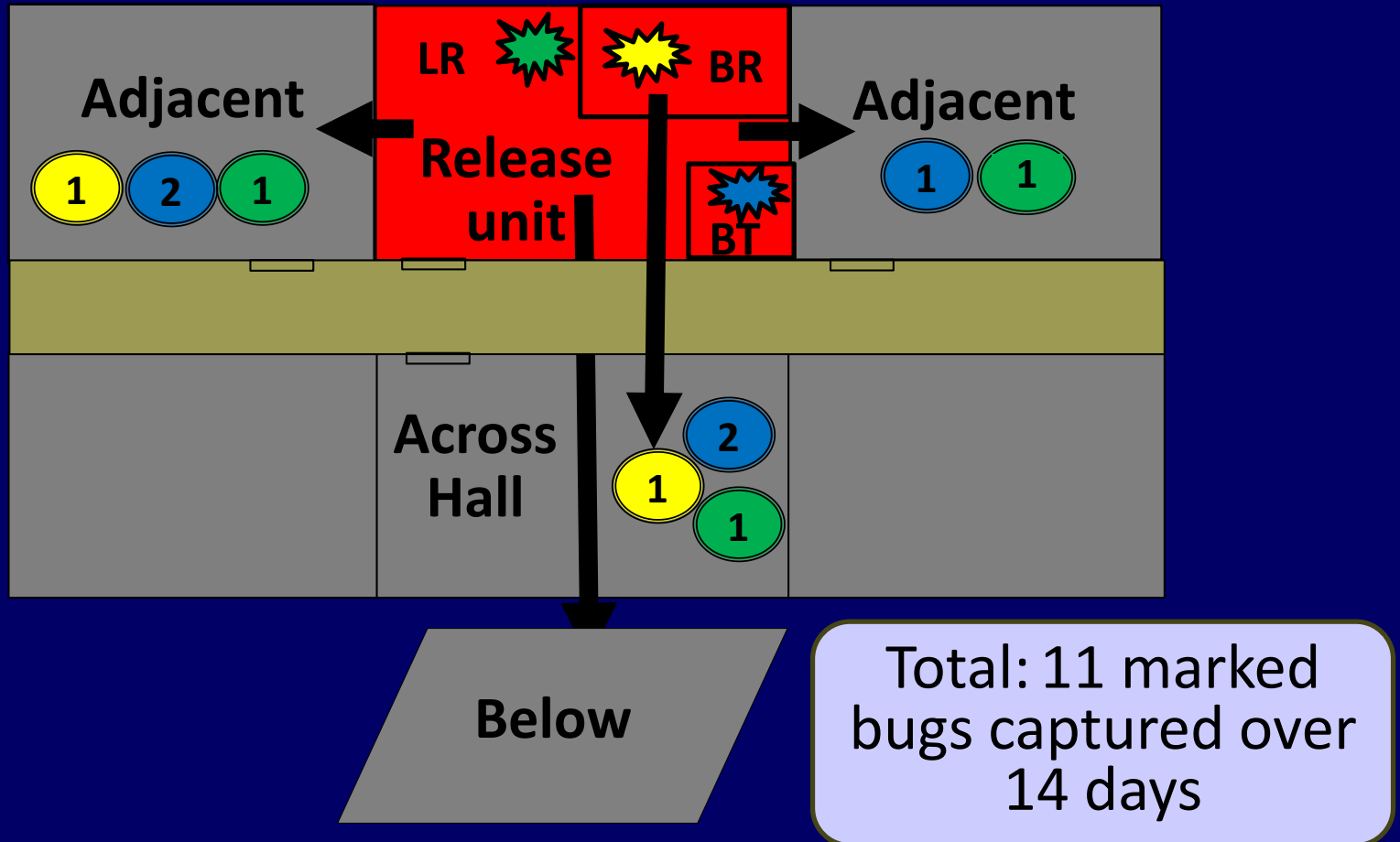
# Bed bugs will readily disperse to neighboring apartments

Mark, Release, Recapture study



6 apts. in study (4 occupied and 2 vacant)

# Marked bed bugs recovered in neighboring units in as little as 3 days



# Bed bugs captured on sticky tape barriers at apartment entry doors



11 marked and 269 unmarked bed bugs trapped on sticky tape barriers

# Infestations often occur in clusters

| # bldgs. | # of apts. | Neighboring apts. infested | Adj. | Above or below | Across hall |
|----------|------------|----------------------------|------|----------------|-------------|
| 6        | 1078       | 72%                        | 42%  | 33%            | 25%         |

1. Inspect neighboring apartments for bed bugs
2. Expand definition of neighboring units to include apts. across the hall

# **Poll Question #10**

What tools and methods  
are in your RFP?

Poorly written contracts are greatly contributing to our failure to control bed bugs in our housing communities

Contracts do not require the use of effective tools and methods

**End Result:**

Lack of an effective bed bug management plan results in chronic infestations and continue spread of bed bugs

# Typical contract language is not geared towards success

- “Once a complaint has been made to the Authority the contractor will visually inspect the unit to verify an infestation.”
- “Apartments will be treated for bed bugs”
- “The bed bug treatment process must have two treatments to each unit”



# A good contract should include:

1. Request price for proactive inspections
2. Not rely on visual inspection alone for detection (include interceptors)
3. Treatment should be based on IPM, not pesticides alone
4. Define the role of Housing in supporting the program
5. Include an effective method for determining elimination
6. Include a QA component to hold pest vendor accountable

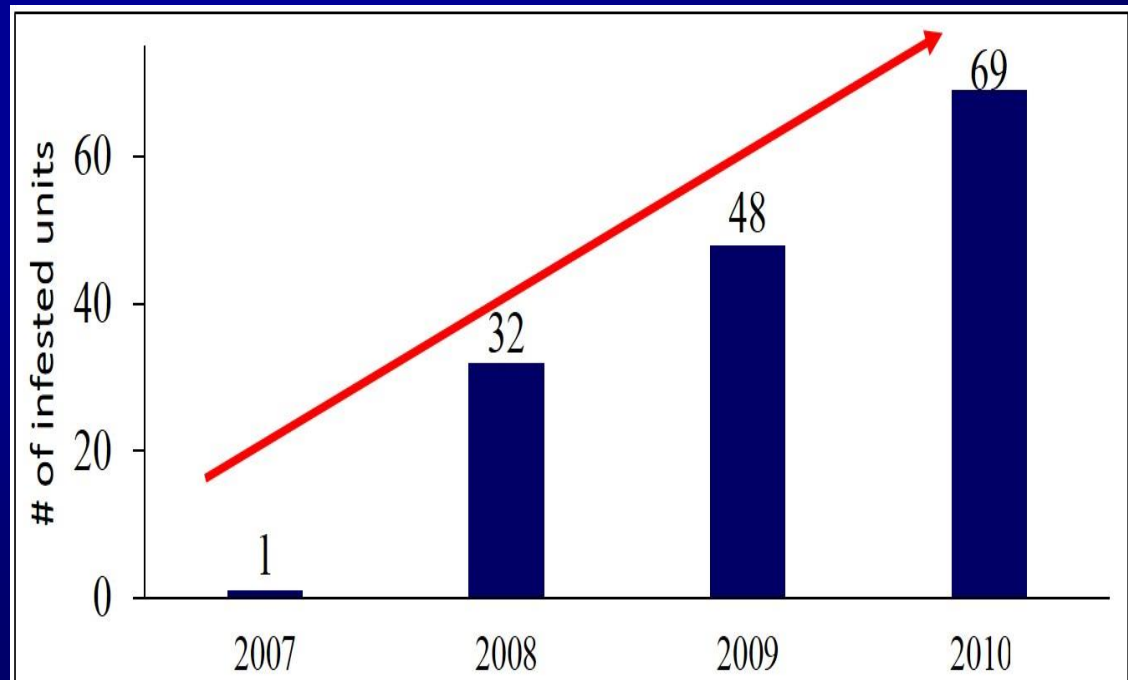
**Moving Forward:  
Contract language needs to  
change in order to drive  
successful bed bug control**

**Model RFP available through Bedbug Central:**

**[www.bedbugcentral.com/sites/default/files/RFP%207.9.18.pdf](http://www.bedbugcentral.com/sites/default/files/RFP%207.9.18.pdf)**

# An assessment-based bed bug management program

- Four high-rise buildings (358 apts.)
- Chronic bed bug problem starting in 2007
- Reactionary approach (report based)
- Spending ~ \$57,000 per year to treat bed bugs



# Community-wide assessment

## Inspections at 0, 6 and 12 months

- Interceptors under legs of beds & furniture (14d)
- Visual inspection of apartments with zero trap catch



# Inspection results

## **Initial inspection:**

- 55 infestations identified (71% unreported)
  - 95% detected by interceptors
- 45% heavily infested (21 to >1,000 bed bugs)

## **Six and twelve month inspections:**

- 14 new infestations identified (71% unreported)
  - 100% detected by interceptors
- 90% low-level infestations (<5 bed bugs)

*Cooper et al. 2015. Pest Management Science*

# Results at 12 months

- Eliminated 96% of treated infestations
- Reduced the infestation rate from 15 to 2%
- 90% less pesticide compared to comparable published field experiments

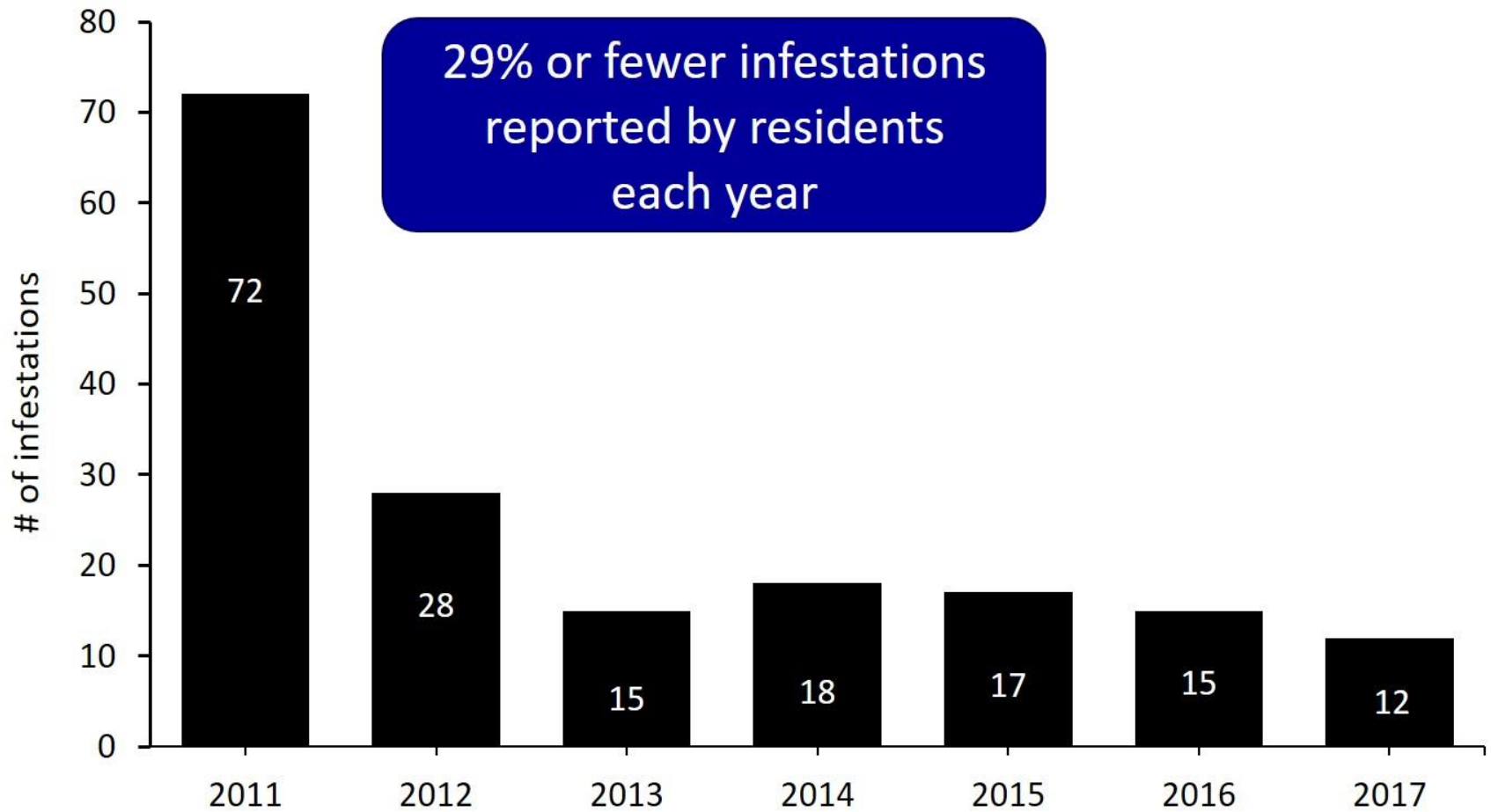
*Cooper et al. 2015. Pest Management Science*

# Commercial implementation of an “assessment-based” program

## **Affordable housing community in Newark, NJ**

- Two 5-story bldgs. (360 apts.) with a chronic and severe bed bug problem
- Spending ~ \$150,000 per year to treat bed bugs

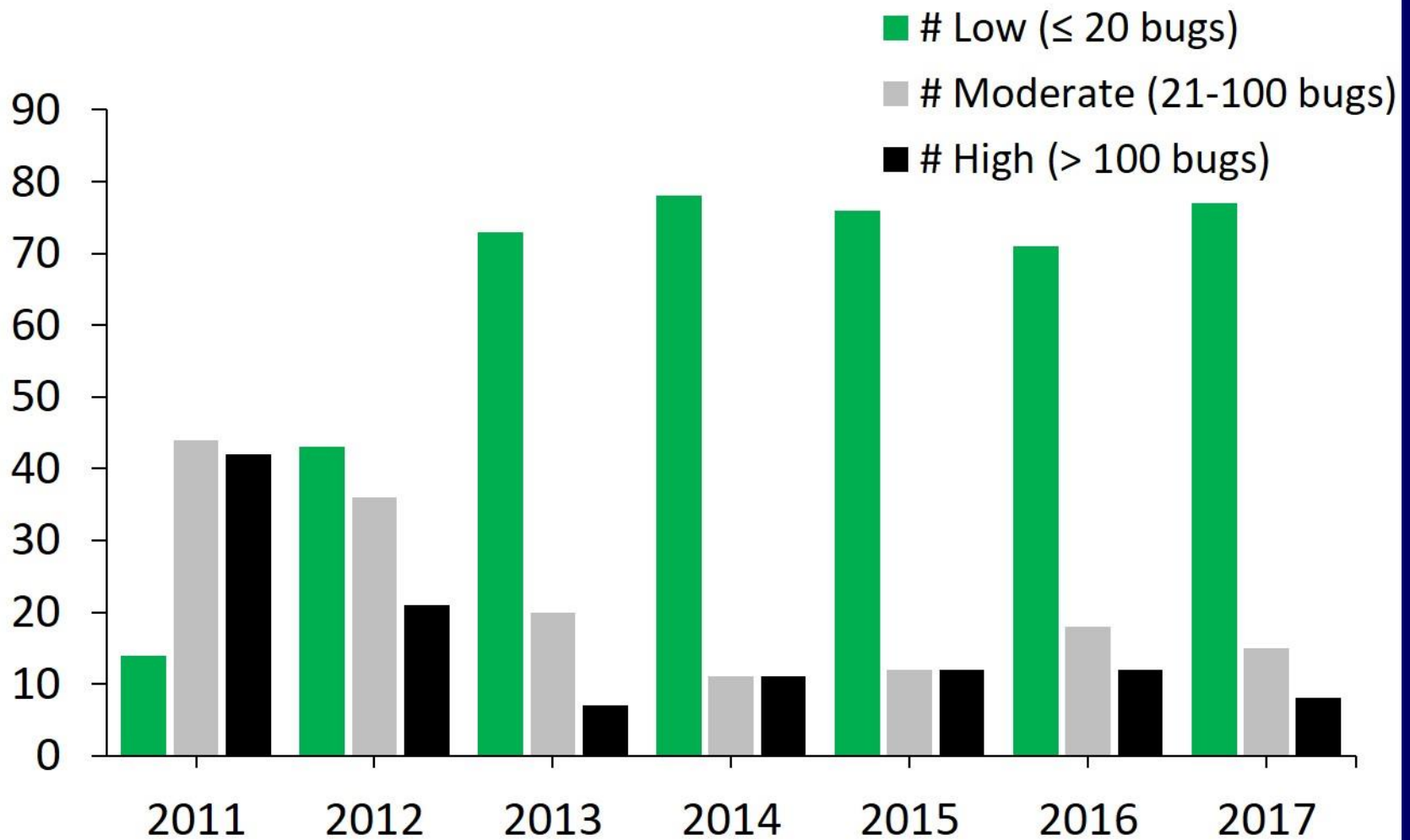
# Number of bed bug infestations



*Cooper unpublished results*



# Severity of infestations over time



*Cooper unpublished results*

# Multi-pest “assessment-based” program (2 communities)

## **Community #1**




- High-rise senior housing  
(14 floors, 221 apts.)

## **Community #2**

- High-rise senior housing (12 floors, 324 apts.)
- Family-style garden apts. (21 bldgs, 105 apts.)

# Comparison of community-wide inspection findings

|                          | # apts. | # Apts. with bed bugs | # Apts. with roaches | # Apts. with mice |
|--------------------------|---------|-----------------------|----------------------|-------------------|
| Comm. #1<br>14 story     | 221     | 19                    | 37                   | 82                |
| Comm. #2<br>12 story     | 334     | 93                    | 19                   | 30                |
| Comm. #2<br>garden-style | 105     | 6                     | 14                   | 65                |

 ≤10% infest. rate  11-20% infest. rate  >20% infest. rate

*Cooper unpublished results*

# Keys to success

1. Don't rely on residents to report bed bugs
  - $\geq 5\%$  infestation rate: bldg. wide inspection
  - $< 5\%$  infestation rate: bldg. wide or modified approach (need to look at ROI)
2. Don't rely on visual inspection alone for detection
3. Don't rely on pesticides alone
  - Encasements, vacuum, steam, interceptors....
4. Continue to follow up until problem is resolved
  - Implement an effective elimination protocol
5. Inspect neighboring units (including across hall)

# Challenges

1. Most property managers unwilling to adopt assessment-based approach
  - Set in their ways
  - “Ignorance is bliss” (don’t want to know truth)
  - Increased up front costs (unwilling to spend money to save money)
2. Need to do better job selling the concept
  - Show examples of success stories
  - Show return on investment

# Thank You



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# For What it's Worth

## **My Opinion:**

It's not that difficult to achieve community-wide success with the right approach in place

Managers of affordable housing communities need to embrace change

- Changing contracts so they are geared for success
- Holding the pest vendor accountable for performing work according to bid specs.

# Not necessary to discard or treat beds with pesticides!



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