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

n=346 infested apts.

Reported by resident: 26%, 91

Proactive inspection: 74%, 255

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 inspection**: 100%
- **Pitfall traps under bed legs**: 56%
- **Sticky traps**: 44%
- **Bed bug dogs**: 42%

*Potter et al. 2015*
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

Based on 77 inspections in apartments with 10 or fewer bed bugs present

% Infestations detected

Visual inspection

52%

Interceptors

92%

Cooper unpublished results
Comparison of scent dogs vs. interceptors

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

Cooper et al. 2014. J. Economic Entomology
Treatments are often limited to the bedroom & living room.

- 93% at beds & furniture
- 7% away from beds & furniture
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 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

- **Pesticides**: 96%
- **Vacuums**: 62%
- **Steam**: 43%
- **Heat**: 42%

*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

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

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

Pesticides: Best used as the last line of defense

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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?

- 3 or more visits: 15%
- 1-3 visits: 85%

Potter et al. 2013. PestWorld
Number of visits required to eliminate infestations

Well established infestations
• > 5 visits

Newly introduced infestations (low-level)
• 1-2 visits

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

Cooper et al. 2015 Pest Management Science
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

Prior to treatment

- Bugs at beds & furniture: 37%
- Bugs away from beds & furniture: 63%

n = 101 apts.

During treatment

- Bugs at beds & furniture: 17%
- Bugs away from beds & furniture: 83%

n = 43 apts.

Unpublished results: Cooper and Wang
Visual inspection (~20 min)
Addition of interceptors at beds

- Visual Insp.
- Interceptors (bed)

- Diagram shows the number of bed bugs in different apartments.
- Apartments 4 has a higher number of interceptors compared to others.
Addition of interceptors away from sleeping areas

![Bar chart showing the number of bed bugs in different apartments.]

- **Visual Insp.**
- **Interceptors (bed)**
- **Interceptors (at & away from bed)**

**Apartment**
1. 1
2. 2
3. 3
4. 4
5. 5

**Number of bed bugs**
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
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

Total: 11 marked bugs captured over 14 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

<table>
<thead>
<tr>
<th># bldgs.</th>
<th># of apts.</th>
<th>Neighboring apts. infested</th>
<th>Adj.</th>
<th>Above or below</th>
<th>Across hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1078</td>
<td>72%</td>
<td>42%</td>
<td>33%</td>
<td>25%</td>
</tr>
</tbody>
</table>

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
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

29% or fewer infestations reported by residents each year

<table>
<thead>
<tr>
<th>Year</th>
<th># of infestations</th>
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<tbody>
<tr>
<td>2011</td>
<td>72</td>
</tr>
<tr>
<td>2012</td>
<td>28</td>
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<tr>
<td>2013</td>
<td>15</td>
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<td>2014</td>
<td>18</td>
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<td>2015</td>
<td>17</td>
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<tr>
<td>2016</td>
<td>15</td>
</tr>
<tr>
<td>2017</td>
<td>12</td>
</tr>
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</table>

Cooper unpublished results
Severity of infestations over time

Cooper unpublished results

- **Low (≤ 20 bugs)**
- **Moderate (21-100 bugs)**
- **High (> 100 bugs)**

![Graph showing severity of infestations over time from 2011 to 2017.](image-url)
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

<table>
<thead>
<tr>
<th></th>
<th># apts.</th>
<th># Apts. with bed bugs</th>
<th># Apts. with roaches</th>
<th># Apts. with mice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comm. #1</td>
<td>221</td>
<td>19</td>
<td>37</td>
<td>82</td>
</tr>
<tr>
<td>14 story</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comm. #2</td>
<td>334</td>
<td>93</td>
<td>19</td>
<td>30</td>
</tr>
<tr>
<td>12 story</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comm. #2</td>
<td>105</td>
<td>6</td>
<td>14</td>
<td>65</td>
</tr>
<tr>
<td>garden-style</td>
<td></td>
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</tr>
</tbody>
</table>

≤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)
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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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!