

Pesticides Misused for Bed Bug Control: Comparing Professional and Nonprofessional Applications Reported to the National Pesticide Information Center, 2013–2017

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Objectives. To compare outcomes when pesticides are used to control bed bugs by professionals and nonprofessionals.

Methods. All US National Pesticide Information Center inquiries from 2013 to 2017 were assessed to identify scenarios involving bed bugs and pesticide applications. Cases were evaluated with respect to types of applicators, misapplications, and human pesticide exposures.

Results. Misapplications were more than twice as likely to be reported in cases involving nonprofessional applications (14%) as in cases involving professional applications (5%). Human exposures to pesticides were reported more often when pesticides were misapplied (70%) than when there were no apparent misapplications (31%).

Conclusions. Both professionals and nonprofessionals may misuse pesticides to control bed bugs, which may increase the risks of exposure and adverse outcomes. Policy interventions may reduce pesticide incidents related to bed bug control by promoting professional involvement and adherence to product label instructions. (*Am J Public Health.* 2021;111(8):1513–1515. <https://doi.org/10.2105/AJPH.2021.306307>)

The US Environmental Protection Agency considers bed bugs a pest of “significant public health importance,” not because they are vectors for human pathogens but because infestations can exacerbate financial, mental, and physical problems.^{1–3} Physical discomfort can include pain, itchiness, and allergic reactions. Reported effects on mental health include anxiety, sleep disruptions, and social isolation. The median cost of bed bug control in a single-family home was \$1225 in 2015.⁴ Patients have been

denied health care treatment and access to public services as a result of the presence of bed bug infestations in their homes.⁵ Tenants have been forced to pay for pest control in apartment buildings, which may have bed bug-related language in lease agreements. Several experts recommend hiring professionals (companies) to control bed bugs rather than attempting to do so oneself.

Pesticides should be applied strictly according to label directions. Although it is a violation of federal law to deviate

from those directions, this occurs on a regular basis. Since 1995, people have relied on the National Pesticide Information Center (NPIC) for science-based information, helping them make decisions about pest control, health risks, regulations, and more. Pesticide specialists regularly note instances of pesticide applications for bed bug control that caused particular concern. Bed bugs live where people spend a great deal of time with limited protective clothing. Individuals who sleep in areas where pesticides are overapplied have

repeated opportunities for absorption, aspiration, or ingestion.

Exposure to pesticides can result in a variety of outcomes, including symptoms that can be nonspecific and attributed to non-pesticide-related illnesses.⁶ Possible symptoms vary greatly depending on location on the body, duration of exposure, and type of pesticide. As an example, pesticide poisoning can take the form of vomiting, sweating, pinpoint pupils, nausea, headache, weakness, dizziness, and other signs.⁷

In this study, we compared case reports collected by the NPIC to determine whether incidents (misapplications or human or animal exposures) were reported more often after applications by licensed professionals or by nonprofessionals.

METHODS

In an effort to compare outcomes when pesticides are used to control bed bugs by professionals and nonprofessionals, we analyzed records of NPIC calls and inquiries (hereafter “cases”) related to bed bugs in a 5-year period (2013–2017). We reviewed each case ($n = 2946$) to determine whether there was a pesticide application and whether the application was completed by a professional or a nonprofessional. For each case, we tabulated adverse effects, misapplications, and spills. A professional applicator was defined as an applicator licensed by the appropriate local pesticide regulatory agency or tribe. An incident was defined as a misapplication, a spill, an unintended exposure, or an adverse effect involving a human or an animal.

RESULTS

We identified 792 pesticide applications (cases) for inclusion in this study: 510

cases involving a nonprofessional application and 282 cases involving a professional application. Nonprofessional pesticide applications for bed bugs were more likely to involve incidents (44%) than professional pesticide applications (34%; $\chi^2 = 5.9$; $df = 1$; $P = .01$). Also, they were more likely to involve misapplications (14% vs 5%; $\chi^2 = 14.6$; $df = 1$; $P = .001$). Human exposures occurred more often when a product was misapplied (70%) than when there were no apparent misapplications (31%; $\chi^2 = 50.4$; $df = 1$; $P < .001$). We noted requests for financial assistance to pay for bed bug control in 95 of 769 cases.

DISCUSSION

Professional pesticide applications for bed bug control involved fewer product misapplications and fewer instances of human exposures. However, about one third of professional applications were characterized as “incidents,” meaning that there was an unintended exposure, a spill, or a misapplication (according to NPIC guidelines). As a result of selective underreporting of events to the NPIC, this likely overrepresents the proportion of cases involving incidents. However, the relatively high proportions of bed bug–related pesticide applications associated with adverse outcomes (34% of professional treatments and 44% of nonprofessional treatments) indicate a potential need for increased education, updated product labeling, or implementation of other strategies to reduce the unique risks associated with bed bugs. It should be noted that all inquiries to the NPIC are self-reported, and individuals may misremember or purposely provide misinformation for a variety of reasons.

Our data also demonstrated that hiring a professional pest control company may be cost-prohibitive. Requests for financial assistance to pay for bed bug control services likely underrepresent actual interest. This type of comment during NPIC inquiries may be secondary to other requests for pesticide information and is not always recorded in case logs.

PUBLIC HEALTH IMPLICATIONS

Federally required certification and licensing for pesticide applicators is intended to prevent product misuse and unintended human exposures. Our data suggest that regulatory licensing programs are successfully lowering risk, but there is room for improvement.

Policy interventions may reduce pesticide incidents related to bed bug control by promoting professional involvement and adherence to product label instructions. The relatively high number of instances of product misapplications in our data among both professionals and nonprofessionals suggests that public information campaigns could be initiated by pesticide manufacturers, statewide pesticide regulatory agencies, or state health agencies to educate users about the importance of following label instructions to reduce public health risks from pesticides.

Employing licensed professionals to control bed bug infestations may reduce the risk of human exposure and pesticide misapplication. Future research should focus on evaluating interventions designed to reduce the public health effects of bed bugs in community settings. [AJPH](#)

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CONTRIBUTORS

All of the authors participated in study design, data collection, and development and revisions of the article. A. Strid and K. Buhl edited the article in response to the reviewers' feedback. A. Strid completed the statistical analyses. K. Buhl originated the study.

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Note. The information in this article does not in any way replace or supersede the restrictions, precautions, directions, or other information on pesticide labels or any other regulatory requirements, nor does it necessarily reflect the position of the Environmental Protection Agency.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

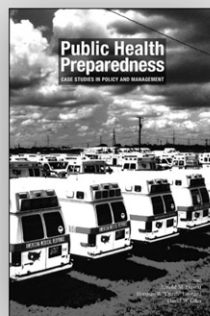
No protocol approval was necessary for this study because no human participants were involved.

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