

Bed Bugs Are Back
Are we ready?

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FOREWORD

Bed Bugs Are Back: Are we ready? is a research report that brings together our local Toronto experience and current worldwide knowledge and understanding of bed bugs. The ultimate goal of *Bed Bugs Are Back: Are We Ready?* is to inform and shape public policy, government responses, and community strategies aimed at implementing effective bed bug interventions that prevent uncontrolled outbreaks.

We, at **Habitat Services** and **WoodGreen Community Services**, first started hearing about bed bugs four or five years ago. We initially believed that the increasing number of bed bug incidents being reported were isolated cases, which could be as easily eradicated as fleas, cockroaches, and other insects that are often a nuisance to us in the places where we live and work. Our experience, and the experience of other non-profit agencies in Toronto and members of our communities, indicated that bed bugs are complex insects. Bed bugs are not like other bugs; they are not easy to eradicate. They often cause much stress and anxiety, and to get rid of them requires adequate, and often ongoing, financial and physical resources.

With funding from the **City of Toronto** and the **Ministry of Health and Long-Term Care**, Habitat Services and WoodGreen Community Services worked with **Public Interest**, which

- conducted over 30 key informant interviews in Toronto
- spoke with bed bug experts in Canada, and all over the world
- located the most up-to-date and ground-breaking stories, trends, and strategies that describe the impact bed bugs are having at the local, national, and international level.

We would like to thank the members of our Advisory Committee who helped us shape the scope and direction of this report:

- Reg Ayre—Toronto Public Health
- Joyce Brown—Ontario Coalition of Alternative Businesses
- Paula Cassin—ABI Possibilities
- Anne Longair—City of Toronto
- Elaine Magil—WoodGreen Community Services
- Chris Persaud and Lorraine Van Wagner—Habitat Services
- Sean Meagher, Rebecca Price, and Alex Goss—Public Interest

We also would like to acknowledge and genuinely thank all of those who agreed to be interviewed as key informants and/or as experts (please see page 80 for a complete list of interviewees). These individuals have contributed toward the development of a more informed understanding of bed bug behaviour and to the public, government, and community responses needed to prevent and eradicate bed bug infestations.

As the rate of bed bug infestations in our communities continues to increase, we hope that this report provides some useful insight and strategies for tackling this complex challenge.

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<http://www.utoronto.ca/forest/termite/Bedbugs/photoindex.html>

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EXECUTIVE SUMMARY: BED BUGS ARE BACK



Overwhelmingly, around the world, bed bugs are back. Between the 1970s and 2000, reports of bed bug infestations across the western world were few and far between. Today they are increasingly common.

Cities around the world are facing significantly higher numbers of bed bug infestations. The number of bed bug calls to New York City staff rose from 537 in 2004 to 6,889 in 2007. A survey of 121 pest control companies in Australia showed a rise in bed bug treatments from 158 in 2000 to 2,464 in 2005¹.

Toronto is no exception. Before 2003, there are no recorded numbers of bed bug infestations, but they have been characterized by Toronto Public Health as sporadic and mild. In 2003, a Toronto study showed that there were only 46 reports of bed bugs to Toronto Public Health but by 2008, preliminary numbers showed that Toronto Public Health received reports of almost 1,500 bed bug infestations between March and October.

Concerns about growing bed bug problems are being heard from Ottawa,² Hamilton,³ Windsor,⁴ Kingston,⁵ London,⁶ Huntsville,⁷ North Bay,⁸ Wasaga Beach,⁹ and Owen Sound.¹⁰ Some of these cities have seen spectacular growth in the number of bed bug incidents over the last few years.

The view of most experts is that the problem is growing rapidly and will likely become significantly worse unless there is rapid, focused, and multi-sector intervention.

WE ARE NOT READY FOR THE OUTBREAK

People have lived with bed bugs since prehistoric times, and, historically, the incidence of infestations was quite high. Records indicate that, in the 1880s, 75% of all homes in England were infested with bed bugs. Roughly half of all homes still had infestations in 1939. About 1 in 3 homes in Europe had infestations in the 1930s and 1940s¹¹.

A concerted effort to address the widespread presence of bed bugs succeeded in virtually eradicating them from most western cities by the 1970s.

Though persistent toxic synthetic pesticides such as DDT receive much of the credit for the eradication of bed bugs, evidence indicates that government-led, integrated systematic approaches were critical. The U.K. Ministry of Health in 1934, for example, required local authorities to intervene actively, by:

- coordinating across government departments to ensure effective eradication strategies
- sending public health nurses to homes for proactive inspections
- creating clear protocols for inspection, cleaning, and spraying
- developing public education tools and actively distributing them
- providing cleaning materials and apparatus and, in some cases, staff to support effective action
- making structural improvements to homes to prevent infestations and spreading
- ensuring follow-up visits
- issuing mandatory orders to landlords for interventions
- compensating tenants for costs.

There is every reason to believe that the effort would not have been successful without this multi-faceted coordinated approach, not least because evidence shows that bed bug resistance to DDT was already becoming established by 1947—only a few years after the product was introduced, and confirmed repeatedly over the next 10 years until, by 1956, the National Pest Control Association was recommending alternative pesticides for bed bugs.

Unfortunately, much of the knowledge that helped to manage bed bugs has been forgotten during the 30 years that bed bugs were thought to be eradicated, yet that knowledge is badly needed to stem the tide of the current outbreak.

LACK OF AWARENESS AND EDUCATION INTENSIFIES THE PROBLEM

Research indicates that most people have little if any knowledge about how to deal effectively with a bed bug infestation. Few people can even accurately identify the problem and they receive little support from professionals. Research shows that medical professionals routinely misdiagnose bed bug bites and pest control professionals need clearer protocols for effectively addressing an infestation. As a result, infestations often grow beyond easily manageable levels before effective interventions are applied. On detection, individuals and even some pest control professionals engage in practices that are at best ineffective and at times can spread infestations. Infested materials are taken, unprotected, through buildings for disposal, spreading bed bugs to hallways, elevators, and lobbies as they go. Infested items are disposed of unlabelled and often reclaimed by others, spreading the infestation to new sites. Partial treatments that disrupt but do not eradicate infestations are used, which fragment and spread colonies rather than destroying them. This weakness in bed bug awareness is contributing to the size and scope of the emerging bed bug problem.

SCOPE OF INFESTATIONS IS INCREASINGLY BROAD

Bed bugs can infest any home. However, bed bugs are mistakenly associated with low-income communities, because they spread most readily and rapidly in high-density settings with high turnover and find it easier to infest buildings with cracks and crevices to hide in. Not only low-cost rental housing fits this description, but also expensive hotels and the dormitories of universities; both face serious challenges managing bed bugs.

Because they are most susceptible to infestations, these settings are the locations first affected by growing bed bug populations but they are by no means the only sites affected. These sites function as the proverbial “canary in the coal mine,” providing an early indication of a growing problem that will eventually affect a broad cross-section of the population. The scope of infestation continues to broaden because of the highly effective and adaptive nature of bed bug transmission. Bed bugs easily stow away on clothing or personal effects to travel to new locations, hide in the smallest of crevices in those new settings, and multiply with enough efficiency to establish colonies of thousands from a single bug in less than a year. As a result, key informants (bed bug experts and people who have experienced, or whose clients have experienced, bed bug infestations) and wide geographical distribution of bed bugs within cities consistently point to increasing incidents in even perceived lower-risk environments. More and more, bed bugs are affecting all residential settings.

THERE ARE GROWING NUMBERS OF SEVERE INFESTATIONS

Bed bugs are able to spread with exceptional speed under a set of particularly advantageous circumstances that are increasingly common in the current outbreak. The presence of severe infestations, and the adaptability of bed bugs, increases the capacity of bed bugs to spread rapidly to a broader range of households in a shorter period of time.

Experts around the world have noted the increasing tendency of highly vulnerable people to suffer severe infestations. The challenges vulnerable people face in addressing an initial infestation, due to infirmities; financial, health, and mental health disruptions in their lives; lack of resources; and limited supports can result in the growth of the infestation to hundreds or thousands of bugs.

SEVERE INFESTATIONS INCREASE THE RISK OF SPREADING

According to leading bed bug experts, large-scale infestations make spreading “inevitable.” Bed bugs will travel from a severely infested site rapidly, even walking between buildings. Most significantly, bed bugs in severely infested sites will be sufficiently agitated to be mobile in the day and to travel in exceptional ways. People suffering from severe infestations have been documented travelling with bed bugs walking on their bodies and on their personal effects. Any sites they visit are subject to infestations. As a result, infestations are increasingly common in atypical sites such as offices, hospitals, buses, subways, and schools. Infestation of these sites exposes everyone to infestations, and these previously unusual infestations are being identified with increasing frequency in Toronto and around the world. Surveys of pest control companies in the United States and Australia show that offices, schools, theatres, and public transit make up one of every eight bed bug infestations. Bed bug incidents in New York schools reportedly rose from 40 in 2005 to 300 in 2007¹² and a public official in New York identified bed bug infestations in five New York subway stations.¹³

These settings increase the risk of infestation to the broader population. An online survey conducted in Toronto in October of 2007 found that 62 of 139 non-profit agency respondents had staff who took bed bugs home from work. Pest control professionals, service providers, and experts all identify an increasing rate of infestation in middle-income single-family homes.

THE IMPACT ON PEOPLE LIVING WITH INFESTATIONS IS CONSIDERABLE

The consequences for people living with infestations are more severe than most people imagine. People who have suffered a bed bug infestation talk of feeling ashamed, fearful, and totally overwhelmed. They frequently describe extreme levels of isolation. Families have abandoned relatives with infestations. A Toronto transportation agency for people who are unable to use public transportation has refused to pick up people with bed bugs, effectively rendering them housebound. Meal delivery and other programs serving isolated people have refused service. People have been barred from work and banned from community service sites.

Research into the impact of bed bug infestations shows debilitating impacts, including very high levels of stress, anxiety, depression, sleep deprivation, and intense preoccupation verging on delusional states. Sufferers have reported taking medication to cope with the experience, and some have reported ongoing mental health issues. Experts also identified significant psychological traumas, sometimes resulting in violent behaviour, cases of self-harm, and even suicide¹⁴. Despite these pressures, there are few social and psychological supports for people with bed bug infestations.

THERE IS A GROWING IMPACT ON WORKPLACES AND PUBLIC SPACES

Confronted with clients facing a bed bug crisis with no meaningful systems of support, non-profit agencies, public health staff, and housing providers have attempted to fill the gap in service delivery. They are clearly not resourced to do so, and the consequences have been considerable.

Staff at non-profit agencies reported increasing amounts of time spent implementing a range of precautions against getting and spreading bed bugs, including the use of protective clothing, laundering work clothes on site, and bagging shoes and materials during visits. Agency staff have to adopt awkward practices in spaces where services are provided such as never sitting, never placing materials on the floor, dressing and undressing for work in a garbage bag, and leaving possessions in sealable plastic bags during the day. Agency staff are increasingly involved in seeking funding to address bed bug-related issues, including Ontario Works and Ontario Disability Support Program (financial assistance programs for people who are not working, or who are mentally or physically disabled) start-up funds to replace infested furniture and small sums to offset the cost of preparation and pesticide application. In cases of chronic unaddressed problems, agency staff have had to intervene directly, carrying out inspections, vacuuming, cleaning, arranging pest control for clients, and intervening with landlords. Some agencies have adopted complex protocols, including freezing the belongings of new residents in housing.

Bed bug problems have progressively migrated from clients' homes to agency offices. In agency infestations, the absence of hosts during the night has resulted in bed bugs moving about offices and biting staff in the daytime.

Agencies report staff taking bed bugs home. One office worker got bed bugs despite never having entered a residential unit for work. The bugs were found in her chair at the office. Agencies are beginning to confront issues such as time off to manage infestations, compensation for bed bug-related costs, work refusals, and resignations over exposure to bed bugs.

COSTS ASSOCIATED WITH BED BUGS WILL INCREASE UNLESS EFFECTIVE ACTION IS TAKEN

The cost of addressing bed bug infestations effectively can be significant. The most effective protocols employ a multi-faceted approach that includes inspection, preparation, cleaning, application of insecticides, and a follow-up inspection. Interventions of this kind can cost \$800 for a single unit with a standard infestation. However, less intensive approaches tend to permit a resurgence of the infestation either by leaving eggs to hatch and repopulate the site, leaving untreated harbourages to repopulate the site, or dispersing bed bugs to other locations nearby and allowing reinfestation from the secondary site.

Fear of stigma, concern about consequences, and reticence about costs often lead both residents and property managers to delay addressing bed bug infestations. Those who take action often lack clear and consistent protocols for addressing an infestation and may pursue less effective approaches.

Repeated, ineffective interventions, or delayed action, can dramatically increase costs, requiring inspections over a broader area with a wider range of inaccessible hiding places, the cleaning of more materials, the spraying of more sites, and an increased number of eggs that can hatch to reestablish the infestation. Costs rise dramatically in these circumstances. A severe infestation in 73 units in a Winnipeg apartment building required \$260,000 in pest control spending and resulted in only a 33-unit reduction in infested apartments, an average cost of almost \$8,000 per unit.¹⁵

The City of Hamilton's Housing Corporation has had to go over budget by \$250,000 "mainly due to bed bug pressures"¹⁶ and Toronto Community Housing has had to increase its pest control budget from \$1 million in total to \$2.5 million for bed bugs alone.¹⁷ Bed bug expert Stephen Doggett estimates Australia has spent \$100 million on bed bug treatments and the problem is on the rise.¹⁸

THERE ARE EFFECTIVE WAYS TO ADDRESS THE PROBLEM

Fortunately, sound protocols exist for treating infestations, including the Code of Practice developed by Stephen Doggett at the Institute for Clinical Pathology and Research in Australia, the guidelines developed by Cornell University and the State of New York Integrated Pest Management Program, the recommendations produced by Michael Potter of the University of Kentucky Department of Entomology, the *Bed Bug Handbook* by Richard Cooper, Larry Pinto, and Sandy Kraft, Toronto Public Health Fact Sheets, Toronto Community Housing Pest Control Protocols, the *Bed Bug Resource Manual* by WoodGreen Community Services in Toronto, and the *Bed Bug Handbook for Shelter Operators* by the City of Toronto Shelter, Support, and Housing Administration.

These protocols clearly lay out the most effective approaches to eradication of an infestation. They describe the critical elements of successful interventions, including:

- detailed inspection
- vacuuming and other forms of capture for live bugs
- preparation and cleaning of infested materials including bedding, mattresses, and crevices that have been used as harbourages
- the application of insecticides or steam
- the sealing of cracks and openings that allow for the entrance of bed bugs
- the dusting of voids or inaccessible spaces that may harbour insects
- a follow-up inspection two weeks later to kill bed bugs that have emerged from eggs that survived the first eradication effort.

Implementing effective protocols can manage the bed bug population, can successfully reduce the number and intensity of infestations, and have shown effectiveness in treating bed bug infestations and controlling the spread of bed bugs. However, these protocols also require time, energy, persistence, focused action, and investment, as well as the physical capacity to move furniture and the visual acuity to conduct close, detailed visual inspections, which are significant barriers for some.

EDUCATION IS CRITICAL

There is universal agreement that the first and most important step in the eradication of bed bugs is proactive education. Bed bug infestations that are identified early are easier and cheaper to eradicate. Increased knowledge promotes compliance with effective protocols and prevents spreading and resurgence of bed bug infestations, while lack of information allows for the use of less effective methods and often exacerbates the problems. Fear, stigma, and misunderstanding frequently increase the problem by discouraging disclosure and early action. Broad awareness of the issue and its solutions, by the general public, before they experience infestations, is the most effective way to encourage early and effective response.

LEADERSHIP IS NECESSARY TO EFFECTIVELY ADDRESS THE GROWING BED BUG INFESTATION

The cost and complexity of the most successful protocols can deter their adoption, despite their efficacy and long-term cost effectiveness, as well as ensuring that the most vulnerable will have difficulty implementing them independently. Efforts to manage bed bugs require support and investment to overcome that barrier if severe infestations and their consequences are to be avoided.

In the middle of the last century, government leadership, like that of the U.K. Ministry of Health, established clear protocols, strongly encouraged their adoption, and provided resources to support and compensate those who could not adopt them independently. This successful strategy curbed bed bug infestations many times the size of those now being experienced in communities across Ontario, and have proven effective again during more recent implementation in Australia. Ontario's efforts to address bed bugs should draw on these models to develop the most appropriate strategies.

RESEARCH OVERVIEW



INTRODUCTION

BED BUGS ARE BACK

Overwhelmingly, across the world, bed bugs are back. Before the year 2000, reports of bed bug infestations across the western world were few and far between. Today they are increasingly common.

Cities around the world are facing significantly higher numbers of bed bug infestations. Some major cities facing a resurgence of bed bugs include Vancouver, Montreal, Boston, Los Angeles, London, Paris, and Sydney. The number of bed bug calls to New York City staff rose from 537 calls in 2004 to 6,889 calls in 2007.¹⁹ One pest control company reported that the number of bed bug treatments it conducted across the United States rose tenfold from 1999 to 2002.²⁰ A survey of 121 pest control companies in Australia showed a rise in bed bug treatments from 158 in 2000 to 2,464 in 2005.²¹ Bed bug incidents in New York City schools have risen from 40 in 2005 to 300 in 2007 (an increase of 750%).²²

Toronto is no exception. Before 2003, Toronto Public Health characterized bed bug infestations as sporadic and mild. In 2003, a Toronto study showed that there were only 46 reports of bed bugs made to Toronto Public Health while Toronto pest control companies made over 1,300 treatments.²³ The number of reports to Toronto Public Health tripled to about 150 by 2006.²⁴ A small survey of pest control companies in 2007 indicated that bed bug infestations became much more widespread, with reports of as many as 4,800 treatments for a single company that year.²⁵ Preliminary numbers show that Toronto Public Health received reports of almost 1,500 bed bug infestations between March and October in 2008.²⁶ This is especially high considering the trend of underreporting bed bugs to Toronto Public Health. While there is the most data available for Toronto, bed bugs are not Toronto's problem alone. Ottawa and Hamilton have produced educational documents to help residents address the bed bug populations,^{27, 28} the City of Kingston is looking for resources to "manage an outbreak" of bed bugs and is conducting housing staff trainings,²⁹ and the Windsor Essex County Health Unit has said that several apartment buildings around the city are plagued by bed bugs.³⁰ Incidents of bed bugs have also been reported in London, Huntsville, and North Bay.³¹ A pest control company that works in the Orillia, Barrie, and Wasaga Beach area said that it has seen a jump from about one call a week to about five calls a day.³² Bed bugs are also spreading in more rural areas; Owen Sound

has also seen a dramatic rise from a few calls a month in 2007 to six calls a week in 2008.³³

Across the globe, and here in Ontario, it is apparent that bed bug infestations are increasing exponentially. Research shows that the causes are complex but the strategies needed to address them are consistent.

WE'RE NOT READY

Bed bugs are an age-old pest and archaeologists suggest that bed bugs have been with humans since prehistoric times. Despite the fact that bed bug fossils have been found dating back 3,500 years, their resurgence has caught most cities entirely off-guard.³⁴

Bed bug infestations were virtually eliminated after the Second World War. Synthetic pesticides such as DDT are often credited with the victory, but evidence indicates a broad and coordinated combination of public investment, education, prevention, and extermination were critical to the success of the effort, and that bed bugs were developing resistance to DDT as early as 1947.³⁵

In the first half of this century, governments in Europe pursued systematic strategies for bed bug control that combined the use of pesticides with effective education efforts and focused interventions to prevent infestation and reinfestation.^{36, 37} In some cases, vigorous and sometimes disturbing propaganda efforts were part of the effort, but the success of the process was built on better education around “housekeeping procedures, methods of eradication, and ... building and housing improvements.”³⁸

In 1934, the U.K. Ministry of Health directed local authorities to take part in a “sustained effort” to manage infestations that was based heavily on education and a proactive bed bug response.³⁹ The directive called for cleaning and preparation as important factors prior to chemical treatment in bed bug management and went even further by granting power to local authorities to demand “the execution of repairs which will be a material factor in preventing re-infestation” and acting to “provide cleansing stations, apparatus and attendants.”⁴⁰ The policy also allowed for compensation to be paid to those who lost articles or had property damaged in the process of deinfestation.⁴¹ The integrated pest management (IPM) methods and proactive bed bug strategy used by the U.K. Ministry of Health are a key reason for the decline of bed bugs in the United Kingdom.

As a result of the success of these types of methods, by the 1970s, bed bugs were thought to be a thing of the past. Unfortunately, apparent victory sowed the seeds for future failure. There has been little research in the field in the last 30 years and great deal of lost knowledge about bed bug treatment and prevention. Studies have found that older people are more likely to recognize and identify bed bugs than younger people.⁴² This lost knowledge led to later detections of bed bugs and their further spread.⁴³ Persistent toxic sprays such as DDT are now banned in most western countries, and some evidence indicates that DDT may have had limited long-term efficacy due to the rise in pesticide resistance in bed bugs (see Pesticide Resistance on page 20). The preventative tools so effective in the last century have fallen into disuse, and inaccurate information about causes and solutions is now common. Bed bug education effectively ceased decades ago along with public investment in bed bug eradication. There is currently a lack of an effective coordinated information campaign to ensure that residents, landlords, pest control companies, non-profit agencies, and governments are knowledgeable about proper bed bug management.

It is important to understand patterns of bed bug infestations, and best practices in terms of treatment, education, and investment, to determine how to bring the current bed bug problem under control.

HISTORICAL SCOPE OF INFESTATIONS

In the past, bed bugs were extremely widespread. There is mention of bed bugs in Ancient Greece and in medieval texts as the insects spread across Europe.⁴⁴ Bed bugs travelled to North America with early European colonists.⁴⁵ By the late 1600s bed bugs were sufficiently numerous to require specialized extermination firms. Among the better-known companies, Tiffin and Son cautioned clients to be vigilant, noting that bugs may start in the bed but “if left alone they get numerous, climb about the corners of the ceiling, and colonize anywhere they can.”⁴⁶ In more recent history, cases of bed bugs are more precisely documented. Central heating apparently enhanced the success of bed bugs through the 1800s and “in the 1880s it was estimated that over 75 per cent of Britain’s homes were infested” with bed bugs.⁴⁷ Over 4 million of London’s 8.6 million people had bed bug infestations in 1939,⁴⁸ and about 1 in 3 homes in Europe had infestations in the 1930s and 1940s.⁴⁹ In this same period, a survey of Swedish moving vans found 47% had bed bugs, and bed bug infestations were common in hospitals, movie theatres, and buses.⁵⁰ The success of intensive post-war efforts at eradication have made the scale of infestation a distant memory, but the historical documentation suggests that large-scale infestations in modern times were common and could again become a genuine risk. According to etymologist Michael Potter, one of the world’s leading experts on bed bugs, “If history repeats itself, bed bugs could again become the stuff of nightmares.”⁵¹

PATTERNS OF INFESTATION

The widespread infestation of bed bugs in the mid-20th century is largely a function of the highly efficient way infestations become established and spread.

HIDING AND TRAVELLING

Only 5 mm long and almost completely flat when unfed, bed bugs can hide in almost any location without detection. Bed bug colonies have been found in seams, joints, and crevices; the slot of a screw; or the spine of a book. Their size and low profile make them very difficult to detect without concerted effort, and facilitate their ability to travel by stowing away in personal belongings. Bed bugs can hide easily in the hem of a garment, the seam of a briefcase, the crease in a shoe, secondhand furniture, or the vent of a laptop. Someone simply sitting in a location that has bed bugs can provide the bed bugs an excellent opportunity to hitch a ride.

Many experts cite travel as being a major cause for the resurgence of bed bugs.⁵² Serious bed bug infestations have been occurring in major travel destinations and spreading to nearby locations—much as they did in the past when port cities were likely to show signs of the first infestations that then spread inland.⁵³

ESTABLISHING AND MAINTAINING COLONIES

The capacity of bed bugs to travel readily is coupled with a remarkable ability to establish and maintain colonies.

Bed bugs can find mates exceptionally quickly due to the secretion of attraction pheromones.

These chemicals draw bugs to each other to establish shared harbourages and to mate. Bed bugs mate rapidly and widely by “traumatic insemination,” which involves the male’s piercing the body of the female to impregnate her. Bed bugs mate readily with a broad range of partners, ensuring a diverse gene pool and high rates of reproduction. Females can lay 5 eggs each day and will generally lay 200 to 500 in less than 10 months. Each successive generation can reach breeding age in four to six weeks, meaning that a single female and her offspring could create a colony of thousands within six months. Bed bug expert Stephen Doggett confirms that a bed bug colony left unaddressed will grow to thousands within a year.⁵⁴

Once established, bed bug colonies are very hard to locate and dislodge. Adult bed bugs feed only every 5 to 10 days, and will remain hidden and inactive at all other times, making them difficult to detect and treat.

Bed bugs can live up to 18 months without feeding; in fact, not feeding *increases* the life span because the bed bug will remain inactive for long periods of time, enduring few biological stresses, almost like a state of hibernation.⁵⁵ This long life span makes them difficult to destroy by passive methods, such as starvation and isolation. Eliminating bed bugs requires a direct intervention.

Bed bugs also cope well with all but the most vigorous and decisive efforts to destroy a colony. Distressed bed bugs release alarm pheromones that cause other bed bugs to disperse immediately, so anything but a thorough eradication effectively carried out is likely to fragment the bed bug population and make it harder to trace and eliminate.

Bed bug eggs are likely to survive efforts to destroy a colony. Bed bug eggs are only 1 mm in length and are often laid in crevices, making them difficult to locate. They are coated with a sticky substance to keep them in place so they are not dislodged by standard cleaning. There is no chemical currently available that kills eggs, which means that a colony can recover from even the most thorough pesticide treatment 12 days later when the eggs hatch and new bed bugs begin feeding.

Bed bugs are also well protected against dehydration. Their natural rate of water loss is exceptionally low. Bed bugs can be killed using heat but lethal temperatures are above 44 degrees Celsius and must be sustained for 20 to 30 minutes.⁵⁶ Lethal heat levels must also be achieved quickly, as gradually increasing heat will cause bed bugs to scatter.

SPREADING INFESTATIONS

Bed bugs can spread effectively throughout a room, apartment, or home. Varying reports show they are able to travel 20 to 100 feet for a blood meal and can wander to new parts of a home with little difficulty. Normally, bed bug infestations start in the mattress or bed frame, but infestations can start in any part of a home.⁵⁷ Bed bugs tend to fragment the colony and move to new harbourages when the harbourage sites in the mattress and frame become heavily populated. In severe infestations, bed bugs can be found everywhere in the home including baseboards, drawers, tables, floor boards, cracks in the wall, electrical sockets, and inside belongings and appliances.

There is no conclusive scientific explanation for bed bugs’ intermittent tendency to leave an established harbourage and start a new one. According to London bed bug expert David Cain, bed bugs may start new colonies based on the amounts of heat and carbon dioxide being

produced.⁵⁸ Studies conducted on traumatic insemination suggest that it causes females to become overwhelmed by repeated mating efforts and seek refuge in new harbourages.^{59, 60} According to Eric Hardebeck, president of Permakil in Ohio, some entomologists are currently exploring the theory that traumatic insemination in large colonies leads to the release of alarm pheromones.⁶¹ Stephen Kells, a bed bug researcher in Minnesota, suggests that fragmentation of harbourages occurs for a combination of reasons including sexual conflict, proportion of males to females, proportion of nymphs to adults, disturbing of the harbourage, and light. Kells suggests that there is likely a “magic number” of bed bugs in a harbourage that leads to spread, but insufficient research has been conducted to determine that “magic number.”⁶² It is clear that the more intense the infestation, the more likely it is to spread to new locations. According to Australian bed bug expert Stephen Doggett, in infestations of thousands of bed bugs (super-infestations), spreading is “inevitable”⁶³.

Regardless of the reason, colonization spreading from one area of an infested dwelling to another is well documented. These widespread infestations, understandably, become more challenging to eradicate as the number of sites for eradication grow.

UNIT-TO-UNIT MIGRATION

In densely clustered housing such as in an apartment building, spread can occur quickly from one home to another.⁶⁴ Within a year, bed bug infestations can grow from a few bugs to thousands. According to U.K. bed bug expert Clive Boase, a bed bug infestation that is left untreated will spread at the rate of about one room every seven weeks through the walls, electrical wiring, and plumbing.⁶⁵ This spread is often to adjacent units, across the hall, and above and below the infested unit. Stephen Doggett has found that the most severe infestations, with several thousand bugs, will invariably lead to infestations in adjacent units.⁶⁶ Doggett’s study of a nursing staff dormitory in 2004 showed that bed bugs spread not only from one unit to the next, but also to units all around the building.⁶⁷ This could be a result of social networks and improper cleaning procedures.⁶⁸ Doggett’s study also shows that bugs bypass some units.⁶⁹ This is likely due to limited access to the units or factors affecting access to the unit such as proper sealing around pipes and plumbing, and the filling of cracks.

WALKING BED BUGS

While bed bugs are known to travel unit to unit, they are also known to walk from building to building in severe and exceptional cases. Eric Hardebeck of Permakil, an American pest control company, reported bed bugs crawling through an alley in broad daylight, climbing up the sides of a building and crawling along telephone wires to enter into an apartment building adjacent to the alley. Bed bugs were found running out into the street, and some had been run over by cars. The bed bugs had survived in mattresses discarded in the alley and by feeding on homeless people who were using the mattresses. The infestation had reached such high levels that the bugs were mobile outside during the day.⁷⁰

The efficiency of bed bugs in hiding, travelling, establishing colonies, spreading, and resisting eradication make them a challenging pest to manage and impose significant demands on any effort to eliminate them.

COSTS OF BED BUG TREATMENT

Bed bugs impose significant costs on those confronted with infestations. Treatment approaches currently in use vary widely, from the simple application of pesticides to complex interventions that include detailed inspections, thorough cleaning and preparation of the site, application of pesticides, and follow-up inspections and treatments. The greatest success is normally achieved through intensive, repeated multi-part treatments (see What to do to Reverse this Pattern—Best Practices on page 20), which involve a considerable amount of time and effort and often specialized equipment. Despite this broad range of approaches, all methods of treatment impose significant costs.

AVERAGE COSTS FOR TREATMENTS

Costs of treating bed bugs vary greatly depending on the type of treatment used. Even pest control professionals have been known to pursue inexpensive but often ineffective strategies such as simple pesticide application. However, the most effective protocols require inspection, cleaning, pesticide application, and follow-up measures, which require considerably greater expense. Costs also depend on the size of the home, the size of the infestation, and the amount of preparatory deinfestation and furniture replacement required. A 2003 study in Toronto showed that homeless shelters were spending an average of \$3,085 per infested shelter.⁷¹ The World Health Organization claims that the average cost of treatment in Canada and the United States is approximately \$300 per room of treatment. This includes treatment of the bed and dressers and two baseboards.⁷² In 2007, Toronto Public Health found that treatments usually ranged from \$200 to \$450 depending on the size of the home being treated—with an average of \$325 per treatment.⁷³ Costs of treatment range from \$200 to \$600 in Washington D.C., for an average of \$400 per treatment. However, Washington Public Health also stated that usually it took three treatments to eliminate the bed bugs.⁷⁴ Stephen Doggett's 2008 survey of pest control companies found that it took a median of two treatments to eliminate bed bug infestations.⁷⁵ Doggett also found the average cost in a home to be about \$617 (including multiple treatments), and in hotels to be about \$1,526 per room, with an average cost of about \$1,000 per infestation⁷⁶. The costs typically included in a thorough bed bug eradication effort in North America are outlined in the *Bed Bugs in New York City: A Citizen's Guide to the Problem*, and include caulking (\$40), mattress cover (\$120), plastic bags (\$35), thorough laundering of bedding and infested materials (\$225) and multiple pesticide applications at \$150 each, for a cost of \$720 and \$1,020 for two to four applications of pesticides, with greater costs required if assistance is needed with physical tasks such as caulking or preparation of the site.⁷⁷

The *Citizen's Guide* also notes the potential need for replacement costs for new bed frame (\$140); couch (\$220); coffee table (\$120); bookshelf (\$120); cabinets (\$200); chairs (\$150); armoire (\$350); clothes, shoes, and coats (\$800); and blankets, sheets, and comforters (\$400) that add up to well over \$2,000 in additional costs.⁷⁸ For supportive housing, there are additional costs relating to staff time in supporting clients in the preparation and treatment of bed bugs.

Based on the average cost per treatment, and the estimated number of infestations in Australia between the years 2000 and 2005, Doggett found that bed bugs cost at least \$100 million in treatments⁷⁹ over that time in Australia.

COSTS OF ALTERNATIVE TREATMENTS

Other methods of inspection and treatment are being used, and they vary in cost. Using specially trained dogs to detect bed bugs in a home can enable a resident to more accurately

identify where in the home bed bug treatment is needed (dogs are 90% accurate at detecting bed bugs, while a human inspector is only 35% to 40% effective), but at \$200 per hour can cost more than a human inspector.⁸⁰ Some companies can super-heat a room using portable heaters to bring the temperature over 120 degrees Fahrenheit (approximately 49 degrees Celsius), and kill the bed bugs. This treatment can cost between \$500 and \$1,000 per room.⁸¹ Another company sells a device that allows you to super-heat smaller belongings such as luggage in a sealed container. This device sells for about \$300.⁸² Cryonite is a type of deep-freezing carbon dioxide that can be applied to belongings, and to baseboards and cracks. The treatment dry freezes and thaws, so no moisture is left in the walls. This treatment can cost \$600 to \$700 per room.⁸³ As this treatment is comparatively new, its effectiveness has not been firmly established.

LEGAL ACTION

With the increase of bed bug infestations, there has been a rise in the number of lawsuits against landlords, offices, and hotels for exposure to bed bugs. Judgments range greatly from a few thousand dollars to the largest judgment of \$382,000 against a hotel.⁸⁴ The judgments are often lower than the claim amounts. There is currently no decision in the suit against a New York hotel for \$20 Million in damages due to bed bugs⁸⁵. A man who stayed at a luxury hotel in Phoenix, Arizona, is suing for \$6 million for damages resulting from over 150 bed bug bites.⁸⁶ In 2007, a university in New York was sued for damages caused by bed bugs suffered by dormitory residents.⁸⁷ A couple in New Jersey successfully sued a furniture company for \$49,000 after they bought a new dresser and bed frame that were infested with bed bugs. The money went to replace all of the furniture they lost as a result of the infestation.⁸⁸

While it is in the power of landlords to evict tenants for not cooperating with bed bug treatments, there are no documented cases of this happening in Toronto. There have been cases of tenants being served eviction notices that have led to the tenants leaving of their own accord, and of tenants being served eviction notices for not paying rent because the tenant refuses to live in—and pay rent for—an apartment that is infested with bed bugs. One case in Toronto that began as an eviction notice for a lack of rent payment led to a judgment of a rent abatement of over \$2,000 in favour of the tenant. The landlord's inaction on bed bugs was cited as a factor in the decision.⁸⁹

HIGH COST OF INACTION

The costs of managing an infestation become higher if the problem is left alone, or is treated improperly. The longer there is inaction, the more the infestation will spread. The larger the infestation, the harder it is to treat, the longer it takes to treat, and more rooms need treatment. Also, the more widespread the infestation becomes, the less likely it is that one will be able to find all of the areas of infestation to treat properly. This can lead to multiple treatments before all harbourages are eradicated. The reported case of an apartment building in Winnipeg illustrates how costs can rise as the problem worsens. In 2004, the building had infestations that, untreated, had spread throughout the building to 73 of its 373 units. Between 2004 and 2008, the building manager spent \$260,000 to get rid of the bed bugs.⁹⁰ Because of the large number of units infested, the bed bugs were able to spread effectively from unit to unit during isolated treatments, and have therefore become more difficult to eradicate. After four years of expensive treatments, bed bugs continued to infest 40 units.

COST OF INEFFECTIVE ACTION

Generally, the do-it-yourself approach to bed bug treatment is ineffective. This can lead to higher costs for future treatments and can worsen the bed bug situation in the building by creating a repelling effect and spreading the infestation. Aerosol pesticide cans,⁹¹ diesel fuel,⁹² and rubbing alcohol⁹³ have been used as home remedies to treat bed bugs. These treatments can be potentially dangerous because of flammability and the overexposure to chemicals. These remedies may create some temporary relief from the bed bug problem by repelling bed bugs, but since these treatments are rarely lethal to the entire colony, they almost certainly cause the bed bugs to spread to new harbourages nearby, and eventually to return when the repellent odours from the chemicals dissipate. U.K. bed bug expert David Cain maintains that the use of customer-applied bug sprays in aerosol cans will almost certainly repel bed bugs to a neighbouring unit, causing new infestations to start and then return to the original site at a later date.⁹⁴ Besides these negative effects of home remedies, temporary relief adds to the delay of effectively dealing with the bed bug infestation. As previously stated, the more time the infestation is given, the more it will grow and spread.

CORRELATION OF POVERTY WITH INFESTATIONS

One enduring myth about bed bugs is their correlation to poverty. All research sources agree that bed bugs do not discriminate among hosts and that absolutely anyone can get a bed bug infestation. In New York and Cincinnati there are well-publicized incidents of severe infestations in wealthy neighbourhoods and penthouse suites of expensive condo buildings.^{95, 96} In New York, bed bugs have infested an expensive condo building owned by the father of a prominent politician, a theatre on Broadway, a \$25 million Central Park duplex, and the chambers of a federal judge.⁹⁷ In Cincinnati, over 7% of homeowners have had bed bugs.⁹⁸ Bed bugs have also been reported in student residences at New York University, Harvard, MIT, University of Vermont, University of Texas,⁹⁹ Ryerson University,¹⁰⁰ and an entire residence that was shut down at McGill University for treatment¹⁰¹.

Research on bed bugs shows that certain risk factors increase exposure to bed bugs, allowing some settings to experience infestations earlier. These risk factors occur in not only inexpensive apartment buildings, exposing people living on low incomes to bed bugs, but also hotels and university residences, with their more affluent residents.

CONDITIONS OF BUILDINGS

Typically, buildings that are high density and in need of repair are more prone to bed bug infestations. Buildings that are crowded bring together more people who can potentially have picked up bed bugs into a space where the bugs can spread. The proximity of new viable hosts makes it more likely that bed bugs will spread from one person's home to another. The presence of multiple homes in close proximity also makes bed bugs harder to treat because any lack of a coordinated pest control treatment allows the bed bugs to migrate back and forth between units.¹⁰² Units in need of repair with gaps between baseboards and in the walls and floors provide more places for bed bugs to hide or create harbourages. Larger gaps are also more difficult to seal or caulk shut, allowing bed bugs to travel easily. Gaps and cracks around pipes and electrical outlets provide opportunities for bed bugs to spread to neighbouring units. The more gaps and hiding places that exist in the home, the more difficult and more expensive it is to treat the infestation and prevent it from spreading.¹⁰³

TURNOVER

High turnover in a building also makes it more likely that bed bugs will come in as new residents can bring bed bugs on their belongings, and moving equipment can become infested.

TENURE

Tenants often lack control over their living environment and are not in a position to take action on the circumstances that contribute to infestations, such as repairing structural defects or ordering coordinated extermination efforts. Weak regulatory standards for rental properties can also contribute to people with lower incomes being exposed to more bed bug infestations.¹⁰⁴

SECONDHAND GOODS

People living with low incomes are more likely to purchase items and furniture secondhand, increasing their risk of bringing infested items into their home.¹⁰⁵

FEWER RESOURCES TO MANAGE BED BUGS

The connection between available resources and the ability to eradicate bed bugs goes back to 16th-century England, where rich and poor alike were known to develop bed bug infestations, but affluent residents were able to replace their bedding and straw more often than those in the surrounding homes, rooting out the bed bugs and giving the appearance that bed bugs were more common in the less affluent households.¹⁰⁶ That circumstance persists, with fewer low-income households being able to dispose of infested furniture, employ costly pest control firms, and invest the time and energy necessary to systematically and comprehensively locate and eradicate harbourages.

INCOME AND BED BUGS

People living on low incomes are exposed to a larger number of these risk factors than the general population. As a result, evidence indicates that people living on low incomes are more likely to be the first to get bed bugs, but over the course of a growing infestation, everyone is susceptible. The same conditions that lead to an increased risk of getting bed bugs apply in hotels and university dorms, which evidence shows, also experience frequent infestations. Reports consistently show that bed bugs reach all income levels eventually and that the scope of infestations, historically, is broad and encompasses all income groups.

CORRELATION OF VULNERABILITY WITH EXTREME INFESTATIONS

Although the correlation between poverty and bed bugs is specious, there is a correlation between severe infestations and high levels of vulnerability.

When they are left to grow unchecked, infestations grow to extreme levels, involving thousands of bed bugs. In most settings, the sufferers respond to the infestation before the infestation reaches the extreme level. However, for a variety of reasons, some households are unable to address the infestation, resulting in exceptionally intense infestations that, as Stephen Doggett notes, inevitably spread.

High levels of poverty can be a barrier to addressing bed bugs. Some people do not have the resources or the financial assistance to manage bed bugs.¹⁰⁷ Not having the financial means to address the bed bug infestation can be a serious barrier to eliminating bed bugs in the home, because often the high costs of preparation and treatment can affect a person's ability to afford other necessities, including food.¹⁰⁸

People with physical or mental disabilities or frail or elderly people are more vulnerable to extreme bed bug infestations because of their limited capacity to take the necessary steps to deal with the problem.¹⁰⁹ Eliminating bed bugs from the home involves not only resources, but also physical work including moving furniture, detailed and extensive visual inspection of the rooms, bagging clothes and belongings, high volumes of laundry, and the disposal of severely infested items. People who face mental challenges or severe addictions, or lack the ability to carry out heavy physical work or the visual acuity to carry out detailed inspections have the hardest time completing these extensive procedures.¹¹⁰

The increasing incidence of severe infestations in these populations has been noted by Australian researcher Stephen Doggett,¹¹¹ as well as community service providers working with vulnerable populations in Toronto.

RANGE OF INFESTATIONS

Bed bug infestations have been found in such a wide range of locations that the risk of exposure to them extends to the entire population.

HOTELS

Hotels are one of the major hot spots for bed bug exposure. They are one of the first points of transfer for people who travel, and are believed to be a major cause of the Australian bed bug resurgence.¹¹² Hotels face considerable risk with regard to bed bugs, with stigma and loss of reputation potentially damaging business. This makes it more difficult for the hotel industry to be seen to be active in addressing or preventing bed bug infestations, because the public might view it as an admission of having a bed bug infestation.^{113, 114} Michael Potter's survey of 509 pest management professionals in the United States showed that 58% had seen infestations in hotels.¹¹⁵ Stephen Doggett's survey of pest control professionals in Australia found that 56% of all treatments carried out were in hotels, motels, hostels, and resorts.¹¹⁶ This includes 462 treatments in five-star hotels (5.6% of all treatments). Doggett's study also showed that the total number of bed bug infestations between 2000 and 2005 likely imposed millions of dollars in costs on the hotel industry for extermination alone. This excluded costs due to lost business, replacement of furniture, legal settlements, and overall harm to the tourism industry because of bed bug infestations. Hotels are best served by a proactive approach that encourages staff to identify early infestations of bed bugs and undertake a comprehensive approach to treatment¹¹⁷; however, the need for discretion can be daunting for hotel owners.

HOSPITALS

There have been increasing numbers of documented incidents of bed bug infestations in hospitals in recent years. Six percent of pest management professionals in the United States had found bed bug infestations in hospitals in 2008.¹¹⁸ In 2007, a pediatric ward in Victoria, British Columbia, was reported to have been closed for fumigation after staff discovered bed bugs.¹¹⁹ A university hospital in Oregon was reported to be dealing with a bed bug infestation that had been growing for two weeks in a patient's locker.¹²⁰

INFESTATIONS IN RURAL AREAS

Infestations are not connected directly to urban living. Though city life is more conducive to bed bug spread through travel, hotels, high-density apartment buildings, and high rental and mobility rates, bed bug infestations are on the rise in rural areas. A survey through the

University of Cincinnati Institute of Policy Research in 2008 showed that Hamilton County (the rural area surrounding Cincinnati) had an infestation rate of 3.6%.¹²¹ The number of bed bug complaints to the county health department had more than doubled every year since 2004.¹²² A pest control company that works in Wasaga Beach, Ontario, noted an increase from about one call a week to about five calls a day.¹²³ Grey County and Bruce County in Ontario have also seen a dramatic rise in bed bug incidents, attracting the attention of the Medical Officer of Health for the Counties.¹²⁴

INFESTATIONS ON CLOTHING AND PERSONAL EFFECTS

The presence of severe infestation has led to bed bugs infesting clothing and objects that are in daily use. People living in severely infested homes have been known to visit public places wearing clothing crawling with bed bugs and carrying personal items that are heavily infested.¹²⁵ These situations can distribute bed bugs to non-residential sites quickly and contribute to the rapid increase in the range of places that bed bugs can be found.¹²⁶

PUBLIC SPACES

Places such as offices, schools, public transit, and theatres can be effective transfer points for bed bugs, and infestations are being found increasingly in these public and common spaces.¹²⁷ Michael Potter's survey of pest management professionals revealed that 2% had encountered bed bug infestations in offices, 5% in schools, 4% in public transportation, and 2% in movie theatres. *The New York Times* reported in 2008 claims that that bed bugs had infested a network newsroom, and that an employee had been bitten while at work.¹²⁸ In New York City, the number of bed bug incidents in schools has increased to 300 a year, in 130 different schools in the city.¹²⁹ University of Kentucky's department of Entomology states that bed bugs "are increasingly being encountered in health care facilities, ... schools, ... theatres, laundries, furniture rental outlets and office buildings."¹³⁰ Edward Brownbear of the New York Department of Housing identified five subway stations that had bed bugs.¹³¹

Public locations are increasingly identified as the sites of infestations because bed bugs, though naturally nocturnal, will adapt and feed on people during the day in some settings, especially when they become agitated or are very hungry making adjustment to non-residential locations increasingly likely.^{132, 133, 134} Canadian bed bug expert Sean Rollo says that bed bugs are extremely opportunistic: "If [bed bugs] are hungry for food during the day then they will go and look for food during the day and this is not a problem for them ... bed bugs will exploit their food source; if something happens they will change their habits to adapt to this change as well as to their environment."¹³⁵

Bed bugs can not only infest non-residential sites, but also transfer to a new host there. An Internet survey conducted in Toronto found that 62 of 139 non-profit agencies interviewed had staff who took bed bugs home from their work—often after a client home visit.¹³⁶ Other non-residential infestations in schools, daycares, offices, and theatres, and on transit make it possible for individuals to develop a bed bug infestation without any direct contact with an infested home. This accelerates the pace at which bed bugs move from high-risk settings to normally low-risk settings, and broadens the infestation more quickly.

Despite the concrete evidence that bed bugs are infesting non-residential sites including offices and public facilities, virtually no policies exist to address non-residential infestations on anything but a reactive basis. Research located no proactive inspection of public facilities, no significant body of human resource policies addressing the impact of workplace infestations, no

consistent policies for compensating staff for infestations at home obtained through work, and no consistent policies for addressing the impact clients with severe bed bug problems have on fellow service users, staff, or facilities.

The well-established incidence of non-residential infestation, its significant impact on the rate of spreading for bed bugs, and the lack of proactive public policy on the matter exposes communities to accelerating rates of infestation and a dramatic broadening of the types of homes and facilities that will confront infestations.

PSYCHOLOGICAL AND SOCIAL IMPACTS

Bed bugs have more than a monetary cost to their victims; they also wreak havoc on people's personal lives. A recent study showed that the majority of people are more upset by finding bed bugs in their home than finding other pests such as rodents, termites, or roaches.¹³⁷ There are many harmful impacts associated with an infestation, including those on emotional, psychological, and social levels. Constant worrying, lack of sleep, and feelings of shame are commonly associated with bed bugs. The physical health concerns associated with bed bugs are limited. They do not transmit diseases and the bites themselves do not necessarily require treatment. There are some minor health impacts of bed bugs such as secondary infections due to scratching, respiratory issues associated with an allergic reaction to bites, and, in severe cases, iron deficiency in infants.¹³⁸ However, the impact of bed bugs on people's mental health is more recognized and widespread.¹³⁹

MENTAL HEALTH: ANXIETY, SLEEP DEPRIVATION, STRESS

Leading health professionals and health organizations acknowledge that there are direct psychological and emotional implications that result from having bed bugs. An article in *The National Review of Medicine* stated that “[b]ed bugs cause physical discomfort as well as a tremendous amount of anxiety, emotional distress and insomnia because they are persistent and reproduce rapidly.”¹⁴⁰ The World Health Organization (WHO) notes that people who constantly suffer from bed bug bites also suffer from a sensitivity syndrome that leaves them anxious and unable to sleep.¹⁴¹ The effects on a person's mental health are evident for both children and adults. There are also reports of children who become pale when living in homes with large infestations, and who are likely suffering a large number of bites per night.¹⁴² Concerns about prolonged anxiety and depression have been raised. These psychological impacts of bed bugs are compounded in people who already suffer from mental health or substance abuse issues.

PARANOIA AND EXTREME MENTAL HEALTH IMPLICATIONS

The increased sense of anxiety that is commonly associated with bed bugs has also caused people to resort to unsafe and unhealthy measures to deal or cope with the bed bugs. The *Ottawa Citizen* documented a story of woman who had been suffering from anxiety and insomnia as a direct result of infestation of bed bugs. Her case of sensitivity to bed bugs was so severe that she had overdosed on sleeping pills as a means to commit suicide to alleviate the stress and psychosis associated with bed bugs.¹⁴³

The anxiety associated with bed bugs also has led people to sleep in their cars, offices, or other locations because they are afraid of the constant bites when they go to sleep at night.¹⁴⁴ There have

also been reports of people getting rid of, and not replacing, their furniture, of sleeping in tents in their homes after the bed bugs were eradicated, and of a nurse that slept in an intensive care unit to get away from bed bugs at home (her home took five treatments before the bed bugs were eliminated).¹⁴⁵

Newspaper stories document cases of paranoia following the discovery of bed bugs, and extreme and reckless reactions including a mother pouring diesel fuel on mattresses in order to kill the bugs, risking exposure to fumes and fire in the desperate effort to eliminate bed bugs.¹⁴⁶ In one case, an apartment building caught on fire in Cincinnati due to a tenant using alcohol to treat an infestation.¹⁴⁷

Bed bugs are identified in connection with “delusory parasitosis” a psychological condition first described in the medical literature more than a century ago, in which the patient has an unwarranted belief that bed bugs are present on or in his body.¹⁴⁸

SOCIAL STIGMA AND ISOLATION

The WHO acknowledges that there is a social stigma associated with having a bedbug infestation which results in negative social impacts. Most people feel ashamed and embarrassed when they discover that they have bed bugs and, as result, socially isolate themselves from others. In addition, because of the negative connotation of bed bugs, people do not want to openly disclose the fact that they have an infestation¹⁴⁹. Bed bugs are mistakenly associated with people who live in unclean conditions, resulting in particularly negative implications for marginalized people who already face barriers to social and economic inclusion.¹⁵⁰ In many instances, people with bed bug infestations become pariahs, cut off from their friends, family, and work associates because no one wants to take the risk of getting bed bugs.



WHAT TO DO TO REVERSE THIS PATTERN— Best Practices

PESTICIDE RESISTANCE

As mentioned above, although DDT is widely credited with eliminating bed bugs in the last century, bed bugs are very efficient in developing pesticide resistance. Growing resistance to DDT was recognized in bed bugs as early as 1947 and had been widely recognized by 1958 in many countries around the world.¹⁵¹ Michael Potter has more recently found resistance to DDT in a particular strain of bed bugs in Ohio.¹⁵²

Since the ban on DDT, other pesticides, most commonly pyrethroids, deltamethrin, and chlorfenapyr, have been used. These pesticides are not persistent toxic chemicals, and are ineffective if simply applied to surfaces; they must come into direct contact with the bed bugs during application.

When used correctly, these pesticides have been shown to be effective against laboratory-raised bed bugs. Unfortunately, resistance to these products is being seen in strains of bed bugs found in the field.

In a study at Virginia Tech, chlorfenapyr was not lethal to bed bugs during the test period and did not prevent bed bug activity including mating, laying eggs, nor the hatching of those eggs.¹⁵³ The same study found significant resistance to pyrethroids in field strains of bed bugs. In fact, K.S. Yoon's study on field strains of bed bugs in New York found them to be 264 times as resistant to deltamethrin as susceptible populations in Florida.¹⁵⁴

Entomologist Michael Potter and his colleagues published an article suggesting that bed bugs are evolving in a manner that has facilitated their resistance to pesticides. Potter argues that the evolution of insecticide resistance could be a primary factor for the resurgence of bed bugs. He and his colleagues conducted two different tests in two different locations of infested sites in Kentucky and Ohio. They found extremely high levels of resistance to two insecticides in both locations.¹⁵⁵ A similar study by John Clark at the University of Massachusetts confirmed that some strains of bed bugs will thrive despite pyrethroid treatment.¹⁵⁶ Clark found mutations in the nervous systems that prevented the effectiveness of pyrethroids. A survey of Australian pest control professionals conducted by Stephen Doggett found that 94.1% of respondents reported that pyrethroids were ineffective for bed bug control.¹⁵⁷ Resistance was also recently found in certain bed bugs in the

United Kingdom and in Africa.¹⁵⁸

DNA analysis of bed bugs indicates that bed bugs have a high rate of gene flow due to high rates of reproduction and mating, indicating that pesticide resistance will continue to spread quickly.¹⁵⁹

BEST PRACTICES: INTEGRATED PEST MANAGEMENT (IPM)

According to the evidence to date, an IPM approach is the best way to deal with bed bug infestations.¹⁶⁰ IPM can be defined as the “use of all possible methods in a logical combination that minimizes risk of pesticide exposure, safeguards the environment, and maximizes effectiveness.”¹⁶¹ This involves coordinated education, identification, inspection, preparation, treatment, prevention, and follow-up measures to ensure that all bed bugs are eradicated and a resurgence of the infestation is prevented.¹⁶² Bed bug behaviour patterns and their emerging resistance to pesticides mean that pesticides alone are unlikely to solve a bed bug problem.

The most prominent examples of best practices are Stephen Doggett’s Code of Practice which has been a factor in reversing bed bug numbers in Australia¹⁶³; Michael Potter’s recommendations through the University of Kentucky Entomology Department¹⁶⁴; the *Bed Bug Handbook* by Richard Cooper, Larry Pinto, and Sandy Kraft¹⁶⁵; an IPM partnership project between New York State and Cornell University¹⁶⁶; Toronto Public Health *Fact Sheets*¹⁶⁷; the *Bed Bug Resource Manual* by Toronto’s WoodGreen Community Services¹⁶⁸; and the *Bed Bug Handbook for Shelter Operators* by the City of Toronto Shelter, Support, and Housing Administration.¹⁶⁹ Review of these and other pest management studies has led to the following best practices for dealing with bed bugs.

EDUCATION

An IPM approach requires that residents, building staff, and pest control professionals be well informed and active participants in the eradication effort. Education should support a shared sense of the objectives and methods of IPM and an orientation toward bed bug prevention.

Early identification of bed bug infestations is a major part of an education program. Eradication is easiest when bed bug infestations are identified early. Identification requires an ability to recognize bed bugs in their various life stages from egg to adult. Bites are often the first indication of infestation. The bites often occur in twos or threes as the bed bug looks for a capillary to feed on. However, many people will not react to bed bug bites. One study indicates that as many as 70% of people do not react to bites.¹⁷⁰ Consequently, education about the signs of bed bug infestations is also important. Signs can include blood stains and fecal stains from bed bugs found on bedding or other surfaces, and the finding of cast bug skins on bedding and in cracks and gaps. Since not all people react to bites, these signs can be the first indication of an infestation.

For those people who do react to bites, some doctors have misdiagnosed them as a variety of skin diseases, allowing the infestation to continue to grow. Bed bug experts see misdiagnosis as widespread, and when Richard Pollack, the lead entomologist at Harvard, tested a group of physicians on bed bug bite identification, not one picked out the bed bug bite correctly.¹⁷¹

Education around stigma, myths, and misinformation should be conducted to ensure that people are unashamed of the bed bugs in their home, are willing to report infestations when they are first suspected, and immediately pursue effective bed bug treatments.

Education should also focus on moving people away from home remedies including the use of over-the-counter insecticides in aerosol cans, rubbing alcohol, and kerosene, to systematic, professional eradication efforts. Home remedies often create a repelling effect that can fragment the colony and push the bed bugs towards adjacent units, only to return at a later time.

People with unsupportive landlords may need education about the legal implications of bed bugs. Tenants should know their rights under local housing legislation such as Ontario's *Residential Tenancies Act* including who is responsible for what portion of the bed bug management strategy. Typically, the landlord is responsible for ensuring the apartment is bed bug free—by hiring a pest control company for treatment—while the tenant is responsible for making sure that the appropriate preparation work is done to allow for effective treatment. Legal advice and supports may be necessary prior to approaching the landlord for treatment; a lack of education and support might isolate people and discourage them from reporting bed bugs out of a fear of eviction or other repercussions from the landlord.

INSPECTION

Tenants and buildings owners should contact the local authorities (which is usually their Public Health Department) to have an inspection done to confirm a bed bug infestation. Inspectors should look for live bugs, bug shells, eggs, blood spots, and fecal stains. Inspectors should document locations of infestations and dates found.

The inspection should start in areas where the resident has noticed bed bugs, or noticed being bitten. As thorough an inspection as possible should be conducted, including looking at any potential harbourage within 20 feet of the bed including mattresses, bed frames, baseboards, dressers, bedside tables, electrical sockets, pictures, clocks, flooring, cracks in walls, peeling wallpaper, wheelchairs, and appliances and electronics. No items should be removed from the room prior to, or during, the inspection. Infestations often start in the mattress and move outward. Proper tools are needed to make the inspection effective. These include flashlights, magnifying glass, forceps, digital camera, screwdrivers, and plastic bags.

Inspections should also be conducted in adjacent units, units across the hallway, and units above and below the infested unit. Similarly, residents should be asked about places they have spent significant amounts of time since they have had bed bugs. These places should also be inspected.

The inspection can also be used as an opportunity to speak directly with the people affected by bed bugs and to provide them with education about bed bug identification, legal issues, preparation, sourcing appropriate pest control companies, effective methods of treatment, and prevention.

Inspectors need to take precautionary measures in order to ensure that they do not take bed bugs back to the workplace, or to their homes. This can include wearing a disposable suit over clothing, or taking a change of work clothes that are removed and bagged prior to returning home then promptly laundered.

Light-coloured sheets can ease an inspection process as bed bugs, blood spots, and fecal spots will show more clearly than on dark sheets. Placing double-sided tape around the bed will not catch all bugs, but will likely catch some bed bugs if they are present, though this method isn't always effective. The tape can be checked regularly to see if the bed bugs are still present.

PREPARATION

A series of measures should be taken prior to treatment to ensure that all hard-to-treat areas are made accessible for the pest control company. This preparation includes bagging all clothing and bedding, and laundering them at high heat, removing clutter from floors and under the bed, vacuuming, and moving furniture away from the wall.

Clutter should be removed from the floors to ensure that as many hiding places as possible are removed. The home should be thoroughly vacuumed to gather up bugs and signs of bugs. It is important to ensure that the vacuum itself does not transport bed bugs from one unit to another and that disposable vacuum bags are used and properly disposed of in closed plastic bags.

Supports are needed for those who are unable to conduct effective preparation themselves due to economic, physical, or mental challenges. This may include having a social worker or other supportive partner help to coordinate preparation and treatment, financial compensation for the disposal of clothing and bedding, and temporary storage. This means that community workers may need to be trained specifically on how to support clients through bedbug infestations.

All pets should be removed from the household prior to and during treatment.

Disposing of furniture that is severely infested may be necessary as part of the preparation process. Because disposing on furniture improperly can lead to the further spread of bed bugs, it is best to consult with a non-profit agency or pest control company prior to disposal to make sure this action is warranted. Disposed furniture should be marked or damaged to prevent reuse, and sealed in plastic before removing from the home to prevent the bed bugs from falling off the items as they are being carried through the hallways. It should be noted that bed bugs will happily infest new furniture, so it is necessary to treat the bed bugs before bringing new items into the home.

TREATMENT

Prior to treatment, the pest control company should provide the resident with a management plan and information on the pesticides to be used. Treatment is only one part of a bed bug management plan, and cannot be successful without the other steps included in the What to do to Reverse this Pattern—Best Practices section. Proposed treatment timelines should also be outlined, detailing follow-up appointments. Pest control companies should be selected based on their development of a management plan, and their experience and knowledge of an IPM approach.

A variety of eradication treatments have been shown to be effective to varying degrees, including spraying chemical pesticides, steam (attaining a surface temperature of 80 degrees Celsius), heat chambers, and extreme cold (below -20 degrees Celsius for two hours). Again, it is necessary that the pest control company is knowledgeable about applying the treatment appropriately, because too much can exacerbate health issues, too little can have a repelling effect, and pesticides inappropriate to the setting can be ineffective.

While steam has been found to be effective in all of the protocols cited here, various types of sprays and pesticides can be applied to treat bed bugs depending on specific situations. Stephen Doggett's survey of pest control companies found that propoxur, bendiocarb, permethrin, and deltamethrin were the most effective pesticide ingredients for spraying in Australia.¹⁷² Of the

most effective pesticides on the market, none has a residual effect longer than the hatching time of eggs (12 days). This means that the pesticide has to make direct contact with the bed bug to kill it. This can be especially difficult in a home with many hiding places (e.g., cracks, gaps, and clutter).

Proper bed bug treatment requires selecting not only the right toxins for pest control but also the right formulations. Similar pesticides, formulated as powders, emulsions, aqueous solutions, or suspensions can deliver the toxic effects to the bed bugs more effectively when the formulation is well suited to the treated surface or setting. There is a need to establish protocols for pest control companies that go beyond basic pest control qualifications, encourage the application of pesticides using appropriate formulations and methods, and embed those efforts in an IPM approach.

Other treatments, including dusting voids and other spaces with diatomaceous earth, can help lower populations or keep infestations at bay. Diatomaceous earth is a non-toxic dust made from crushed fossilized shells. At the microscopic level, the dust is sharp; as the bed bug walks over the dust, its outer shell is cut, causing the bed bug to lose water. The bed bugs will eventually die from dehydration. Caution should be taken when applying diatomaceous earth so that it is not directly inhaled due to potential health concerns with the dust entering the lungs.

Further, a number of preventive measures can be taken to stop bed bugs from coming back, including ongoing inspection and monitoring for bed bugs; sealing all gaps along baseboards, windows, and doorways with caulking; enclosing mattresses and box springs with sealed plastic mattress covers; removing to eliminate harbourage sites; laundering clothes regularly (including drying at 45 degrees Celsius for 30 minutes); and avoiding bringing used furniture into the home without thorough inspection.

Vacating a room is not a treatment option as bed bugs can survive for up to 18 months and the relocation of the host is more likely to spread bed bugs than to kill them.

STEAM

Research seems to indicate that steam is one of the most effective ways of eradicating bed bugs, but specific procedures and methods must be used in order to properly eliminate the bed bugs. Steam is more effective than most pesticides because it kills bed bugs in all stages of development, including eggs.¹⁷³ As previously stated, no chemical pesticides can kill bed bug eggs. Some pest control companies use steam as their primary bed bug treatment as a less-toxic option. Both Stephen Doggett and the World Health Organization recommend steam as an effective and preferred treatment of bed bug infestations.^{174, 175}

Steaming is appropriate for belongings that cannot be put in a dryer, and for locations such as mattresses, furniture, and baseboards. Steaming must be done slowly, no faster than 15 seconds per 30 centimetres, and at the right temperatures to prevent causing other detrimental health effects such as mould or promotion of other bugs. Certain steaming machines are better at producing “dry steam,” which can reduce the likelihood of mould developing. Surface temperatures of the areas steamed should be between 70 and 80 degrees Celsius immediately after steaming. The steamer nozzle must come in direct contact with the surface being treated (e.g., baseboards), and steam pressure should be low enough to avoid dispersing bed bugs. If the pressure is too high, or if a single jet nozzle is used, then the bed bugs can be literally blown to a different area of harbourage. Placing a cloth over the steamer head can help increase surface

temperatures, and reduce the blowing effect. Steam is not a cure-all pest control method and should be done in conjunction with effective preparation, and the use of some type of residual pesticide.

FOLLOW-UP

Generally, eradication of a bed bug infestation will take two or more treatments. It is important that inspectors and pest control companies follow up with the client at least two weeks after the initial treatment to determine whether eradication was successful. This allows sufficient time for eggs that were present during the previous spraying to hatch and become vulnerable to the pesticides. Follow-up from a friend, landlord, or non-profit agency is particularly necessary to make sure they have the supports they need. Supports may be needed for people who are experiencing forms of trauma following a bed bug infestation

Ideally, the resident should be kept out of the home until the bed bug eradication has been confirmed by the follow-up visit, to prevent reinfestation by new bed bugs and feeding by any bed bugs that survived the initial eradication effort—as this can lead to the laying of more pesticide-resistant eggs. During the time leading up to the follow-up visit, the floors should not be vacuumed as this can remove any residual pesticides.

Housing management should keep a record of infestation locations and dates within a building.

BEST PRACTICES: INVESTMENT

While an IPM approach is most likely to result in the elimination of bed bugs, it is also costly and time consuming for residents and property managers. This can potentially be a deterrent for people to follow the appropriate procedures, which can lead to the further spread of infestations.

Experts recognize the need to address these barriers systematically and create financial incentives to support comprehensive IPM efforts.

The Ontario Government has allowed Ontario Disability Support Program and Ontario Works recipients to apply for funds to prepare their units for treatment and to replace any lost furniture as a result of bed bug infestations. The funds may allow up to \$799 per person once every 24 months (about \$1,500 for families).

In Toronto, Toronto Public Health has set aside \$75,000 to support people in preparing their apartments for bed bug treatment. This money is specifically for people who live with low incomes and who do not qualify for Ontario Disability Support Program or Ontario Works funds. Toronto Public Health estimates that this money will likely support 100 people in preparing their units.¹⁷⁶

Property owners in Boston have access to a fund that provides \$200 per recipient through the State of Massachusetts and the Allston Brighton Community Development Corporation. Recipients are required to commit to an IPM strategy and a prevention strategy for each infested unit.¹⁷⁷

Also in Toronto, WoodGreen Community Services administers a small fund of \$8,000 to assist low-income individuals and families who do not have the financial resources to get rid of bed bugs in their homes. The fund can be used for pest control spray, steaming, and other preparation activities. WoodGreen received the grant for this program from United Way of Toronto.

In 2005, the City of Toronto made a one-time investment of \$930,000 into the Toronto Shelter system. The funds were used to replace 45% of all mattresses and bed frames with bed bug-resistant materials¹⁷⁸.

These initiatives show foresight but are not sufficient to fully address the demand for financial supports.

BEST PRACTICES: SYSTEMIC RESPONSE

IPM protocols, education, and investment are effective only insofar as they are well informed, correctly applied, and widely adhered to.

Lessons from our past, and lessons from Australia today, tell us that comprehensive adherence to protocols is best achieved through a government-led systemic response that outlines what needs to be done to eliminate bed bugs, actively promotes adherence to those guidelines, and provides an investment of resources to ensure that residents and property managers have the support they need to bring bed bugs under control.

In the 1930s, people in Europe were more accustomed to bed bugs. Residents would fill all cracks in their homes, people (and even hospitals) replaced wooden bed frames with metal frames. New construction was done with bed bugs in mind, and people were advised to check their beds frequently for bed bugs.¹⁷⁹ The impetus to do these things often came from governments. In the United Kingdom, the government's approach involved developing a coordinated effort to address bed bugs, including education for "sanitation officers" on how to identify and address infestations, and including natural colour drawings of what bed bugs look like for easy identification.¹⁸⁰ Local Authorities were instructed on how to carry out the education and treatment work, and were granted the power to "recover the reasonable costs and expenses."¹⁸¹ The work of the U.K. Ministry of Health not only highlights the importance of a coordinated approach backed by investment and resources, but also demonstrates that many of the recommendations around education, preparation, and prevention remain similar over 70 years later.

In Australia, the government has increased funding to public housing to eliminate bed bugs using a Code of Practice developed by Stephen Doggett, similar to the best practices described above. The code was developed as a set of guidelines and practices to be followed for the control and treatment of bed bugs in Australia. Since implementing the code, Pest control companies in Australia have seen a decline in the number of bed bug infestations. While there are likely other contributing factors, including a global financial crisis, and a decline in tourism, the code is an important reason for the reversal of bed bug numbers in Australia.¹⁸² This is a promising result that has real applications for people trying to manage bed bugs in Ontario today.

CONCLUSION



Bed bugs are a challenging pest to manage. They are clearly resurgent around the world, and their well-evolved strategies for establishing, maintaining and spreading colonies are difficult to overcome. The circumstances of urban living enhance their already robust opportunities to grow. While there is no correlation between poverty and bed bugs, low-income households are the most likely to face infestations first during the current resurgence. The complexities of addressing bed bug infestations also make vulnerable populations particularly susceptible to intensive infestations. Those intensive infestations make the spreading of bed bugs more rapid and more extensive, affecting a broader range of sites and a broader cross-section of the population. Failure to act and to support segments of the population in which the bed bug infestation is growing most rapidly has left cities such as New York and Sydney facing the exponential growth of bed bug populations. Toronto faces similar risks if we follow in their footsteps. However, that is not the only possible outcome. Historically, systematic dissemination of information and sound bed bug management protocols, supported by government-led impetus to action and the economic and social supports necessary to enable compliance, have overcome the growth of bed bug populations. Current efforts in Australia appear to be re-creating that success. Communities facing this resurgence should draw on these lessons and perhaps avoid the adverse experiences of some world cities.

RESULTS OF KEY INFORMANT INTERVIEWS ON BED BUG INFESTATIONS IN TORONTO



To determine the extent of the bed bug problem in Toronto, 45 key informant interviews were carried out with selected experts, landlords, agency staff, and people who have experienced bed bug infestations.

The interviews revealed growing concern among all participants and a realization that there is a significant challenge to be faced in the immediate future. Bed bugs are definitely back in Toronto as well as across Ontario. Along with them come not only the well-known itchy welts, but a host of other challenges. Bed bug sufferers face shame, isolation, insomnia, ill health, and often the loss of basic supports they rely on. Non-profit agencies experience disruptions in their operations, human resources challenges, and barriers to service for vulnerable people. Landlords, agencies and a range of public services, including hospitals, schools, daycares, and public transit, face new risks and considerable costs.

But experts from around the world also point to opportunities that Toronto can seize to avoid the crises facing other world cities. Toronto Public Health and leading agencies in the city have already begun to take the critical steps required to address the growing bed bug issue. With clear policies, public education, and strategic investment, cities in Ontario could avoid the challenges now faced by New York, London, Sydney, and Washington D.C.

BED BUGS ARE BACK

*"This is the most challenging pest I've encountered in my career.
We're in big trouble."*

Professor Michael Potter, Bed Bug Expert, University of Kentucky

In interviews, all respondents indicated that the bed bug problem is widespread and growing in Toronto. All landlords and professionals interviewed have been encountering bed bugs in growing numbers over the last five years. All agencies interviewed have clients with bed bugs. Most agencies indicated that they had been encountering significant bed bug issues for roughly the last five years. Landlords indicate that 3% to 4% of their units have multiple incidences of bed bug infestations, and community service agencies indicate that anywhere from 4% to 70% of their clients have had bed bugs, with the median incidence being approximately 15% of all clients.

PEOPLE HAVE LITTLE KNOWLEDGE OF BED BUGS AND HOW TO DEAL WITH THEM

“A lot also has to do with the lack of education (about bed bugs) and the fact that if you are uneducated then you will not know the signs of bed bugs.”

Richard Grotsch, shelter staff

Interviews showed that most people who had experienced infestations were not well informed about bed bugs prior to their infestation and did not recognize the signs early on. Most were unaware that they had bed bugs until well into the infestation. Most sought advice from doctors around visible welts and itching but none received a correct diagnosis. Experts interviewed believed that doctors are generally poorly informed about bed bugs and that misdiagnosis with other types of pests such as fleas and scabies is common.

“Some people think of bed bugs as a nursery rhyme.”

Paula Cassin, ABI Possibilities

Unfortunately, once bed bugs are correctly identified, many people adopted poor strategies to cope with them. Instead of systematic eradication, residents pursued haphazard strategies including improper use of chemicals, dangerous applications of homemade remedies, improper vacuuming, incorrect cleaning and laundering of clothing, and the improper disposal of infested furniture. The careless transportation of infested furniture and clothing has resulted in bed bugs being dropped in hallways, elevators, laundry rooms, and other common areas. In some cases, because of the apparent good condition of the discarded furniture, it was quickly taken in by other residents, contributing to the further spread of the infestation throughout the building.

THE SPREADING OF INFESTATIONS

“They use that dust, you’re supposed to sprinkle it sparingly but they just pour it everywhere, the bed bugs walk around it. Seniors use kerosene; oh, the fumes. Public education is not very effective.”

Agency staff member

“In some places bed bugs have spread because of people dragging their mattresses in the hallways and dropping the bugs.”

Agency staff member

Infestations are spreading rapidly in Toronto, and respondents traced the origins of infestations to a daunting array of sources. Universities indicated that students bring bed bugs from home. Staff at community service agencies identified having picked up bed bugs from their workplaces and clients, as well as giving examples of clients who got bed bugs from secondhand furniture, used clothing, or even from a pre-existing condition in the apartment they moved into. Interview subjects identified that they had gotten bed bugs from new blankets and new mattresses. Most of the people interviewed could not identify an infested home they had visited at any time prior to suffering an infestation, which means they were either unaware of being in an infested home or were exposed

to bed bugs in a non-residential setting. Agency staff had seen cases of bed bug infestations coming from daycares, stores, and doctors' offices. Landlords noted that bed bugs have spread when people visit others' homes, but also see infestations spread through exposure to bed bugs in common areas in apartment buildings. Professionals also tended to attribute increased risk of bed bugs with various aspects of travel, including hotel stays and even taxi rides.

“Buildings that are poorly maintained can exacerbate the problem. Carpeting, panelling, cracks are a recipe for disaster.”

Reg Ayre, Toronto Public Health

Landlords, agency staff, and professionals found that spreading is more likely in high-density buildings, especially those that have structural problems such as cracks and voids between units. Bed bugs have used gaps in walls, electrical conduits, pipes and plumbing, and simply walking across hallways to access other units.

“They will crawl or be carried; all it takes is one pregnant female to go undetected to give rise to the next generation.”

Lou Sorkin, bed bug expert

CORRELATION OF BED BUGS WITH POVERTY

“The difference is not that bed bugs are a product of one's income status but rather the ability to do treatment is impacted by one's income.”

Sean Rollo, bed bug expert

“(Persistent infestations happen to low-income people) because they may lack resources to fund eradications; it is a capacity issue for people who are marginalized.”

Paula Fletcher, Toronto City Councillor

Among the common misconceptions about bed bugs is the widespread assumption that their presence is correlated with untidy conditions or poverty. All respondents agreed that bed bugs are a widespread issue facing people from all backgrounds, tenures, and incomes. Bed bugs can and will affect anyone with blood. Most respondents recognized that historical stigma distorts our understanding of bed bugs, and leads to assumptions that poverty or unsanitary conditions are associated with bed bugs. Most respondents also noted that people who live with low incomes are exposed to more risk factors for bed bugs and have fewer protective factors. People living on low incomes tend to live in denser settings, in buildings with more structural problems and higher turnover, and with more transient populations, all of which contribute to the spreading of bed bugs. People with low incomes are also more likely to obtain secondhand furniture and clothing, thereby increasing their risk of getting bed bugs. As a result, they tend to experience an upsurge of infestations earlier than the general population. Low-income households are the proverbial “canary in the coal mine” for the bed bug issue.

SEVERE INFESTATIONS

“The bug people said (the infestation) was the worst they’d seen. The infestation was covered; it looked like mildew with so many specks.”

Sandy Woodhouse, Canadian Mental Health Association

When it comes to numbers of reported bed bug cases, it appears that Toronto is experiencing increasing and widespread incidence of severe infestations. Most respondents have had encounters with severe infestations, which have included as many as thousands of bed bugs active in the daytime, swarming on surfaces, and nesting in walls. Landlords are finding unit with have very serious infestations, and almost all agency staff interviewed could identify clients with severe infestations.

“They are nocturnal but this does not mean that they cannot come out during the day.”

Dr. Tomislav Svoboda, Seaton House

Most experts noted a proliferation in the number of severe infestations and intensity of those infestations as well. Some indicated that they were finding that the bugs were larger and more aggressive than in the past. Agency staff also noted an increase in the overall resilience of bed bugs and increasing incidents of behaviours such as feeding and travelling by day.

“Some bugs were on one of our tables crawling in the day.”

Agency staff member

Respondents found that vulnerable people were among the first to face the most serious problems. Agency staff found people facing mental health issues, especially hoarders, were at risk of severe infestations, but experts and agency staff also noted that seniors, people who are infirm, and people who have limited physical ability, time, or resources to address the problem were also among the people who developed serious infestations earliest. People lacking funds for an exterminator or the free time to conduct a thorough inspection, preparation, and cleaning as well as carry out an IPM effort have also faced significant infestations. Agency staff noted that public housing residents and other vulnerable populations seemed to be among the most frequently affected by severe infestations, either due to limited resources, infirmities, and other challenges, or proximity to others in those circumstances.

While these factors have a distinct impact on who faces severe infestations earliest, most experts and agency staff experienced with bed bugs agree that everyone is at risk of infestations if the bed bug problem is allowed to escalate.

IMPACTS OF SEVERE INFESTATIONS

Severe infestations appear to be responsible for creating the more widespread distribution of bed bugs in Toronto, broadening the scope of infestations to a wider and wider range of potential populations.

Experts interviewed agreed that bed bugs are normally nocturnal, but all respondents agreed that those habits will change if circumstances warrant. Agency staff and experts recognized that bed bugs will travel by day and feed by day, and many had encountered infestations severe enough that

bugs were very active during the daytime, walking on people, and swarming on walls and objects, including objects in use. This daytime travel enables bed bugs to be more widely distributed as they hide on objects and individuals travelling about in their daily activities in public places, rather than emerging only in homes, when people are at rest. One expert noted that if bed bug infestations were severe enough, spreading is “inevitable.” As a result, experts and agency staff saw an increase in the number of bed bug incidences in middle-income homes in Toronto.

“Bed bugs are nocturnal by nature. But it is the same thing with humans; if there is a niche that needs to be exploited, bed bugs will exploit that resource. If they are hungry for food during the day, then they will go and look for food during the day and this is not a problem for them.”

Sean Rollo, bed bug expert

Most respondents noted cases of infestations in offices and non-residential settings, including police stations, fire halls, laundries, hospitals, schools, daycares, public transit, and even movie theatres. Landlords are finding bed bugs in their common areas as well as in the residential portions of their buildings.

Experts and agency staff agreed that non-residential sites function as places where bed bugs spread from the most exposed communities to those less at risk of early infestation. All experts interviewed anticipated that the situation would become significantly worse unless action was taken. One called the current experience with bed bugs “the tip of the iceberg.”

IMPACT ON PEOPLE IN INFESTED HOMES

“I was afraid and scared and felt alone. I also felt the initial shame that people feel, and embarrassed. You go through this process of not wanting to talk about it or knowing who to talk to about it—not everyone will support you.”

Bed bug sufferer

All interview subjects indicated that bed bug sufferers face a crushing array of negative impacts from infestations.

Sufferers talk of feeling ashamed, fearful, and totally overwhelmed once they determined they had bed bugs, which was usually after extensive and fruitless efforts to determine the cause of their welts.

“I was frantic; I could not sleep for two nights until the exterminator came to take care of it.”

Bed bug sufferer

Virtually all respondents noted that people living with bed bugs face sometimes extreme levels of isolation. Families have abandoned relatives with infestations. A public transport service had refused to pick up people with bed bugs, effectively rendering them housebound. Landlords noted that families tend to panic when they find a relative has bed bugs and reactions are severe and often irrational. In many cases, people suffering from bed bugs self-impose isolation out of shame and fear of recrimination.

Not surprisingly, most agencies had encountered people who had bed bugs but denied it to avoid the consequences.

“There is a stigma attached to having bed bugs and it causes hardship for those with infestations. There is a false perception that individuals with a bed bug infestation must not be clean. There have been occasions when community agencies have refused to serve infested apartments, and in a few instances, an entire building, if even one of the units is known to be infested.”

Steve Floros, Toronto Community Housing

Respondents also identified further debilitating economic impacts of bed bugs that extended also into the workplace. Many respondents cited cases in which people with bed bugs had missed work or even been barred from work, and lost income. Sufferers also reported having work-related problems and reported that their workplaces seemed unsympathetic and unprepared for the issue of bed bugs. In many cases, sufferers identified that their workplace environments became very hostile regarding their bed bug situation. One case documented that a bed bug sufferer was asked to repeatedly take showers at work and as a result quit from the associated humiliation and stigma. In another instance, a sufferer was humiliated at work for having bed bugs; as a result, agency staff were brought into her workplace to do a public education session about bed bugs for her colleagues.

Experts, agency staff, and people who have suffered infestations described debilitating impacts from bed bugs, including very high levels of stress, anxiety, depression, sleep deprivation, and intense preoccupation verging on delusional states. Some sufferers reported taking medication to cope with the experience and some have reported ongoing mental health issues. Experts also identified significant psychological traumas, sometimes resulting in violent behaviour, cases of self-harm, and even two suicide attempts.

Despite these intense challenges, few respondents could identify effective psychological or social supports for people suffering from bed bugs. Respondents insisted that psychological supports were badly needed.

BED BUG SUFFERER PROFILE

FEMALE, MIDDLE-INCOME HOUSEHOLD

“It took me a while before I found out that I had bed bugs. The reason for this is that my bites kept on getting misdiagnosed for months by doctors. I just kept on getting these welts on me like swollen hives, and I went to my doctor who told me that it was hives, then fleas. I could not understand how she could have thought that it was fleas; we don’t even have pets. Then I went to a dermatologist and asked them what it was. They told me that they were not sure but they knew that it was an insect bite and prescribed some cortisone cream. This went on for a while until someone at work gave me a number to call. I called the number and the man came over to my house and told me that I had bed bugs. I was devastated. I mean me, I had bed bugs. People think that you are dirty or poor and I was not either of those. I was shocked and went into a downward spiral of fear, loss, and anger. Fear because I was afraid of having them and knew that they were so hard to get rid of, loss because it is difficult to have to throw things away, and anger because I wish that I had found out sooner so that the infestation did not have to get as bad as it did. I felt scared and ashamed. I mean who do I tell? How were people going to react? I remember taking my clothes

to clean at the laundromat and seeing a friend of mine and she was asking me what I was doing there, so I told her that I had bed bugs and she flinched away from me in disgust, like “eww.” I mean this was a friend who was treating me like a leper. Bed bugs make you become social lepers. You have no one to really talk to, no one to really tell how you feel. I felt guilty for having bed bugs, I felt ashamed. I told my family not to come over to my house; we did not have anyone come over. After the laundromat incident I was very selective about who I told; I did not need another negative reaction like that—I could not handle it. I honestly think that I became mentally unhealthy. I lost focus in work, I could not think straight, and I became so emotional thinking and wondering why and how this could happen to me. For me this was very devastating; I could not sleep. I was afraid to sleep in my bed, my own bed. I felt vulnerable and alone and angry that I managed to bring them home. I did not know how to communicate with my husband about this, I was embarrassed. It totally disrupted my life. Just thinking back to this is starting to make me itch ... I can't talk about this anymore.”

BED BUG SUFFERER PROFILE

MALE, MIDDLE-INCOME HOUSEHOLD

“I know that I got bed bugs from my former workplace. Despite their continuous efforts to prevent bed bugs, it was like they were playing in a losing battle with the little critters. I took what I thought were all the precautionary methods not to come in contact with them. Other people from work had brought them home and I was determined that I would not be another victim. Needless to say, one morning I woke up and found a bite that was itchy on my face. I immediately knew what it was—after all, I had heard all the horror stories. I checked my mattress and sheets and found blood spots and some bed bugs.

Even though I did have a familiarity with bed bugs from work, I must admit that I still became overwhelmed with the prospect of actually having them. I mean, I had to think about what having bed bugs meant to my life and what I would have to do to get rid of them. For me, this was very overwhelming and I became extremely distraught. Bed bugs really do change your life, how you live, and how others see you. Think about this; I had to spend over \$4,000, throw out my furniture and other personal effects ... in many ways you start to lose yourself when you get bed bugs. This is something that is very hard for people to understand.

Bed bugs for me also became very time consuming and totally interrupted my life. I had to take over three days off from work in order to prep my apartment just for the spraying. I had to do extra laundry, extra cleaning. Most importantly, I became so isolated. To be honest, until you go through it, you have no idea just how horrifying it really is. It is just natural for you to become paranoid; you lose sleep, you end up dreaming and thinking about bed bugs—they just consume every fibre of your being. I had to isolate myself from my family and friends; I did not want anyone coming over. I was too afraid that they would bring bed bugs home. This was very difficult for me because you need someone to talk to because it is awful ... very awful. There were many days that I did not see an end in sight. I became stressed, I lost focus, and I was constantly afraid that I was not being diligent enough about the bed bugs and that they were going to be in my life forever. To have this constantly preoccupying your thoughts can be very depressing. In the end, I just could no longer take it. After multiple sprayings and no real tangible results, I just decided to move. I could no longer live like a prisoner in my own home; it was just too hard for me. People need to really understand that, yes, there is the financial toll that bed bugs have on your life—you know, the money you spend and the time you lose from work. But it goes way beyond that; bed bugs also have a psychological and emotional toll. That, as well, you can always buy a new couch but you can't always buy peace of mind once you have bed bugs.”

IMPACT ON AGENCIES AND SERVICES

“One staff member decided to quit because she couldn’t work with bed bugs.”

Agency staff member

The sudden growth of the bed bug problem has had a significant impact on the agencies and housing providers that support vulnerable people. Agency and housing provider staff have formed the front line in the battle against bed bugs.

“Work has increased. There is an increased amount of work and time being spent on bed bugs and the mad rush to get services and funding in place.”

Agency staff member

Most agencies currently addressing bed bug issues are doing so from necessity. Confronted with clients facing a bed bug crisis and no meaningful systems of support, agencies have attempted to plug the service gap. Agencies also indicated that they are not only inadequately trained to deal with bed bugs, but also are clearly not resourced to do so, and the consequences have been severe. Staff at agencies report increased workloads from their efforts to address the issue. Staff indicated that they had to spend increasing amounts of time implementing a range of precautions against getting and spreading bed bugs, including the use of protective clothing, laundering work clothes on site, and bagging shoes and materials during visits. Agency staff find they need to adopt awkward practices such as never sitting, never placing materials on the floor, dressing and undressing for work in a garbage bag, and leaving possessions in sealable plastic bags during the day. Surprisingly, despite all these proactive measures, the majority of agencies interviewed had not developed protocols to deal with clients with severe infestations, including clients who arrive at the agency with live bed bugs on their body. Refusal of service is common in severe situations. Some housing organizations have had to pursue evictions to address chronic non-compliance with bed bug protocols.

“With bed bugs, depending on infestation, it takes a full day (of staff time) for a housing support worker, half day for a case manager. Spread out over a couple weeks this is a lot of time. We do everything from bagging up belongings, admin-type items like filing reports, negotiating with landlords and ODSP; some need help doing the laundry.”

Agency staff member

Staff spend more and more time learning about bed bugs, developing protocols, and providing information about bed bugs to colleagues and clients. Staff are increasingly involved in seeking funding to address bed bug-related issues, including seeking Ontario Works and Ontario Disability Support Program funds to replace infested furniture and seeking small sums to offset the cost of pre-treatment preparation and pesticide application. Agencies also take on related matters for clients, including speaking to landlords and arranging referrals. In cases of chronic unaddressed problems, agency staff have had to directly intervene, carrying out inspections, vacuuming, preparing a site, and arranging pest control for clients. Some agencies have adopted complex protocols to reduce risks, including freezing the belongings of new residents in supportive housing settings.

The impacts of bed bugs on agencies extend well past advocacy and awareness on behalf of their clients to their own staff as well. Many agency staff responded that they are not ready to handle

the emotional and psychological toll that bed bugs cause for both their clients and themselves. Many cited not being trained as mental health professionals; others complained that they *are* trained mental health workers, but are not pest removal experts. Staff also noted that they were not reservoirs of information, and many of them lacked the formal knowledge and training needed to tackle bed bugs. For many of them, this was an ever evolving learning experience. Likewise, staff would sometimes turn to their managers for assistance and guidance, but noted that their managers were just as unprepared to effectively tackle bed bugs. Agency staff also noted that they had other jobs to do, but had become so immersed in bed bugs that their other work duties were being neglected. Agency staff also reported that both time and money were being diverted to bed bugs and that agencies are not properly funded to adequately deal with bed bugs; ultimately, there is just too little time and too little money to really make an impact.

“There is on some levels a huge rift between employees and the organization. We hear things like ‘I was trained as a social worker, I don’t want to deal with bugs.’ I fear we have lost a number of long-standing employees because they are worried about taking (the bed bugs) home.”

Agency staff member

“Staff have bought scrubs to wear over their clothing. They leave them at work and wash them in the night. We are also advising staff not to sit on people’s furniture. We have to think about how to work with people differently. (Staff express) more anger than shame. There is an expectation that the employer can remove this. (The) office looks like a war zone with plastic bags everywhere for clothing and personal belongings.”

Agency staff member

Bed bug problems have progressively migrated from clients’ homes to the agency offices. Agencies reported bed bug activity in their offices, including bed bugs travelling and biting by day and obvious bed bug activity in common areas. Agencies that have had bed bug occurrences in their offices have replaced considerable amounts of furniture.

“For sure, bed bugs have added to the workload of what staff have to do. I have had dreams about bed bugs. There is a concern amongst staff about bringing them home.”

Agency staff member

Landlords and agencies reported staff taking bed bugs home. Respondents cited cases of staff facing ongoing trouble with bed bugs, in one case throwing out 2 to 3 beds before getting the problem under control. One office worker got bed bugs despite never having entered a residential unit for work; the bugs were found in her chair at the office. She suffered lost work time and decontamination costs as well as considerable disruption in her work and personal life. Staff who have had bed bugs have tended to need a full day of time off to make the appropriate arrangements for deinfestation.

“ Staff have told me that they want to come back to work, but the bed bugs scare me. There has been work stoppage; in one case this led to a nervous breakdown. I must admit that I even wake up at night with skin tingling.”

Agency staff member

Some landlords and agencies are issuing staff protective clothing, often including full coveralls. Others arrange for staff to launder uniforms and other clothing at work. Despite these efforts, some housing providers are facing work refusals from staff, and agencies have had work refusals and resignations over exposure to bed bugs. Agencies reported growing challenges when addressing the increasing dissatisfaction staff feel over exposure to bed bugs and the pressure they get from their families to ensure minimal risk. Agencies demonstrated that there is a growing need to provide ongoing reassurance and support to staff. Agencies are also becoming increasingly concerned about staff retention issues as a result of bed bugs. One agency had an offer of employment refused by a candidate because of bed bugs and received a call in the middle of the night threatening resignation over bed bugs.

“One staff found a bed bug on clothing, did a major office search, and now we are looking at better methods to protect the staff: bigger boots, etc. We are learning on the fly.”

Agency staff member

Despite the growing pressure, most workplaces have no protocols for dealing with bed bug–related human resource issues. Some have offered training and education, but few have a comprehensive strategy.

Landlords and agency staff all anticipated the problem will grow worse with time.

COSTS

The cost of addressing a bed bug infestation varies with the intensity of the infestation and the approach used. The protocols that were generally identified as effective used

- detailed inspection
- vacuuming and other forms of capture for live bugs
- preparation and cleaning of infested sites including bedding, mattresses, and crevices that have been used as harbourages
- the application of insecticides or steam
- the sealing of cracks and spaces that allow the entrance of bed bugs
- the dusting of voids or inaccessible spaces that may harbour insects
- follow-up inspection within two weeks to kill bed bugs that have emerged from eggs that survived the first eradication effort (see *What to do to Reverse this Pattern—Best Practices* on page 20 for a more specific review of effective eradication protocols)

These processes usually require an intensive effort on the part of sufferers and agency staff, and are time consuming and expensive.

For the basic treatment of a single unit (including inspections, cleaning and preparation, and application of pesticides and/or steam), respondents tended to spend between \$400 and \$2,000. Ryerson University spends \$1,000 on a single student residence, and agencies estimate \$500 to \$2,000 for most homes. Most experts felt a cost of \$400 to \$2,000 was typical. There was general agreement that more intense infestations cost significantly more to address.

In addition to basic treatment, there are costs related to materials, including mattress covers, preparation-related supplies and, in some cases, furniture replacement.

These costs, though considerable, are dramatically outweighed by the cost of inaction or of ineffective treatments. Some sufferers interviewed paid as much as \$3,000 of their own money to address their bed bug issues due to repetitive, ineffective treatments, resulting in significant debt and a loss of their savings.

“The cost of bed bug treatments has had a significant impact on our pest control budget. Four to five years ago, our budget for pest control was \$1 million. This year, \$2.5 million dollars is being spent - largely to address bed bug infestations. We recognize that treatment and elimination of bed bugs using only pesticides is often ineffective. That’s why we have implemented a holistic and environmentally-focused approach to pest management. This includes staff and tenant education, as well as effective, non-chemical treatment.”

Steve Floros, Toronto Community Housing

Toronto Community Housing (TCH) has seen the extent to which bed bug costs can spiral out of control. TCH’s pest control budget has skyrocketed in recent years, and it is attributed completely to the increased expenditure on bed bugs. There are additional costs for new furniture, new cupboards, and relocation costs if a unit has to be emptied. Toronto is discovering what most communities have found: the high cost of addressing bed bugs effectively is still cheaper than the stratospheric costs of waiting, when an infestation will often have grown out of control.

BARRIERS TO ADDRESSING BED BUGS

“Education is a big barrier for landlords and for clients. Landlords play the blame game.”

Agency staff member

“It’s hard to get all the stakeholders around an infestation on the same page.”

Elaine Magil, WoodGreen Community Services

Respondents anticipate significant growth of the bed bug problem in Toronto due to the many barriers to effective efforts to address the growing bed bug infestation.

KNOWLEDGE

Most respondents acknowledged that there is relatively poor knowledge about the most effective ways to address bed bugs in Toronto. Some pest control professionals with experience working with infestations also noted that there appeared to be a lack of coordinated approaches to addressing bed bugs and that some strategies were consistently ineffective in terms of eradicating bed bugs. Some respondents had encountered the use of traditional but ineffective and dangerous do-it-yourself strategies such as the application of kerosene. In most cases, respondents had encountered practices that were more likely to contribute to spreading the bed bug infestations to other areas of the home and adjacent units. Others described the use

of aerosols and other repellants, which simply dispersed bed bugs more widely. Pest control professionals, landlords, and agency staff agreed that understanding of the most effective practices was often poor even among their colleagues. They felt that education on this matter is critical to stemming the growth of the bed bug population.

COST

“People that don’t have the funding available would give up; it is a battle they can’t win. They can’t afford to pay the money that is necessary.”

Sandy Costa, bed bug control expert

Most respondents also identified cost as a significant barrier to action. Low-income households and vulnerable people are most at risk of early infestation, and the cost in time and expenses of properly addressing a bed bug infestation often exceeds their physical and financial resources.

LANDLORD/TENANT ISSUES

Lack of clarity around roles and lack of cooperation on the part of landlords and tenants was also seen by many respondents as a significant barrier. Tenants often avoided reporting bed bugs to landlords for fear of penalties such as being charged for exterminations, being evicted, having their furniture disposed of, or being exposed to stigma and recrimination by fellow tenants. These and other fears have resulted in tenants refusing access to units to prevent landlords from taking action on bed bugs. At the same time, landlords may choose to ignore or reject signs of bed bug infestations due to the cost of effective treatments and fear of damaging the reputation of the building.

Experts and agency staff believe clearer protocols and expectations around roles would improve the control of bed bugs in multi-unit buildings in Toronto.

CAPACITY

“We are educating people on what to watch for and teaching them not to panic. Before that, people didn’t even know, or they used Raid.”

Agency staff member

“There needs to be more skilled professionals who know the process—and who are not out there just to make a quick buck. We need reputable companies that do the job right and not companies that don’t follow up.”

Steve Koufis, bed bug prep expert

Agencies also pointed out a shortage of pest control services that have the capacity to carry out an effective bed bug management protocol. Many pest control firms simply apply pesticides, which fall well short of a fully effective protocol. Both agencies and pest control specialists identified that there needs to be greater emphasis and education focused on properly preparing units for treatments. They identified the importance of preparation as a critical component in achieving optimal results for bed bug treatments. Pest control respondents noted that there was a lack of companies who were able to do the needed preparation (bagging, wrapping, laundering, etc) and agencies reported that there was a lack of consistency on the pest control company’s part when it came to understanding the importance of preparation and its direct implications

on treatment failure. Effective eradication was hampered by the shortage of companies providing comprehensive preparation, which sets a ceiling on the number of infestations that could be addressed at any one time, causing long waitlists and a bottleneck effect, so that agencies had to wait weeks before they could get assistance for their clients.

STRATEGIES FOR EFFECTIVE ACTION

EARLY INTERVENTION

“The most important thing is getting the stigma out of the problem. Don't just call it a low-income/hygiene/hostel-related issue. This is a universal issue; this could happen in any building, anywhere in the city, at any income level, at any rent level. It could creep up in your building, and you need to be aware that there are supports and protocols that you need to follow. So when it happens, you can deal with it quickly. We need heightened awareness.”

Brad Butt, Greater Toronto Apartment Association

Severe infestations are more difficult to eradicate and more likely to spread. As a result, experts indicated that early intervention is critical to managing bed bugs. Misdiagnosis, lack of awareness, lack of information on effective strategies, and lack of support for costs and other challenges tend to prevent effective early intervention, but respondents agree that efforts to address these critical gaps could dramatically improve Toronto's ability to prevent infestations from growing and spreading.

EDUCATION

Experts and agency staff agreed that lack of information and education is an important barrier to effectively dealing with bed bug infestations and, as a result, many infestations that could have been addressed early reached a level of severity that made them hard to eradicate.

Not surprisingly, almost all respondents felt more education is a critical element of addressing the growing problem of infestations. Most respondents saw education as the *most important* tool in preventing bed bugs, effectively eradicating infestations and avoiding their recurrence in Toronto. There is already some evidence to support this expectation. Agency staff also indicated that agency-based education efforts in this city have had some positive effects on their clients' abilities to manage bed bugs, and one local landlord found education efforts had helped tenants manage bed bugs better.

“We need to develop strategies for entire buildings, mass education campaigns for the public at large, increase social assistance for vulnerable populations, have more public awareness to reduce stigma, get landlords on board teaching people integrated pest management, stop self-treating with over-the-counter products (as this builds resistance in bed bugs).”

Cathy Loik, Toronto Public Health

Pest control professionals felt a need for increased education within their profession as well. Some respondents identified that there was a range of approaches to how a pest control company addresses an infestation. According to some respondents, this had direct implications

on whether or not a treatment would be effective. For example, several pest control companies identified that not all their colleagues were aware of the crucial role that preparation played in the effectiveness of treatment. Pest control professionals also indicated that it was very important that there be follow-up after treatments. Many respondents identified that the lack of follow-up also had negative implications in terms of adequately treating bed bug infestations.

Experts noted that proactive education on the prevention and treatment of bed bugs makes the greatest difference in keeping bed bugs at bay.

Most respondents urged the creation of a range of informative written materials but many expressed concerns about the effectiveness of traditional flyers. Most respondents encouraged the use of simple fact sheets, preferably in multilingual formats with many pictures. Many experts, agency staff, landlords, and sufferers also encouraged more user-friendly formats including videos, workshops, community meetings, and even a hotline.

All respondents agreed that sound protocols for bed bug prevention and eradication are the most important topics of education. Methods for inspection, cleaning and preparation work, and other aspects of effective eradication should be included. Experts also felt pest control companies needed to be educated about effective protocols.

“Widespread education can help everyone with early recognition. This also keeps costs lower. We also need to work more on taking away the shame and stigma.”

Agency staff member

Respondents indicated that education efforts should be broad-based and mainstream, appealing to people before they get bed bugs, not afterward, and supporting prevention as well as explaining eradication. Many respondents also felt that education efforts should help to demystify bed bugs, treating them as an increasingly common, manageable pest that can be controlled with the correct strategies. Materials should attempt to erase stigma and encourage people to seek support.

Most respondents believed that local public health departments were the best organization to lead the eradication effort and promote better bed bug management. There was a sense that this would best be done in partnership with other city departments, and with support from senior levels of government. Agency staff also noted the success of community workers in reaching people facing infestations and providing direct support. They encouraged a public health approach that included agency-based interventions that made the best use of the strong connections agencies have, especially to vulnerable populations, to ensure the message gets to everyone. Some landlords also noted the benefits of engaging fellow tenants in the effort to educate people about bed bugs.

PROTOCOLS

“Steam is a must. One of the best tools we currently have.”

Michael Goldman, pest control

Experts and agency staff agreed that clear, consistent protocols for addressing bed bugs would be an effective tool in improving the success of eradication efforts and reducing the all-too-common use of ineffective and sometimes harmful strategies. Experts recommend widely

disseminated, government-endorsed protocols.

“Steam has its usages. For those sensitive to pesticides, it’s very useful; useful for wheelchairs and mattresses. Vacuuming and steaming done diligently could get rid of 90% of any infestation.”

Reg Ayre, Toronto Public Health

Leading experts and agency staff agreed that protocols would have to include an IPM approach that goes well beyond simple pesticide application, and includes thorough preparation and cleaning. Most agency staff also recommended some basic interventions such as enclosing and encasing mattresses in seamless mattress covers, replacing wooden furniture with metal wherever possible, sealing holes and cracks, and generally reducing the opportunities for harbourages.

“Steam is great for killing the eggs. Steam needs to be a part of a broader plan.

Sean Rollo, bed bug prep expert

Experts and leading agency staff agreed that the use of steam was a valuable tool in bed bug eradication. Most respondents agreed that pesticide application is a small part of the solution, in part due to the declining effectiveness of most legal pesticides, and they saw pesticides as a tool to be used in combination with other aspects of pest management. Landlords found pesticide application to be an ineffective solution and found that incomplete treatments led to repeated bed bug occurrences.

Experts and most agency staff taking a leadership role on bed bugs agreed that a thorough inspection of an infested unit was critical and that adjacent units should also be inspected as a matter of course. Building managers should be notified of infestations so they can take appropriate precautions, but experts and agencies differed on the notification of other tenants due to the impact of stigma on the tenants in the infested units. Return visits were seen as absolutely necessary, and at least two and usually three visits were recommended.

Though the history is brief on the application of these protocols in contemporary settings, one agency noted a decline in bed bug incidences once it had adopted clear and consistent protocols, and one expert noted declines in bed bug infestations where similar protocols were applied.

Experts also recommended proactive inspections to prevent infestations, preferably twice a year. Landlords found that a building-wide management plan for bed bugs, based on the core strategies indicated by best practices, is the most appropriate approach.

PSYCHOLOGICAL AND SOCIAL SUPPORTS

All respondents interviewed agreed that the psychological impacts of bed bugs were detrimental to the well-being of people suffering infestations. Many sufferers reported having felt anxiety and loss of sleep and a constant preoccupation with bed bugs. Bed bug sufferers noted that they were unable to concentrate on their work, lost focus, and withdrew from interacting with others. In some cases, after their homes had been eradicated of bed bugs, many sufferers felt uneasy and unsafe, and reported waking in the middle of the night because they felt something crawling on them. Others spoke of still living out of plastic containers a year after having a successful treatment to prevent bed bugs from re-entering their possessions. Agency staff and sufferers identified that the stigma that surrounds bed bugs made it very difficult to get support on a psychological level. Many bed bug sufferers identified that they faced the barrier of not having

anyone to confide in about their emotions and trauma surrounding bed bugs. The inability to confide in someone meant they could not adequately address the trauma of having bed bugs, further compounding their social isolation and demonstrating the importance of the role of support in the coping process for addressing bed bugs.

Bed bug sufferers agreed that psychological supports are needed to help people through these circumstances. Most agency staff and some landlords have also encountered the need for psychological supports during deinfestation. Experts also indicated that assistance to vulnerable people was a critical ingredient of a successful strategy for bed bug eradication. Sufferers recommended access to counselling for those who need it. One agency noted a San Francisco program that allows bed bug sufferers to share stories on a drop-in basis to relieve the sense of isolation.

FINANCIAL SUPPORTS

Experts, agency staff, landlords, and bed bug sufferers all agreed that the problem of bed bug infestations would require access to financial assistance and other supports for people who have few resources or who face significant challenges.

Bed bug sufferers said they needed financial support to manage the intensive approach necessary for effectively addressing bed bugs, and believed that many people avoid addressing bed bugs in the early stages because of concern about costs. Bed bug sufferers also said that workplaces need to develop better HR protocols to support employees with bed bugs.

Agencies currently link eligible clients to Ontario Works, Ontario Disability Supports Program, and other small support funds, but the funding available is inadequate to the task and the eligibility issues exclude many who need support. Agencies also expressed frustration in not being able to access alternative funds for those clients who did not have the financial means to tackle their bed bug infestation and did not qualify for social assistance supports. This was echoed by sufferers, who identified that in many cases they were unable to handle the financial costs associated with having bed bugs and had to resort to borrowing money from family and friends. This further reinforces what agencies and service providers have been saying for a while—that the current level of funding in place does not adequately meet the demands of the financial implications of addressing bed bug infestations. A comprehensive strategy to fund bed bug interventions for those who cannot address them independently is required to avoid intensive infestation and the resulting rapid spread of bed bugs.

“We are learning not to panic but to be aware.”

Agency staff member

AGENCY INTERVENTIONS

All agencies interviewed would be interested in helping to create an infrastructure that supports people who have bed bugs.

Agencies stated that, with the proper funding, they would be willing to play a role in education and outreach to clients and the broader population to encourage appropriate responses to bed bugs and to reduce stigma and anxiety. Agencies see a role for themselves in developing and promoting more coordinated and consistent education efforts for their clients and the broader public about bed bug

issues. Agencies also indicated that with the proper supports they would be willing to follow up with clients to support their efforts to address bed bug problems, including playing a supportive role in advocating for and resolving landlord/tenant issues, which can be a barrier to successfully addressing bed bugs.

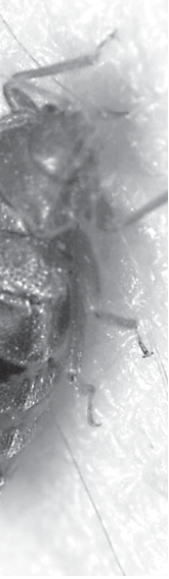
“Unit prep is the key, and dealing with the client in a dignified and respectful manner. This is a real intrusion on their lives.”

Agency staff member

Agencies articulated that various supports and resources need to be in place to assist them in helping their clients deal with bed bugs. They identified that this would have to be a multi-pronged approach in terms of communication, education, outreach, and materials.

Many agencies responded that they would be willing to coordinate education and outreach efforts to address the stigma commonly associated with bed bugs. However, they also identified that the supports needed to coordinate these would require a communications budget.

Having identified that some resources and supports are lacking for vulnerable populations to address bed bug issues, agencies would also be willing to be an access point for necessary practical supports such as steamers, vacuums, and laundry. Staff at agencies agreed that easier access to these supports would make the process of dealing with bed bugs less overwhelming their clients. Providing these supports, however, would require considerable storage space, as well as funding for staff time and materials such as vacuums, laundries, and steam machines.



CONCLUSIONS

“If people don’t start reporting, and if companies don’t provide better services, and if there is no money to help those in need, the problem is going to explode to (affect) everyone.”

Steve Koufis, bed bug prep expert

Bed bugs are on the rise in Toronto. Interviews in all sectors show evidence of rapidly increasing populations. The situation is worsened by the increasing numbers of severe infestations, for the most part occurring in the homes of highly vulnerable people with few of the resources needed to address the problem. Those severe infestations are increasing the rate at which bed bugs spread to public places. Most respondents noted that they are seeing a rise in bed bug infestations among higher-income populations, indicating that the rapid increase in bed bug populations is extending far beyond vulnerable people. However, a growing bed bug crisis can be prevented. Comprehensive protocols for managing bed bugs are showing success elsewhere, and Toronto has put in place some of the early stages of a potentially successful effort to curb the growth of this pest. Proactive education efforts, systematic responses, government-endorsed protocols, and social and financial supports to enable vulnerable people to comply with demanding protocols can, if established early, help Toronto avoid the fate of other world cities struggling to turn back a mushrooming bed bug crisis.

“They will be the new cockroaches and mosquitoes and we will be living with them.”

Agency staff member

RECOMMENDATIONS



RECOMMENDATION 1:

THAT THE PROVINCE OF ONTARIO TAKE THE LEAD TO MANAGE THE BED BUG ERADICATION EFFORT IN ONTARIO.

- 1.1 Due to the rapid expansion of bed bug issues across Ontario, in urban and rural settings, and the need for public leadership to facilitate an effective, broad-based, comprehensive, and consistent response to the growing bed bug infestation, that the Ontario Government should take the lead and adopt, on a province-wide basis, the policies outlined below and support and facilitate the systematic adoption of those policies by municipalities across Ontario.*
- 1.2 As local public health authorities have, in most jurisdictions, played the leading role in addressing bed bug infestations, that the Ontario Ministry of Health and Long-Term Care should take the lead for the provincial government and adopt, on a province-wide basis, the policies outlined below and support and facilitate the systematic adoption of those policies by jurisdictions across Ontario.*

RECOMMENDATION 2:

THAT THE PROVINCE OF ONTARIO, IN CONJUNCTION WITH LOCAL MUNICIPALITIES, CREATE A PUBLIC AWARENESS CAMPAIGN TO ADDRESS BED BUGS.

- 2.1 That the Ministry of Health and Long-Term Care initiate the public awareness campaign to support an effective effort to engage the public in addressing the bed bug issue in a proactive, well-informed, and pragmatic manner.*
- 2.2 That the awareness campaign be implemented through municipal public health departments.*
- 2.3 That municipal public health departments initiate the public awareness campaigns immediately, with Ministry of Health and Long-Term Care support augmenting the process as soon as possible.*
- 2.4 That municipal public health departments engage community agencies, service organizations, tenant groups, and neighbourhood associations in the delivery of this awareness campaign to provide information sources that are familiar and comfortable to the intended audiences.*
- 2.5 That the awareness campaign make every effort to reduce the stigma and alarm attached to bed bug infestations.*

- 2.6 *That the awareness campaign be designed to inform residents, before they experience infestations, that bed bugs are a common pest and that they can be managed with appropriate interventions including early identification, early intervention, and consistent adherence to established bed bug management protocols.*
- 2.7 *That the awareness campaign provide residents with a basic understanding of best practices in bed bug management, connect residents to information and resources to assist them in the management of bed bugs, and provide residents with the tools to select appropriate supports including pest control professionals who apply effective protocols for bed bug eradication.*

RECOMMENDATION 3:

THAT THE PROVINCE OF ONTARIO ADOPT AND PROMOTE SOUND PROTOCOLS AND WORK WITH LOCAL MUNICIPALITIES TO SEE THEM IMPLEMENTED.

- 3.1 *That the Ministry of Health and Long-Term Care adopt and promote bed bug management protocols based on best practices as exemplified in well-researched work in the field such as Stephen Doggett's Code of Practice; Michael Potter's recommendations through the University of Kentucky Entomology Department; the Bed Bug Handbook by Richard Cooper, Larry Pinto, and Sandy Kraft; the Integrated Pest Management partnership project between New York State and Cornell University; the existing Toronto Public Health Fact Sheets; and the Bed Bug Resource Manual created by WoodGreen Community Services.*
- 3.2 *That these protocols include the approaches demonstrated to be effective in addressing infestations including proactive inspection, early identification, early intervention, detailed inspection, extensive cleaning and preparation, removal of live bugs, appropriate removal and disposal of severely infested materials, treatment through the application of steam or pesticides of the appropriate type and formulation, inspection and/or treatment of adjacent units including those vertically adjacent, and follow-up inspections.*
- 3.3 *That these protocols are promoted through municipal public health departments, municipal licensing, property standards, and by-law enforcement departments, either directly or through interdivisional structures, to make every effort to ensure that these protocols are as widely understood and adopted by property owners and managers as possible.*
- 3.4 *That the Ministry of Municipal Affairs and Housing actively promote the adoption of these protocols among municipalities and housing operators.*

RECOMMENDATION 4:

THAT THE MINISTRY OF HEALTH AND LONG-TERM CARE, IN CONJUNCTION WITH LOCAL MUNICIPALITIES, UNDERTAKE, THROUGH EDUCATIONAL AND REGULATORY EFFORTS, TO ENSURE THAT CRITICAL PARTNERS IN THE EFFORT TO ERADICATE BED BUGS, INCLUDING PEST CONTROL PROFESSIONALS, LANDLORDS, AND MEDICAL PROFESSIONALS, PLAY A CONSTRUCTIVE AND ACTIVE ROLE IN IDENTIFYING AND ADDRESSING INFESTATIONS.

- 4.1 *That the Ministry of Health and Long-Term Care support education and/or undertake regulation to ensure that landlords:*
 - a. *Pursue proactive inspection, early identification, and immediate action*

- b. *Understand and apply the protocols, best practices, and integrated pest management methods described in Recommendation 2*
 - c. *Understand and act on the responsibilities of landlords to address infestations under the relevant legislation*
 - d. *Appreciate and be prepared to address the very high costs of decontamination if the infestations are not acted on quickly and are allowed to become severe and spread through a building.*
- 4.2 *That the Ministry of Health and Long-Term Care support education and/or undertake regulation to ensure that pest control professionals:*
- a. *Understand and apply the protocols, best practices, and integrated pest management methods described in Recommendation 2*
 - b. *Appreciate the insufficiency of simple pesticide application as a treatment for bed bugs and appreciate the range of options, including non-toxic options, for addressing bed bugs effectively*
 - c. *Appreciate the insufficiency of one-time interventions and adopt protocols that ensure follow-up inspection and treatment.*
- 4.3 *That the Ministry of Health and Long-Term Care support public health departments in alerting medical professionals to the indicators of bed bug infestation to ensure they can accurately identify and diagnose bed bug bites and provide patients with timely and appropriate advice about actions to take to treat both the symptoms and the infestation itself.*
- 4.4 *That the Ministry of Health and Long-Term Care undertake efforts including information and if necessary public investment to develop an adequate supply of bed bug disinfection preparation and cleaning services to adequately provide for the demand for this critical service.*
- 4.5 *That the Ministry of Health and Long-Term Care encourage the adoption of these protocols by municipalities and by housing providers, through education and regulation as appropriate.*
- 4.6 *That the Ministry of Municipal Affairs and Housing support the adoption of these protocols by municipalities and by housing providers, through education and regulation as appropriate.*
- 4.7 *That municipal departments of public health, licensing, property standards, and by-law enforcement take on the front-line delivery of these education and regulatory efforts, either directly or through interdivisional structures, and provide independent education and regulatory controls as required for an effective effort to ensure adoption of the protocols*

RECOMMENDATION 5:

THAT THE PROVINCE OF ONTARIO, IN CONJUNCTION WITH LOCAL MUNICIPALITIES, PROVIDE FUNDING TO FACILITATE THE ERADICATION OF BED BUGS IN RESIDENTIAL SETTINGS.

- 5.1 *That the Ministry of Health and Long-Term Care provide resources required to ensure that every Ontario resident, regardless of income or circumstances, have access to effective bed bug eradication and the funding they need to complete a successful eradication effort.*
- 5.2 *Because the eradication of bed bugs requires the early identification of and effective intervention in all infestations, that municipal departments of public health act immediately to take the necessary steps to support and facilitate early identification and interventions, with Ministry of Health and Long-Term Care support augmenting those efforts as soon as possible.*

5.3 *That efforts to support early intervention and effective eradication include:*

- a. *Providing for effective inspections*
- b. *Promoting and facilitating proactive inspection wherever possible*
- c. *Working with Local Health Integration Networks, Community Care Access Centres, and funding organizations to support community agencies as a vehicle for providing the assistance described in 4.1c and 4.1d*
- d. *Supporting community agencies by making tools, information, and staff available to enable vulnerable residents to independently address bed bug infestations.*

5.4 *That efforts to support early intervention and effective eradication ensure the populations most vulnerable to bed bug infestations, particularly those most vulnerable to severe infestations, receive the supports and funding necessary to enable them to address infestations when they occur, including, wherever necessary:*

- a. *Support in managing deinfestation processes*
- b. *Social and psychological supports during deinfestations*
- c. *Financial supports for households that cannot afford the costs of deinfestation including the clearing, preparation, and treatment of the home as well as the replacement of severely infested materials.*

5.5 *That the Ministry of Municipal Affairs and Housing facilitate the effort at early intervention and effective eradication by contributing resources and supporting action in the areas described in 5.3.*

RECOMMENDATION 6:

THAT THE PROVINCE OF ONTARIO, IN CONJUNCTION WITH LOCAL MUNICIPALITIES, DEVELOP EFFECTIVE TOOLS FOR IDENTIFYING AND ADDRESSING BED BUG INFESTATIONS IN PUBLIC PLACES AND THE CHALLENGES THOSE NON-RESIDENTIAL INFESTATIONS CREATE.

- 6.1 *That municipal public health departments, either directly or through interdivisional structures, develop policies for proactive inspection and early intervention and treatment on City property as indicated by established patterns of infestation in public spaces in other jurisdictions.*
- 6.2 *That municipal public health departments, either directly or through interdivisional structures, support other public institutions and community organizations in developing policies for proactive inspection and early intervention and treatment on their property as indicated by established patterns of infestation in public spaces in other jurisdictions.*
- 6.3 *That municipal public health departments, either directly or through interdivisional structures, support the development of appropriate human resources protocols for staff affected by bed bug infestations in public institutions and community organizations, and staff exposed to bed bugs in private residences in the course of their duties.*
- 6.4 *That the Ministry of Health support municipalities in the development and implementation of these policies.*

END NOTES

- ¹ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ² City of Ottawa, “Bed Bugs,” http://www.ottawa.ca/residents/health/environments/bed_bug/index_en.html (accessed July 30, 2009).
- ³ City of Hamilton, “Bed Bugs,” http://www.myhamilton.ca/NR/rdonlyres/741F5A03-D92D-452E-B855-A5F5BD0B12D9/0/Bed_bugs.pdf (accessed July 30, 2009).
- ⁴ D. Williamson, “Balcony Bedroom,” *Windsor Star*, September 19, 2007, <http://www.canada.com/windsorstar/story.html?id=0c2eeb2f-0320-4ec4-bfeb-34f34d1cf9dd&k=59457> (accessed July 30, 2009).
- ⁵ City of Kingston, Affordable Housing Development Committee Meeting Notes. November 28, 2008, http://www.cityofkingston.ca/pdf/cityhall/committees/housing/minutes/2008/AHD_Minutes_Nov20.pdf (accessed July 30, 2009).
- ⁶ Bed Bug Registry—Ontario, 2009, <http://bedbugregistry.com/location/on>, (accessed July 30, 2009).
- ⁷ Ibid.
- ⁸ Ibid.
- ⁹ N. Taylor, “Bed Bugs! Instances of Irritating Insects Increasing,” *Orillia Packet and Times*, January 23, 2009. Pg A1.
- ¹⁰ D. Langlois, “Rise of Bed Bugs Troubles Health Unit,” *Owen Sound Sun Times*, December 24, 2009. Pg A3.
- ¹¹ M. Potter, “Lessons from the Past,” Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ¹² Conversation with Michael Siciliano, January 16, 2009.
- ¹³ Gallahue, P. et al., “Subway’s Blood-Bug Invasion,” *New York Post*, May 8, 2008, http://www.nypost.com/seven/05082008/news/regionalnews/subways_blood_bug_invasion_109879.htm (accessed July 30, 2009).
- ¹⁴ H. Adami, “Bed Bugs Turn Woman’s Life Upside Down,” *Ottawa Citizen*, December 3, 2008, http://www.faceoff.com/hockey/columnists/bios/story.html?id=158426f1-5c42-4c03-ba9b-34a5926b529b&cadd_feed_url=http%3A%2F%2Fwww.faceoff.com%2Fscripts%2Fcolumns.aspx%3Fpublication%3DOttawa%2BCitizen%26byline%3Dhugh%2Badami&cp=1 (accessed July 30, 2009).
- ¹⁵ “Bed Bugger. Bed Bugs 40, Humans 33, Bed Bug Infestation: 185 Smith St. in Winnipeg,” February 2, 2007, Bedbugger.com, <http://bedbugger.com/2007/02/22/bed-bugs-40-humans-33-185-smith-street-in-winnipeg> (accessed July 30, 2009).
- ¹⁶ Monthly Financial Report: City of Hamilton Housing, February 11, 2009, http://cityhousinghamilton.com/userfiles/file/BOD_documents/BOD20090211/Report%2309009OctoberMonthlyFinancial.pdf (accessed July 30, 2009).
- ¹⁷ Conversation with Steve Floros, April 9, 2009.
- ¹⁸ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ¹⁹ D. Feiden. “Bed Bug Epidemic Attacks New York,” *New York Daily News*, December 30, 2007. http://www.nydailynews.com/news/2007/12/30/2007-12-30_bedbug_epidemic_attacks_new_york_city.html (accessed July 30, 2009).
- ²⁰ M. Baumann, “Bed Bugs Check into Properties Throughout the Country,” *Hotel and Hotel Management*, vol. 270: 30.
- ²¹ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ²² Conversation with Michael Siciliano, January 16, 2009.
- ²³ S. Hwang et al., “Bed Bugs in an Urban Environment,” *Emerging Infectious Diseases* (April 2005), <http://www.cdc.gov/ncidod/eid/vol11no04/04-1126.htm> (accessed July 30, 2009).
- ²⁴ *Bed Bug Issues in Toronto: Board of Health Report* (February 2008) <http://www.toronto.ca/legdocs/mmis/2008/hl/bgrd/backgroundfile-11155.pdf> (accessed July 30, 2009).
- ²⁵ Ibid.
- ²⁶ Toronto Bed Bug Project Fund, “Staff Report Action Required: Bed Bug Project Update,” November 12, 2008, <http://www.toronto.ca/legdocs/mmis/2008/hl/bgrd/backgroundfile-17412.pdf> (accessed July 30, 2009).
- ²⁷ City of Ottawa, “Bed Bugs,” http://www.ottawa.ca/residents/health/environments/bed_bug/index_en.html (accessed July 30, 2009).
- ²⁸ City of Hamilton, “Bed Bugs,” http://www.myhamilton.ca/NR/rdonlyres/741F5A03-D92D-452E-B855-A5F5BD0B12D9/0/Bed_bugs.pdf (accessed July 30, 2009).
- ²⁹ City of Kingston, Affordable Housing Development Committee Meeting Notes, November 28, 2008, http://www.cityofkingston.ca/pdf/cityhall/committees/housing/minutes/2008/AHD_Minutes_Nov20.pdf (accessed August 6, 2009).

- ³⁰ D. Williamson, "Balcony Bedroom," *Windsor Star*, September 19, 2007. <http://www.canada.com/windsorstar/story.html?id=0c2eeb2f-0320-4ec4-bfeb-34f34d1cf9dd&ck=59457> (accessed July 30, 2009).
- ³¹ Bed Bug Registry—Ontario, <http://bedbugregistry.com/location/on> (accessed July 30, 2009).
- ³² N. Taylor, "Bed Bugs! Instances of Irritating Insects Increasing," *Orillia Packet and Times*, January 23, 2009. Pg A1.
- ³³ D. Langlois, "Rise of Bed Bugs Troubles Health Unit," *Owen Sound Sun Times*, December 24, 2009. Pg A3.
- ³⁴ M. Potter, "Lessons from the Past," Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ³⁵ W. Quarles, "Bed Bugs Bounce Back," *IPM Practitioner*, Vol. 29, No. 3 (March/April 2007) <http://www.birc.org/MarApril2007.pdf> (accessed July 30, 2009).
- ³⁶ M. Potter, "Lessons from the Past," Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ³⁷ UK Ministry of Health, *Report on the Bed Bug*, 1934, http://lrs.afpmb.org/2TS11XKF9Y8PFBXYQSMZD25M/arc/al_06_tit_fetch/1/1021 (or search "accession:1021" at lrs.afpmb.org) (accessed August 6, 2009).
- ³⁸ "Mind the Bed Bugs Don't Bite as the Critter Numbers Boom," *The Evening Standard*, October 19, 2006. <http://www.thisislondon.co.uk/news/article-23371319-details/Mind+the+bed+bugs+don%27t+bite+as+critter+number+s+boom/article.do> (accessed July 30, 2009).
- ³⁹ UK Ministry of Health. *Report on the Bed Bug*, 1934, http://lrs.afpmb.org/2TS11XKF9Y8PFBXYQSMZD25M/arc/al_06_tit_fetch/1/1021 (or search "accession:1021" at lrs.afpmb.org) (accessed August 6, 2009).
- ⁴⁰ Ibid.
- ⁴¹ Ibid.
- ⁴² K. Reinhardt, "Who Knows the Bed Bug? Knowledge of Adult Bed Bug Appearance Increases with People's Age in Three Counties of Great Britain," *Journal of Medical Entomology* Vol. 45, No. 5 (2008): 956–58.
- ⁴³ Ibid.
- ⁴⁴ M. Potter, "Lessons from the Past," Pest Control Technology Online, August 21, 2008. <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ⁴⁵ Ibid.
- ⁴⁶ Ibid.
- ⁴⁷ "Mind the Bed Bugs Don't Bite as the Critter Numbers Boom," *The Evening Standard*, October 19, 2006, <http://www.thisislondon.co.uk/news/article-23371319-details/Mind+the+bed+bugs+don%27t+bite+as+critter+number+s+boom/article.do> (accessed July 30, 2009).
- ⁴⁸ A. Mallis. *Handbook of Pest Control*, 8th Edition, 2007.
- ⁴⁹ 2008. M. Potter. Lessons from the Past. Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ⁵⁰ Ibid.
- ⁵¹ Ibid.
- ⁵² S. Doggett, "The Resurgence of Bed Bugs in Australia: With Notes on their Ecology and Control," *Environmental Health Journal*, Vol. 4, No. 2 (2004): 30–38. http://medent.usyd.edu.au/bedbug/papers/jeh_bedbug_resurgence.pdf (accessed July 30, 2009).
- ⁵³ M. Potter, "Lessons from the Past," Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ⁵⁴ Conversation with Stephen Doggett, January 8, 2009.
- ⁵⁵ "Blood Sucking Insects: Bed Bugs," [NEWpestsolutions.com](http://www.newpestsolutions.com/bloodsuckinginsects.htm), <http://www.newpestsolutions.com/bloodsuckinginsects.htm> (accessed July 30, 2009).
- ⁵⁶ S. Doggett and R. Russell. "The Resurgence of Bed Bugs in Australia." Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ⁵⁷ Conversation with Stephen Kells, February 2, 2009.
- ⁵⁸ Conversation with David Cain, January 15, 2009.
- ⁵⁹ M. Pfister. Aggregation and Dispersal Behavior of the Common Bed Bug, *Cimex lectularius* L., and a Method of Detection Using Canines, Master's Thesis, University of Florida http://etd.fcla.edu/UF/UFE0022594/pfister_m.pdf (accessed July 30, 2009).
- ⁶⁰ Conversation with Stephen Kells, February 2, 2009.
- ⁶¹ Conversation with Eric Hardebeck, January 30 2009.
- ⁶² Conversation with Stephen Kells, February 2, 2009.

- ⁶³ Conversation with Stephen Doggett, January 8, 2009.
- ⁶⁴ World Health Organization, “Public Health Significance of Urban Pests,” <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).
- ⁶⁵ C. Boase, “Bed Bugs—Reclaiming our City,” *The Biologist*, Vol. 51, No. 1 (2004): 9–12. http://www.ioab.org/userfiles/File/biologist_archive/Biol_51_1_Boase.pdf (accessed July 30, 2009).
- ⁶⁶ Conversation with Stephen Doggett, January 8, 2009.
- ⁶⁷ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ⁶⁸ S. Doggett, “The Resurgence of Bed Bugs in Australia: With Notes on their Ecology and Control,” *Environmental Health Journal*, Vol. 4, No. 2 (2004): 30–38. http://medent.usyd.edu.au/bedbug/papers/jeh_bedbug_resurgence.pdf (accessed July 30, 2009).
- ⁶⁹ Conversation with Stephen Doggett, January 8, 2009.
- ⁷⁰ Conversation with Eric Hardebeck, January 30, 2009.
- ⁷¹ S. Hwang et al, “Bed Bugs in an Urban Environment,” *Emerging Infectious Diseases*, Vol. 11, No. 4 (April 2005): 533–38. <http://www.cdc.gov/ncidod/eid/vol11no04/04-1126.htm> (accessed July 30, 2009).
- ⁷² World Health Organization. *Public Health Significance of Urban Pests*, 2008, <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).
- ⁷³ *Bed Bug Issues in Toronto: Board of Health Report*, 2008, <http://www.toronto.ca/legdocs/mmis/2008/h1/bgrd/backgroundfile-11155.pdf> (accessed July 30, 2009).
- ⁷⁴ Conversation with Gerard Brown, D.C Public Health.
- ⁷⁵ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ⁷⁶ Ibid.
- ⁷⁷ “New York vs. Bed Bugs,” *Bed Bugs in New York City: A Citizen's Guide to the Problem*, 2008 http://newyorkvsbedbugs.org/wp-content/uploads/2009/02/bed_bugs_in_new_york_city.pdf (accessed July 30, 2009).
- ⁷⁸ Ibid.
- ⁷⁹ Ibid.
- ⁸⁰ S. Munoz, “New Tactics Take a Bite out of Bed Bugs,” *Wall Street Journal*, March 20, 2008. <http://online.wsj.com/article/SB120596873874750153.html> (accessed July 30, 2009).
- ⁸¹ Ibid.
- ⁸² Packtite website, <http://paktite.com> (accessed August 6, 2009)
- ⁸³ Ibid.
- ⁸⁴ World Health Organization, “Public Health Significance of Urban Pests,” 2008, <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).
- ⁸⁵ ABC News: Good Morning America, “Couple Wants \$20 Million after Bedbug Attack,” March 9, 2006, <http://abcnews.go.com/GMA/story?id=1704757> (accessed July 30, 2009).
- ⁸⁶ Wayodd.com, “Guest Suing for \$6 Million Over Bed Bug Bites at Hilton Hotel in Arizona,” January 4, 2007, <http://www.wayodd.com/guest-suing-for-6-million-over-bed-bug-bites-at-arizona-hilton-hotel/v/6120> (accessed July 30, 2009).
- ⁸⁷ J. Martinez, “Fordham Coed Sues Over Bed Bugs,” *New York Daily News*, September 21, 2007, http://www.nydailynews.com/news/2007/09/21/2007-09-21_fordham_coed_sues_over_bedbugs_in_hotel_.html (accessed July 30, 2009).
- ⁸⁸ J. Borg, “Family Wins Verdict over Bed Bugs,” *ABC Action News*, July 6, 2008, <http://abclocal.go.com/wpvi/story?section=news/local&cid=6255804> (accessed July 30, 2009).
- ⁸⁹ Landlord and Tenant Board. Case of Havcare Investments Inc. and Tenant. Amended Order, Toronto, February 17, 2009.
- ⁹⁰ Bed Bugger, “Bed Bugs 40, Humans 33, Bed Bug Infestation: 185 Smith St. in Winnipeg,” <http://bedbugger.com/2007/02/22/bed-bugs-40-humans-33-185-smith-street-in-winnipeg> (accessed July 30, 2009).
- ⁹¹ Conversation with David Cain, January 15, 2009.
- ⁹² A. Dutton, “Good Night Sleep Tight,” *Washington City Paper*, January 28, 2009. <http://www.washingtoncitypaper.com/display.php?id=36746> (accessed July 30, 2009).
- ⁹³ Grandma’s Home Remedies. “Home Remedies for Bed Bugs,” 2009, <http://www.grandmashomeremedies.com/bed-bugs.html> (accessed July 30, 2009).
- ⁹⁴ Conversation with David Cain, January 15, 2009.

- ⁹⁵ Cincinnati NBC Video, “Bed Bugs a Growing Problem in Tri-State,” May 1, 2007, <http://www.wlwt.com/video/13237549/> (accessed July 30, 2009).
- ⁹⁶ D. Feiden, “Bed Bug Epidemic Attacks New York,” *New York Daily News*, December 30, 2007, http://www.nydailynews.com/news/2007/12/30/2007-12-30_bedbug_epidemic_attacks_new_york_city.html (accessed July 30, 2009).
- ⁹⁷ Ibid.
- ⁹⁸ Institute for Policy Research: University of Cincinnati, “Greater Cincinnati Survey” 2008.
- ⁹⁹ “Bed Bugs in Dorms,” Bedbugger.com, <http://bedbugger.com/category/bed-bugs-in-dorms> (accessed July 30, 2009).
- ¹⁰⁰ K. Jarvis, “Fumigating Pitman 831,” *The Eye Opener*, November 14, 2006. <http://www.theeyeopener.com/article/3032> (accessed July 30, 2009).
- ¹⁰¹ K. Harris, “Bed Bug Infestations Plagues More Residents,” *The McGill Tribune*, October 24, 2006. <http://media.www.mcgilltribune.com/media/storage/paper234/news/2006/10/24/News/Campus.Bed.Bug.Infestation.Plagues.More.Residents-2386353.shtml> (accessed July 30, 2009).
- ¹⁰² World Health Organization, “Public Health Significance of Urban Pests,” 2008, <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).
- ¹⁰³ Ibid.
- ¹⁰⁴ Canadian Centre for Policy Alternatives—Manitoba, “Scandalous Truth about Bed Bugs,” November 6, 2008, http://www.policyalternatives.ca/documents/Manitoba_Pubs/2008/FF_Nov_6_2008_Bed_Bugs.pdf (accessed July 30, 2009).
- ¹⁰⁵ A. Mallis, *Handbook of Pest Control*, 8th Edition, 1997.
- ¹⁰⁶ M. Potter, “Lessons from the Past,” Pest Control Technology Online, August 21, 2008. <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ¹⁰⁷ *Bed Bug Issues in Toronto: Board of Health Report*, 2008, <http://www.toronto.ca/legdocs/mmis/2008/hl/bgrd/backgroundfile-11155.pdf> (accessed July 30, 2009).
- ¹⁰⁸ T. Fletcher, “Bug Off! A Bed Bug Infestation in the Lower Mainland is Wreaking Havoc on People’s Lives,” BC People with AIDS Society (November/December 2006) http://www.bcpwa.org/articles/issue_45_8_Bug_off.pdf (accessed July 30, 2009).
- ¹⁰⁹ *Bed Bug Issues in Toronto: Board of Health Report*, 2008, <http://www.toronto.ca/legdocs/mmis/2008/hl/bgrd/backgroundfile-11155.pdf> (accessed July 30, 2009).
- ¹¹⁰ N. Parness, “Toronto’s Bed Bug Infestation Getting Worse,” CTV News, November 14, 2008, http://toronto.ctv.ca/servlet/an/local/CTVNews/20081117/bed_bugs_081117/2001117/?hub=TorontoNewHome (accessed July 30, 2009).
- ¹¹¹ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ¹¹² Ibid.
- ¹¹³ M. Baumann, “Bed Bugs Check into Properties Throughout the Country,” *Hotel and Hotel Management*, Vol. 270 (2003): 30.
- ¹¹⁴ E. Simon, “Re-emergence of Bed Bugs Creates Pest-Control Issues,” *Hotel and Hotel Management*, Vol. 42 (May 17, 2004) http://findarticles.com/p/articles/mi_m3072/is_9_219/ai_n6070427 (accessed July 30, 2009).
- ¹¹⁵ M. Potter, “The Business of Bed Bugs,” *Pest Management Professional*, January 1, 2008. <http://www.mypmp.net/pestcontrol/Cover+Story/The-Business-of-Bed-Bugs/ArticleStandard/Article/detail/488172> (accessed July 30, 2009).
- ¹¹⁶ S. Doggett and R. Russell. “The Resurgence of Bed Bugs in Australia.” Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ¹¹⁷ E. Simon, “Re-emergence of Bed Bugs Creates Pest-Control Issues,” *Hotel and Hotel Management*, Vol. 442 (May 17, 2004), http://findarticles.com/p/articles/mi_m3072/is_9_219/ai_n6070427 (accessed July 30, 2009).
- ¹¹⁸ M. Potter, “The Business of Bed Bugs,” *Pest Management Professional*, January 1, 2008, <http://www.mypmp.net/pestcontrol/Cover+Story/The-Business-of-Bed-Bugs/ArticleStandard/Article/detail/488172> (accessed July 30, 2009).
- ¹¹⁹ “Bed Bug Infestation Closes Pediatric Rooms,” *Times Colonist*, September 20, 2007, <http://www2.canada.com/victoriatimescolonist/news/story.html?id=6c6c2a1f-49ec-4b2a-8af4-2ffb300c5433&k=66348> (accessed July 30, 2009).
- ¹²⁰ J. Rojas-Burke, “Visiting Hours are Over for Bed bugs Over at OHSU,” September 24, 2008, http://www.oregonlive.com/news/index.ssf/2008/09/ohsu_working_to_rid_admitting.html (accessed July 30, 2009).
- ¹²¹ Institute for Policy Research: University of Cincinnati, *Greater Cincinnati Survey*, 2008.
- ¹²² Joint Bed Bug Task Force: Cincinnati-Hamilton County Health Department, *Strategic Plan*, 2008.
- ¹²³ N. Taylor, “Bed Bugs! Instances of Irritating Insects Increasing,” *Orillia Packet and Times*, February 2009, <http://www.orilliapacket.com/ArticleDisplay.aspx?e=1400547> (accessed July 30, 2009).

- ¹²⁴ County of Grey: Social Services Committee Meeting Minutes, February 11, 2009. <http://www.greycounty.ca/files/meetingdocuments/ssc-feb-11-2009.pdf> (accessed July 30, 2009).
- ¹²⁵ The City of Portland, “Bed Bugs,” <http://www.ci.portland.me.us/hhs/hhsbedbugsmanual.pdf> (accessed July 30, 2009).
- ¹²⁶ Conversation with Rima Zavys, April 1, 2009.
- ¹²⁷ University of Kentucky Entomology, “Bed Bugs,” <http://www.ca.uky.edu/entomology/entfacts/ef636.asp> (accessed July 30, 2009).
- ¹²⁸ J. Steinberg. “Bedbugs at Fox News,” *The New York Times*, March 18, 2008. http://www.nytimes.com/2008/03/18/arts/18arts-BEDBUGSATFOX_BRF.html (accessed July 30, 2009).
- ¹²⁹ Conversation with Michael Siciliano, January 16, 2009.
- ¹³⁰ M. Potter, “The Business of Bed Bugs,” *Pest Management Professional*, January 1, 2008, <http://www.mypmp.net/pestcontrol/Cover+Story/The-Business-of-Bed-Bugs/ArticleStandard/Article/detail/488172> (accessed July 30, 2009).
- ¹³¹ P. Gallahue et al., “Subway’s Blood-Bug Invasion,” *New York Post*, May 8, 2008 http://www.nypost.com/seven/05082008/news/regionalnews/subways_blood_bug_invasion_109879.htm (accessed July 30, 2009).
- ¹³² Cornell University, “Bed Bugs,” 2008, http://www.entomology.cornell.edu/public/IthacaCampus/ExtOutreach/DiagnosticLab/Factsheets/Bed_Bugs.html (accessed August 6, 2009).
- ¹³³ Harvard University, “Bed Bugs Biology and Management, 2008, <http://www.hsph.harvard.edu/bedbugs> (accessed August 6, 2009).
- ¹³⁴ Medical Entomology Purdue University, “Bed Bugs. <http://www.entm.purdue.edu/publichealth/insects/bedbug.html> (accessed July 30, 2009).
- ¹³⁵ Key Informant Interview with Sean Rollo. March 18, 2009.
- ¹³⁶ Unpublished Research by WoodGreen Community Services, 2008.
- ¹³⁷ J. Intini, “Sleeping with the Enemy,” *Macleans*, January 8, 2008, http://www.macleans.ca/science/health/article.jsp?content=20080103_112804_5792 (accessed July 30, 2009).
- ¹³⁸ S. Doggett, “The Resurgence of Bed Bugs in Australia: With Notes on their Ecology and Control,” *Environmental Health Journal* Vol. 4, No. 2 (2004): 30–38. http://medent.usyd.edu.au/bedbug/papers/jeh_bedbug_resurgence.pdf (accessed July 30, 2009).
- ¹³⁹ T. Fletcher, “Bug Off! A Bed Bug Infestation in the Lower Mainland is Wreaking Havoc on People’s Lives,” BC People with Aids Society (November/December 2006), http://www.bcpwa.org/articles/issue_45_8_Bug_off.pdf (accessed July 30, 2009).
- ¹⁴⁰ J. Wallace, “Bed Bug Resurgence Crawls into Urban Centres,” *National Review of Medicine*, Vol. 2, No. 19 (November 15, 2005), http://www.nationalreviewofmedicine.com/issue/2005/11_15/2_patients_practice01_19.html (accessed July 30, 2009).
- ¹⁴¹ World Health Organization, Public Health Significance of Urban Pests, 2008 <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).
- ¹⁴² A. Anderson and K. Leffler, “Bed Bug Infestations in the News: A Picture of an Emerging Public Health Problem in the United States,” *Journal of Environmental Health*, May 2008, ppg 24-27.
- ¹⁴³ H. Adami, “Bed Bugs Turn Woman’s Life Upside Down,” *Ottawa Citizen*, December 3, 2008, http://www.faceoff.com/hockey/columnists/bios/story.html?id=158426f1-5c42-4c03-ba9b-34a5926b529b&add_feed_url=http%3A%2F%2Fwww.faceoff.com%2Fscripts%2Fcolumns.aspx%3Fpublication%3DOttawa%2BCitizen%26byline%3Dhugh%2Badami&p=1 (accessed July 30, 2009).
- ¹⁴⁴ T. Fletcher, “Bug Off! A Bed Bug Infestation in the Lower Mainland is Wreaking Havoc on People’s Lives,” BC People with Aids Society (November/December 2006), http://www.bcpwa.org/articles/issue_45_8_Bug_off.pdf (accessed July 30, 2009).
- ¹⁴⁵ J. Intini, “Sleeping with the Enemy,” *Macleans*, January 8, 2008. http://www.macleans.ca/science/health/article.jsp?content=20080103_112804_5792 (accessed July 30, 2009).
- ¹⁴⁶ A. Dutton, “Good Night, Sleep Tight,” *Washington City Paper*, January 28, 2009, <http://www.washingtoncitypaper.com/display.php?id=36746> (accessed July 30, 2009).
- ¹⁴⁷ “Self Treatment for Bed Bugs Probably Caused Cincinnati Fire.” *Bedbugger.com*, January 26, 2009, <http://bedbugger.com/2009/01/26/self-treatment-for-bed-bugs-probably-caused-cincinnati-fire> (accessed July 30, 2009).
- ¹⁴⁸ N. Hinkle, “Delusory Parasitosis,” *American Entomologist* (Spring 2000) <http://www.ent.uga.edu/pubs/delusory.pdf> (accessed July 30, 2009).
- ¹⁴⁹ World Health Organization, “Public Health Significance of Urban Pests,” 2008, <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).
- ¹⁵⁰ Canadian Centre for Policy Alternatives—Manitoba, “Scandalous Truth about Bed Bugs,” November 6, 2008, http://www.policyalternatives.ca/documents/Manitoba_Pubs/2008/FF_Nov_6_2008_Bed_Bugs.pdf (accessed July 30, 2009).

- ¹⁵¹ J. Busvine, "Insecticide Resistance in Bed-Bugs," *Bulletin of the World Health Organization*, Vol. 19, No. 6 (1958): 1041–52, [http://whqlibdoc.who.int/bulletin/1958/Vol19/Vol19-No6/bulletin_1958_19\(6\)_1041-1052.pdf](http://whqlibdoc.who.int/bulletin/1958/Vol19/Vol19-No6/bulletin_1958_19(6)_1041-1052.pdf) (accessed July 30, 2009).
- ¹⁵² M. Potter, "Lessons from the Past," Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ¹⁵³ David J. Moore and Dini M. Miller, "Laboratory Evaluations of Insecticide Product Efficacy for Control of *Cimex lectularius*," *Journal of Medical Entomology*, Vol. 45 (2008): 956–58.
- ¹⁵⁴ Kyong Sup Yoon, Deok Ho Kwon, Joseph P. Strycharz, Craig S. Hollingsworth, Si Hyeock Lee, and J. Marshall Clark, "Biochemical and Molecular Analysis of Deltamethrin Resistance in the Common Bed Bug," *Journal of Medical Entomology*, Vol. 45, No. 6 (2009): 1092–101.
- ¹⁵⁵ M. Potter, et al., "Insecticide-Resistant Bed Bugs: Implications for the Industry," PCT Online, July 2007, http://www.sterifab.com/new_web_page/MAGAZINE_REPRINTS/july%20bed%20bugs.pdf (accessed July 30, 2009).
- ¹⁵⁶ R. Lloyd, "Bed Bugs Resist Pesticides," *Live Science*, January 12, 2009. <http://www.livescience.com/animals/090112-bed-bug-resistance.html> (accessed July 30, 2009).
- ¹⁵⁷ S. Doggett and R. Russell. "The Resurgence of Bed Bugs in Australia." Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ¹⁵⁸ A. Romero, M. Potter, and K. Haynes, "Insecticide-Resistant Bugs: Implications for the Industry," Pest Control Technology Online, July 26, 2007, <http://pctonline.com/articles/article.asp?MagID=1&ID=2954&IssueID=232> (accessed July 30, 2009).
- ¹⁵⁹ Allen L. Szalanski, et al., "Mitochondrial and Ribosomal Internal Transcribed Spacer 1 Diversity of *Cimex lectularius* (Hemiptera: Cimicidae)," *Journal of Medical Entomology*, Vol. 45 (2008).
- ¹⁶⁰ Toronto Public Health, *Bed Bugs: For Professionals*, 2009, <http://www.toronto.ca/health/bedbugs/infoforprofessionals.htm> (accessed July 30, 2009).
- ¹⁶¹ J. Gangloff and C. Pichler, "Guidelines for Prevention and Management of Bed Bugs in Shelters and Group Living Facilities," Cornell University, 2008. http://nysipm.cornell.edu/publications/bb_guidelines/files/bb_guidelines_nyc1.pdf (accessed July 30, 2009).
- ¹⁶² Ibid.
- ¹⁶³ S. Doggett, "A Code of Practice: For the Control of Bed Bug Infestations in Australia," 2007, http://medent.usyd.edu.au/bedbug/cop_ed2_completed.pdf (accessed July 30, 2009).
- ¹⁶⁴ M. Potter, "Bed Bugs," *University of Kentucky Entomology*, 2008, <http://www.ca.uky.edu/entomology/entfacts/ef636.asp> (accessed July 30, 2009).
- ¹⁶⁵ L. Pinto, R. Cooper, and S. Kraft, *The Bed Bug Handbook*, 2007.
- ¹⁶⁶ J. Gangloff and C. Pichler, "Guidelines for Prevention and Management of Bed Bugs in Shelters and Group Living Facilities," Cornell University, 2008, http://nysipm.cornell.edu/publications/bb_guidelines/files/bb_guidelines_nyc1.pdf (accessed July 30, 2009).
- ¹⁶⁷ Toronto Public Health, "Fact Sheets for Public, Landlords and Property Managers, and Other Professionals," 2009, <http://www.toronto.ca/health/bedbugs/factsheets.htm> (accessed July 30, 2009).
- ¹⁶⁸ WoodGreen Community Services and The Community Bed Bug Committee, *The Bed Bug Resource Manual: A Guide to Preventing, Treating, and Coping with Bed Bugs*, 2008, <http://www.woodgreen.org/Temp/BedBugResourceManualDec172008.pdf> (accessed July 30, 2009).
- ¹⁶⁹ City of Toronto Shelter, Support, and Housing Administration, *Bed Bugs: A Handbook for Shelter Operators*, December 12, 2007, <http://www.toronto.ca/housing/pdf/bedbug.pdf> (accessed July 30, 2009).
- ¹⁷⁰ J. Goddard, R. DeShazo, "Bed Bugs and Clinical Consequences of their Bites," *Journal of American Medical Association*, Vol. 301, No. 13 (April 1, 2009): 1358–66.
- ¹⁷¹ WebMD, "Don't Lose Sleep Over Bed Bugs," <http://www.webmd.com/a-to-z-guides/features/dont-lose-sleep-over-bed-bugs?page=2> (accessed July 30, 2009).
- ¹⁷² S. Doggett and R. Russell. "The Resurgence of Bed Bugs in Australia." Proceedings of the Sixth International Conference on Urban Pests, William H Robinson and Dániel Bajomi (editors), July 13 to 16, 2008.
- ¹⁷³ S. Kells, "Non-Chemical Control of Bed Bugs," *American Entomologist*, Vol. 52, No. 2 (2006): 107–10, <http://www.entsoc.org/pubs/periodicals/ae/ae-2006/Summer/Kells.pdf> (accessed July 30, 2009).
- ¹⁷⁴ S. Doggett et al., "Encasing Mattresses in Black Plastic Will Not Provide Thermal Control of Bed Bugs," *Journal of Economic Entomology*, Vol. 99, No. 6 (2006), pp 2132-2135.
- ¹⁷⁵ World Health Organization, Public Health Significance of Urban Pests, 2008, <http://www.euro.who.int/document/e91435.pdf> (accessed July 30, 2009).

- ¹⁷⁶ Toronto Bed Bug Project Fund, “Staff Report Action Required: Bed Bug Project Update,” 2008, <http://www.toronto.ca/legdocs/mmis/2008/hl/bgrd/backgroundfile-17412.pdf> (accessed July 30, 2009).
- ¹⁷⁷ Allston Brighton Community Development Corporation Website, “Programs: Community Organizing,” 2009, <http://www.allstonbrightoncdc.org/bedbugs.htm> (accessed July 30, 2009).
- ¹⁷⁸ *Staff Report: One Time Allocations of 2005 City of Toronto Homeless Initiatives Fund and Off the Streets and Into the Shelters Funds*, 2005, <http://www.toronto.ca/legdocs/2005/agendas/committees/cms/cms051011/it014.pdf> (accessed July 30, 2009).
- ¹⁷⁹ M. Potter, “Lessons from the Past,” Pest Control Technology Online, August 21, 2008, <http://www.pctonline.com/articles/article.asp?ID=3264> (accessed July 30, 2009).
- ¹⁸⁰ U.K. Ministry of Health. Report on the Bed Bug, 1934, http://lrs.afpmb.org/2TS11XKF9Y8PFBXYQSMZD25M/arc/al_06_tit_fetch/1/1021 (or search “accession:1021” at lrs.afpmb.org) (accessed August 6, 2009).
- ¹⁸¹ Ibid.
- ¹⁸² Conversation with Stephen Doggett, January 8, 2009.

APPENDICES

APPENDIX A

KEY INFORMANT INTERVIEW INTRODUCTION

Hi, my name is _____ and I'm working with a team of people on behalf of WoodGreen Community Services to explore bed bug issues in Toronto. WoodGreen has suggested that it would be good to speak with you about your knowledge and experience with bed bugs, to get a better understanding of bed bugs in Toronto and globally. The interview will take about 45 minutes to an hour [depending on the type of interview].

Over the past couple months, we have been researching bed bugs through existing articles and news stories to gain an understanding of emerging trends and best practices. We're now trying to dig deeper and connect some of what we've found with your own knowledge and experience.

We are interviewing a series of residents, agencies, landlords, and bed bug experts. We're hoping that the information we gather from these interviews will help improve bed bug education and management practices as well as point to areas where more support is needed.

If you prefer not to have your name mentioned, please say so and we will honour that. If this is not a good time, could we arrange a date and time to go through the interview?

APPENDIX B

Key Informant Interview Script—AGENCIES

GENERAL

Name:

Organization:

Position:

Have any of your clients ever had bed bugs?

Do you have a sense of how they came to be in their units?

Accept standard answers (friends with infestations, used furniture/clothing) and prompt:

- Have you come across any unusual forms of spreading such as active walking, day travel, outdoor travel? Describe.
- Have you encountered any bed bug spread that was unusual for other reasons (prompt: odd location)? Describe.
- Are there any circumstances you have seen that make spreading more likely (prompt: person's behaviours, structure of building, etc.)? Describe.

Can you describe the kinds of bed bug incidents your clients experience and any patterns you see in those incidents?

Prompt for:

- What percentage of your clients would you say have had problems with bed bugs?
- Do some clients seem to get bed bugs more than others? If so, what is the pattern? (check for income, travel, mental health, other challenges, clutter, age or condition of unit)
- Why do you think there would be a pattern here?
- Do your clients have recurring problems?
- Generally, for those people, how often does an infestation recur? For how long?
- Have some clients had what you would consider a serious infestation?
- Can you describe the infestations (e.g., numbers of bugs or areas infested, visibility of infestation)?
- Do some clients seem to get serious infestations more than others? If so, what is the pattern (prompt: who gets serious infestations)? Why do you think that pattern exists?

How long have you been aware of bed bugs as a serious issue?

Have you seen changes relating to bed bugs in the past few years?

Prompt for:

- Have you seen a change in the frequency of incidents in the last several years?

- Have you seen a change in the intensity of incidents in the last several years?
- Have you seen a change in who is getting bed bugs in the last several years?
- How would you describe the change?

What precautions do your clients take to avoid infestation and later recurrence?

How do they know to take these precautions?

How effective are they?

What precautions do you and your staff take to avoid infestation and later recurrence in your clients' residence?

How effective are they?

What kind of information or education might help clients be more proactive in preventing bed bugs or effective in addressing them?

Prompt for:

- Form (workshops, flyers, posters)
- Content (general information, treatment, prevention tips)
- Source
- Distribution method

What have been the consequences of infestations for your clients?

Prompt for:

- Costs (extermination, thrown-away goods)
- Impacts on family and personal life
- Impact on sleep, health, wellbeing
- Psychological impacts

Do you have clients who have infestations but say they don't mind?

If so, why are some clients more tolerant of bed bugs than others?

How have bed bugs affected your work (and/or personal life)?

What have been the consequences of infestations for you?

Prompt for:

- Costs (extermination, thrown-away goods: try to identify an average cost and if the cost changes with severity of the infestation)
- Refusal of access and services to clients who have bed bugs
- Clients refusing services due to fear of bed bugs
- Increased complaints
- Challenges with staff

Can you tell me how you and your clients deal with infestations?

Prompt for:

- Tenant-led extermination efforts (prep/cleaning, steam, pesticides, disposal of goods,

inspection of adjoining units, dusting, landlord notification)

- Request to client's landlord to take action on the infestation
- Tracking effectiveness of extermination (repeat efforts, duration of process, outcome)
- Referrals to social supports, advice for clients (check on information, accessibility, effectiveness)

Are you aware of any resources or supports for people who have been psychologically impacted or had their health adversely impacted due to bed bugs?

Do you think there should be some kind of support to assist people who have been impacted by bed bugs?

What barriers have you encountered in dealing with bed bugs?

- Prompt for unit access, costs, shame/fear of bad reputation, lack of information, lack of supports

Have you encountered incidents or infestations in non-residential areas (e.g., offices, meeting rooms, common spaces)?

Was there anything about infestations you are aware of that was unusual or unexpected (such as unusual patterns of spreading or day feeding)?

Have any of your staff ever had bed bugs?

If so, can you tell me about that experience?

Prompt for:

- Do you know if they got them from a unit or from a non-residential area?
- Do you know if they got them through their work?

How has that affected your staff?

Prompt for:

- Do you know anything about how it felt (e.g., the impacts on family and personal life, the impact on sleep or any psychological impacts)
- Precautions, effectiveness of precautions, changes in attitudes toward work, family and friend reactions, stress, costs for extermination and lost goods, shame, lack of information, support)
- Extermination process (cleaning, steam, pesticides)
- Effectiveness (repeat efforts, duration of process, outcome)

What precautions do your staff take to avoid getting bed bugs? What does that have on your operations?

Do you think most people who are at risk in their jobs are aware of their risk?

How has your work changed at all in light of what you now know about risk?

Have you ever had issues with work refusal because of bed bugs?

Does your agency/group currently provide any bed bug–services? If so, which ones? Prompt for:

- Inspections
- Education
- Access to financial assistance/resources
- Cleaning of units/prep work
- Booking pest control services
- Communication with landlords
- Liaise with OW/ODSP for Community Start-Up or other funds
- Vacuuming
- Referral to other resources
- Other _____
- If not, why not?
- If not, what do you currently do when clients/units have bed bug problems?

(If provides bed bug–related service): What led you to get involved in bed bug issues?

If funding were available, would you want to be involved in more bed bug work or would you want to leave that to outside resources?

If so, what type of bed bug work would you like to do? What would you be able/interested in doing?

Prompt for:

- Inspections of clients' homes
- Inspections of external community members' homes
- Education sessions
- Mental health counselling/support around anxiety
- Prep/cleaning to prepare a home for pest control
- Starting a social enterprise to provide prep and/or spray services
- Other _____

What resources would you need to do that?

Would you be interested in promoting efforts to improve the work being done to address the bed bug problem?

What do you know about bed bugs that you would want others to know?

(For out of town only): What's different or distinct about your experience because of where you live?

(For out of town only): Are bed bugs just a Toronto issue?

Do you expect, with things as they are, that bed bugs will get better or worse over time?

APPENDIX C

Key Informant Interview Script—LANDLORDS

GENERAL

Name:

Organization:

Position:

Have any of your tenants/residents ever had bed bugs?

Do you have a sense of how they came to be in their units?

Accept standard answers (friends with infestations, used furniture/clothing) and prompt:

- Have you come across any unusual forms of spreading such as active walking, day travel, outdoor travel? Describe.
- Have you encountered any bed bug spread that was unusual for other reasons (prompt: odd location)? Describe.
- Are there any circumstances you have seen that make spreading more likely (prompt: person's behaviours, structure of building, density, clutter)? Describe.

Can you describe the kinds of bed bug incidents your tenants/residents experience and any patterns you see in those incidents?

Prompt for:

- What percentage of your tenants/residents would you say have had problems with bed bugs?
- Do some tenants/residents seem to get bed bugs more than others? What is the pattern? (check for income, travel, mental health, other challenges, clutter, age or condition of unit)
- If so, why do you think there is a pattern here?
- Do your tenants/residents have recurring problems?
- Generally, for those people, how often does it recur? For how long?
- Have some tenants/residents had what you would consider a serious infestation?
- Can you describe the infestations (e.g., numbers of bugs or areas infested, visibility of infestation)?
- Do some tenants/residents seem to get serious infestations more than others? If so, what is the pattern (prompt: who gets serious infestations)? Why do you think that pattern exists?

Have you seen changes relating to bed bugs in the past few years?

Prompt for:

- Have you seen a change in the frequency of incidents in the last several years?
- Have you seen a change in the intensity of incidents in the last several years?
- Have you seen a change in who is getting bed bugs in the last several years?

- If so, how would you describe it?

What precautions do your tenants/residents take to avoid infestation and later recurrence?

How do they know to take these precautions?

How effective are they?

What precautions do you and your staff take to avoid infestation and later recurrence in your buildings?

How effective are they?

What kind of information or education might help tenants/residents be more proactive in preventing bed bugs or effective in addressing them?

Prompt for:

- Form (workshops, flyers, posters)
- Content (general information, treatment, prevention tips)
- Source
- Distribution method

What have been the consequences of infestations for your tenants/residents?

Prompt for:

- Costs (extermination, thrown away goods, dollar amounts)
- Impacts on family and personal life
- Impact on sleep, health, wellbeing
- Psychological impacts

What have been the consequences of infestations for you?

Prompt for:

- Costs (extermination, thrown-away goods: try to identify an average cost and if the cost changes with severity of the infestation, dollar amounts)
- Loss of business
- Increased complaints
- Challenges with staff

Can you tell me how you and your tenants/residents deal with infestations?

Prompt for:

- Tenant-led extermination efforts (prep/cleaning, steam, pesticides, disposal of goods, inspection of adjoining units, dusting, landlord notification)
- Landlord-led extermination efforts (prep/cleaning, steam, pesticides, disposal of goods, inspection of adjoining units, dusting, tenant education)
- Tracking effectiveness of extermination (repeat efforts, duration of process, outcome)
- Referrals to social supports, advice for tenants/residents (check on information, accessibility, effectiveness)

How do/did you choose a pest control company?

From your experience, what makes an extermination effort particularly successful?

Are you aware of any resources or supports for people who have been psychologically impacted or had their health adversely impacted due to bed bugs?

Do you think that there should be some kind of support to assist people who have been impacted by bed bugs? Please describe.

What barriers have you encountered in dealing with bed bugs?

Prompt for unit access, costs, shame/fear of bad reputation, lack of information, lack of supports

Have you encountered incidents or infestations in non-residential areas (e.g., offices, meeting rooms, common spaces)?

Do you have any mandatory reporting procedures for staff who encounter bed bugs?

Have any of your staff ever had bed bugs?

If so, can you tell me about that experience?

Prompt for:

- Do you know if they got them from a unit or from a non-residential area?
- Do you know if they got them through their work?

How has that affected your staff?

Prompt for:

- Do you know anything about how it felt (e.g., the impacts on family and personal life, the impact on sleep or any psychological impacts)?
- Precautions, effectiveness of precautions, changes in attitudes toward work, family and friend reactions, stress, costs for extermination and lost goods, shame, lack of information, support)
- Extermination process (cleaning, steam, pesticides)
- Effectiveness (repeat efforts, duration of process, outcome)

What precautions do your staff take to avoid getting bed bugs? What impact does that have on your operations?

Have you ever had issues with work refusal because of bed bugs?

Was there anything about infestations you are aware of that was unusual or unexpected like unusual patterns of spreading or like day feeding?

Do you expect, with things as they are, that this situation will get better or worse over time?

APPENDIX D

Key Informant Interview Script—SUFFERERS

I'd like you tell me about your [your client's] experience with bed bugs, including how you [they] got them, what it was like having them.

Are you aware of how you got bed bugs?

Prompt for:

- Where do you think you got them?
- Were you aware that there was an infestation at the location from which you got them?
- Where in the home/setting that you know had bed bugs?
- Were you in a home/setting that you think may have had bed bugs?
- Do you know if any units next to you had bed bugs?

How did you figure out that you had bed bugs?

Prompt for:

- Searching online, blogs, etc.
- Identified by family doctor
- Identified by family or coworker

How did you feel when you found out that you had bed bugs?

Prompt for:

- General feelings (scared, violated, ashamed, etc.)
- What was your initial reaction (anger, loneliness)?

After you discovered that you had bed bugs, what did you do?

Prompt for:

- Call an exterminator; search place for other sites of infestation
- Throw away furniture
- Inform other people who had come in contact with place

Did you disclose that you had bed bugs to family, friends, and coworkers? If so how was their reaction? How did that make you feel?

Prompt for:

- Did they support you?
- Did they isolate themselves from you?
- Were they shocked and concerned for you?

Did you feel that you needed to socially isolate yourself from family, friends, and coworkers? If so, why?

What were the impacts of having bed bugs on your personal life?

What were the impacts of having bed bugs on your work?

What were the impacts of having bed bugs on your family?

Where did you turn to get emotional support?

Did having bed bugs affect your performance at work?

What were some of the psychological effects of having bed bugs?

Prompt for:

- Depression
- Anxiety
- Loss of sleep
- Loss of focus

How did these psychological effects affect you and your health?

Did you notice any changes in other members of your household? If so, what kind of changes?

Prompt for:

- Changes in children's behaviour
- Changes in partner's behaviour
- Changes in people's behaviour at work

Did you personally feel stigmatized, or discriminated against, for having bed bugs? If so, how? Why?

I'd like you to tell me about your [your client's'] experience with bed bugs, how you dealt with them, and the costs of dealing with them.

How far along was the infestation when you first noticed it?

Are you aware of the number of infestations and the sizes of infestations that you had?

Can you please describe the methods and measures that you took to address your bed bug infestation?

Prompt for:

- Self-help methods (self-spraying, natural remedies, unsafe measures, etc.)
- Calling a pest control company
- Alternative methods such as IPM, sealing their house, steaming, buying a mattress cover, vacuuming, etc.

What made you decide to use these methods?

What was the financial cost of having bed bugs?

Prompt for:

- Costs of throwing away good, clothes, extermination
- Costs of cleaning and prepping
- Other identifiable cost

How long was the duration of treatments, and do you feel that these treatments were effective?

Did you have to undergo repeated treatments; if so, why?

Were you able to handle the financial costs of dealing with your bed bug infestation?

In your experience, what do you think works and does not work when it comes to dealing with bed bugs?

What would make it easier for you to deal with a bed bug infestation?

I'd like you tell me what kind of advice you would give people working on the issue of bed bugs, including government.

Is there anything that surprised you about your experience with bed bugs?

What kinds of supports do you wish you had to help you to better address your bed bug problem?

What kinds of information/educational tools would be helpful for people who are dealing with bed bugs?

What kinds of supports do you think are needed to help people who are suffering from bed bugs?

Prompt for:

- Financial
- Emotional
- Educational

Who, or what institution, do you think is the most appropriate to administer bed bug education and why?

APPENDIX E

Key Informant Interview Script—EXPERT/AGENCY COMBINATION

GENERAL

Name:

Organization:

Position:

Who can get bed bugs?

Why do you think that people associate bed bugs with low incomes or marginalized people?

Are there things that contribute to the likelihood of getting bed bugs?

Prompt for:

- Used materials
- Travel

Are there things that contribute to the likelihood of an infestation?

Prompt for:

- Building condition
- Clutter
- Ability to address

How do you define an infestation?

Are there different levels of infestations? If so, how are they classified?

Are there things that contribute to the severity of infestations?

Prompt for:

- Clutter
- Building condition, etc.)

Does that affect some populations more than others?

Have any of your clients ever had bed bugs?

Do you have a sense of how they came to be in their units?

Accept standard answers (friends with infestations, used furniture/clothing).

Prompt for:

- Have you come across any unusual forms of spreading such as active walking, day travel, outdoor travel? Describe.
- Have you encountered any bed bug spread that was unusual for other reasons (prompt: odd

location)? Describe.

- Are there any circumstances you have seen that make spreading more likely (prompt for: person's behaviours, structure of building, etc.)? Describe.

Are there things that contribute to the likelihood of spreading from an infested site? Does that affect some populations more than others?

In what ways have you seen bed bugs spreading?

Prompt for:

- Transfer from sites other than visits to homes
- Independent travel between units
- Independent travel between buildings

Have you encountered cases of bed bugs travelling during the day? If so, can you describe the circumstances?

What should be done to try to manage the spread of bed bugs?

Can you describe the kinds of bed bug incidents your clients experience and any patterns you see in those incidents?

Prompt for:

- What percentage of your clients would you say have had problems with bed bugs?
- Do some clients seem to get bed bugs more than others? If so, what is the pattern? (check for income, travel, mental health, other challenges, clutter, age or condition of unit)
- Why do you think there would be a pattern here?
- Do your clients have recurring problems?
- Generally, for those people how often does it recur? For how long?
- Have some clients had what you would consider a serious infestation?
- Can you describe the infestations (e.g., numbers of bugs or areas infested, visibility of infestation)?
- Do some clients seem to get serious infestations more than others? If so, what is the pattern (prompt: who gets serious infestations)? Why do you think that pattern exists?

Have you encountered cases of bed bugs feeding during the day? If so, can you describe the circumstances?

How long have you been aware of bed bugs?

Have you seen changes relating to bed bugs in the past few years?

Prompt for:

- Have you seen a change in the frequency of incidents in the last several years?
- Have you seen a change in the intensity of incidents in the last several years?
- Have you seen a change in who is getting bed bugs in the last several years?
- How would you describe it?

What precautions do your clients take to avoid infestation and later recurrence?

How do they know to take these precautions?

How effective are they?

What precautions do you and your staff take to avoid infestation and later recurrence in your clients' residence?

How effective are they?

What kind of information or education might help clients be more proactive in preventing bed bugs or effective in addressing them?

Prompt for:

- Form (workshops, flyers, posters)
- Content (general information, treatment, prevention tips)
- Source
- Distribution method

Who, or what institution, do you think is the most appropriate to administer bed bug education and information, and why?

How has your work changed at all in light of what you now know about risk?

What have been the consequences of infestations for your clients?

Prompt for:

- Costs (extermination, thrown away goods)
- Impacts on family and personal life
- Impact on sleep, health, wellbeing
- Psychological impacts

Do you have clients who have infestations but say they don't mind?

If so, why are some clients more tolerant of bed bugs than others?

How have bed bugs affected your work (and/or personal life)?

What have been the consequences of infestations for you?

Prompt for:

- Costs (extermination, thrown-away goods: try to identify an average cost and if the cost changes with severity of the infestation)
- Refusal of access and services to clients who have bed bugs
- Clients refusing services due to fear of bed bugs
- Increased complaints
- Challenges with staff

Can you tell me how you and your clients deal with infestations?

Prompt for:

- Tenant-led extermination efforts (prep/cleaning, steam, pesticides, disposal of goods,

- inspection of adjoining units, dusting, landlord notification)
- Request to client's landlord to take action on the infestation
- Tracking effectiveness of extermination (repeat efforts, duration of process, outcome)
- Referrals to social supports, advice for clients (check on information, accessibility, effectiveness)

How do/did you choose a pest control company?

In your experience, what is required to eradicate a bed bug infestation?

Prompt for:

- Inspection
- Cleaning
- Steaming
- Pesticide application (including dust)
- Education
- Inspection and treatment of adjacent units
- Notification of the managers and occupants of the infested building
- Return visits
- Process for return visits

What is the typical cost required to eradicate infestations?

Does that cost change with the severity of the infestations?

What is the range?

Are you aware of any resources or supports for people who have been psychologically impacted or had their health adversely impacted due to bed bugs?

Do you think that there should be some kind of support to assist people who have been impacted by bed bugs?

What barriers have you encountered in dealing with bed bugs?

Prompt for:

- Unit access
- Costs
- Shame/fear of bad reputation
- Lack of information
- Lack of supports

What can help overcome those barriers?

Have you encountered incidents or infestations in non-residential areas (e.g., offices, meeting rooms, common spaces)?

Have any of your staff ever had bed bugs?

Can you tell me about that experience?

Prompt for:

- Do you know if they got them from a unit or from a non-residential area?
- Do you know if they got them through their work?
-

How has that affected your staff?

Prompt for:

- How it felt, the impacts on family and personal life, the impact on sleep or any psychological impacts
- Precautions, effectiveness of precautions, changes in attitudes toward work, family and friend reactions, stress, costs for extermination and lost goods, shame, lack of information, support)
- Extermination process (cleaning, steam, pesticides)
- Effectiveness (repeat efforts, duration of process, outcome)

What precautions do your staff take to avoid getting bed bugs? What impact does that have on your operations?

Do you think most people who are at risk in their jobs are aware of their risk?

Have you ever had issues with work refusal because of bed bugs?

Do you have any mandatory reporting procedures for staff who encounter bed bugs?

Does your agency/group currently provide any bed bug–related services? If so, which ones?

Prompt for:

- Inspections
- Education
- Access to financial assistance/resources
- Cleaning of units/prep work
- Booking pest control services
- Communication with landlords
- Liaise with OW/ODSP for Community Start-Up or other funds
- Vacuuming
- Referral to other resources
- Other _____
- If not, why not?
- If not, what do you currently do when clients/units have bed bug problems?

(If provides bed bug–related service): What led you to get involved in bed bug issues?

If funding were available, would you want to be involved in more bed bug work or would you want to leave that to outside resources?

If so, what type of bed bug work would you like to do? What would you be able/interested in doing?

Prompt for:

- Inspections of clients' homes
- Inspections of external community members' homes
- Education sessions
- Mental health counselling/support around anxiety
- Prep/cleaning to prepare a home for pest control
- Starting a social enterprise to provide prep and/or spray services
- Other _____

What resources would you need to do that?

Would you be interested in promoting efforts to improve the work being done to address the bed bug problem?

Was there anything about infestations you are aware of that was unusual or unexpected like unusual patterns of spreading or like day feeding?

What do you know about bed bugs that you would want others to know?

(For out of town only): What's different or distinct about your experience because of where you live?

(For out of town only): Are bed bugs just a Toronto issue?

Do you expect, with things as they are, that bed bugs will get better or worse over time?

APPENDIX F

Key Informant Interview Script—EXPERTS

GENERAL

Name:

Organization:

Position:

**Have you ever encountered bed bugs through your work or in other ways?
Please describe how you normally come in contact with bed bugs.**

INCIDENCE

Who can get bed bugs?

Why do you think that people associate bed bugs with low incomes or marginalized people?

Are there things that contribute to the likelihood of getting bed bugs?

Prompt for:

- Used materials
- Travel

Are there things that contribute to the likelihood of an infestation?

Prompt for:

- Building condition
- Clutter
- Ability to address

Does that affect some populations more than others?

Are there things that contribute to the severity of infestations?

Prompt for:

- Clutter
- Building condition, etc.

Does that affect some populations more than others?

SPREADING

**Are there things that contribute to the likelihood of spreading from an infested site?
Does that effect some populations more than others?**

What ways have you seen bed bugs spreading?

Prompt for:

- Transfer from sites other than visits to homes
- Independent travel between units
- Independent travel between buildings

Have you encountered cases of bed bugs travelling during the day? If so, can you describe the circumstances?

What should be done to try to manage the spread of bed bugs?

NON-RESIDENTIAL INFESTATION AND TRANSFER

How do you define an infestation?

Are there different levels of infestations? If so, how are they classified?

We've heard of people finding bed bugs in non-residential settings such as schools, offices, movie theatres, public transit, and office buildings. Have you encountered any infestations in these locations?

Have you encountered any cases of bed bugs being transferred to someone else's home through these transfer points? If so, did this result in an infestation?

Have you encountered cases of bed bugs feeding during the day? If so, can you describe the circumstances?

CHANGE IN SEVERITY

Have you seen any changes in the rate or types of bed bug incidents in the last five years?

Have you seen changes in the severity of incidents?

Have you seen changes in the locations of bed bug incidents?

Prompt for:

- Types of people
- Types of businesses
- Types of settings

Given the current attitudes and awareness about bed bugs in Toronto, what do you expect will happen with the rate of infestation in the city of the next 5 to 10 years?

IMPACTS

Have you come across any instances where bed bugs have had an impact on someone's life beyond

the physical bites?

- What were those impacts?
- Specifically, do you think are any psychological impacts associated with bed bug infestations?
- How do these impacts affect the overall health and well-being of someone affected by bed bugs?
- Have you come across any instances of people becoming stigmatized by bed infestations?
Why is this?
- Are you aware of any social stigma associated with bed bugs?
- What have the social impacts of this been?
- How do you think people deal with this?
- Are you aware of any resources or supports for people who have been psychologically or had their health adversely impacted due to bed bugs?
- Do you think that there should be some kind of support to assist people who have been impacted by bed bugs?

TREATMENT

In your experience, what is required to eradicate a bed bug infestation?

Prompt for:

- Inspection
- Cleaning
- Steaming
- Pesticide application (including dust)
- Education
- Inspection and treatment of adjacent units
- Notification of the managers and occupants of the infested building
- Return visits
- Process for return visits

What is the typical cost required to eradicate infestations?

Does that cost change with the severity of the infestations?

What is the range?

What are the barriers that people experience to addressing infestations?

What would help them overcome those barriers?

What should be done to prevent reinfestation?

INFORMATION

What kinds of information would be helpful for people who deal with bed bugs?

How would that information be best distributed?

What kind of education would be the most effective for residents? For property managers? For pest control companies?

Who, or what institution, do you think is the most appropriate to administer bed bug education and why?

If there was one thing that you wanted to know about bed bugs, that would help eradicate bed bugs in North America, what would it be? Is there anyone we should be speaking with, or any reports we should be reading, to get a better understanding of these bed bug issues?

APPENDIX G

KEY INFORMANT INTERVIEW LIST

1. Reg Ayre, Toronto Public Health
2. Andalie Andamali, Toronto Community Housing
3. Heidi Billyard, Good Sheppard Centers
4. Gerard Brown, DC Public Health
5. Brad Butt, Greater Toronto Tenants Association
6. David Cain, Pest Control London, England
7. Paula Cassin, ABI Possibilities
8. Renee Coree, New York vs Bed Bugs
9. Sandy Costa, Pest Control
10. Stephen Doggett, University of Sydney and Westmead Hospital, Australia
11. Paula Fletcher, Toronto City Counsellor
12. Steve Floros, Toronto Community Housing
13. Dr. Abbass Ghavam-Rassoul, CAMH & St. Michael's Hospital
14. Michael Goldman, Pest Control
15. Richard Grotsch, Bug'n'Scrub
16. Dr. Camille Jones, Cincinnati Public Health
17. Dan Kass, New York City Health Department
18. Stephen Kells, University of Minnesota—Entomology
19. Steve Koufis, Pest Control
20. Cathy Loik, Toronto Public Health
21. Anne Longair, Toronto Shelter Services
22. Hazel Lynn, Grey Bruce
23. Elaine Magil, WoodGreen Community Services
24. Celine Mauboules, Vancouver Housing Planner
25. Rocky Merz, Cincinnati Health Department
26. Eric Hardback, Pest Control
27. Victoria Natola, Federation of Metro Tenants Association
28. Dr. Richard Pollack, Laboratory of Public Health Entomology, Harvard School of Public Health
29. Dr. Michael Potter, University of Kentucky—Entomology
30. Sean Rollo, Bed Bug Expert
31. Michael Siciliano, New York Department of Education—Pest Control
32. Jacqueline Schwan, Grey Bruce
33. Lou Sorkin, Museum of Natural History
34. Bed Bug Sufferer #1
35. Bed Bug Sufferer #2
36. Bed Bug Sufferer #3
37. Bed Bug Sufferer #4
38. Bed Bug Sufferer #5
39. Bed Bug Sufferer #6
40. Bed Bug Sufferer #7
39. Dr. Tomislav Svoboda, Seaton Hall & St. Michael's Hospital
40. Amele Teffera, Sherbourne Bus
41. Lynsdy Thomas, WoodGreen Community Services
43. Glenn Weppler, Ryerson University
44. Sandy Woodhouse, Peterborough CAMH
45. Rima Zavys, WoodGreen Community Services