Do the Same Houses Poison Many Children? An Investigation of Lead Poisoning in Rochester, New York, 1993–2004

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SYNOPSIS

Objectives. In several cities, researchers have found that a discrete number of properties owned by a small number of owners house multiple lead poisoned children over time. The purpose of this study was to determine whether or not a small number of properties were implicated in the poisoning of multiple children in Rochester, New York, between 1993 and 2004.

Methods. We analyzed the patterns of ownership and repeated positive environmental investigations (i.e., documented lead hazards) in homes of lead poisoned children using county health department data during a 12-year period.

Results. A small percentage (14.8%) of properties in which the health department found a lead hazard had previously documented lead hazards. When a second positive investigation occurred, the average elapsed time between investigations was a little less than three years. Only four property owners owned more than two properties that had multiple positive investigations.

Conclusions. In some cities, a small number of properties or property owners provide housing for a large percentage of lead poisoned children. However, this situation is not universal. In Rochester, a relatively small percentage of homes that housed a child with an elevated blood lead level have a history of housing lead poisoned children. In cities like Rochester, lead hazard reduction resources should focus on high-risk housing stock determined by factors such as age, value, and condition, rather than on those with a prior record of housing lead poisoned children.

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Childhood lead poisoning remains a significant health threat, particularly in many older urban areas.[1] The six-year post-intervention evaluation of 14 U.S. Department of Housing and Urban Development programs showed that well-designed lead hazard control projects are effective in reducing lead hazards for an extended period of time.[2] However, public funds for lead hazard control are limited. It is essential to target these and other resources efficiently to help communities meet the federal goal of eliminating childhood lead poisoning.

In several cities with high lead poisoning rates, researchers have identified a discrete number of properties that have been responsible for a large number of elevated blood lead level (EBL) cases over time. For example, a recent study found that 67 high-risk buildings in Chicago were associated with a total of 994 children with EBLs from 1997–2003.[3] While this was a small percentage of the total population of 49,362 children with EBLs during that time, it suggests that in cities with multi-unit buildings with recurrent lead problems, it may make sense to target resources to structures with a history of housing lead poisoned children.

Similarly, Rappaport found that a small number of property owners were responsible for the housing of 20% (797) of the children with blood lead levels higher than 20 µg/dL in Providence, Rhode Island, between 1993 and 2001.[4] In such situations, targeting lead hazard reduction efforts at owners of properties where children were poisoned in the past could yield great dividends in reducing the number of lead poisoning cases. This may be particularly true when a small number of owners own a large proportion of the high-risk properties in the community.

These well-publicized reports may suggest that most cities with high lead poisoning rates similarly have a small number of landlords who own many repeat poisoning properties and are responsible for a significant portion of childhood lead poisoning cases. If so, identifying and targeting lead hazard control efforts at these properties could efficiently prevent lead poisoning. Indeed, some government agencies have developed policies based on this observation, such as targeting federal lead hazard reduction grants at the homes of previously lead poisoned children. However, implementing such policies in a community without such a pattern of repeat poisoning properties could result in inefficient, if not dangerously misdirected, lead poisoning prevention strategies.

Lead poisoning rates in Rochester, New York, are approximately 10 times the national average. A 2002 study commissioned by the Monroe County Department of Public Health reported that 23.6% of the City of Rochester children younger than 6 who were screened for lead between 1993 and 2000 had blood lead levels higher than 10 µg/dL.[5] The geographic distribution of Rochester's lead problem appears to be typical of cities with high lead poisoning rates in many ways. Most of the childhood lead poisoning occurs in the 90% of Rochester's 99,789 housing units that were built prior to 1950.[5] Most of these buildings are one- to four-unit houses that are currently rented to low-income families in the "crescent," an area characterized by high rates of poverty, crime, and pre-1950 rental housing surrounding Rochester's central city. Many of the houses in this area have been poorly maintained, resulting in lead hazards.

However, Rochester housing experts and community group leaders recognize that the ownership pattern of low-income rental housing in Rochester is different from many other cities in several ways. In Rochester, most landlords own only one or two properties; very few property owners or management companies own large numbers of properties.

This article investigates the pattern of repeat poisoning properties during a 12-year period in Rochester in the context of targeting lead hazard control resources efficiently. The analysis addresses two related questions. First, when the health department identifies lead hazards in the home of a child with an EBL, how frequently is it that that property had been previously identified with lead hazards in an EBL investigation? Second, is there an identifiable number of property owners whose properties were repeatedly implicated in EBL investigations? If the answer to either or both of these questions was "yes," a targeted strategy of education, enforcement, and lead hazard control focused on properties with prior lead hazards might significantly reduce EBLs in Rochester. We found that neither is the case; therefore, a different strategy for primary prevention is necessary to eliminate childhood lead poisoning in Rochester.

METHODS

Data source

We obtained data from the Monroe County Department of Public Health on the addresses and dates of positive environmental investigations that occurred between 1993 and 2004 in the homes of Rochester children with EBLs. These environmental investigations were triggered by the report of a child with a blood lead level above the current action level. Prior to fall 2003, this level was 20 µg/dL; after that date, investigations could also be triggered by two venous tests

with results higher than 15 µg/dL within a year but at least three months apart. Both primary residences and other properties where the children spent significant time were investigated. Only properties with positive investigations (those in which a lead hazard was found) were included in the database.

After identifying lead hazards at a property, the health department required the property owner to address the hazards under guidelines set by the New York State Department of Health pursuant to Part 67 of the New York State sanitary code. Property owners generally addressed lead hazards using temporary controls, such as paint stabilization, rather than full abatement. Because temporary controls do not remove all the lead from the property, there is the possibility of recurrence of lead hazards at properties with environmental investigations. Recurrence of lead hazards is unlikely in the small number of cases (generally where there had been repeated poisonings) in which abatement was required. Also, it is important to note that some of the repeat poisoning properties have been demolished since they were last implicated in a case of lead poisoning.

Data analysis

In addition to the health department's environmental investigation data, we accessed the City of Rochester's Web-based tax assessment database. We matched this data to the health department records to obtain current ownership and use (owner occupied or rental) information for the repeat poisoning properties. We analyzed the database in a Microsoft® Excel spreadsheet.[6] For each property, we compiled the dates of each positive environmental investigation. We calculated the percentage of properties and units in each year that had had a prior positive investigation. To investigate whether the effectiveness of lead hazard control treatments changed over time, we then calculated the number and percent of properties that had had an investigation in the past three years and the length of time between investigations.

RESULTS

Frequency of repeat poisoning properties

Between 1993 and 2004, the health department conducted 4,003 positive environmental investigations in the homes of children with EBLs (Table 1). These investigations occurred at a total of 3,289 properties. The health department investigated 500 (14.8%) of these properties two or more times (referred to here as "repeat poisoning properties"). The vast majority (406) of the properties with repeat visits had a total of two positive investigations; only 18 had more than three total visits.

Table 1. Frequency of repeat positive investigations at residential properties/units, 1993–2004

Number of investigations per property/unit	*Properties investigated*		*Units investigated*	
	N	*Percent*	N	*Percent*
One	2,789	85.2	3,280	90.6
More than one	500	14.8	340	9.4
2	406	12.0	304	8.4
3	76	2.2	29	0.8
4	16	0.5	7	0.2
5	2	0.1	0	0.0
Total properties/units investigated	3,289	100	3,620	100

It is important to note that the number of housing units that were investigated multiple times is lower than the number of properties with multiple visits (i.e., repeat properties). For example, if an investigation took place in an upstairs unit of a two-unit house, the hazards in that unit would have been cited and repaired. But unless the child spent time in the lower unit, the health department would not have investigated and ordered repairs in the lower unit. Two years later, a different child with an EBL might live in the lower unit, thereby triggering a second investigation. If the health department then found hazards at that unit, we recorded this as a repeat poisoning property, but not a repeat poisoning unit. The distinction between repeat properties and repeat units is made in Table 1. Each year, more total units than properties are investigated because a property could have two or more units that had a positive investigation in the same year (i.e., if the child spent significant time in both units of a two-unit property).

Unit information was not complete for 44 data entries. Table 1 shows repeat property visits only for those visits in which unit information was consistent and identical for all investigations. For example, if unit information was included for one investigation but not another, it was assumed that the investigations took place at different units. Because of this conservative assumption in the cases with incomplete information, Table 1 may underestimate the number of units with multiple positive investigations. The actual number of units with repeat positive investigations may have been as high as 387 (9.7%).

For those properties that had multiple positive investigations, a mean of 921 days (a little more than two and a half years) elapsed between visits. A quarter

of the repeat visits occurred within approximately one year (334 days) and half within two years (616 days). To determine whether the patterns of repeat investigations changed over time, the annual positive investigations data were analyzed by whether the property had had an investigation in the prior three years.

Not surprisingly, there were a small number of repeat investigations in 1993 and 1994, because investigations were not recorded for the prior three years. Data from these years are included to show the trends in the total number of positive investigations conducted over time. One might expect that if the efficacy of interventions ordered to address lead hazards improved over time, there would be a decreasing percentage of investigated units with prior positive investigations in the previous three years. However, there is no consistent pattern of change between 1995 and 2004. Omitting 1993 and 1994, the data show that of all the units inspected in any one year, between 3.8% and 14.2% (between 6.2% and 26.7% of properties) had been found to have a lead hazard in the prior three years (Table 2).

Ownership patterns of repeat poisoning properties

Among the 500 properties with repeat investigations, addresses of 471 (94.2%) were matched with ownership data in the online City of Rochester tax assessment database. The remaining 29 properties could not be matched using the tax assessment database, likely due to the use of multiple address names or an error in address data entry. Of the 471 matched properties, 68 (14.4%) were owned by the City of Rochester, generally as a result of tax foreclosure. Of these 68 properties, 45 (66.2%) were listed as vacant lots because the structures had been demolished. Thus, at least 9% (45 of 500) of the repeat poisoning properties no longer exist. An additional 63 properties were listed as owner occupied. According to the tax assessment database, the remaining 340 (72.2% of the 471 matched properties) were rental properties, suggesting that about three-quarters of the repeat poisoning properties were rental housing.

To explore the hypothesis generated by the experience in cities like Providence and Chicago—in which a small number of property owners own properties that may be responsible for a significant percentage of total lead poisoning prevention cases—we explored the ownership patterns of homes that had multiple positive investigations during this period of time. Table 3 shows the number of owners who owned one or more rental properties with multiple positive investigations (i.e., repeat poisoning rental properties).

The majority of owners of repeat poisoning rental properties owned only one such property. Of those who owned repeat poisoning properties, 88.6% owned only one; another 10.1% owned two. Only one owner owned more than three repeat poisoning rental properties. Table 3 may underestimate the number of properties owned by a family or corporation, as matches were made by exact name only, although some owners may do business under multiple names (such as different family members' names). It is also important to note that many of these properties changed owners over time, so the current owner may not have owned the property at the time of the most recent environmental investigation.

In addition, the vast majority of the owners of these repeat poisoning rental properties were very small-scale landlords. A search of the entire city tax assessment

Table 2. Properties/units with a prior positive investigation in the previous three years

Year	Number of properties investigated	Properties with investigation within prior three years		Number of units investigated	Units with investigation within prior three years	
		N	Percent		N	Percent
1993	584	17	2.9	588	8	1.4
1994	822	81	9.9	893	43	4.8
1995	472	126	26.7	593	84	14.2
1996	350	57	16.3	412	35	8.5
1997	243	40	16.5	297	24	8.1
1998	206	24	11.7	263	17	6.5
1999	148	19	12.8	195	14	7.2
2000	133	14	10.5	169	10	5.9
2001	113	7	6.2	132	5	3.8
2002	127	13	10.2	156	8	5.1
2003	100	19	19.0	137	11	8.0
2004	91	19	20.89	129	17	13.2

Table 3. Ownership patterns of rental properties (*n*=340) with multiple positive investigations

Number of repeat poisoning rental properties per owner	*Number of owners*	*Percent of owners*
1	264	88.6
2	30	10.1
3	3	1.0
4	0	0
5	0	0
6	0	0
7	1	0.3
Total number of owners	298	100

database showed that 98.7% (294) of the individuals who owned repeat poisoning rental properties owned a total of only one or two rental properties in the City of Rochester. These data suggest that there is not a pattern of large property owners who are responsible for most of the repeat poisoning properties in Rochester.

DISCUSSION

This study did not find a set of property owners who own multiple properties in the City of Rochester that repeatedly poison children. Unlike some other cities, only a small percentage of the homes of EBL children in Rochester were later found to have lead hazards in connection with an environmental investigation for a subsequent EBL child. About three-quarters of the properties that received multiple visits were rental properties, but few property owners owned more than one such property.

There are several uncertainties that limit what we can conclude from this analysis. For example, in properties that had only one positive investigation, we could not tell whether the health department ordered repairs that continue to protect children to this day, whether children with EBLs live there but have not been screened, or whether children no longer live in the unit. Homes that previously housed lead poisoned children may actually be safer because the health department required their owners to make repairs to address lead hazards. Repairs may or may not be working in concert with public education and the federal lead disclosure laws, which may heighten residents' awareness of past or potential lead hazards in this housing. If so, it might contribute to increased behavioral risk-reduction measures, such as cleaning, hazard avoidance, and diet in homes that had previously housed a lead poisoned child. However, surveys conducted in Rochester suggest that compliance with federal disclosure laws is low, so new tenants and owners are unlikely to know about the history of lead hazards at their residence. (Unpublished data, Katrina Smith Korfmacher, PhD, Environmental Health Sciences Center, University of Rochester, August 2005.)

Despite such uncertainties, this study suggested that there is room for improvement in lead hazard treatments in homes of children with EBLs. For example, if all positive investigations in the last three years of the database (2002–2004) resulted in permanently lead safe units, more than 13% of the 129 units where lead hazards were found in 2004 would have been lead safe. It is important to note, however, that some of the children whose blood lead levels triggered these investigations may have been exposed to lead from other sources instead of or in addition to their current residence. Thus, although their residence was reinvestigated and found to have lead hazards, these hazards may or may not have been responsible for the child's EBL.

The health department tends to require more permanent controls in properties that repeatedly house lead poisoned children. Nonetheless, the fact that the average time elapsed is less than three years for those properties that did have a repeat investigation indicates that there may be a portion of the housing stock that requires more extensive and permanent controls to remain safe over time.

Another change suggested by these findings is that environmental investigators should look for lead hazards and mandate their repair in all units of a property in which lead hazards are found. Table 1 suggests that up to 160 positive investigations (32% of all repeat investigations, 4% of total investigations) occurred at new units in previously inspected properties. If all units of a multi-unit property were treated when one unit was found to have lead hazards in the course of an environmental investigation, these hazards might have been avoided. Such strong enforcement of property-wide lead hazard control has previously been found to be cost-effective.[7]

This study suggests that improvements in the treatment of properties with positive environmental investigations might slightly reduce childhood lead poisoning rates. However, because of the small number of repeat investigations, a strategy of targeting properties with past lead hazards for further lead hazard reduction measures is not likely to significantly reduce childhood lead poisoning rates in Rochester. Similarly, because so few property owners own multiple repeat poisoning properties, targeting resources at owners of properties that historically poisoned children is also not likely to be effective in reducing childhood lead poisoning rates.

However, previous studies have shown that lead

poisoning is geographically concentrated in certain neighborhoods in Rochester.[5] Studies in other cities have also suggested that lead poisoning prevention strategies should focus on neighborhoods with high risk factors for lead hazard control.[8–10] Based on this analysis, it appears that targeting high-risk areas in Rochester with systematic environmental testing and repairs has the potential to dramatically affect lead poisoning rates in the city, whereas targeting homes with past hazards does not.

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