

Healthy Homes: Lead Elimination Program Improves Quality of Life

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Abstract –Middle Tennessee State University’s (MTSU) Tennessee Lead Elimination Action Program (TN LEAP) received three separate grant awards from the US Department of Housing and Urban Development’s Office of Healthy Homes and Lead Hazard Control. The purpose of the awards is to reduce childhood lead poisoning through lead-based paint hazard remediation. TN LEAP has remediated over three hundred homes since 2006. Information generated from TN LEAP activities supplied data to a related research project funded by the National Science Foundation titled STEPping up Undergraduate Research at Middle Tennessee (STEP^{MT}). The NSF-supported project used the data generated from TN LEAP activities to determine the extent to which participants in TN LEAP remediation experience detectable improvements in their quality of life as it relates to a healthier home environment. Survey questionnaires of pre-remediation (n = 54) and post-remediation (n = 36) sites (separate samples) proved an overall improvement in conditions such as respiratory problems, headaches, peeling paint, visible powder, dust, insects, pest droppings, ventilation, and mold. The significance is that improvements indicate participants experience additional benefits beyond the elimination of lead hazards. Post-remediation individuals are more aware of health issues in the home and take steps to mitigate hazards other than lead. For example, the percent of rooms in houses without insects and pest droppings increased from 38.3% to 67.6%. Post-remediation homes that pass retesting are certified safe from major lead hazards. Surveys reported children under age six living in 70.6% of the post-remediation homes. The homes are cleaner and healthier environments for the children and adults.

Keywords: healthy, home, lead, hazard, remediation

INTRODUCTION

Middle Tennessee State University (MTSU) obtained three grants from the US Department of Housing and Urban Development’s (HUD) Office of Healthy Homes and Lead Hazard Control since 2006. The purpose of the contracts, titled Tennessee Lead Elimination Action Program or TN LEAP, is to reduce childhood lead poisoning through lead-based paint hazard remediation. The program has remediated approximately 300 homes and has about 100 more homes slated for remediation. The research reported herein is the first attempt to analyze the database of information created by the project.

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A summer research project (2010) sponsored by a grant from the National Science Foundation titled STEPping up Undergraduate Research at Middle Tennessee (STEP^{MT}) examined the TN LEAP database, conducted surveys, and analyzed the results that are reported here. The objective of the research is to gain insight into the potential spillover effects the intervention efforts have toward creating healthier homes.

BACKGROUND

Lead paint came into widespread residential use in the 19th century due to its durability, flexibility, permanence, mold resistance, and color stability. Unfortunately, it also introduced lead poisoning as a ubiquitous hazard in the home where it previously occurring primarily due to occupational exposure in adults. Lead does not degrade and is strongly absorbed to soil. In fact, lead from past uses such as deteriorating exterior paint, still remains in the soil in drip-line areas surrounding the perimeter of dwellings.

Lead is a neurotoxin that can lead to impaired speech and hearing, hyperactivity, impairments in learning and memory, and irreversible brain damage. Young children are extremely vulnerable to its effects due to low body weight, iron deficiency, poor nutritional status, and hand-to-mouth activity. For the past 30 years, epidemiologic studies have found inverse associations between children's intellectual functioning and blood lead concentrations [Caron, 1]. Even at low levels of exposure, lead can affect a child's mental and physical growth. Fetuses exposed to lead in the womb, because of their mothers exposure, either previously or while pregnant, may be born prematurely and have lower weights at birth. Exposure in the womb, in infancy, or in early childhood can have detrimental effects that persist lifelong [Shannon, 6].

The United States banned lead-based paint in 1978. In 1992, Congress passed the Housing and Community Development Residential Lead-Based Paint Hazard Reduction Act (Title X) to protect families from exposure to lead from paint, dust, and soil associated with lead paint in residential homes. Congress also established the HUD Office of Lead Hazard to oversee implementation with the mandate to eliminate lead-based paint hazards in private owner and low-income tenant occupied homes through grants to communities that addresses lead paint hazards at the local level.

Middle Tennessee State University's Tennessee Lead Elimination Action Program (TN LEAP), through a HUD grant award, identifies through inspection and risk assessment, then controls, lead-based paint hazards in pre-1978 properties owned by qualified applicants with jurisdiction across the state of Tennessee. The MTSU TN LEAP program's three rounds of competitive funding awards are from the HUD Office of Healthy Homes and Lead Hazard Control. The primary funding goal is childhood lead poisoning prevention through lead-based paint hazard control in privately owned residential housing where children less than six years of age live, visit, or play. The purpose of this study is to gain insight of the spillover health effects due to the TN LEAP program interventions.

Studies have demonstrated that housing interventions such as addressing structural deficiencies or lack of safety devices have spillover effects that improve health [Jacobs, 2 and 3, for example]. The research, coupled with reports by health care and housing professionals, has generated interest in promoting health by addressing unhealthy housing conditions—but with a holistic approach. In 1999, the Office of Lead Hazard Control changed to the Office of Healthy Homes and Lead Hazard Control with the goal of transitioning to a program with combined objectives [Maring, 4]. Healthy Homes programs are comprehensive and focus on multiple residential housing hazards beyond lead poisoning, such as pest management, mold, fire safety, and carbon monoxide poisoning prevention. Addressing multiple issues for residents in a single home visit or intervention process can improve the quality of life, protect the health and safety of more people, and ultimately reduce nation health care costs [Meyer, 5].

DATA COLLECTION

A component of the third HUD award to TN LEAP was to begin the process of transitioning from a Lead Hazard Control (LHC) program to a multi-faceted Healthy Homes Initiative program. The first step was to develop a Healthy Home Initiative survey instrument (HHI) for obtaining information on other hazards such as sewer repair, plumbing and electrical repair, roof replacement, or weatherization. The survey was adapted from an existing instrument used by a similar program. The population studied included 319 residencies consisting of 265 post-remediation residencies and 54 pre-remediation residencies. Fifty-four applicants completed the pre-remediation survey between December 2008 and April 2010, along with the other enrollment documents required for program participation.

Survey recipients returned 36 completed post-remediation surveys. Fifty-three surveys returned unopened due to vacant property.

RESULTS

Results from the pre- and post-remediation surveys are presented in Table 1. These results illustrate the benefits of remediation even though the separate and non-equivalent samples are not conducive to statistical analysis.

The majority of householders were owners in both surveys. Most homes (55.6%) in the pre-remediation survey were built before 1960, as were 88.9% of the post-remediation homes. One or more children with elevated blood lead levels lived in 43.4% of the pre-remediation homes. Surveys reported children under age six living in 70.6% of the post-remediation homes.

Lead-based paint hazards in the homes were reduced through remediation. The number of small and large (greater or smaller than 8" by 11") areas of loose, chipping, or peeling paint or holes in the walls were substantially reduced, as were surfaces with visible gray-black powder. Poison hazards including not having the phone number of the poison control center or not having Syrup of Ipecac in the home were not substantially reduced. The percent of homes with eleven other safety hazards including electrical outlets and cords, latching or locked cabinets and drawers, or working smoke detectors also were not different between the pre- and post-remediation survey results.

Cleanliness and ventilation of the homes were improved with remediation. The percent of homes with rooms that had windows that did not open and with no inlet or exhaust vents for air was lower after remediation than among the pre-remediation homes. The percent of homes with dust, smell of mold, and visible insects and/or rodent droppings was also lower after remediation.

Improvements in the conditions to the homes through remediation resulted in a healthier environment. The percent of homes that had one or more occupants go to the emergency room for respiratory problems or headaches was lower after remediation than before remediation. These results from analysis of the pre-remediation and post-remediation surveys indicate that renovation resulted in improvements in housing conditions.

CONCLUSIONS

Although this intervention addresses health issues associated with lead, it is likely that the spillover effect [Jacobs, 2] from lead-based paint remediation is the primary cause of other improved conditions. Counseling provided to the property occupants during remediation projects may contribute to the effect. This limited study supports the idea that a holistic approach [Maring, 4] to address health issues other than lead-based paint alone will achieve even greater positive results. Such interventions will likely improve the health and safety of more people, and ultimately reduce nation health care costs [Meyer, 5]. A holistic healthy home approach combined with an energy assessment/repair protocol will address health and energy efficiency simultaneously. The energy assessment/repair element would reduce national/regional energy consumption, lower individual heating/cooling costs, and reduce strains on energy supply systems such as electric power grids and gas pipelines. This study suggests that intervention is a key element in property occupants' awareness of the importance of healthy home issues. Therefore, increasing counseling during remediation projects with more emphasis on health and safety will help achieve the long-term program objective of increasing the quantity of healthy, safe, affordable housing.

Further research could assess the utility of providing a "user's manual" to homeowners/renters of renovated homes. The manual would provide information that would stay with the home for best practices for keeping the home safe and healthy as well as provide recommended maintenance schedules. Further research could also provide evidence of what a holistic health and energy intervention program should entail.

Table 1. Pre- and Post-remediation survey results

	Pre-remediation	Post-remediation
	n = 54	n = 36
Characteristic	%	%
Owner occupied	90.74	77.78
Year built		
Before 1940	27.78	38.89
1940 - 1959	27.78	50.00
1960 - 1977	44.44	11.11
Hazards in the home		
Small areas of loose, chipping or peeling paint	65.91	31.03
Large areas of peeling paint or holes in walls	47.73	13.33
Visible gray-black powder	47.50	28.13
One or more poison hazards	80.39	76.67
One or more other safety hazards	92.31	93.75
Ventilation		
All rooms are ventilated	24.00	32.35
No rooms are ventilated	40.00	23.53
Dust		
All rooms have little or no dust	34.00	55.88
All rooms have dust	28.00	20.59
Visible insects and/or droppings		
No rooms have visible insects and/or droppings	38.30	67.65
All rooms have visible insects and/or droppings	12.77	17.65
Mold		
No rooms smell of mold	59.18	73.53
All rooms smell of mold	8.16	2.94
Health problems of occupants		
Emergency room visit for respiratory problems	9.80	2.94
Emergency room visit for headache	5.88	0.00

Note: 43.4% of pre-remediation homes had one or more children under age 6 with elevated blood lead levels

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