The Costs of Lead Poisoning in Vermont

Dartmouth Center for Evaluative Clinical Sciences (CECS)

MAD TEAM REPORT

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Executive Summary

Introduction

In 1993, Vermont passed Act 94 (amended in 1996 by Act 165) entitled the "Childhood Lead Poisoning, Screening and Lead Hazard Abatement Act." This law was designed to protect children and workers from lead poisoning through screening, treatment, education and promotion of essential management practices implemented through voluntary participation of employers, healthcare providers, homeowners and landlords. Since the passage of this law, there has been a moderate decrease in lead poisoned children in Vermont. The percentage of children tested with elevated blood lead levels (BLL's) has decreased from 9.1% in 1994 to 3.3% in 2004. It is felt that the primary driver of this drop has been the elimination of leaded gasoline, which has significantly reduced environmental lead.

Despite this significant decrease in BLL's in VT, lead poisoning still poses significant financial and social burdens for adults and children in Vermont. In 2005, 224 one and two year-old children were lead poisoned in Vermont as defined by the EPA action limit of 10 μg/dL. Once exposed to lead, the body absorbs and incorporates lead into the bone, brain, kidney and other tissues which remains a toxic risk for from 2 to 40 years depending on the storage site. All humans, especially pregnant women, their unborn babies and children less than 5 years old experience the consequences of lead toxicity, including impaired neurobehavioral development, decreased mental capability and increased risk of renal failure, hypertension and heart disease. If there is no change in current efforts to manage environmental lead exposure in Vermont, the costs of lead poisoning will likely increase as both population and inflation increase.

The central decision facing policy makers in Vermont involves the trade-off between the cost of lead poisoning prevention versus the long-term hazards which lead exposure poses for children and society. The purpose of this document is to review the risks of lead poisoning and the associated costs to Vermont's citizens so that reasonable choices for reducing lead hazards can be considered. Cost estimation is a useful tool to help build consensus about the importance of this issue and can provide reasoning for the increased funding needed to implement programs to reduce lead in Vermont. After describing the cost benefit of reducing lead exposure in the state, policy options for reforming Vermont's policy on lead poisoning will be reviewed.

Risks associated with lead

Currently in Vermont over 3 percent of tested 1 year-olds still exhibit blood lead levels over 10 μg/dL. However, many more of Vermont's children are at risk. Data obtained from the Vermont Department of Health (VDH) indicate that 23 percent of children (0 to 5 years of age) who were tested between 1997 and 2005 had lead levels between 5 -10 μg/dL. With substantial evidence indicating that levels greater than 5 μg/dL pose a risk of learning and behavioral problems, the prevalence of lead exposure in Vermont is not an isolated problem.

Costs associated with lead poisoning in Vermont

The financial burden of lead poisoning on Vermont from continued childhood lead exposure is significant. Quantifiable costs to the state for children with BLL's > 10 μg/dL are approximately $15 million annually. If loss of future income for children with low-level lead poisoning (5-9 μg/dL) is included, this annual cost climbs to approximately $80 million. These estimates are very conservative for several reasons. First, it includes only known cases of lead poisoning and many susceptible children are still not tested in Vermont. Second, these numbers only include costs that are easily quantifiable, such as loss of future earnings, medical expenses and educational costs. Many other important costs are not included in our estimation and include associated infant mortality; health effects on stature, hearing and vitamin D metabolism; the cost of violent behavior and juvenile delinquency to the criminal justice system; potential lawsuits and court cases and continued costs associated with lead law enforcement.

In addition to the monetary impact of lead poisoning, the distribution of lead in the environment places more risk on low-income families and increases the burden of lead clean-up on landlords providing housing to these families. While the uneven impact of lead poisoning raises significant environmental justice concerns, approximately 40 percent of poisoned children in Vermont live in owner occupied housing which suggests that all socioeconomic levels are affected to some degree.

Policy recommendations

Although specific policy recommendations are not the primary focus of this report, the significant costs to Vermont and the fact that efforts to date have only partially addressed the problem of lead poisoning in the state lead to the conclusion that further action to remediate the impact of environmental lead in Vermont is necessary. Due to severe risks and financial burden of lead on Vermont's citizens and communities, it is important that strong legislative leaders take action to stop this pressing public health problem. Various policy options are available to Vermont legislators, policy makers, and Vermont Department of Health. These options include:

- Supplement the current law by mandating additional funding sources and/or increased enforcement.
- Balance funding and enforcement measures to encourage participation of citizens and property owners.
- Engage stakeholders by diffusing the impact of remediation costs.
- Mandate presale lead inspection of all Vermont real estate.
- Engage and inform Vermont's citizens through targeted educational and social marketing techniques.

The Two Faces of Lead Poisoning in Vermont

Johnny

When Johnny was 1 year old, he was screened for blood lead at a local WIC clinic and found to have a blood lead level of 23 μg/dL (micrograms per deciliter of whole blood). After this screening, WIC notified the Vermont Department of Health (VDH), which in turn inspected Johnny's home for lead. The inspector found loose lead paint in the living room and bedroom window areas and on the front and back porch. Because Johnny's house was rental property, the VDH ordered the landlord to repair and stabilize the loose paint and encouraged Johnny's mother to keep the window wells and the porches clear of paint chips and dust. Although Johnny was supposed to return for additional diagnostic tests over the next year, his single mother worked two full-time jobs, making it impossible for her to meet appointments.

When Johnny was screened again the following year, he had a blood lead level of 45 μg/dL. Because of the severity of his exposure, he needed oral chelation therapy at a cost of $320 dollars, which was paid for by his Medicaid coverage. After his therapy, a second environmental investigation of Johnny's home revealed high levels of lead paint dust in the window wells. Over the next two years, VDH performed six environmental investigations and scheduled eight nurse follow-up appointments. After over $6,000 spent by VDH and Medicaid in direct health care costs, the property was deemed to be "lead-safe," and Johnny's BLL had fallen to less than 10 μg/dL.

Three years later, Johnny entered kindergarten. He had problems paying attention in class and controlling his aggressive behavior with other children. By first grade, he was placed in a special education program at a cost of $15,700 dollars per year. After three years of special education, the school district had spent $47,200 for Johnny's education. When Johnny finally graduated from high school, he took a job at a local grocery store as a checker. His grades were too low to apply for scholarships at the local community college.

Anne

When Anne was 1 year-old, her family moved into an old 19th century farmhouse in Woodstock. Her parents, both lawyers in the local community, decided they wanted to expand the house to make an extra room for Anne and her older brother, Ben. During the expansion, Anne was exposed to lead-containing dust from paint which was sanded down from the walls in her new bedroom. One month later, Anne's blood lead levels were identified in an annual screening to be 23 μg/dL. Her parents were shocked to learn of Anne's elevated levels. After learning of how she was exposed, they quickly removed the children from the house for the remainder of the construction project.

As Anne's family was fully covered by Exclaimer Insurance Co., Anne received high-quality medical care over the next four years. Her blood lead levels were tested eight more times and her calcium and iron levels closely monitored. Testing bills amounted to $70 dollars. Her parents' anxiety about their daughter's exposure was immeasurable.

Over the next few years, Anne's parents were careful to spend extra time with Anne as she began to read and write. They also invested in motor skills tutoring to make sure she did not have any attention problems when she started school. By the time Anne entered kindergarten, she was an average student without apparent attention or behavioral problems. Only her stature was a bit below average. Over the next few years, her parents continued to pay for extra tutoring of one hour per week at a cost of $100 dollars per hour, amounting to $520 per year.

Thanks to her parents' time and money spent on tutoring and education, Anne went on to lead a very successful life. She attended a four-year college and became a teacher.

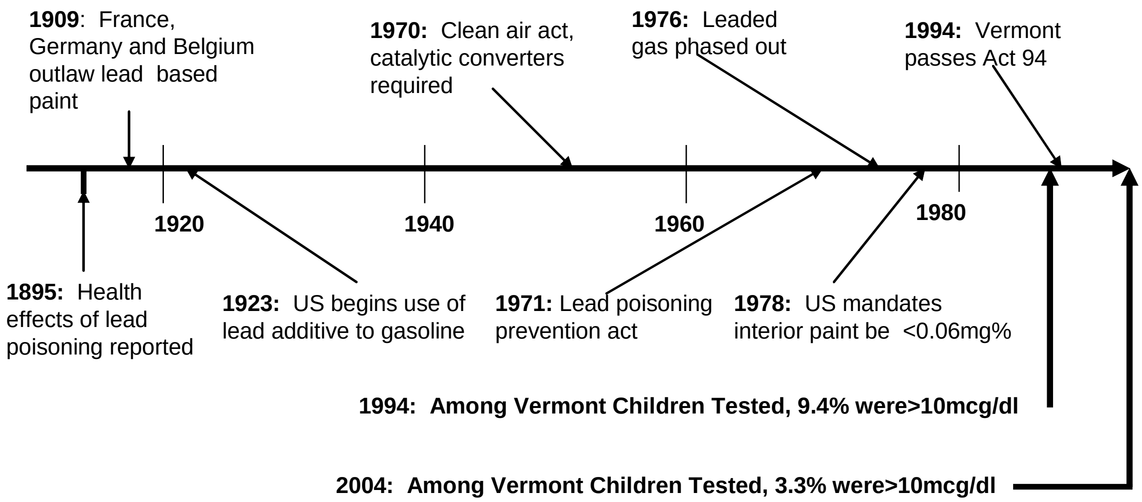
Background on Lead Poisoning

Lead poisoning is a common and preventable pediatric health problem in the United States (Kaminsky, 1998). Lead has been known to be a major public health issue for the last one-hundred years, posing both social and financial burdens on communities worldwide. Furthermore, as was alluded in two fictional lead cases, lead poisoning is not a problem of one particular geographical area, ethnic group or socioeconomic class, yet it works synergistically with other social risk factors to pose serious long-term effects on a community.

Beginning in the 1920s, childhood lead poisoning began to gain wider recognition as a common childhood disease (Rabin, 1989). In the United States, articles began to appear in medical journals and textbooks, recounting cases of children poisoned by ingesting the lead paint in their homes on woodwork, baby cribs, and other furniture (Rabin, 1989). Today, although research has since identified a number of different sources of lead (for example, consumer products, food and water), ingesting lead-contaminated dust is still the most common pathway of exposure.

Despite the substantial evidence which documented the risk of lead in the 1920s and 30s, federal legislation did not prohibit the production of lead paint until 1971. Shortly thereafter, in 1978, the acceptable limit for indoor paint was lowered to 0.06%. Unfortunately, by this time, significant damage to public health and the environment had already been done. According to the National Health and Nutrition Examination Survey (NHANES) conducted between 1976 and 1980, 700,000 children under the age of six had elevated blood lead levels (BLL's) (Mahaffey, 1980) (Figure 1).

Figure 1 Timeline of Lead



Adapted from www.chicagolead.org

Lead Poisoning and Leaded Gasoline

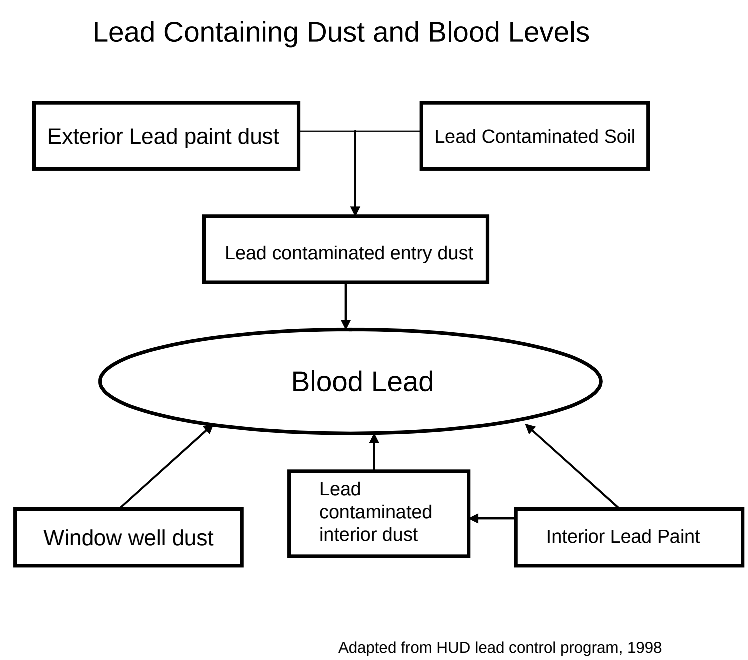
Data from NHANES III in 1994 revealed a 68% reduction in elevated blood lead levels for the total U.S. population and a 64% reduction for children compared to NHANES I, 1974 (NHANES, 2006). Most experts from the Center for Disease Control (CDC, 2005) and Housing and Urban Development (HUD) feel that the primary driver of this drop was the elimination of leaded gasoline in the mid-1980s, which has significantly reduced environmental lead. Despite these reductions, fuel combustion emission residue in soil, left behind from sixty years of leaded gasoline use, is still one of the three main environmental sources of lead, along with lead paint from housing built before 1978 and industrial sites from the 18th and 19th centuries (Bailey et al., 1998).

Special Impacts of Lead on Children and Pregnant Women

Because of their small body mass relative to adults and stage of neural development, children are the most vulnerable population to lead poisoning. In the U.S, approximately 310,000 children aged 1-5 years have blood lead levels (BBL's) greater than the CDC recommended level of 10 micrograms of lead per deciliter of blood (μg/dL) (CDC, 2005). A large number of rigorous experimental studies have provided evidence regarding the adverse effects of lead on the developing central nervous system at levels as low as 10 μg/dL (Needleman et al., 1990). Severely high lead exposure levels in children (BLL's over 80 μg/dL) can cause coma, convulsions and death. Lower exposure levels can cause serious changes in both cognitive and behavioral function by damaging the central nervous system (Wakefield, 2002).

Children are at greater risk for lead poisoning than adults because they absorb lead from the gastrointestinal tract more readily (Bellinger et al., 2004). The combination of children's normal hand to mouth behavior and floor crawling during infancy places them at risk of exposure to lead in contaminated dust. As shown below, there are a number of routes by which lead-containing dust can collect and migrate within a house (Figure 2).

Figure 2: Major routes of exposure to lead-containing dust



In addition to environmental lead, poisoning can also occur during and after pregnancy. Pregnant women can transmit their blood lead to a fetus through the placenta, thereby causing low birth weight and fetal death. Nursing mothers can also transmit lead through breast milk to developing infants (Ettinger et al., 2004; Ettinger et al., 2006). The transmission of maternal blood lead occurs via direct transplacental transfer while contaminated breast milk continues to expose the child to lead. Nearly 100% of the lead found in the breast milk is bioavailable to the infant (Anastacio et al., 2004) although in smaller quantity than during the pregnancy.

Special Impacts of low blood lead levels (BLL<10 μg/dL)

The CDC reduced the action limit for a measured BLL in children from 25 μg/dL to 10 μg/dL in 1985. Although many consider BLL's lower than 10 μg/dL to be "normal," pre-industrial humans had virtually no lead exposure and virtually no bone or dentine stores of lead (Patterson et al. 1991). Significant evidence now suggests that BLL <10 μg/dL affects children's health, especially in terms of neurobehavioral development. Several recent studies indicate that BLLs below the current threshold in children leads to significant intellectual impairment as measured by IQ. Estimates of loss of IQ due to low lead exposure (BLL<10 μg/dL) range from 3.9 to 7.4 IQ points (Lanphear et al. 2005, Canfield et al. 2003, Bellinger and Needleman, 2003).

In addition to IQ loss, some studies have linked low BLL's to health effects, such as neurobehavioral deficits (Chiodo et al. 2004); poor academic performance (Lanphear et al. 2000); increased dental caries (Moss et al. 1999); increased risk of spontaneous abortion (Borja-Aburto et al. 1999) and hearing loss (Schwartz and Otto, 1991). This evidence reinforces the belief that there is no known safe BLL threshold for children. (See Figure 3)

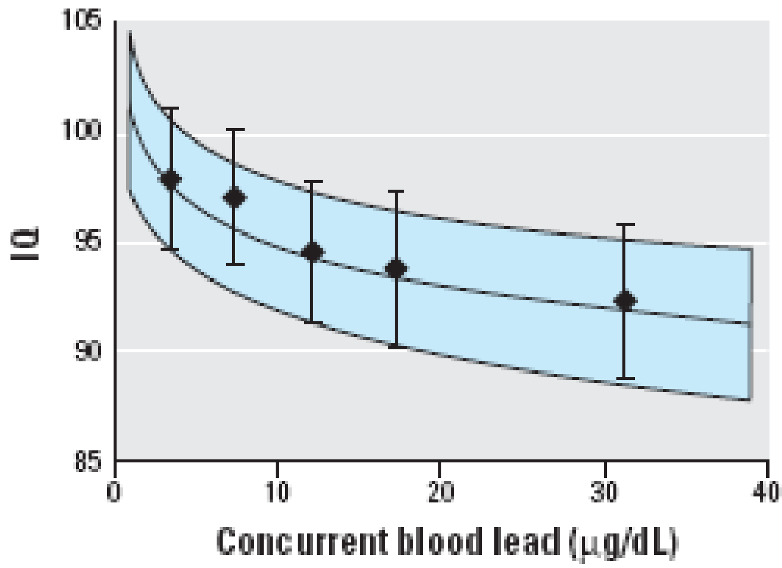


Figure 3: Log curve of IQ loss at BLL<10, Lanphear 2006.

Current Status of Lead Poisoning and Prevention in Vermont

In 1993, Vermont passed Act 94 with a goal to "eliminate lead as an environmental toxin by 2010." It was amended in 1996 by Act 165, which was designed to protect children and workers from lead poisoning through screening, treatment and education, along with the promotion of essential management practices (EMPs) implemented through voluntary participation of employers, healthcare providers, homeowners and landlords. Act 165 was supported by financial grants from the CDC and HUD.

In comparison to other states, Vermont is unique in its lead policy, as most other states have enforcement as part of the law or delegated to a state department for policy development and enforcement . The voluntary nature of Act 94, and the absence of sufficient state funding have created several problems. First, the program has primarily focused on secondary prevention, such as detection and screening, as opposed to primary preventive measures. Second, Vermont's dependency on grant funding from the CDC has created financial instability in the Childhood Lead Prevention Program (CLPPP).

Environmental lead comes primarily from two sources in Vermont. The state has the second oldest housing stock in the US, thereby making lead-containing pre-1978 paint the most prominent and serious route of lead exposure (Census Bureau, 2000). The lead paint problem is especially important as the slow rate of new housing development in Vermont has created a crisis of affordable housing. There will be an anticipated shortfall of 21,000 affordable homes by 2010 (VT Department of Housing and Community Affairs, 2006). The second source is fuel emission lead contaminating soil near roadways and in cities.

Despite the passage of VB 94 and 165, the efforts to educate the public, healthcare professionals and property owners about the hazards of environmental lead have not been as successful as hoped. It is estimated that the voluntary compliance with the rental housing is less than 4,000 out of 81,000 property owners, homeowners and daycare owners (VDH, 2006). The original law anticipated that the insurance industry would help ensure compliance by requiring EMP affidavits prior to approval of coverage but this has not occurred (Fleishman et al., 2004).

Although Vermont's goal of universal screening of one and two year olds is not supported by many in Vermont, screening has increased to 78% and 35% for one and two year olds respectively in 2004. The American Academy of Pediatrics (AAP) supports screening of high risk children only (AAP website, 2006). Epidemiological studies also support the use of risk-targeted screening, which includes census tract residence, age, poverty level and ethnic origin. (Sargent et al.1997). Yet, due to the scattered and ethnically homogenous population of Vermont children and the widespread environmental lead exposure in the state, universal screening seems to be a reasonable approach in this state which will help focus primary prevention strategies and identify children in need of intervention.

Despite the significant decrease in BLL's over the last ten years, lead poisoning still poses serious financial and social burdens for adults and children in Vermont. In 2005, 224 one and two year-old children were lead poisoned in Vermont as defined by the EPA action limit of 10 μg/dL. However, many more of Vermont's children are at risk. Data obtained from the Vermont Department of Health (VDH) indicate that among the children tested, 23 percent of children (0 to 5 years of age) between 1997 and 2005 had lead levels between 5 -10 μg/dL (VDH, 2006). As noted previously, this level of lead exposure may put these children's health in danger.

"Get the Lead Out of Vermont"

"Get the Lead Out of Vermont" has been convened by the Attorney Generals (AG) office in conjunction with the Vermont Department of Health to gather stakeholders who are involved in lead poisoning prevention across the state. The overall goal is to investigate the current policies for combating lead poisoning in Vermont, along with understanding the social and financial burdens posed by lead on Vermont's citizens.

The central decision facing policy makers in Vermont involves the trade-off between the cost of lead poisoning prevention versus the long-term hazards which lead exposure poses for children and society. The next part of this report will review the costs to Vermont's citizens imposed by environmental lead so that the reasonable choices for reducing the lead hazards can be considered. Cost estimation is a useful tool to help build consensus about the importance of this issue and can provide reasoning for the increased funding needed to implement programs to reduce lead in Vermont. After describing the cost benefit of reducing lead exposure in the state, policy options for reforming Vermont's policy on lead poisoning will be reviewed.

Cost of Environmental Lead Exposure in Vermont

In this section, we will detail both quantifiable and non-quantifiable costs of environmental lead. A complete summary of these costs can be found in Table 1. This summary estimate is based on a thorough review of the literature on environmental lead exposure and its associated costs. To create our estimates, we used several important studies and government analyses which discuss the quantifiable costs of lead poisoning (Stefanak et al., 2005; Korfmacher, 2003; Grosse et al., 2002; HUD, 1999; Kemper et al., 1998; EPA, 1996; Salkever, 1995; Schwartz, 1994). However, it is important to note that many potentially significant effects of continued lead exposure cannot be monetized.

Table 1. Summary of the costs of lead poisoning to the state of Vermont

Description of cost	Estimate of annual cost (2006 dollars)	Comments
Lost future earnings (BLL>10 µg/dL)	$13,674,528—14,515,524	Range based on two different methods of estimation.
Lost future earnings (BLL 5-9 µg/dL)	$65,595,906	Based on continued lead toxicity below the CDC action level of 10 µg/dL.
Direct health care costs	$51,814	Does not include long-term health care costs.
Special education	$219,841	Probably vastly underestimates true costs because this includes only children with BLL's>25 mcg/ml.
Total annual cost	**$79,542,089 – 80,383,085**	**Conservative estimate of total cost as many non-quantifiable costs are not included.**

Monetized costs include loss of future earnings, medical costs associated with lead poisoning, cost of special education and criminal justice costs. For this analysis, costs have been updated to 2006 dollars using the Consumer Price Index (CPI) and, where appropriate, discounted at a three percent rate. The EPA has concluded that a three percent rate is appropriate to estimate the social rate of time preference for annualized non-capital costs and benefits (EPA, 1996). The monetized costs will each be detailed separately with an explanation of the evidence supporting the estimate. Non-monetized costs include the impact of fetal exposure to lead, the impact on individual families who must care for a lead-poisoned child, enforcement related expenses, long-term health effects, criminal justice costs and potential litigation costs.

Lost Future Earnings

Lost future earnings due to cognitive dysfunction induced by lead poisoning is responsible for the majority of the monetized cost. In studies on the impact of lead poisoning, lost future earnings represents at least 90 percent of the quantifiable costs associated with lead poisoning. Given the impact of this cost, we have included several estimates to obtain a cost range for Vermont.

First, we followed the approach of Korfmacher (2003) who performed an analysis of the cost of lead poisoning to the state of New York. To adapt her estimates for lost future earnings to Vermont, we used the most recent estimate of the number of 0-5 year olds in Vermont who have tested higher than 10 µg/dL in 2005 (Appendix 1). The total annual cost was estimated by using the difference in mean BLL's between children who were lead poisoned (14 µg/dL) and children in lead-safe housing (2µg/dL). The resulting number is then multiplied by the total number of poisoned children in 2005 (266) to give the total excess blood lead in µg/dL for lead-poisoned children over baseline children. Finally, the result is multiplied by $ 4,284, which is the estimated cost of lost income per µg/dL of blood lead (Grosse et al. 2002). This gives an annual total of 13,674,528 in lost future earnings.

Table 2. Annual lost future income in Vermont using linear BLL effect.

Mean difference in BLL	12
Number of children (0-5) with BLL>10μg/dL	266
Earnings loss/IQ point (3% discount rate applied)	$4,284
Annual loss in future income	**$13,674,528**
Loss of income tax revenue (3.1 % rate)	**$423,910**

Korfmacher (2003) used data available prior to 2002 to estimate the lost income for each point increase in BLL, which was based on a linear model to adjust for the effect of BLL on IQ. However, a recent pooled analysis of prospective cohort data (Lanphear et al., 2005) concluded that lead impact on IQ is not linear, and in fact the effect is more dramatic at lower BLL's. Using this data, we updated the lost future earnings estimate using this non-linear model. The analysis model was based on a HUD regulatory impact analysis from 1999. This analysis used a figure of $11,502 of lost future income for each lost IQ point (Salkever 1995). This number combined with the non-linear IQ data and the VDH data on poisoned children gives an estimate of lost future income of $14,515,524 for children with BLL's greater than 10 μg/dL. However, as mentioned previously, there is substantial evidence to suggest that BLL's less than 10 μg/dL can have significant health effects. The advantage of this model is that it allows us to estimate the loss in future income for Vermont children with low-level lead exposure ($65,595,906). This estimate is so high due to the large number of Vermont children with BLL's in the 5-9 μg/dL range (approximately 23 percent of all children tested between 1997 and 2005 in Vermont had BLL's in the 5-9 range).

Table 3. Annual lost future income in Vermont by non-linear BLL effect.

BLL Range	Mean BLL	Loss in IQ	# of Children	Total IQ
5 to 9	7.00	2.73	2089	5703
10 to 14	12.00	4.28	192	822
15 to 19	17.00	5.23	47	246
20 to 45	32.50	7.18	27	194
Loss in earnings per IQ point (HUD,1999)				$11,502
Total annual cost without 5-9 ug/dL BLL				**$14,515,524**
Total annual cost including low-level exposure				**$80,111,430**

Health Care Costs

In addition to adverse effects on cognitive function, lead poisoning can also cause acute damage to children's developmental and physical functioning. The direct health care costs associated with lead poisoning consist of treatment of severely lead poisoned children, including chelation therapy, and monitoring and follow-up of moderately poisoned children, such as lab testing, physician visits, and home inspections (Korfmacher, 2003). In 1998, an analysis of the cost-effectiveness of universal screening found baseline estimates for costs of treating lead poising children (Kemper et al. 1998). Table 4 details the costs used by Kemper updated to 2006 dollars. From these costs, the total costs per child based on their BLL levels were calculated using Korfmacher's approach (Table 5).

Table 4. Direct treatment and follow-up health care costs.

Direct Health Care Treatment	Baseline Costs of Treatment
Venipuncture	8.25
Capillary blood sampling	4.13
Lead assay	22.02
Risk assessment questionnaire	2.53
Nurse-only visit	40.44
Physician Visit	101.11
Environmental investigation and hazard removal	410.76
Oral chelation	319.76
Intravenous chelation	2341.94

Table 5. Total direct health care costs per child based on BLL levels (ug/dL).

BLL in ug/dL	Health care treatment needed	Total Cost per child
10 to <15	Diagnostic Testing* Nurse Visit	70.71
15 to <20	Diagnostic Testing Nurse Visit	70.71
20 to <45	Diagnostic Tests (8 total) Nurse Visits (8 total) Environmental Investigation	1296.2
45 to <70	Diagnostic Tests (8 total) Nurse Visits (8 total) Environmental Investigation Oral Chelation	1651.96
Over 70	Diagnostic Tests (8 total) Nurse Visits (8 total) Environmental Investigation Intravenous Chelation	3683.14

*Diagnostic Testing includes venipuncture and lead assay costs

For Vermont, the total direct costs of health care for 2006 amount to $51,814 (Table 6). Of these total costs, the majority are paid for by Medicaid or the Vermont State Department of Health. This amount is an underestimate of the total medical burden associated with lead poisoning in Vermont because the estimate does not include costs associated with long-term health effects of lead poisoning. These health effects include cognitive and behavioral problems, hypertension, stroke and osteoporosis. Costs for psychological treatment associated with attention deficit disorder or aggressiveness have not been estimated, although both behavior problems have been linked to lead exposure (Needleman et al., 2002). Additionally, although adult hypertension has been linked to a history of childhood lead poisoning (Kim et al., 1996), there is no quantifiable cost analysis which has addressed the link between hypertension and lead.

Table 6. Annual direct health care costs for Vermont

BLL	Treatment costs per child	Number of children (0-5) in 2006	Total costs
10 to 14	$70	192	$13,473
15 to 19	$71	47	$3,323
20 to 45	$1,297	27	$35,018
45 to 70	$1,652	N/A	$0
over 70	$3,683	N/A	$0
	Total		**$51,814**

Special Education Costs

Because of the strong link between both IQ and behavior and lead poisoning, previous cost estimations have focused on quantifying the contribution of lead poisoning to special education costs. In addition to the reduction of lifetime earnings mentioned earlier, cognitive impairment poses serious risk to a child's success in school and in future jobs. According to Schwartz (1994), 20% of children with BLL's over 25 μg/dL need special education, which may include assistance from reading teacher, psychologist or other specialist for an average of 3 years (Schwartz, 1994; Korfmacher, 2003).

To estimate the total special education costs due to lead poisoning, we multiplied 20% of children who have a blood lead level greater than 25 each year (5.4) by the average annual cost of three years of special education in Vermont. In 2005, the average annual cost of special education in Vermont was $15,732 per child (Department of Education, 2006). This number was calculated by dividing the entire local, state, and federal funding sources for special education in Vermont for K-12 by the total student count. Based on this estimate, a year of special education typically costs about as much as a one-time expense to remediate a house (VDH, 2005).

Overall, the total special education costs for Vermont amounts to $219,841 per year (Table 7). We applied a three percent discount rate to the annual special education costs based on the assumption that the costs are incurred at an average of 5 years in the future (for 1 year-olds who are exposed to lead) (Stefanak et al., 2005). Table 7 likely underestimates the true cost of special education because a child's ability to learn is impaired by lead exposure at levels far below 25µg/dL (Lanphear et al., 2005). However, there have also been no long-term studies which clearly delineate the differences in special education cost between non-lead poisoning and lead-poisoned children.

Table 7. Annual special education costs.

Number of children with BLL>25 in 2006	27
20% of children with BLL >25	5.4
Cost of 3 yrs of Special Education in 2005	$47,196
Discounted Cost (3% rate)	$40,711
Total Annual Cost	**$219,841**

Juvenile Delinquency/Criminal Justice

While lead poisoning has been strongly linked to behavioral problems, Needleman et al. (2002) found that elevated bone lead also correlated to increased risk of juvenile delinquency. Both Stefanak et al. (2005) and Kormacher (2003) used this study to estimate that approximately 10 percent of juvenile delinquency is attributable to childhood lead poisoning. While this estimate is substantial, no estimate for the costs of adult behavior on criminal justice costs has been made. It is probable that significant costs carry through to the adult population. For example, the rate of violent crime in the United States correlates well with the addition and subsequent removal of tetraethyl lead in gasoline (HUD, 1999).

Other Costs

We have obtained estimates of monetized costs secondary to ongoing lead poisoning in Vermont. However, many costs cannot be quantified but are likely significant. Current research suggests that there is a range of additional health impacts of lead exposure on children including impairment of Vitamin D metabolism, decreased stature and hearing loss. Due to the multi-factorial nature of lead poisoning, it is difficult to isolate these health impacts; however it is important to note that there is substantial observational and cross-sectional evidence which suggests these are in part due to lead exposure (Needleman et al., 1990). Other potential non-monetized costs include potential neonatal mortality and early miscarriage, criminal justice costs, costs incurred by individual families who must care for a lead-poisoned child, enforcement related expenses, long-term health effects, criminal justice costs and potential litigation costs.

Who Bears the Costs of Lead Poisoning?

The stakeholders who bear the vast majority of the burden for lead poisoning are the children. In this document, the cost borne by poisoned children is estimated in the form of loss of future income. Lead exposure has been associated with cognitive and physical developmental issues, leading to lowered IQ, juvenile delinquency, learning problems, stature, hearing loss, and vitamin D metabolism and these costs are non-quantifiable. In addition, as one cannot estimate a dollar amount for the lifelong social costs of living with cognitive impairment as well as physical developmental issues resulting from lead poisoning. Environmental lead cleanup would greatly improve the future of Vermont's children.

Families of lead poisoned children also bear a significant portion of the costs of lead poisoning. Families must endure both the monetary burden and psychological stresses of caring for a lead poisoned child. The financial care extends beyond the short term costs of finding the source of lead in their living space and controlling it and includes healthcare costs, additional screening, transportation and lost days at work. Long term burdens include the energy and effort to raise a child with cognitive impairment and possibly private education costs for those with the means.

Vermont's current law places the lead remediation responsibility of rental units solely upon the landlords. If the state adopted more stringent enforcement and fines in regards to EMP's, the major monetary burden would fall upon landlords. If all landlords complied with EMP's, the estimated cost for initial cleanup (2005 dollars from the VDH 2005 report to the state legislature would be $65,686,090 and the ongoing annual cost would be $15,566,390. Costs of abatement would likely be significantly higher. If landlords were forced to bear the majority of this cost, one possible outcome could be the loss of low income housing.

With current lack of compliance from landlords and homeowners, Vermont state government currently covers all the costs of public health focused lead screening, environmental investigations of hazard homes, and lead prevention programs. In addition, the government pays for most of the medical care, special education, and juvenile delinquency costs associated with lead poisoning. Damage from lead poisoning is an annual expenditure for the state of Vermont, which will paid for each year if no action is taken to control the problem.

Policy Recommendations

The primary objective of this report is to review the literature on the health effects and cost impacts of lead poisoning and, using this literature as a basis, to discuss the continued costs to the state of Vermont. Estimates of quantifiable costs were made when supported by the literature and data on Vermont was available. For several reasons, the monetized costs likely grossly underestimate the true costs. This is in part due to the use of conservative estimates of both the number of children affected by lead poisoning in Vermont (many children are not tested) and the likely financial impacts (loss of future earnings, medical costs and special education costs). In addition, many costs are not quantifiable either because there is inadequate data or it is simply not possible to place a dollar amount on certain social costs.

Although policy assessment was not the primary focus of this paper, the significant costs to Vermont and the fact that Vermont's efforts to date have only partially addressed the problem of lead poisoning in the state leads us to the conclusion that the state must take further action to remediate the impact of environmental lead on the citizens of Vermont. We have identified four major gaps in the current policy, including:

- Lack of enforcement in current law (VT Act 94)
- Lack of funding in current law
- Need to focus on primary instead of secondary prevention of lead poisoning

These observations are also supported by the comprehensive collaborative review of state legislation addressing lead poisoning by the Center for Environmental Health Sciences at Dartmouth and the Vermont Law School (see Appendix 2).

Lack of enforcement and funding

The lack of primary funding has left the state's agencies dependant on grants – a strategy that is not conducive to long term planning and infrastructure development. At present, the Department of Health and the Department of Housing and Community Development, along with a loosely connected network of paid and voluntary health officers, building departments, and healthcare providers, share accountability for detection, prevention, and management of lead poisoning in Vermont. With increasing demands for shrinking resources, financing a remediation program in Vermont is becoming increasingly challenging. Current stakeholder positions seem to pit parents and child advocates against landlords, banking interests and the real estate industry.

In 2003, the CDC identified and summarized the primary funding mechanisms used at the state-level to fund lead abatement and prevention programs. Some of these mechanisms to generate funds in Vermont include (CDC, 2006):

- Establish annual property tax on real estate built pre-1978 (CA)
- Mandatory lead report on all real estate sales (MA)
- Offer tax income credit for lead abatement (MA)
- Secure dedicated funding for code enforcement (NJ)
- Impose taxes or fees on lead polluters (CA)
- Impose tax on paint manufactures (ME)

Although imposing taxes and fees on paint manufactures or polluters, such as the twenty-five cent paint tax used in Maine, the Maryland annual rental unit registration fee, or a transfer fee on all residential and commercial real estate sales may be fair and efficient means to generate funds. Property owners should be incentivized to remediate their homes and thereby recognize the hazards of lead in their own communities. Other approaches which attract property owner participation include requiring mandatory lead reports on all real estate sales (MA) or offering income tax credits for abatement (MA). It is likely that current efforts to educate property owners to act are failing because owners do not want to disclose the results of any lead analyses at the time of sale.

Need for primary lead poisoning prevention

The most important objective of primary prevention is to identify and remediate lead hazards before children are exposed. Secondary prevention measures are reactive, identifying and treating exposed children and reducing chances of further exposure. Primary prevention has the benefit of preventing a case of poisoning and over time is the only way to permanently eliminate lead hazards, producing a positive return on the investment. To date, Vermont has mostly focused on secondary prevention approaches by screening and identifying poisoned children. To encourage more primary prevention, we need to create a better incentive structure for property owners to play a role in abatement and prevention.

Overall, a mixture of primary prevention, state funding and enforcement are needed in order to efficiently eradicate the problems of lead poisoning in Vermont. As federal dollars become increasingly limited, it is very important to find creative ways to fund programs on state-level. The health of future generations is dependent on how the current legislature deals with lead. Children who are exposed to lead today will suffer the impact of lost earnings and decreased quality of life in future years. Vermont depends on a healthy and well educated citizenry and a clean environment both of which are endangered by the continuing risk of lead poisoning. We cannot afford to not combat this serious and pressing social and environmental problem.

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Appendix 1. 2001-2005 Lead Levels for Vermont State (VDH, 2006)

Lead Levels By Year 2001-2005

Preliminary 2005	Population	# Tested	% Tested	# Normal BLL	# 10 – 14	# 15 – 19	# 20+	# elevated	% elevated
lt 1 yr	6,317	451	7.1%	436	4	7	4	15	3.3%
1 yr	6,818	5,119	75.1%	4,976	105	25	13	143	2.8%
2 yrs	6,634	2,470	37.2%	2,389	62	10	9	81	3.3%
3 yrs	6,567	406	6.2%	391	12	3	0	15	3.8%
4 yrs	7,048	233	3.3%	226	5	1	1	7	3.1%
5 yrs	6,474	120	1.9%	115	4	1	0	5	4.3%
Total, 0-5	39,858	8,799	22.1%	8,533	192	47	27	266	3.0%
CDC									
0-36 month	19,445	8,183	42.1%	7,938	177	42	26	245	3.0%
37-72 months	21,819	633	2.9%	611	16	5	1	22	3.5%

2004	Population	# Tested	% Tested	# Normal BLL	# 10 – 14	# 15 – 19	# 20+	# elevated	% elevated
lt 1 yr	6,317	453	7.2%	439	12	2	0	14	3.1%
1 yr	6,818	5,007	73.4%	4,821	119	39	28	186	3.7%
2 yrs	6,634	2,362	35.6%	2,258	75	15	14	104	4.4%
3 yrs	6,567	523	8.0%	501	15	4	3	22	4.2%
4 yrs	7,048	323	4.6%	306	11	3	3	17	5.3%
5 yrs	6,474	139	2.1%	133	4	1	1	6	4.3%
Total, 0-5	39,858	8,807	22.1%	8,458	236	64	49	349	4.0%
CDC									
0-36 month	19,445	7,978	41.0%	7,668	211	56	43	310	3.9%
37-72 months	21,819	847	3.9%	807	26	8	6	40	4.7%

2003	Population	# Tested	% Tested	# Normal BLL	# 10 – 14	# 15 – 19	# 20+	# elevated	% elevated
lt 1 yr	6,341	430	6.8%	418	8	3	1	12	2.8%
1 yr	6,467	4,329	66.9%	4,170	112	27	20	159	3.7%
2 yrs	6,681	1,246	18.6%	1,174	53	10	9	72	5.8%
3 yrs	6,710	440	6.6%	407	24	5	4	33	7.5%
4 yrs	7,050	270	3.8%	256	10	4	0	14	5.2%
5 yrs	6,609	124	1.9%	121	2	1	0	3	2.4%
Total, 0-5	39,858	6,839	17.2%	6,546	209	50	34	293	4.3%
CDC									
0-36 month	19,489	6,135	32.4%	5,884	180	41	30	251	4.1%
37-72 months	20,369	714	3.6%	672	29	9	4	42	5.9%

2002	Population	# Tested	% Tested	# Normal BLL	# 10 – 14	# 15 – 19	# 20+	# elevated	% elevated
lt 1 yr	6,331	388	6.1%	379	7	1	1	9	2.3%
1 yr	6,618	4,516	68.2%	4,300	161	31	24	216	4.8%
2 yrs	6,725	984	14.6%	901	59	18	6	83	8.4%
3 yrs	6,850	418	6.1%	382	24	6	6	36	8.6%
4 yrs	7,158	275	3.8%	258	13	4	0	17	6.2%
5 yrs	7,470	146	2.0%	137	6	1	2	9	6.2%
Total, 0-5	41,152	6,727	16.3%	6,357	270	61	39	370	5.5%
CDC									
0-36 month	19,674	6,012	31.5%	5,694	234	52	32	318	5.3%
37-72 months	21,478	724	3.6%	672	36	9	7	52	7.2%

2001	Population	# Tested	% Tested	# Normal BLL	# 10 – 14	# 15 – 19	# 20+	# elevated	% elevated
lt 1 yr	6,356	370	5.8%	363	5	0	2	7	1.9%
1 yr	6,693	4,345	64.9%	4,117	173	34	21	228	5.2%
2 yrs	6,692	869	13.0%	800	52	9	8	69	7.9%
3 yrs	6,912	407	5.9%	367	29	8	3	40	9.8%
4 yrs	7,184	285	4.0%	266	11	6	2	19	6.7%
5 yrs	7,595	176	2.3%	168	7	1	0	8	4.5%
Total, 0-5	41,432	6,452	15.6%	6,081	277	58	36	371	5.8%
CDC									
0-36 month	19,741	5,703	28.9%	5,388	237	46	32	315	5.5%
37-72 months	21,691	765	3.5%	707	41	13	4	58	7.6%

Appendix 2.

State Legislation Addressing Prevention of Childhood Lead Poisoning:

A Policy Report for the Greater Manchester (NH) Partners Against Lead Poisoning

November 2004

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Executive Summary

In the fall of 2003, the Greater Manchester (NH) Partners Against Lead Poisoning formed a committee to explore legislative approaches to reducing the risk of childhood lead poisoning in New Hampshire. The purpose of this report is to support those efforts. "State Legislation Addressing Prevention of Childhood Lead Poisoning: A Policy Report for the Greater Manchester (NH) Partners Against Lead Poisoning " includes a summary and analysis of legislation enacted in several northeastern U.S. states, descriptions of strategies and coalitions involved in the process, accounts of the effectiveness of these laws and a brief look at the use of litigation to change laws.

Regulation of lead paint hazards occurs at the federal, state, and local levels. While the federal government sets guidelines and standards, state government has the legal power and duty to implement federal guidelines. Municipalities also play a role, through city ordinances and codes. But a law is only as good as its implementation. In this report, the authors have placed particular emphasis on examining how laws in some of New Hampshire's neighboring states — Massachusetts, Maryland, Rhode Island and Vermont — are working to protect children from harmful exposures to lead. This information has been gathered from individuals representing a broad range of organizations and agencies working on lead poisoning prevention in each state.

The political, social and economic climates that drive legislation have a powerful effect not only on legal language, but on the way the spirit of the law is translated into action. This "back story" is also relevant to any effort to consider legislative change in the state, and we have included this context along with a synthesis of legal language and other key aspects of each state's law. This report does not thoroughly analyze administrative regulations and rules, although the authors acknowledge that they are important to understanding statutes in practice. The rules and regulations promulgated by state agencies often lay out in detail the roles and responsibilities of specific individuals who consequently feel the direct impact of a law.

Statutory schemes that are most effective in preventing childhood lead poisoning are those that emphasize "primary prevention," that is, identifying and remediating lead hazards before children are exposed or harmed. "Secondary prevention" measures are reactive, attempting to identify and treat exposed children and to reduce chances of further exposure.

Lead laws may employ incentives ("carrots") to motivate property owners to identify and ameliorate lead paint hazards and/or consequences ("sticks") to punish those who do not comply with the law. Incentives generally take the form of financial relief or legal protection against liability in lead poisoning cases. For example, Massachusetts, Vermont, and Maryland give some form of liability protection for property owners who take specific steps to make properties lead-safe. Massachusetts also provides an income tax credit as an incentive. Consequences for violation of the law generally take the form of civil or criminal penalties.

Incentives alone have not been shown to be an effective means of inducing property owners to ameliorate lead paint hazards. Under Vermont's law, property owners who perform yearly "Essential Maintenance Practices" are legally assumed to be fulfilling their duties in providing "a reasonable standard of care," which gives them protection against lawsuits by families of poisoned children. But since there have been no lawsuits against negligent property owners in Vermont, this protection is not effective as an incentive. In addition, there is little enforcement of this standard and no penalties for property owners who fail to perform Essential Maintenance Practices. Consequently, insurers in Vermont are no longer accepting a property owner's claim of having performed EMPs as grounds for issuing lead liability protection. In Massachusetts, lawsuits against property owners responsible for lead paint exposure resulting in harm to a child have resulted in large settlements, so liability protection does provide an incentive. The private sector provides an additional "stick" since insurers do not provide liability insurance against lead poisoning liability unless property owners are in compliance with the law.

Financial incentives such as subsidies for property maintenance and lead hazard control also work best in states where lead-safe standards exist and are enforced. This is the case in Massachusetts, which provides grants and deferred loans to homeowners and rental property owners for lead hazard control. On the other hand, in states where penalties are not enforced, financial incentives are less effective. In New Hampshire, municipalities report difficulty in enrolling property owners in the highest risk areas in these programs. Rental property owners may be reluctant to have their housing identified as potentially hazardous; or they may be reluctant or unable to spend money on lead work that is discovered, but not covered, by a financial incentive program.

Criminal or civil penalties can be an effective means of prompting compliance with the provisions of lead laws that apply to housing as long as there are resources to implement these schemes. The lead law passed in 2002 by Rhode Island lays out tough penalties for noncompliance, but did not include a funding mechanism for implementation. In contrast, Massachusetts has adequate resources for implementation and enforcement and has levied large fines on property owners found to be negligent.

Initial conditions: Forces driving legislation

The final version of a law is profoundly influenced by the identities and agendas of those who launch the legislative process, the resources available to various interest groups and the number and diversity of the stakeholders included in the legislative process. The impetus for lead legislation can come from public health concerns of the medical community, as was the case in Massachusetts; from political pressure resulting in a statutory or gubernatorial mandate, as were the cases in Vermont and Maryland; or from the concerns of the insurance industry over liability costs associated with lead-poisoned children, as was the case in Rhode Island.

In some cases, the initial push gathered powerful momentum for a law reflecting the interests of the initiating parties. In Massachusetts, the result was the country's first comprehensive state lead poisoning prevention law. In other cases, the response to the initial push was formation of an assembly of a stakeholders charged with drafting legislation, and the final version of the law is a compromise reflecting the interests of most persuasive of those stakeholders. Vermont's law reflects the interests of rental property owners who were on the panel that drafted the legislation. The legislative process was short, with little debate. In contrast, the stakeholders brought together by gubernatorial mandate in Maryland defended radically different positions on the direction a new lead law should take. The bill passed after a lengthy legislative process as property owners successfully lobbied for changes reflecting their interests. Child health advocates contend the final version of the law favors the interests of property owners over those of tenants. A similar process took place in Rhode Island, where competing bills were drafted by different interest groups.

In general, the major stakeholder groups fall into two opposing camps: public health, housing and children's advocates who want property owners to bear the major responsibility and cost for making housing "lead safe" and rental property owners, realtors and insurers who argue that this burden is too costly, and should be shifted to or at least shared by tenants or families.

Money talks: funding mechanisms

A mechanism for funding the administration of a state lead program is vital to its enforcement and implementation. Insufficient funding is most often cited as the greatest barrier to implementation of lead poisoning prevention programs on the state level.[1] All the state programs outlined in this report are, according to interviewees, lacking the resources they need to properly implement and enforce the state's lead law, and all are feeling the effects of nation-wide state budget deficits.

The Massachusetts lead program subsidizes its education efforts through licensing fees for lead workers, funds abatement through a revolving loan program for property owners and receives a sizable portion of HUD lead hazard control funding. The governor's campaign to combat lead poisoning in Maryland funneled $50 million over three years to state and city programs for implementation and enforcement of the state's lead law, though state funding has been reduced since the campaign ended in 2003. Rhode Island's law, passed in 2002, included no funding appropriation or other revenue-producing mechanism. This has made it nearly impossible to implement the program, and the new law is currently under review. In Vermont, there are no funding mechanisms for the lead program. Fees for lead worker accreditation, certification and licensing support these activities. Most of the states reviewed for this report rely heavily on funding from the Centers for Disease Control and Prevention, the Department of Housing and Urban Development and from the Environmental Protection Agency.

[1] Doug Farquhar. 1994. *Lead Poisoning Prevention: A Guide for Legislators*. Washington, DC: National Council of State Legislatures.

Litigation as a strategy

Litigation against lead paint manufacturers, property owners and rental property managers has been used to address lead poisoning. Negligence suits against property owners have, in some states, established a duty to protect tenant children from lead poisoning from exposure to lead-based paint. Suits against lead paint manufacturers by injured children and their families have sought to hold paint makers responsible for making an unsafe product, but have been unsuccessful because plaintiffs have not been able to prove that a specific company manufactured the paint that ultimately poisoned the child. Despite litigants' uneven success in their individual suits, they have significantly contributed to the overall effort to reduce lead poisoning, for as a result of them, state legislatures have become more active in regulating property owners and managers.

A new tactic — states suing the paint industry for injuring the public as a whole by causing an environmental health concern — may be more successful, particularly in light of successful tobacco industry litigation based on a similar premise. Such a suit is currently pending in Rhode Island.

Beyond legislation: Next steps

There are many ways to reduce the risk of childhood lead poisoning that do not rely on legislation. Fostering better collaboration between departments charged with protecting health, targeting education to those with the power to make change in their communities rather than families alone, directing lead-hazard control efforts to high-risk neighborhoods rather than single housing units, and approaching lead paint exposure through a "healthy home" paradigm are all effective tools for reducing lead poisoning incidence. New Hampshire's Childhood Lead Poisoning Prevention Program has involved a wide range of stakeholders to develop a comprehensive plan including many of these approaches. Most importantly, lead poisoning *prevention* requires a focus on discovering hazards in housing *before children are harmed* rather than using the child as the “canary in the coal mine.”

The comments and experiences of those interviewed for this report suggest that the current political and economic climates present serious obstacles for new state legislation aimed at preventing lead poisoning. At the same time, New Hampshire agencies charged with protecting public health and the environment have the power to promulgate new regulations without legislative change. Municipalities, likewise, have the power to enact local ordinances that would support the goals of preventing childhood lead poisoning. The authors suggest that a next step for the Legislative Committee of the Manchester GMPALP might be a review of regulations promulgated by agencies in other states, and a review of city ordinances that have been shown to be effective. This could include the drafting of some model regulations and ordinances that might be adapted by New Hampshire agencies and municipalities.

Summary of State Programs and Statutes

Notable aspects of law and program

Massachusetts	• emphasizes detection of lead hazards before child is poisoned • balance of incentives and penalties • long established infrastructure • funding mechanism built into statute • universal screening
Rhode Island	• free universal screening • 2002 statute (now under review) includes balance of incentives and penalties • 2002 statute emphasizes detection and mitigation of lead hazards before child is poisoned
Vermont	• clear standard of care • do-it-yourself Essential Maintenance Practices are relatively easy for rental property owners to perform
Maryland	• registry of pre-1950s housing • lead hazard control or dust clearance test required at tenant turnovers • once a tenant child is poisoned, all units owned by that rental property owner must be brought into compliance • owners of pre-1950s rental housing must be in compliance to use rent court or to receive authorization to rent a unit

Criticisms of law or program

Massachusetts	• some property owners view compliance as difficult
Rhode Island	• property owners view compliance as difficult • poor compliance among property owners • very little implementation and enforcement because resources have not been garnered to support law • recent legislative action has stalled further implementation
Vermont	• poor compliance among property owners, with no consequence for noncompliance written into statute • too few state resources available for enforcement
Maryland	• poor compliance particularly in highest risk areas • compliance only required for pre-1950 rental units • liability protection has not been a successful incentive for compliance

Impetus behind comprehensive legislation

Massachusetts (1971 law)	• interest in the Boston medical community about lead poisoning • new awareness of high prevalence of children with elevated blood lead levels • new knowledge about the effects of lead on IQ
Rhode Island (2002 amendments)	• pressure by the insurance industry to add liability protection to the state's existing lead law • formation of a multi-stakeholder commission by the Childhood Lead Action Project, an advocacy group
Vermont (1996 law)	• pressure from parent of lead-poisoned child • state statute passed, setting up a commission to draft a bill
Maryland (1995 law)	• lawsuits against rental property owners and insurance industry's refusal to insure against liability • pressure by property owners to avoid lead liability • concern by child advocates • mandate by governor to set up a commission to draft a bill

Major public health advocates

Massachusetts	• medical community • families of lead poisoned children • Massachusetts Law Reform Institute
Rhode Island	• Childhood Lead Action Project, Providence, RI • realtors (during initial passage) • some state representatives
Vermont	• State Department of Health • Vermont Childhood Lead Poisoning Prevention Program
Maryland	• Coalition to End Childhood Lead Poisoning, Baltimore, MD

Major advocates for economic interests

Massachusetts	• real-estate lobby
Rhode Island	• insurance industry
Vermont	• banking and insurance industry • rental property owners
Maryland	• property owners

Consequences for non-compliance with law

Massachusetts	• civil or criminal penalties • potential for a lawsuit
Rhode Island	• civil or criminal penalties • potential for a lawsuit
Vermont	• potential for lawsuit
Maryland	• civil or criminal penalties • potential for lawsuit

Incentives for property owners to control lead hazards

Massachusetts	• grants, loans, and income tax credit for lead work • liability protection for property owners who complete interim control or abatement
Rhode Island	• income tax credit for lead work • guaranteed lead poisoning liability insurance for rental property owners and better rates for those with a Certificate of Conformance
Vermont	• liability protection for property owners who complete yearly Essential Maintenance Practices
Maryland	• liability protection for property owners who comply with law

Source of funding for implementation and enforcement

Massachusetts	• a revolving loan program for property owners funds abatement • licensing fees from lead workers, realtors and others funds education • Boston Department of Neighborhood Development • CDC, HUD
Rhode Island	• CDC, HUD
Vermont	• CDC, HUD, EPA • fees from training programs, certification, and licensing support the Health Department's accreditation, certification and licensing activities
Maryland	• CDC, HUD • state appropriation, with additional appropriations following the governor's campaign against lead poisoning (which ended in 2003)