NEW HAMPSHIRE

Healthy Homes & Lead Poisoning Prevention Program

2016 LEAD DATA AND PROGRAM REPORT

State of New Hampshire

Department of Health and Human Services

Division of Public Health Services

Healthy Homes & Lead Poisoning Prevention Program

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SURVEY/FEEDBACK

The HHLPPP invites you to complete a Survey providing with your valuable feedback about this report at: https://www.surveymonkey.com/r/NHLeadExposureReportSurvey

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Decades after lead was banned in residential paint and nearly half century since the federal Lead-Based Paint Poisoning Prevention Act was signed into law, the toxic legacy of lead continues to negatively impact thousands of families in New Hampshire by undermining the health, economic and social outcomes of our young children. New Hampshire continues to struggle with viable options for eliminating lead hazards in residential housing which is the root cause of so many poisonings. With 62% of our housing stock built before 1978 when lead was banned from residential lead paint, we can no longer deny that our housing stock is impacting public health. The long term economic and social impact that our housing stock is having on our state as a whole is too large to deny. Lead paint in old homes can no longer be someone else's problem.

In December 2016, the legislatively appointed Childhood Poisoning Prevention & Lead Screening Commission made formal recommendations to our policy makers on what should be included in upcoming legislation. These suggestions included implementing universal testing; involving the municipal building permitting process to educate contractors on lead safe work practices; requiring real estate disclosure for lead in drinking water; addressing lead in drinking water in rentals, schools, childcare systems and public water systems; appropriating $3 Million annually for lead remediation; requiring tenants to comply with landlords during lead remediation; evicting tenants who knowingly make lead hazards; modify the whole-building enforcement approach; taking on education and enforcement of EPA's Renovate, Repair and Painting Program, requiring essential maintenance practices for pre - 78' housing, and reducing the blood lead action level to 5ug/dL. Some of these recommendations were introduced in Senate Bill 247 that is still under legislative consideration at the time of this report.

The HHLPPP has been successful in partnering with municipalities, legislators, educations, clinicians, child development specialists, lead professionals and stakeholders in keeping this environmental issue at the forefront. Our message has not changed. Preventing childhood exposure to lead has a large return on investment; every dollar invested in lead hazard control results in health, educational, and other savings of between $17-221, (Gould 2009) a return slightly better than even vaccines.

The HHLPPP thanks you all in advance for your efforts to eliminate lead poisoning as an environmental hazard to your children.

Beverly Baer Drouin
Administrator, Healthy Homes & Environment Section
Division of Public Health Services

Among children tested in 2016, 741 (4.6%) had elevated blood lead levels equal at or above (≥) 5 µg/dL

EXECUTIVE SUMMARY

The New Hampshire (NH) Department of Health and Human Services (DHHS), Division of Public Health Services (DPHS), Healthy Homes & Lead Poisoning Prevention Program (HHLPPP) is mandated by law to collect the blood lead test results of children and adults who are residents of New Hampshire. In 2016, the HHLPPP received blood lead test reports for **15,981** children (18.8% of children ages 0-6 years old) under the age of 6 years who were tested for blood lead levels. Of those children tested, **51%** were aged 12 to 23 months and **29%** were aged 24 to 35 months.

Among these children tested, **741** (**4.6%**) had elevated blood lead levels equal to or greater than (≥) 5 micrograms per deciliter (µg/dL), the reference level set by the Centers for Disease Control and Prevention (CDC).[1] Of these 741 children with Elevated Blood Lead Levels (EBLLs), **77%** were White and **57%** were insured by Medicaid. Over **54%** of new blood lead elevations ≥5 µg/dL in 2016 were identified among children residing in communities designated as New Hampshire's 21 highest-risk communities for lead exposure.

Out of the 15,981 children tested in 2016, **104** (0.6 %) children had blood lead levels ≥10 µg/dL. Among these 104 children, **80** were new elevations that occurred in 2016 in which nurse case management and environmental investigations were initiated. The remaining **twenty four** children were already in case management from previous years. **One** child had a confirmed, venous blood lead level ≥45 µg/dL, resulting in medical chelation therapy, a procedure for the most severe cases of lead poisoning.

In 2016, **24 out of 79** (30%) of New Hampshire's refugee children under the age of six years old newly arrived in NH who were tested for elevated blood lead had elevations ≥5 µg/dL, as compared

[1]CDC has established the reference level of 5 µg/dL to identify children with blood lead levels that are much higher than most children's levels. Approximately 500,000 children in the U.S. exceed this reference level, which is based on the U.S. population of children ages 1 to 5 who are in the highest 2.5% of children tested for lead in their blood. While no safe blood lead level in children has been identified, a level of ≥5 µg/dL indicates a recommendation for case management and action to reduce the child's future lead exposure (CDC, 2016).

to 4.6% of children tested statewide. In 2016, an estimated **33%** of school-age children (K-12) have had a blood lead elevation ≥5 µg/dL at *some* point in their lives.

The HHLPPP environmentalists initiate investigations at the homes of all children who have blood lead levels that are ≥10 µg/dL to identify the potential source(s) of the child's poisoning. When a poisoned child resides in a multi-unit property with lead hazards, environmentalists often investigate other units in the same property. In 2016 the HHLPPP investigated a total of **123** housing units. As a result of these investigations, the DHHS issued **97** Administrative Orders of Lead Hazard Reduction (Orders) for the removal of lead hazards at **39** properties (one Order for each apartment). An additional **26** letters with specific recommendations on strategies to make the home safe from lead hazards were sent to the parents of children with an elevated blood lead level who own their own homes.

Surveillance data was also collected statewide for adults over the age of 16 years tested for blood lead. A total of **2,781** adults were reported to the HHLPPP as having their blood lead level tested. Of those reported, **420** (15 %) had confirmed new elevations ≥5 µg/dL. The number of adults tested for blood lead elevations and the number of confirmed elevations ≥5 µg/dL both increased slightly by an estimated 3 and 11 percent respectively in 2016 as compared to counts reported to the HHLPPP in 2015.

Funded to build capacity among New Hampshire's licensed lead professionals, the HHLPPP administered licenses to a total of 236 people that included 3 Lead Inspectors, 16 Risk Assessors, 5 Trainers, 80 Abatement Contractors, 22 Abatement Supervisors and 115 Abatement Workers.

The HHLPPP continues to be successful in securing funding from the CDC, the U.S. Environmental Protection Agency, New Hampshire Office of Medicaid, State General Funds, the CDC Preventive Health and Health Services Block Grant and the dedicated Lead Poisoning Prevention Fund to support staff and program activities. In addition to our federal partners, the HHLPPP collaborated with both internal partners (e.g., Environmental Public Health Tracking Program) and external partners (e.g., Community Health Institute, Conservation Law Foundation, the Cities of Manchester and Nashua Health Departments) in delivering services for the prevention of childhood lead poisoning.

NOTABLE 2016 ACCOMPLISHMENTS INCLUDE:

- Plans for the deployment of a new, state-of-the-art surveillance and case management software system continue to move forward with a target deployment period of Spring 2018. This software will improve the quality of surveillance data used to inform the legislature and to educate healthcare providers and citizens.
- Publi
the M

Increased outreach and education to physicians resulted in a 20% increase in testing rates

the Granite State Pediatrician on "Recent Changes to NH's Childhood Lead Poisoning Law: What Granite State Pediatricians Need to Know". This article was written in collaboration with Dr. William Storo, President Granite State Pediatric Society, and pediatrician at Dartmouth-Hitchcock Concord Clinic. In addition, Parenting New Hampshire magazine interviewed the Program to write an article on Lead Poisoning: "What You Should Know About Lead Poisoning."

- Collaborated with the DHHS/DPHS Environmental Public Health Tracking Program and the Department of Environmental Services' Drinking Water and Groundwater Bureau to examine areas of New Hampshire that historically have high rates of lead poisoning in children under the age of six. GIS maps were created of these high risk communities mapping blood lead level data by census block, overlaying the municipality water supply piping. This collaboration provided valuable information to town and city municipalities on streets of specific communities where the age and status of water main piping may need to be reviewed for potential lead contamination.

- Assisted in the coordination of the Greater Nashua Region Pediatric Health Provider Education Dinner. The featured guest speaker was Patrick M. Vivier, MD, Ph.D, Brown University who spoke on the health impacts of lead poisoning in young children making comparisons between Rhode Island and New Hampshire. As a follow up, Dr. William Storo, President of the New Hampshire Pediatric Society and practicing physician at Dartmouth-Hitchcock Clinic in Concord discussed New Hampshire's burden of lead poisoning and steps the legislatively appointed Childhood Poisoning Prevention & Lead Screening Commission plan to take to improve testing rates for 1 and 2 year old children statewide.

- Partnered with the EPA Region I in the Brady Sullivan Manchester Mill West lead contamination cleanup project that lead to EPA issuing Brady Sullivan a fine of $139,171 and the onsite contractor an Administrative Complaint for $152,848 for violation of the federal laws surrounding the work practices, disclosure, permits and required license associated with working with lead.
- Collaborated with the Woman, Infant and Children (WIC) Nutrition and Food Service Program of the Community Action Program Belknap-Merrimack Counties on an electronic blood lead reporting pilot project. The WIC programs statewide test an estimated 1,000 children annually for lead poisoning. If successful this pilot will eliminate faxed paper reporting with a secure electronic data file that will increase efficiency of data reporting.
- Partnered with the City of Claremont, Hospital and School Administrative Unit to identify strategies to eliminate lead poisoning among children in their community. In an unprecedented collaboration, this group brainstormed strategies and developed action steps to increase blood lead testing levels among one and two year olds, strengthen City housing code and the building application process to eliminate lead hazards in their housing stock and ways to access grant funding to improve their pre-1978 stock .
- Participated as a member of the legislatively appointed Childhood Lead Poisoning Prevention & Screening Commission chaired by Senator Dan Feltes (D). In December, the Commission released to the Governor, President of the Senate, Speaker of the House and State Library the 1st Annual Report that included twelve recommendations for primary prevention and increasing testing rates of at risk children. Furthermore, SB247 was filed by Senator Dan Feltes that includes many of these recommendations.

Despite these accomplishments, the HHLPPP and statewide public health activities directed towards eliminating childhood lead poisoning experienced challenges including: incomplete or non-existent reporting of lead testing data necessary to inform public health activities; limited public health resources; difficulties reaching our highest risk populations to ensure adequate screening rates among them; and maintaining lead prevention as a top priority among stakeholders.

It is our hope and anticipation that through exemplary leadership and strong partnerships, as well as collaborations with our stakeholders and all residents of this State, the near future will show tremendous progress in addressing our aging housing stock and ultimately reducing childhood lead poisoning in New Hampshire.

THE IMPACT OF CHILDHOOD LEAD POISONING

New Hampshire has some of the oldest housing stock in the United States. Sixty-two percent of New Hampshire's housing stock was built before lead-based paint was banned in 1978, the highest percentage of any state in the US. (EPHT, 2014). Children living in houses and apartments built prior to 1978 are at increased risk for lead exposure. Lead paint does not have to be peeling or flaking to pose a threat. Even in well-maintained homes, lead paint can create toxic dust through friction and impact that is not easily visible to the naked eye. Any lead-painted surfaces that are subject to friction or abrasion can generate lead dust. When windows or doors are opened and closed, the paint on the window or door rubs against the paint of the frame or jamb and creates very fine particles of lead paint dust that fall on the windowsill and floor. It takes only trace amounts of this lead dust to poison a child. Remodeling or renovating a pre-1978 house or apartment without using lead safe work practices poses one of the greatest risks of lead poisoning. When interviewing parents of children with recent elevated blood leads, approximately one-third of parents reported that renovations occurred during the past six months (HHLPPP, 2015).

Due to normal developmental behaviors, infants, toddlers and young children under the age of three years are especially vulnerable to lead exposure. These children come into close contact with lead in their environments through laying, sitting, crawling and playing on the floor and in areas where lead paint dust collects. Age appropriate hand-to-mouth behavior and placing objects in their mouths also results in ingestion of lead-contaminated dust. Infants and toddlers ingest lead when they explore their environment and relieve teething discomfort by mouthing lead-painted objects and surfaces. Fifty percent (50%) of the lead ingested by an infant is absorbed, compared to only 5 to 15% of that ingested by an adult (Council, 1993) due to the fact that children under age six years of age have not yet developed a blood-brain barrier. This brain-protective, filter -like, anatomical structure prevents lead, other heavy metals and other toxins from entering the human brain. Without it, children's brains have no protective barrier and the lead in their blood flows freely into their brains negatively impacting brain growth and function.

Lead can accumulate in the body over months or years of exposure. This accumulation can have a number of adverse effects. According to a report released from the President's Taskforce on Environmental Health Risks and Safety Risks to Children,[3] even low-level lead exposures less than 5 µg/dL can affect attention, executive functions, visual-spatial skills, speech, language and fine and gross motor skills and can result in increased

[3] The President's Taskforce on Environmental Health Risks and Safety Risks to Children is comprised of representatives across nine federal agencies and departments, including the U.S. Departments of Agriculture, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, Justice, Labor, and Transportation, as well as the Consumer Product Safety Commission, Environmental Protection Agency, Council of Economic Advisers, Council on Environmental Quality, Domestic Policy Council, National Economic Policy Council, Office of Management and Budget, & Office of Science and Technology Policy.

impulsivity and aggression (Children, 2016). Blood lead levels less than 10 µg/dL are associated with increases in behavioral effects and decreases in hearing, cognitive function and postnatal growth. Very high levels, greater than 40 µg/dL, are associated with observable symptoms, including abdominal pain. Extremely high levels, over 80 µg/dL, can induce convulsions and cause the loss of muscle control and even death.

Of all of lead's negative impacts on a child's health and development, it is lead's damage to a child's developing brain that is of the most concern. Young children are most vulnerable for lead exposure due to their developmentally appropriate behaviors (e.g. hand to mouth activity) at the same time that their brains are rapidly developing. Between birth and 2 years of age, children develop more neural connections in areas of language, higher cognitive function, and sensory pathways (vision and hearing) than at any other time in their lives (JP Shonkoff, 2000). Lead exposure interferes with key aspects of the development of the brain's anatomical architecture, including synapse development and function, and the biochemical connections between synapse terminals, namely reducing the efficacy of the neurotransmitter Dopamine, the dominate neurotransmitter in the Frontal Lobe (areas of Executive Function) of the brain (Needleman, 1990) and the production of brain-derived neurotropic factor (BDNF), a chemical critical to the creation of new synapses in the hippocampus, the brain's center for memory and learning (Stanfield, 2012). The Cincinnati Lead Study, a joint research project between Cincinnati Children's Hospital and the University of Cincinnati, has been following children exposed to lead into adulthood. It is the longest running study of its kind in the world. The study has demonstrated that as childhood blood-lead levels increase, gray matter volume decreases in multiple areas of the brain. The study notes that the regions of a child's brain with the largest gray matter loss are the areas known for impulse control, emotional regulation and decision making. (Cecil, 2008).

Twenty years of research demonstrates that lead exposure has unambiguous, negative, long-lasting effects on intelligence, behavior and health. Early childhood exposure appears to have large negative consequences on behavior, increasing impulsivity and aggression. Even moderate lead exposure in early childhood can have substantial negative impact on behavior. (Reyes 2015) Once a child's health or cognition has been harmed by lead, the effects can be permanent and persist from childhood through adulthood. Long term impact of lead exposure on children as they enter school include lower IQ, learning disabilities, behavior problems and low and failing test schools. As lead-exposed children grow, they engage in aggressive and risky behaviors at higher rates. The negative outcomes include higher rates of teenage pregnancies, higher high school drop-out rates, and more criminal arrests and adult criminal activity. (Stansfield, 2008, Wright, 2008, Reyes, 2015)

TESTING CHILDREN FOR LEAD EXPOSURE IN NEW HAMPSHIRE

Screening tests for blood lead levels play a critical role in the determination and classification of the health of an individual, especially children and provide the HHLPPP with vital information on community lead levels. This information is important for the continuous monitoring of population health. Blood lead level tests can also be used to measure the effectiveness of public health education and other prevention activities.

The public health goal for testing is the prompt identification of children with EBLLs, as there is no safe level of lead exposure and even low levels of exposure have harmful effects on the health and development of the child and negative impacts on the community.

The current *New Hampshire Childhood Lead Poisoning Screening and Management Guidelines*[4] developed by the HHLPPP provide recommendations to healthcare providers on when to test a child for lead poisoning, what methods can be used, and what follow-up schedule is necessary. In accordance with the *Guidelines,* recommendations for blood lead screening focus on the population most at risk in terms of age, socioeconomic status, age of housing, renovations occurring in the home, and other known risk factors. Several factors influence the rate of lead poisoning in a community. The CDC recommends that cities and towns with 27% or more pre-1950 housing stock are considered high-risk communities. (CDC, 2013) Some communities are determined to be at an even higher risk for lead poisoning ("highest-risk") due to additional factors, including the percentage of the population under the age of six; the percentage under the age of six living in poverty; the percentage of children under the age of six enrolled in Medicaid or other federal assistance programs; and special populations living in the communities. A list of the highest-risk communities is included in the **Table 3** on page 23.

In high-risk communities, the HHLPPP recommends a "universal" testing approach, with all children tested at 1 year old and again at 2 years old. Older children, up to 6 years old, who have not previously been tested while living in their current residence, should also be tested. If they have moved to a new residence, begun attending a child care facility built prior to 1978, have been exposed to a pre-1978 renovation project, or have exhibited at-risk behavior since the time of their last blood test, a new blood test should be conducted.

In low-risk communities, the HHLPPP recommends a "targeted" screening approach. For children between ages 1 and 2 years old who live in low-risk communities, providers use a *Lead Exposure Risk Questionnaire* to identify

[4] Available at http://www.dhhs.nh.gov/dphs/bchs/clpp/documents/screening.pdf.

children with individual risk factors that will require blood lead testing. This questionnaire should also be used for children ages 3 to 6 years old who reside in targeted (or low risk) communities, have not been previously tested, have renovation activities taking place at home, have moved to a new residence, have begun attending a child care facility built prior to 1978, or have exhibited high-risk behavior. A positive or uncertain response to *one or more* questions on the *Lead Exposure Risk Questionnaire* denotes that testing is necessary.

All children enrolled in Medicaid or Head Start, regardless of town of residence, are currently recommended to have a blood lead test at both 1 and 2 years of age (CDC December 8, 2000). In addition, children 3 to 6 years old who have not previously been tested, regardless of town of residence, should also be tested.

A description of the algorithm that the HHLPPP uses for classifying blood lead test results for public health surveillance and case definition purposes is provided in the **Technical Notes and Acronyms** section.

2016 PEDIATRIC SURVEILLANCE DATA

NEW HAMPSHIRE'S PEDIATRIC TESTING COUNTS

Historically, pediatric blood lead testing rates in New Hampshire have been influenced by several factors, including:

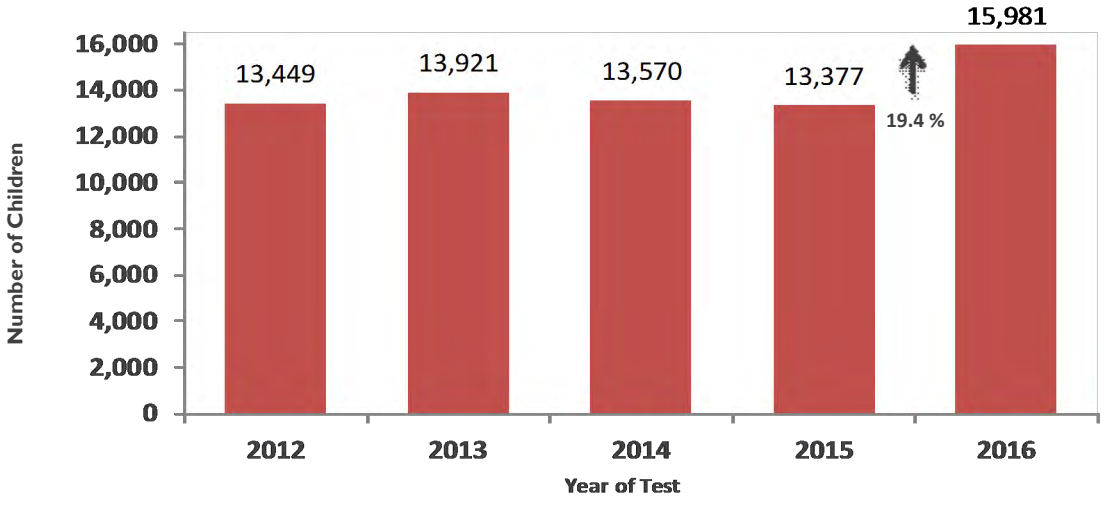
- The number of children eligible for testing
- Current legislation and its enforcement
- Knowledge and practices of healthcare workers
- Collaboration among public health partners
- Community activism
- Public health program priorities and available resources
- Public knowledge about lead hazards and
- Special epidemiologic investigations in response to perceived/potential epidemics.

After many years of relative stability in the number of annual lead screens among New Hampshire children under 6, in 2016 we observed a 19.4 % increase (**Figure 1**) in the number of children screened. This increase has been partially attributed to changes in community priorities and current public health practices including: training, outreach, community efforts, availability of resources and recent changes in local policy. Similar to prior years, a majority (80%) of 2016 tests were conducted among children who were aged 12 – 23 months (1 year old) *and* 24-35 months (2 years old) at the time of testing. Evidence-based lead testing guidelines from CDC and the American Academy of Pediatrics, mirrored in the *New Hampshire Childhood Lead Poisoning Screening and Management Guidelines,* focus on these two age groups as the most vulnerable. Other vulnerable populations which remain a focus of New Hampshire's screening guidelines include refugee children, those with siblings with EBLLs and those who have not been previously tested.

The number of blood lead tests by town is greatly influenced by the denominator or underlying child population of that town. The 2016 testing rates in New Hampshire's high-risk towns where universal testing is recommended fell short of expectations and the target of 100% testing for one and two year olds. The highest testing rates in 2016 for any towns with population of more than 500 children under the age of six years old was observed in Berlin, a community historically known for its high-risk of lead elevation. In 2016, Franklin, Farmington, Laconia, Pelham, Raymond, Salem, and Seabrook also had high testing rates with more than 20% of the population under 6 years old tested for blood lead exposure.

FIGURE 1

Annual Number of Children Tested for Blood Lead Capillary and Venous Ages 0 – 6 Years Old in NH, 2012 - 2016



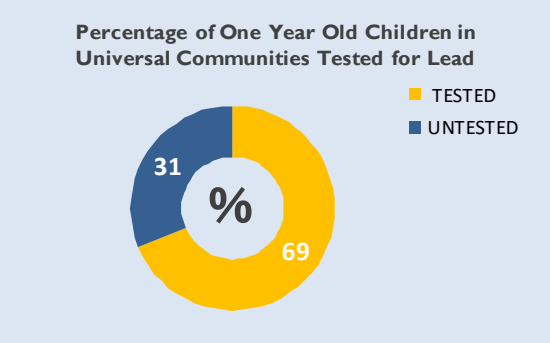
Proportion of Children Meeting Screening & Management Guidelines in NH, 2016

As the data presented in **Figure 2** below indicate, healthcare workers are challenged with meeting *Childhood Lead Poisoning Screening and Management Guidelines* for specific populations at risk for blood lead poisoning. These populations include 1 and 2 year old children who live in high risk communities designated by DPHS, are insured by Medicaid, are receiving benefits under the Women, Infants, and Children program (WIC), and are enrolled in Head Start.

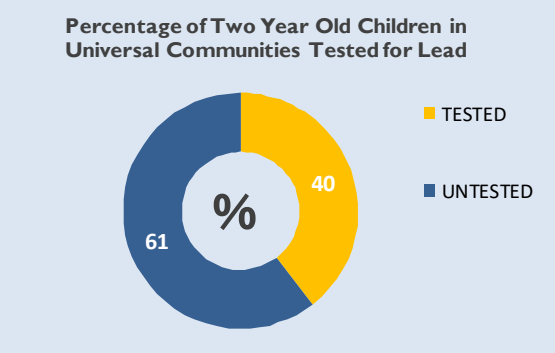
The State of New Hampshire's *Childhood Lead Poisoning Screening and Management Guidelines* goal is to achieve 100% testing for blood lead among one and two-year-olds living in universal communities as well as the high risk populations described earlier in this section

FIGURE 2

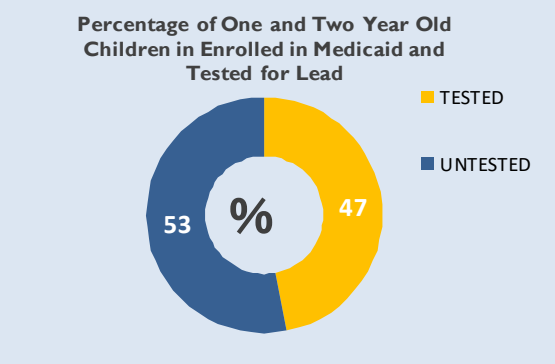
Percentage of Children Tested as per New Hampshire Screening and Management Guidelines



In 2016, **69% of 1-year-old children living in Universal Communities** were tested for blood lead within their 1st year of birth (5,043 of 7,344). Current guidelines recommend that 100% of all 1-year old children living in these communities should be tested for lead exposure.



In 2016, **40% of 2-year-old children living in Universal Communities** were tested for blood lead within their 2nd year of birth (2,996 of 7,578). Current guidelines recommend testing for all (100%) 2-year-old children living in these communities should be tested for lead exposure.



In 2016, **47% of 1 and 2 Year olds insured by Medicaid** were tested for blood lead levels in 2016 (4,408 of 9,403). Current guidelines recommend all (100%) 1 and 2 Year olds insured by Medicaid be tested for blood lead.

ELEVATED BLOOD LEAD LEVELS AMONG NEW HAMPSHIRE CHILDREN

In 2016, blood lead test reports for 15,981 children aged 6 years or younger were received and used in this report. Of these, 741 children had an EBLL ≥5 µg/dL and 80 were new confirmed elevations ≥10µg/dL. Twenty-four children tested had elevations ≥10 µg/dL that were reported in previous years. Among all children reported as tested in 2016, 50.6% were male and 77.1% where white. **Table 1** shows the distribution of childhood lead test results in 2016 stratified by age, sex, and race. As shown in that table, most (81%) of the 741 elevations greater than 4 µg/dL were among children in the most commonly tested age groups: 12 – 23 and 24—35 month. In 2016 we noted that minority (blacks/ African Americans) populations were disproportionately represented among elevations ≥10 µg/dL. This racial group comprised 2% of the population tested yet made up 15 % of elevations. Only 1 of the 12 elevations among racial minorities was reported in a new arrival "refugee". It is also worth noting that a majority (95%) of the children tested throughout 2016 had blood lead levels below 5 µg/dL, the level of public health concern.

Figure 3 depicts those children under the age of six identified with new elevations ≥5 µg/dL and/ or ≥10 µg/dL compared to those children with blood lead levels that remain elevated from the previous year(s).

FIGURE 3

Children Under the Age of 6 Years with New (Incident) and Existing (Prevalent) Elevations ≥10µg/dL plotted along all Elevations ≥ 5 µg/dL, NH, 2012-2016

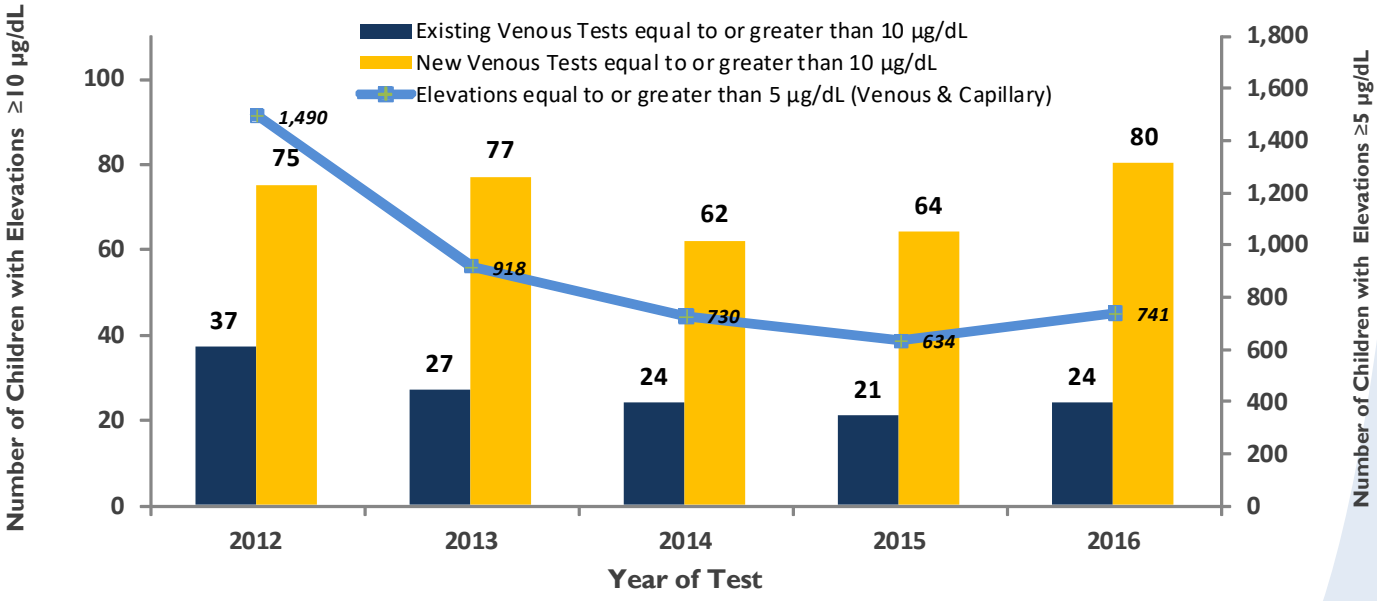


TABLE 1

Blood Lead Levels in Children 0 - 6 Years by Selected Characteristics in NH, 2016

	Blood Lead Level					
AGE GROUP IN MONTHS	0 - 4 µg/dL Venous & Capillary Tests	5 - 9 µg/dL Venous & Capillary Tests	≥10 µg/dL Capillary Tests	New ≥ 10 µg/dL Venous Tests	Existing ≥ 10 µg/dL Venous Tests	Total Number (Percentage)
0 to 11	758	19	< 5	< 5	0	784 (4.91)
12 to 23	7,812	295	14	47	9	8,177 (51.17)
24 to 35	4,446	165	9	18	6	4,644 (29.06)
36 to 72	2,224	128	< 5	***	***	2,376 (14.87)
SEX						
Female	7,540	292	15	34	8	7,889 (49.36)
Male	7,697	315	15	46	16	8,089 (50.62)
Other/Unknown	3	0	0	0	0	3 (0.02)
RACE						
White	11,753	474	24	60	22	12,333 (77.17)
Asian	476	***	0	< 5	0	504 (3.15)
Black/African American	352	26	< 5	***	0	393 (2.46)
American Indian, Alaska Native, Native Hawaiian, Other Pacific Islander	***	< 5	0	0	0	20 (0.33)
Other/Unknown	2,640	80	3	6	2	2,731 (17.01)
TOTAL	**15,240**	**607**	**30**	**80**	**24**	**15,981* (100)**

Excludes 12 children with test results from unknown test type* ** Masked—to protect confidentiality*

DESCRIPTION OF TERMS USED IN NH CLASSIFICATION OF LEAD POISONING

Capillary A blood lead test performed on a sample obtained via a finger stick, typically used for screening.

Venous A blood lead test performed on a sample from veins, drawn via syringe, typically used for confirming blood lead levels.

0 - 4 µg/dL Ven. & Cap. Tests Represent children whose blood lead level was below the level recommended by the CDC for public health intervention.

5-9 µg/dL Ven. & Cap. Tests Represent children who's families and landlords received outreach/educational information from the HHLPPP.

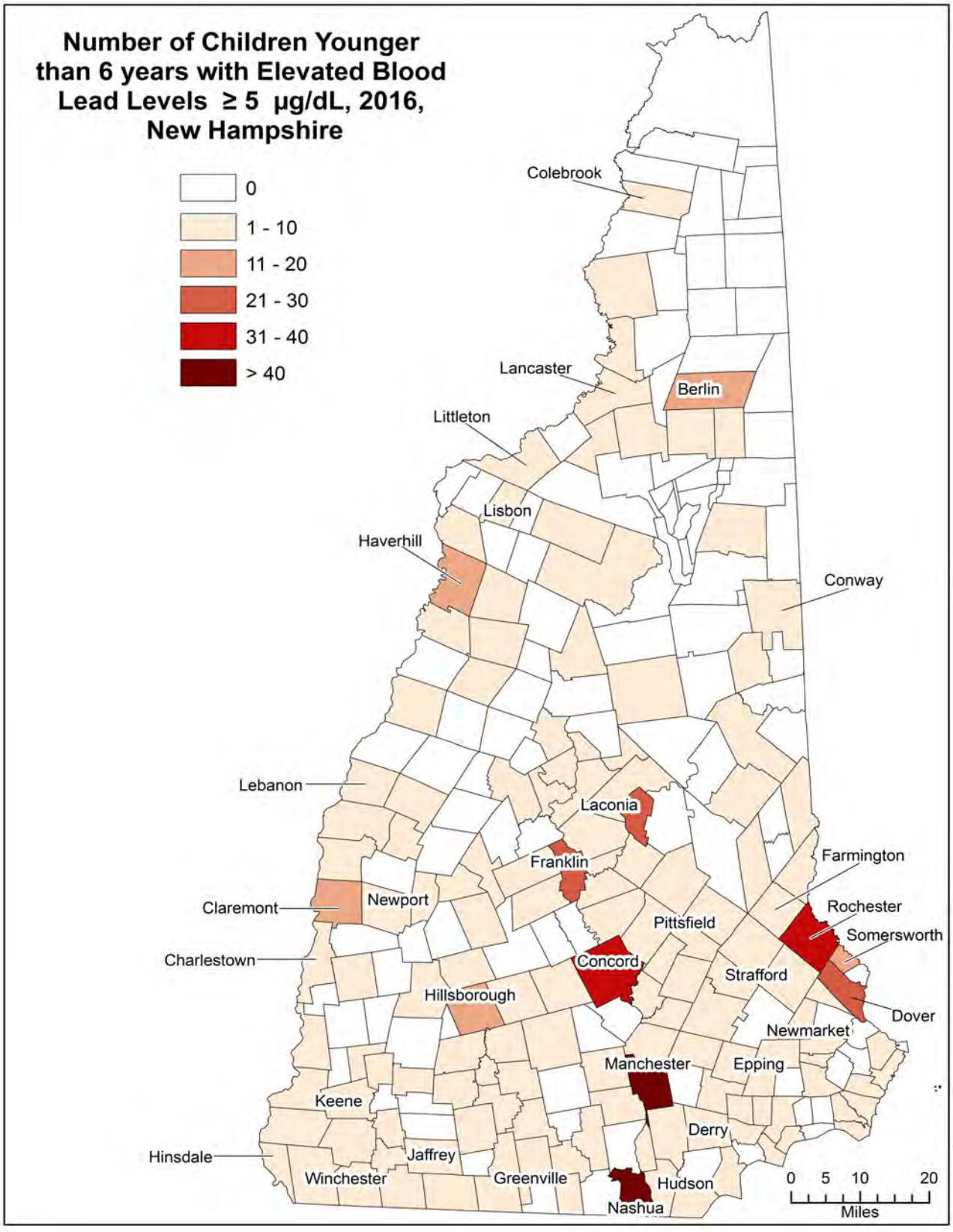
≥10 µg/dL Capillary Tests Represent children with elevated capillary blood leads that did not return to their doctor for a confirmatory venous test or the blood lead test was not reported to the HHLPPP.

≥New 10 µg/dL Venous Tests Represent those children with new elevations that received medical case management and an investigation from the HHLPPP.

Existing >10 µg/dL Venous Tests Represent those children who's blood lead remains elevated due to ongoing exposure or body burden from a previous year(s).

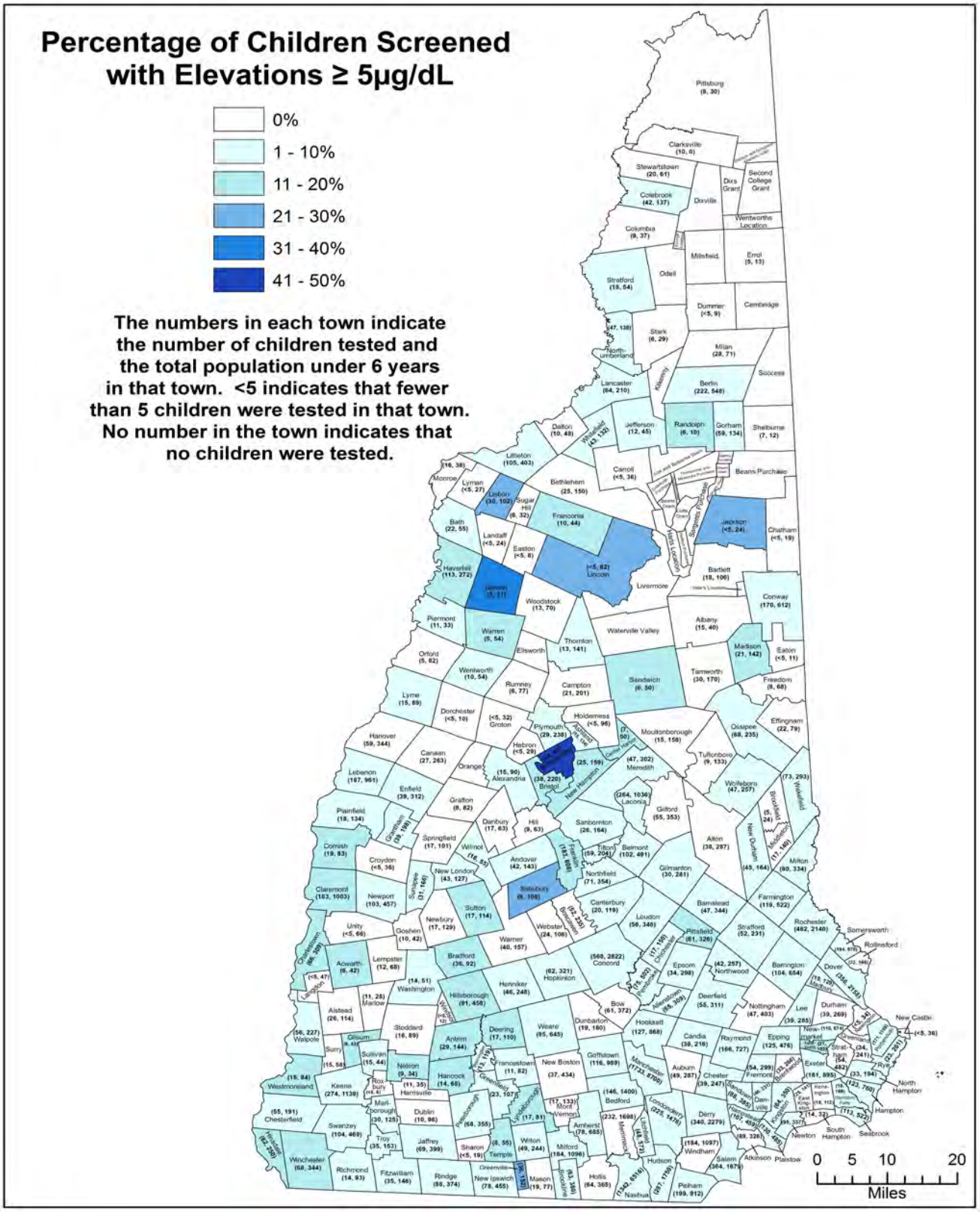
MAP 1

Geographic Distribution of Blood Lead Levels ≥5 µg/dL Among Children Aged 6 Years or Younger in NH, 2016



MAP 2

Geographic Distribution of the Proportion (%) of Children aged 6 years or under Tested with blood lead levels ≥ 5 µg/dL, NH, 2016



MEAN BLOOD LEAD LEVELS IN NH's CHILDREN

The CDC uses a reference level of 5 µg/dL to identify children whose blood lead levels are much higher than most children's levels and for whom initiation of public health action is recommended (Prevention, 2014). However, no safe blood level in children has been identified.

In 2016, the arithmetic mean of all New Hampshire children under the age of six who were tested for lead poisoning was 2.81 µg/dL.

The highest mean value (3.26 µg/dL) was reported among children aged 36 to 72 months old and among Black/African Americans (3.51 µg/dL) as shown in **Table 2** below**.** There was no noted difference in the mean blood lead level by sex.

Over the last 5 years, trends in mean blood lead levels among NH children under the age of 6 show that children 12 to 23 months usually have

TABLE 2

Mean Blood Lead Levels by Age, Sex, and Racial Group for All Tests in NH, 2016

AGE GROUP	Number of Tests	Median Blood Lead Test Value, µg/dL	Mean Blood Lead µg/dL 95% Confidence Interval	Highest Blood Lead µg/dL
0 to 11 months	846	3.0	2.74 (2.64 - 2.84)	15
12 to 23 months	8,970	2.0	2.66 (2.61 - 2.71)	86
24 to 35 months	5,162	3.0	2.85 (2.75 - 2.95)	(Outlier Value)
36 to 72 months	2,670	3.0	3.26 (3.13 - 3.38)	57
SEX				
Female	8,646	3.0	2.74 (2.69 - 2.80)	86
Male	8,999	3.0	2.87 (2.81 - 2.94)	(Outlier Value)
Other/Unknown	3	2.0	2.0 (-0.4 - 4.4)	3
RACE CATEGORY				
White	13,675	3.0	2.89 (2.85 - 2.93)	86
Asian	545	2.0	2.61 (2.42 - 2.79)	23
Black/African American	492	3.0	3.51 (3.21 - 3.80)	32
American Indian/Alaska Native	12	3.0	2.75 (2.19 - 3.30)	4
Native Hawaiian/Other Pacific Islander	9	2.0	2.55 (1.27 - 3.83)	6
Other/Unknown	2,915	2.0	2.36 (2.21 - 2.52)	(Outlier Value)
NEW HAMPSHIRE	17,648*	3.0	2.81 (2.77 - 2.85)	(Outlier Value)

**Capillary and venous tests*

the lowest blood lead mean, while children ages 36 to 72 months have the highest blood lead mean.

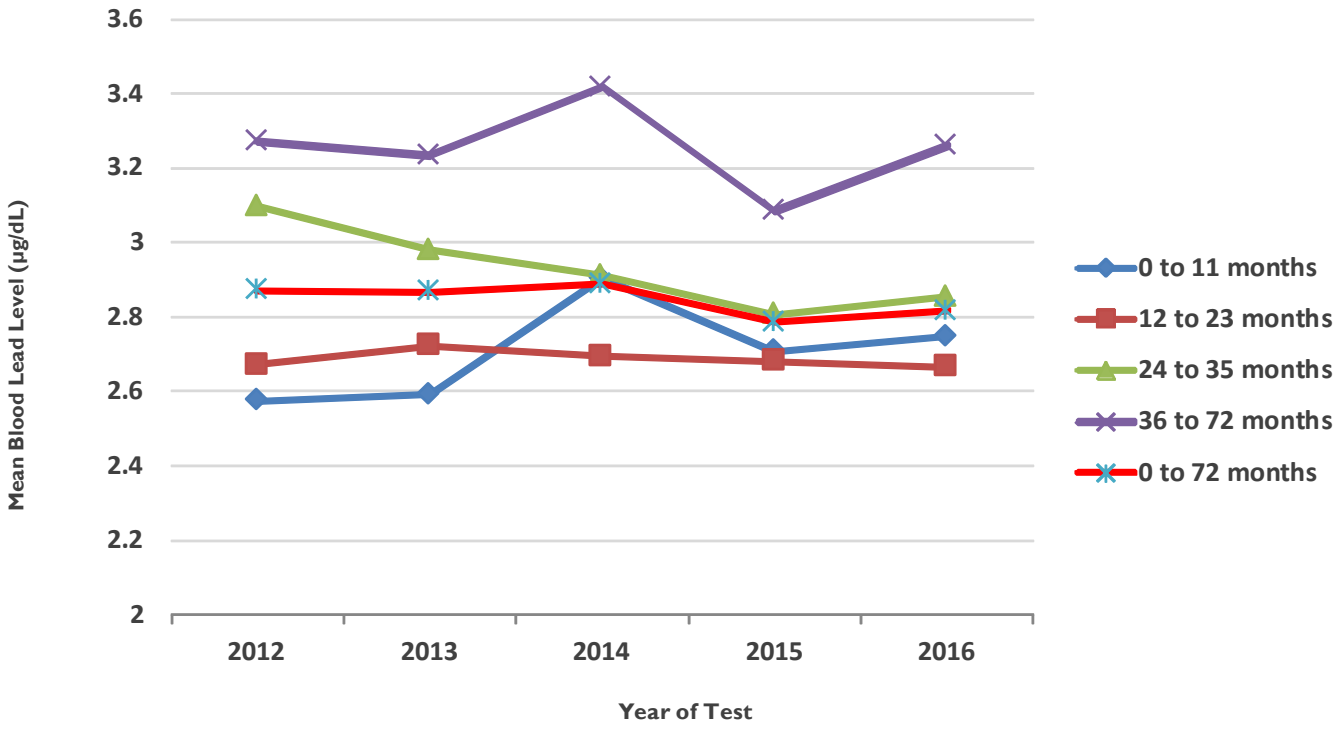
The mean blood lead levels for children residing in New Hampshire's 21 highest-risk areas (2.97µg/dL) were significantly ($p < 0.0001$) higher than the mean levels observed in non-high risk communities (2.71 µg/dL) or statewide (2.81 µg/dL). Greenville and Franklin reporting the highest mean blood lead levels of 4.5 µg/dL and 4.2 µg/dL respectively. Other towns with high (≥ 3.0 µg/dL) mean blood lead levels among New Hampshire's highest risk communities included: Berlin, Concord, Dover, Franklin, Keene, Laconia, Pittsfield, Rochester, Somersworth and Stratford.

High mean blood lead levels (with at least 30 tests performed) were also observed in communities not designated as highest risk, including: New Hampton (Mean = 7.11 µg/dL, 35 tests), Woodsville (Mean = 4.1 µg/dL, 90 tests), Weare (4.0 µg/dL, 93 tests), Ossipee (Mean = 5.36 µg/dL, 33 tests), and Lisbon (Mean = 4.77 µg/dL, 53 tests).

Over the last 5 years, there has been a slight but stable decline in the mean blood lead levels reported throughout New Hampshire among the different age and racial groups tested.

FIGURE 4

Mean Blood Lead Level Trends Among Children Younger than 6 Years by Age Group in NH 2012-2016



CHILDREN IN NEW HAMPSHIRE'S HIGHEST RISK COMMUNITIES

Best practices in public health surveillance and funding requirements recommend that public health agencies periodically evaluate communities in their jurisdiction to determine the likelihood that a child residing in a community may experience lead poisoning. Upon evaluation, the proper designation of a community's risk for lead poisoning facilitates better allocation of limited public health resources and adequately communicates the health risks to the public. In 2015, the HHLPPP re-evaluated the risk level for lead poisoning among of New Hampshire's 234 communities and designated 21 communities (towns and cities) as the State's highest-risk communities. **Table 3** below summarizes the data for the state while **Tables 4** on following pages outlines the surveillance data for New Hampshire's 21 highest risk communities.

Several environmental and social factors were used in combination to create a matrix that determined a community's risk for childhood lead poisoning. For each community, these factors included percentage of pre-1950 housing stock >27%; percentage of children with EBLL ≥10 µg/dL; percentage of children under 6 insured by Medicaid and/or living below federal poverty level guidelines; percentage of residents living in rental units; and a community's designation as a refugee resettlement area.

According to the 2016 Census estimates, there are an estimated 28,536 children under the age of 6 years living in New Hampshire's 21 highest-risk communities. These children represent about 34% of all children under the age of 6 residing in the State (78,974 children). According to the *New Hampshire Childhood Lead Poisoning Screening and Management Guideli*nes, 100% of one- and two-year olds living in these (21) communities should have been tested for elevated blood lead, yet only 52.7% (4,975 children of 9,427 total) were tested.

Sixty-five percent (65%) of all 2016 elevations ≥ 10 µg/dL and 53% all 2016 elevations ≥ 10 µg/dL were reported among residents of these high risk communities.

TABLE 3

NH Total: Number of Tests and Elevations by Age Group, 2016

TOWN & AGE GROUP IN MONTHS		NUMBER SCREENED	POPULATION 2010	SCREENING RATES (%)	0 - 4 µg/dL Ven. & Cap. Tests	5 - 9 µg/dL Ven. & Cap. Tests	≥10 µg/dL Capillary Tests	New ≥10 µg/dL Venous Tests Only	Existing ≥10 µg/dL Venous Tests Only
NH Total	0 to 11	784	12,994	6.0	758	19	4	3	.
	12 to 23	8,177	13,521	60.4	7,812	295	14	47	9
	24 to 35	4,644	13,959	33.2	4,446	165	9	18	6
	36 to 72	2,376	44,293	5.3	2,224	128	3	12	9
TOTAL, NEW HAMPSHIRE		**15,981**	**84,767**	**18.8**	**15,240**	**607**	**30**	**80**	**24**

TABLE 4

Highest-Risk Communities: Number of Elevations and Risk Factors in NH, 2012 -2016

COMMUNITY	Total Number of Children with BLL 5 – 9 µg/dL	Total Number of Children with BLL ≥10 µg/dL	Percentage Pre-1950 Housing by Town	Percentage Insured by Medicaid by Town	Percentage Under 6 yo. Living Below Poverty by Town	Percentage Living in Rental Units by Town	Designated Refugee Resettlement Area in last 5 Years
ANTRIM	26	< 5	40.7	14.8	18.7	23.5	No
BERLIN	176	5	58.8	23.4	25.2	39.5	No
CLAREMONT	96	13	49.6	18	9.6	35.7	No
CONCORD	117	33	37.8	14.8	13.7	45.3	Yes
DOVER	51	13	32.4	12.2	16.7	49.3	No
FRANKLIN	108	11	49.2	25.7	40.7	40.4	No
GREENVILLE	19	< 5	47.5	16.8	26.8	26.3	No
HAVERHILL	< 5	0	36.7	16.3	5.0	29.3	No
KEENE	161	7	41	11.3	18.8	44.6	No
LACONIA	65	10	37.7	23.2	27.3	43.4	Yes
LEBANON	14	5	30.9	11.1	17.2	50.7	No
MANCHESTER	658	114	43.9	16.8	23.6	51.5	Yes
NASHUA	288	45	23.7	13.8	20.1	43.3	Yes
NEW CASTLE	0	0	38.7	1.2	0	23.1	No
PITTSFIELD	24	8	40.3	21.7	30.7	40.9	No
RINDGE	28	< 5	22.4	10.7	15.6	23.5	No
ROCHESTER	154	29	27.1	17.7	34.8	36.0	No
SOMERSWORTH	61	8	34.3	16.3	22.4	43.5	No
STRATFFORD	11	< 5	23.1	31.3	74.4	18.4	No
TROY	24	< 5	47.1	10.8	14.7	30.2	No
WALPOLE	14	< 5	51.3	10.2	19.9	27.8	No

** Data from specific site excluded from publication pending validation*

TABLE 5

NH Highest-Risk Communities: Testing Data, 2016

TOWN & AGE GROUP IN MONTHS		NUMBER SCREENED	POPULATION Census 2010	PERCENTAGE SCREENED (%)	0 - 4 µg/dL Ven. & Cap. Tests	5 - 9 µg/dL Ven. & Cap. Tests	≥ 10 µg/dL Capillary Tests	New ≥10 µg/dL Venous Tests Only	Existing ≥10 µg/dL Venous Tests Only
ANTRIM	0 to 11	0	28	0	0	0	0	0	0
	12 to 23	16	19	84.2	14	< 5	0	0	0
	24 to 35	11	24	45.8	10	< 5	0	0	0
	36 to 72	< 5	73	< 5	< 5	< 5	0	0	0
BERLIN	0 to 11	28	87	32.2	27	0	< 5	0	0
	12 to 23	70	75	93.3	64	5	0	< 5	0
	24 to 35	60	102	58.8	56	< 5	0	< 5	0
	36 to 72	64	284	22.5	56	8	0	0	0
CLAREMONT	0 to 11	0	128	0	0	0	0	0	0
	12 to 23	91	172	52.9	84	5	< 5	< 5	0
	24 to 35	55	177	31.0	51	< 5	0	0	0
	36 to 72	35	526	6.7	27	6	0	< 5	< 5
CONCORD	0 to 11	28	128	21.9	27	0	0	< 5	0
	12 to 23	253	172	147.1	236	17	0	0	0
	24 to 35	138	177	78.0	133	< 5	0	< 5	0
	36 to 72	107	526	20.3	94	8	0	< 5	< 5
DOVER	0 to 11	7	374	< 5	7	0	0	0	0
	12 to 23	180	356	50.6	168	8	< 5	< 5	< 5
	24 to 35	105	341	30.7	99	6	0	0	0
	36 to 72	62	1087	5.7	59	< 5	0	0	0
FRANKLIN	0 to 11	5	99	5.1	< 5	0	< 5	0	0
	12 to 23	81	96	84.4	71	6	< 5	< 5	0
	24 to 35	55	95	57.8	45	9	0	< 5	0
	36 to 72	40	318	12.6	34	5	0	< 5	0
GREENVILLE	0 to 11	0	19	0	0	0	0	0	0
	12 to 23	23	23	100.0	18	< 5	0	< 5	0
	24 to 35	7	26	26.9	< 5	< 5	0	< 5	0
	36 to 72	6	84	7.1	5	0	0	< 5	0
HAVERHILL	0 to 11	< 5	45	< 5	< 5	0	0	0	0
	12 to 23	< 5	35	8.6	< 5	< 5	0	0	0
	24 to 35	< 5	69	4.3	< 5	0	0	0	0
	36 to 72	< 5	123	< 5	< 5	0	0	0	0
KEENE	0 to 11	< 5	159	< 5	< 5	0	0	0	0
	12 to 23	145	182	79.7	139	< 5	0	< 5	< 5
	24 to 35	91	185	49.1	90	< 5	0	0	0
	36 to 72	32	613	5.2	30	< 5	0	0	0
LACONIA	0 to 11	12	178	6.7	11	0	0	< 5	0
	12 to 23	120	178	67.4	112	7	0	< 5	0
	24 to 35	70	174	40.2	64	6	0	0	0
	36 to 72	61	506	12.1	55	6	0	0	0

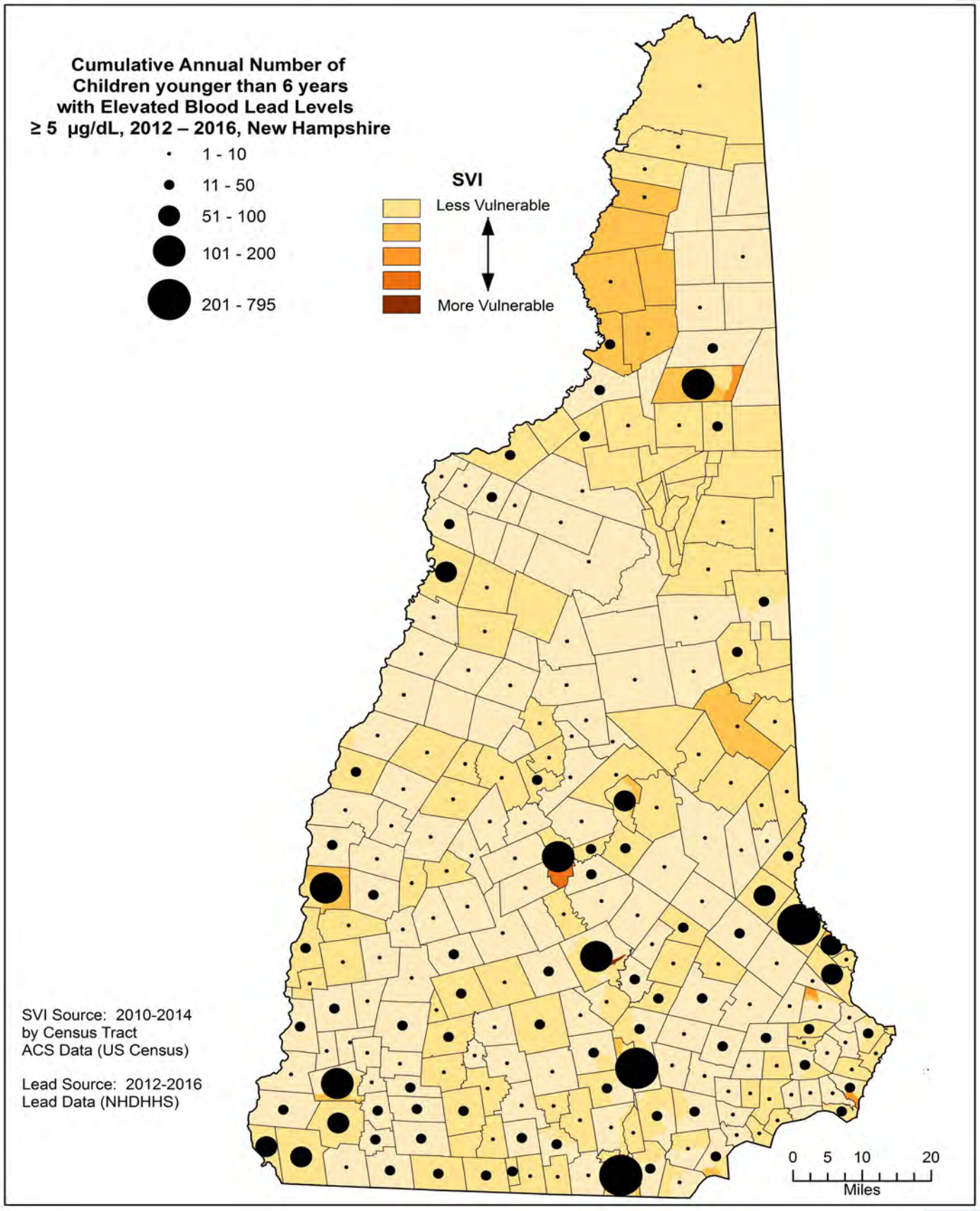
TABLE 5 CONTINUED

NH Highest-Risk Communities: Testing Data, 2016

TOWN & AGE GROUP IN MONTHS		NUMBER SCREENED	POPULATION 2010	PERCENTAGE SCREENED (%)	0 - 4 µg/dL Ven. & Cap. Tests	5 - 9 µg/dL Ven. & Cap. Tests	≥10 µg/dL Capillary Tests	New ≥10 µg/dL Venous Tests Only	Existing ≥10 µg/dL Venous Tests Only
LEBANON	0 to 11	5	184	< 5	< 5	0	0	0	0
	12 to 23	64	174	36.8	61	< 5	0	0	0
	24 to 35	37	160	23.1	36	< 5	0	0	0
	36 to 72	8	443	< 5	7	0	0	0	< 5
MANCHESTER	0 to 11	54	1,525	3.5	50	< 5	0	0	0
	12 to 23	955	1,512	63.2	903	42	0	10	0
	24 to 35	483	1,498	32.2	457	21	0	< 5	< 5
	36 to 72	237	4,165	5.7	213	21	0	< 5	< 5
NASHUA	0 to 11	29	1,076	< 5	29	0	0	0	0
	12 to 23	750	1,088	68.9	721	23	0	6	0
	24 to 35	368	1,078	34.1	354	9	< 5	< 5	< 5
	36 to 72	191	3,274	5.8	178	11	< 5	0	< 5
NEW CASTLE	0 to 11	0	5	0	0	0	0	0	0
	12 to 23	< 5	7	28.6	< 5	0	0	0	0
	24 to 35	0	5	0	0	0	0	0	0
	36 to 72	0	20	0	0	0	0	0	0
PITTSFIELD	0 to 11	< 5	63	6.3	< 5	0	0	0	0
	12 to 23	33	47	70.2	27	< 5	0	< 5	< 5
	24 to 35	11	45	24.4	10	< 5	0	0	0
	36 to 72	12	171	7.0	11	< 5	0	0	0
RINDGE	0 to 11	< 5	73	< 5	< 5	0	0	0	0
	12 to 23	59	65	90.8	57	< 5	0	0	0
	24 to 35	22	65	33.8	22	0	0	0	0
	36 to 72	6	171	< 5	5	< 5	0	0	0
ROCHESTER	0 to 11	7	333	< 5	7	0	0	0	0
	12 to 23	181	384	47.1	167	9	< 5	< 5	< 5
	24 to 35	171	380	45.0	163	5	< 5	< 5	< 5
	36 to 72	78	1,043	7.5	69	7	0	0	< 5
SOMERS-WORTH	0 to 11	6	170	< 5	< 5	< 5	0	0	0
	12 to 23	97	163	59.5	90	5	< 5	< 5	0
	24 to 35	53	157	33.7	51	< 5	0	0	0
	36 to 72	35	480	7.3	33	< 5	0	0	0
STRAFFORD	0 to 11	< 5	23	13.0	< 5	< 5	0	0	0
	12 to 23	34	36	94.4	31	< 5	0	0	0
	24 to 35	12	44	27.3	11	0	< 5	0	0
	36 to 72	< 5	128	< 5	< 5	0	0	0	0
TROY	0 to 11	0	22	0	0	0	0	0	0
	12 to 23	19	30	63.3	18	< 5	0	0	0
	24 to 35	12	21	57.1	10	< 5	0	0	0
	36 to 72	< 5	80	5.0	< 5	0	0	0	0
WALPOLE	0 to 11	0	24	0	0	0	0	0	0
	12 to 23	25	51	49.0	25	0	0	0	0
	24 to 35	11	30	36.7	11	0	0	0	0
	36 to 72	< 5	122	< 5	< 5	0	0	0	0

MAP 3

Social Vulnerability Index and Blood Lead Elevations in NH, 2012 – 2016



In **MAP 3**, the geographic distribution of the cumulative number of New Hampshire children under 6 years old with elevated blood lead levels ≥ 5 µg/dL between 2012 and 2016 was superimposed over the geographic distribution of social vulnerability of New Hampshire's towns and cities, as measured by a set of socioeconomic and demographic factors that affect the resilience of communities. The factors considered when determining a measure for a community's social vulnerability index in New Hampshire include social economic status, household composition, disability, minority status, language, housing, and transportation.

Based on the data plotted on **Map 3**, we can conclude that higher social vulnerability contributes to the number of elevations ≥ 5 µg/dL reported in that community. Other risk factors known to impact the number of elevations ≥ 5 µg/dL are listed in **Table 4**.

RECIPIENTS OF MEDICAID, WOMEN, INFANT AND CHILDREN (WIC) AND HEAD START

Current screening guidelines in New Hampshire recommend that all children enrolled in Medicaid, WIC, or Head Start, regardless of town of residence, be tested for blood lead at both one and two years old. New Hampshire Lead law, RSA 130-AA:5-b sets of goal of achieving 85% testing by 2017 for children who live in high-risk communities, or are insured by Medicaid, receiving benefits under the WIC program or are enrolled in Head start. In addition, current

Federal law states that all children receiving Medicaid benefits have two blood lead tests, at both one- and two-years of age. Children in these populations are typically at a much higher risk for lead poisoning. At the time of this publication, data from the Head Start and WIC programs had not been made available for inclusion in this report. Testing rates among one and two-year-old children receiving Medicaid benefits have historically been below the required level of 100%. In 2016, an estimated 72% of one year olds and 31% of two-year-old Medicaid recipients received blood lead tests. In any given year, Medicaid enrollees consistently comprise the majority of blood lead elevations ≥5 µg/dL reported among children under the age of six.

In 2016, we noted that 57% of NH children under 6 years with elevations ≥5 µg/dL were among Medicaid enrollees. This population, therefore, continues to represent a group of individuals who are at a higher risk for EBLLs.

As shown in **Table 6** below, 50% of 2016 elevations ≥5 µg/dL in Medicaid recipients under six-years-old were among the 12 to 23 month group.

A high proportion of 2016 Medicaid enrollees that were tested for lead exposure were residing in New Hampshire's most populous towns including: Manchester, Nashua, Rochester and Concord. However, the following towns reported a high percentage of elevations (≥ 5 µg/dL) among Medicaid enrollees tested for lead in that town: Lakeport, Munsonville, North Sandwich, South Acworth ; all (100%) of tests among Medicaid enrollees were elevated ≥ 5 µg/dL. In Barnstead, Bridgewater, and Temple; 50% of tests among Medicaid enrollees were elevated. In Franconia, this proportion was 40%, while in Enfield it was 37% and 35% in Lisbon. In the towns of Antrim, Benton, Cornish, Madbury, Pike, Sutton and Warren 33% of tests among Medicaid enrollees were elevated.

TABLE 6

Blood Lead Levels Among Medicaid Recipients by Age, Sex, and Racial Group in NH, 2016

AGE GROUP IN MONTHS	Blood Lead Level						
	0 - 4 µg/dL Venous & Capillary Tests	5 - 9 µg/dL Venous & Capillary Tests	≥ 10 µg/dL Capillary Tests	New ≥ 10 µg/dL Venous Tests	Existing ≥ 10 µg/dL Venous Tests	Total Number	Percent in Subgroup
0 to 11	175	10	1	2	.	188	3.55
12 to 23	2449	156	7	32	5	2,649	50.08
24 to 35	1639	99	7	12	5	1,762	34.40
36 to 72	546	71	2	7	7	633	11.98
Female	2,415	160	7	21	5	2,608	49.91
Male	2,394	176	10	32	12	2,624	50.09
Other/Unknown	0	0	0	0	0	0	0
RACE							
White	3,845	279	15	39	17	4,195	80.18
Black/African American	177	18	1	11	.	207	3.96
Asian	141	11	.	.	.	152	2.91
American Indian/Alaska Native	6	.	.	.	.	6	0.11
Native Hawaiian/Other Pacific Islander	4	1	.	.	.	5	0.10
Other/Unknown	636	27	1	3		667	12.74
TOTAL	4,809	336	17	**53**	**17**	**5,232**	**100**

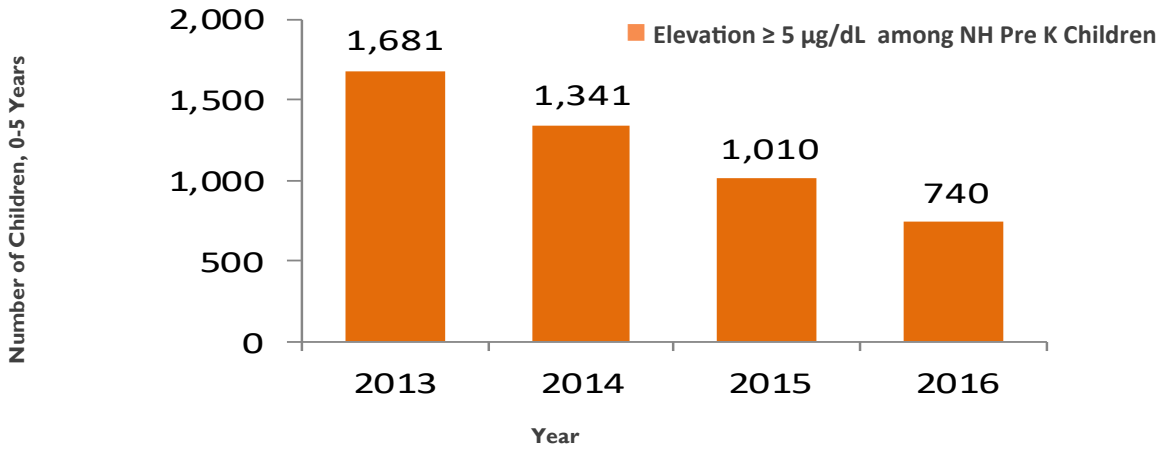
BLOOD LEAD ELEVATIONS AMONG PRE SCHOOL AND SCHOOL-AGE CHILDREN

In 2016, 179,734 children (ages 5-18 years) were enrolled in New Hampshire public schools grades Kindergarten through 12, plus an additional 16,852 children in non public schools. (Education, 2017). Using historical statewide blood lead surveillance data and methods described in the **Technical Notes and Acronyms section** of this report, the HHLPPP estimated that 65,367 of school-going children in 2016 had a reported EBLL ≥5 µg/dL at *some point* in their lives. While the data does not include those children not tested and does not account for those who moved into or out of New Hampshire in this time frame, this number represents about 33.2% of children enrolled in New Hampshire public and private schools in 2016.

In 2016, there were 740 children younger than 5 years old (Pre-Kindergarten age) who had a reported EBLL ≥5 µg/dL at *some point* in their lives.

FIGURE 5

Number of Pre-Kindergarten Children (0-5 Years) with a History of EBLL in NH, 2013-2016



LEAD POISONINGS AMONG REFUGEES IN NEW HAMPSHIRE

In 2016 a total of 517 refugees of *all ages* were relocated into New Hampshire from twenty-one countries within Africa, Asia, the Middle East and Europe. The HHLPPP works closely with the DHHS Office of Health Equity to ensure that refugee children are tested for lead and their parents and guardians are educated on environmental lead hazards. Nurse case managers continue to find that these families not only do not fully understand the threat of environmental lead poisoning, and some use medicines and home remedies from their own countries that may contain lead.

By federal mandate, all refugee children ages 6 months to 16 years should be tested for lead within 90 days of arrival as part of the resettlement process. In 2016, a total of 166 refugee children aged 6 months to 16 years were resettled in New Hampshire. Eighty-four percent (84%) of these refugee children were initially tested for lead within 90 days of their arrival. Surveillance data also showed that 66 (40%) of these children had at least one post settlement follow-up blood lead test within 180 days of arrival, as recommended by federal guidelines for post arrival lead screening.

Thirty percent (30%) of the 79 newly arrived refugee children ≤6 years old that were tested for blood lead levels had an elevation ≥5 µg/dL, as compared to 4.6 % of the general population of children tested in New Hampshire. **Table 7** shows that the majority (70%) of refugee children under the age of six that have been tested for blood lead are between 0-4 µg/dL.

30% OF REFUGEE CHILDREN HAD ELEVATIONS ≥5 µG/DL AS COMPARED TO 4.6% OF THE GENERAL POPULATION OF CHILDREN TESTED IN NH

TABLE 7

Lead Poisoning Among "New" Refugee Children (0 - 6 Years) in NH, 2016

AGE GROUP (In Months)	Blood Lead Level				
	0 - 4 µg/dL Venous & Capillary Tests	5 - 9 µg/dL Venous & Capillary Tests	≥ 10 µg/dL Venous Tests Only	Total Number	Percent (%) in Subgroup
0 to 11	0	< 5	0	< 5	1.27
12 to 23	10	5	0	15	18.99
24 to 35	12	< 5	0	15	18.99
36 to 72	33	14	< 5	48	60.76
SEX					
Female	25	13	0	38	48.10
Male	30	10	< 5	41	51.90
RACE					
Black/African American	45	10	< 5	56	70.89
White	< 5	< 5	0	5	6.33
Asian	< 5	7	0	8	10.13
Other/Unknown	7	< 5	0	10	12.65
TOTAL	55	23	< 5	79	**100**

FIGURE 6

Distribution (percentage) of Refugee Children (Under 6 years) - By Country of Birth. Resettled in New Hampshire and Tested for lead, 2016

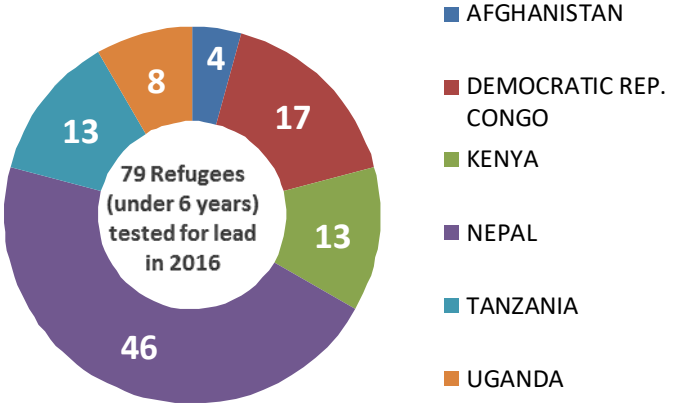


Figure 6 shows the country of birth for 79 refugee children under the age of six years old that resettled into New Hampshire in 2016. The majority (45.8%) of these children's birth country was Nepal. Twelve and a half percent (12.5%) of these refugee children were born in Tanzania, 12.5% were born in Kenya, and 8.3% in Uganda, all 3 countries located in East Africa.

ELEVATED BLOOD LEAD LEVELS IN ADULTS

Most adults who are exposed to lead are exposed through their employment or hobbies. The U.S. Occupational Safety & Health Administration (OSHA) lead regulations mandate that employers provide medical monitoring to their employees who, on any given day, are exposed to airborne lead above the "action level" of 30 µg/m^3 (micrograms per cubic meter of air). Since November 2015, the surveillance case definition for an EBLL used by the CDC and National Institute of Occupational Safety and Health (NIOSH) includes workers age 16 and older with blood lead concentrations ≥5 µg/dL of whole blood, in a venous blood sample (NIOSH, 2016). This case definition is used by the national Adult Blood Lead Epidemiology and Surveillance (ABLES) program, the Council of State and Territorial Epidemiologists (CSTE), and CDC's National Notifiable Diseases Surveillance System (NNDSS).

The U.S. Department of Health and Human Services recommends that EBLLs among all adults be reduced to less than 10 µg/dL. The OSHA Lead Standards require workers to be removed from lead exposure when EBLLs are ≥50 µg/dL (construction industry) or 60 µg/dL (general industry) and allow workers to return to work when the EBLL is below 40 µg/dL. The OSHA Lead Standards also give the examining physician broad flexibility to tailor special protective procedures to the needs of individual employees. Therefore, the most current guidelines for management of lead-exposed adults should be implemented by the medical community at the current CDC/NIOSH reference EBLL of 10 µg/dL.

In 2016, a total of 2,781 adults in New Hampshire were screened for lead poisoning, as shown in **Table 8.** Among those tested in 2016, a total of 425 (15.2 %) adults had EBLLs ≥5 µg/dL. Males comprised the majority (67%) of adults tested as well as those identified as having elevated blood leads (91%). Their engagement in occupations and hobbies that are associated with lead exposure, such as industrial painting and construction, accounts for this distribution.

The mean for adult blood lead tests in 2016 was 3.46 µg/dL. The towns with highest means (over 20 tests) include: Northwood, Tilton, Northfield, Manchester, Franklin, Merrimack, Hampton, Laconia, Exeter, Durham, and Barrington in descending order of average mean. Since 2012, there has been a steady increase in the number of adults tested for lead exposure in New Hampshire. The number of elevations ≥5 µg/dL has remained relatively stable during this period as shown in **Figure 7.**

FIGURE 7

Trends in Adult Blood Lead Testing and Elevations (≥5 µd/dL) in NH, 2012- 2016

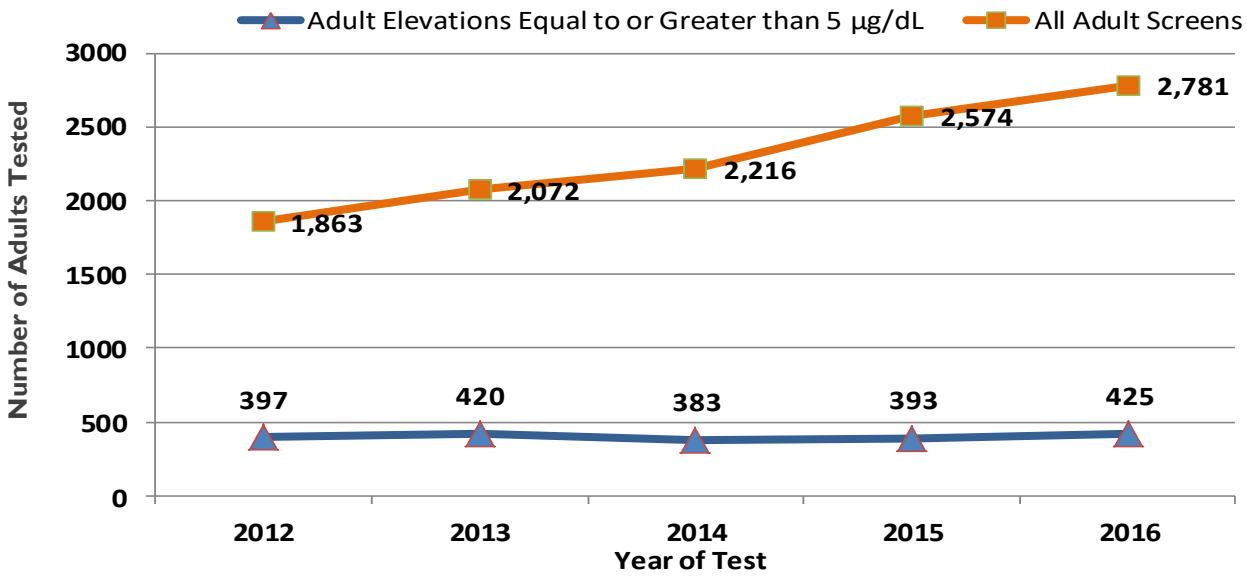


TABLE 8

Distribution of Adult Blood Lead Test Results and Elevations (≥5 µd/dL) in NH, 2016

AGE GROUP	Blood Lead Level							
	< 5µg/dL	5 to 9 µg/dL	10 to 24 µg/dL	25 to 39 µg/dL	≥40 µg/dL	TOTAL	INCIDENCE Confirmed Elevations ≥5 µg/dL	PREVALENCE Confirmed Elevations ≥5 µg/dL
16 - 30	529	50	34	3	5	**621**	67	24
31 - 40	473	52	27	5	6	**563**	57	31
41 - 50	442	42	26	4	1	**515**	47	25
51 - 60	455	52	29	6	3	**545**	55	35
61 - 70	275	36	19	6	0	**336**	39	22
71 +	182	12	7	0	0	**201**	11	7
SEX								
FEMALE	771	27	9	1	1	809	24	12
MALE	1585	217	133	23	14	1972	252	132
TOTAL	**2,356**	**244**	**142**	**24**	**15**	***2,781***	**276**	**144**

ENVIRONMENTAL INVESTIGATIONS AND NURSE CASE MANAGEMENT

Until 2012, children were identified by the CDC as having a blood lead "level of concern" if the test result was 10 or more µg/dL of lead in blood. CDC is no longer using the term "level of concern" and is instead using a "reference value" of 5µg/dL to identify those children who have been exposed to lead and require case management. Currently, New Hampshire's RSA 130-A is less stringent than CDC's guidance and requires that the HHLPPP investigate cases of elevated blood leads ≥10 µg/dL in children under the age of six. When a poisoned child resides in a multi-unit property that has been identified to have lead hazards, the environmentalist investigates all other units in the same property.

During 2016 the HHLPPP visited the homes of **65** children under the age of six to identify potential sources of lead poisoning and provide outreach and education. Of these 65 children, **26** children lived in residences that were owner-occupied and the remaining **39** lived in rental units.

For those 26 children living in homes that their parent/guardian owned, a letter of recommendation follows the onsite visit that includes information to help them locate a U.S. Department of Housing and Urban Development (HUD) lead-based paint hazard control grant program, identify a contractor certified in lead-safe work practices, and educational material to help them work lead safely through "Do-It-Yourself" (DIY) projects.

In 2016, 39 children with elevations greater than 10 µg/dL resided in rental units. Investigation into these cases resulted in the HHLPPP issuing **97** Administrative Orders of Lead Hazard Reduction (Orders) on 97 units within **39** properties. The Order requires the property owner to remove all lead exposure hazards contained in the property. A unit is defined as a single family home or apartment within a multiunit building.

A total of 62 children under the age of six with EBLL ≥10 µg/dL entered into Nurse case management with the HHLPPP, bringing the total case load up to 250 children. These children received home visits from Public Health Nurses to discuss follow-up testing, diet, hygiene, and methods to help reduce the child's EBLL. The Public Health Nurses also work with providers to ensure these children receive the follow-up testing and developmental screening they need.

Children remain in case management until he/she has had at least one blood lead level below 5 µg/dL after an elevation of ≥10 µg/dL and/or the child has moved to a new address built after 1978 and their lead level has decreased below 5 µg/dL.

PRIMARY PREVENTION – KEEPING LEAD EXPOSURES FROM HAPPENING

REMOVING LEAD HAZARDS FROM HOUSING

Through private monies and funding from the U.S. Department of Housing and Urban Development (HUD) historically awarded to the cities of Nashua and Manchester and to the New Hampshire Housing Finance Authority's Lead-Based Paint Hazard Control Programs, approximately 1,300 units housing low-income families have had lead hazards removed in the last decade. According to the 2011-2015 American Community Survey 5-Year Estimates over 286,600 housing unites statewide were built before 1979 and may contain lead hazards. Of these units, this survey data indicates that 98,800 units are occupied by renters. According to the 2014 *Economic Burden of Environmentally Attributable Illness In Children of New Hampshire,* produced by the New Hampshire Environmental Public Health Tracking Program, around 18,000 of these housing units housed young children, of which 2,478 homes were at highest risk with low income families and children six and under. Based on historical data from New Hampshire's three HUD Lead Hazard Control Programs, costs for lead abatement (depending on the size of unit and number of lead hazards) was in the range of $8,000 to $10,000 per housing unit. It is estimated to remove lead from these targeted 2,478 homes the costs for abatement is between $19.8 and $24.8 million.

BUILDING CAPACITY AMONG LICENSED LEAD PROFESSIONALS

The HHLPPP focuses grant funding received from the EPA on maintaining a lead accreditation certification program to build capacity among lead professionals and contractors in the private sector to support the removal of lead hazards in residential housing. In 2016, New Hampshire's licensed lead professionals included included 3 Lead Inspectors, 16 Risk Assessors, 5 Trainers, 80 Abatement Contractors, 22 Abatement Supervisors and 115 Abatement Workers. These lead professionals are brought together annually for continuing education purposes to discuss best practices, changes in legislation and State and federal
laws.

U.S. ENVIRONMENTAL PROTECTION AGENCY'S RENOVATE, REPAIR AND PAINTING (RRP) RULE

According to the 2016 HHLPPP surveillance data, over one-third of children with an EBLL ≥10 µg/dL live in a home with recent or ongoing renovations. The EPA's Lead Renovation, Repair and Painting Rule (RRP Rule) requires that firms performing renovation, repair and painting projects that disturb lead-based paint in homes, child care facilities and preschools built before 1978 be certified by EPA, use certified renovators who are trained by EPA-approved training providers and follow lead-safe work practices. In 2015, there were 1,910 RRP certified firms and 10,314 certified renovators in New Hampshire (EPA, 2016). As consumer demand for lead safe renovators increases, it is expected that the number of RRP certified firms and renovators will increase to meet these demands. To help drive consumer demand, the EPA has implemented a "Look for the Logo" campaign, shown in the top right of this page, to increase consumer education and awareness on the importance of hiring individuals who are lead-safe certified.

Currently the HHLPPP does not have authority over consumer complaints made to the Department regarding RRP. Consumers that want to report firms and renovators that are not following lead-safe work practices, did not notify property owners or occupants about potential lead-based paint hazards, or are not Lead-Safe Certified Firms and/or Lead-Safe Renovators, are directed to complete a electronic tip/complaint form or to contact the EPA Tip & Complaint Line at 617-918-TIPS [8477].

TECHNICAL NOTES AND ACRONYMS

CLASSIFICATION OF COMMUNITIES AS TARGETED, UNIVERSAL, AND HIGHEST-RISK

Targeted Communities: These are defined as communities where a targeted approach for lead testing is warranted. A targeted approach is used in communities designated as low risk. For children between ages one and two-years-old who live in low-risk communities, providers use a *Lead Exposure Risk Questionnaire* to identify children with individual risk factors that will require blood lead testing. This questionnaire should also be used for children ages 3 to 6 years old who have not been previously tested, have renovation activities taking place at home, have moved to a new pre-1978 residence, have begun attending a child care facility built prior to 1978, or have exhibited high-risk behavior. A positive or ` uncertain response to *one or more* questions on the *Lead Exposure Risk Questionnaire* denotes that testing is necessary.

Universal Communities: These are communities designated as high-risk communities for Lead poisoning. Children living or visiting these communities are at an elevated risk for lead poisoning. In these communities, the HHLPPP recommends a "universal" screening approach in which all children are tested at one-year-old and again at two-years-old. Older children, up to 6 years old, who have not previously been tested while living in their current residence, if in a universal community, should also be tested. If they have moved to a new residence, begun attending a child care facility built prior to 1978, have been exposed to a pre-1978 renovation project, or have exhibited at-risk behavior since the time of their last blood test, a new blood test should be conducted.

Highest-Risk Communities: Historically, the HHLPPP has focused on eight communities deemed "highest-risk" that included Berlin, Claremont, Franklin, Laconia, Manchester, Nashua, Newport and Rochester.
A comprehensive evaluation of New Hampshire's 234 communities was completed in 2015 and the Program determined that there are twenty-one communities of highest-risk. These communities include: Antrim, Berlin, Claremont, Concord, Dover, Franklin, Greenville, Haverhill, Keene, Laconia, Lebanon, Manchester, Nashua, New Castle, Pittsfield, Rindge, Rochester, Somersworth, Stratford, Troy and Walpole. Our future actions will incorporate periodic evaluations of community trends to identify new or previously unidentified highest-risk areas. All highest-risk communities are also Universal screening communities.

HHLPPP'S ALGORITHM FOR CLASSIFYNG BLOOD LEAD TEST RESULTS

Public Health Concern: A child under the age of six years old with a capillary or venous blood test result between 5.0 and 9.9 µg/dL that was performed by a laboratory that is Clinical Laboratory Improvement Amendments (CLIA)-approved or an approved point-of-service instrument.

Public Health Action: A case of an elevated blood lead level is defined as a child under the age of six with a confirmed venous blood test result based on a test performed by a laboratory that is CLIA-approved. To avoid duplicative child case counting in any given year, only the highest venous test result is used to define a child's annual level of poisoning. A child tested for blood lead levels in New Hampshire may be tested multiple times, as recommended by pediatric healthcare providers. Consistent with public health surveillance, tests are classified in such ways as to best describe the child's levels of poisoning in the given year.

Blood Lead Sampling Techniques: Several factors can influence the quality of blood lead measurements. The ubiquity of lead in the environment makes contamination of specimens during collection a major source of error. Blood collected by venipuncture (venous) has a low likelihood of contamination compared to blood collected by finger stick (capillary). Capillary specimens are a successful method for blood lead testing, provided that the finger is washed thoroughly with soap and water prior to the collection procedure to minimize the risk of contamination.

Confirmed Test Result: A confirmed blood lead test result is one obtained from a venous blood sample that has been tested by CLIA-approved laboratory.

Confirmed Elevation Greater than 10 µg/dL (Children): The DHHS shall investigate cases of lead poisoning in children reported under RSA 141-A whose blood lead level meets or exceeds 10 µg/dL of whole venous blood, as reported on 2 separate tests except that a blood level may be designated as elevated by the health care provider when the level reported meets or exceeds 10 µg/dL on the first venous test. With such a declaration, a second test shall not be required.

Incidence (Elevations) Greater than 10 µg/dL (Children): A child with a confirmed venous elevation of blood lead poisoning based on a sample collected in a given year if the child has no prior reports/history of elevations above the threshold level used in defining an elevation (e.g., 10 µg/dL).

Prevalence (Elevations) Greater than 10 µg/dL (Children): A child with a confirmed venous elevation of blood lead poisoning based on a sample collected in a given year if the child has a prior reports/history of confirmed elevations above the threshold level used in defining an elevation (e.g., 10 µg/dL).

ADULT BLOOD LEAD TEST CLASSIFICATION

Adult blood lead tests include all reported state (New Hampshire) residents age 16 years or older. Adults aged 16 years with a blood lead concentration of greater than or equal to 5 µg/dL of whole blood venous blood sample are considered an elevated blood lead level (EBLL).

Incident/new (EBLL) - An adult whose highest BLL was ≥ 5 µg/dL in the current calendar year, but was **not** in the State Lead registry/ Surveillance database in the immediately preceding calendar year with a BLL of 5 µg/dL

Prevalent/Existing (EBLL). An adult whose highest BLL was ≥ 5 µg/dL in the current calendar year, but was in the State Lead registry/ Surveillance database in the immediately preceding calendar year with a BLL of ≥ 5 µg/dL.

ESTIMATING CHILDREN ENROLLED IN SCHOOL WITH A PRIOR HISTORY OF ELEVATION ≥5 µG/DL

To calculate the number of school-age children with a prior history of elevation ≥ 5 µg/dL in any given year, the number of unique children aged 5 to 18 years old in that year, that also had a prior history of elevation ≥5 µg/dL, as based on historical data from the HHLPPP surveillance database, was extracted. For example, for 2015, children born between 1997 and 2009, inclusive, that had a prior history of elevation reported to the HHLPPP were included in this dataset as the total number of K – 12 children with a history of an elevation. An estimate of the total number of children enrolled in school was obtained from the State of New Hampshire's Department of Education postings (https://my.doe.nh.gov/profiles/profile.aspx).

HHLPPP SURVEILLANCE DATA QUALITY

The measures (counts and rates) in this report are considered best possible estimates that may be limited by a few factors, including: late reporting of test results by reporting sources; incomplete information reported; updates in case definitions for lead poisonings; and changing program priorities. The HHLPPP staff continuously review data in the New Hampshire DHHS Lead Poisoning Surveillance System and implement measures to contain factors that may compromise the quality and integrity of data. These measures include: data comparisons with ancillary databases containing relevant data (e.g., vital statistics); increasing the number of reporting sources reporting data electronically; and developing user-friendly means for secure electronic data reporting by providers using point-of-service lead analyzing devices to avoid data quality associated with illegible data on paper and fax reports.

ACRONYMS

ABLES	Adult Blood Lead Epidemiology & Surveillance
BLL	Blood Lead level
CDC	Centers for Disease Control and Prevention
CLIA	Clinical Laboratory Improvement Amendments
CSTE	Council of State and Territorial Epidemiologists
DHHS	Department of Health and Human Services
DIY	Do It Yourself
DPHS	Division of Public Health Services
EBLL	Elevated Blood Lead Level
EPA	U.S Environmental Protection Agency
HHLPPP	Healthy Homes and Lead Poisoning Prevention Program
HUD	US Department of Housing and Urban Development
NIOSH	National Institute Occupational Safety and Health
NNDSS	National Notifiable Diseases Surveillance System
OSHA	Occupational Safety and Health Administration
RRP	Renovate, Repair and Paint
SB	Senate Bill
US	United States
WIC	Special Supplemental Nutrition Program for Women, Infants and Children

ABBREVIATIONS

µg/dL	Micrograms per deciliter
µg/m^3	Micrograms per cubic meter

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