Comparative Assessment of Lead Poisoning Screening Practices in Maine & New England

HEALTH JUSTICE
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The "Comparative Assessment of Lead Poisoning Screening Practices in Maine and New England" was commissioned by the Maine Affordable Housing Coalition (MAHC) and prepared by Health Justice Innovations, LLC principals Emily Benfer and John McHugh. MAHC is a membership organization that consists of more than 130 diverse private and public sector organizations committed to ensuring that all Mainers are adequately and affordably housed. Professor Benfer is faculty member and the director of the Health Justice Advocacy Clinic at Columbia Law School. She is a nationally recognized expert on healthy housing and lead poisoning prevention laws and regulations, who has written and lectured extensively on the topic and provided technical advice to advocates and legislators nationwide. She is the 2018 recipient of the David P. Rall Award for advocacy in public health from the American Public Health Association for her work to advance lead poisoning prevention. Dr. McHugh is an assistant professor at Columbia University Mailman School of Public Health. He joined the faculty at Columbia after nearly 10 years at a nationally recognized consulting firm where he worked with hospitals and health systems. Dr. McHugh provided analytical support to the project.

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1. Process & Objectives

To better understand Maine's ability to prevent and identify cases of childhood lead poisoning, researchers sought to:

- Conduct an independent review of lead screening and lead poisoning trends in Maine
- Compare Maine screening rates to other New England states
- Compare lead screening laws and practices throughout New England

This report provides an overview of lead poisoning rates and screening trends in New England in order to inform a more thorough analysis of state policy and the reforms necessary to protect children from exposure to lead, a debilitating neurotoxin. Data were collected from individual state databases and previously published lead testing annual reports. Maine data was collected from the Maine Environmental Health Public Health Tracking Network website. Where possible, national Center for Disease Control and Prevention (CDC) databases were used to confirm trends and differences across states. Qualitative interviews were conducted with public health department officials in each New England state to provide additional context and identify screening trends and best practices. New England universal screening laws were compared and analyzed. State definitions of lead poisoning and their respective action thresholds were also included in the legal assessment.

2. Lead Poisoning: Overview of the Issue

Maine's current Lead Poisoning Control Act, adopted in 1991, set the goal of eradicating childhood lead poisoning by 2010; yet in 2019, lead poisoning remains a risk to many of Maine's children.[1] One factor contributing to lead poisoning, and the leading source of exposure for children in Maine, is lead paint in older housing.[2] Maine's housing inventory is one of the oldest in the country. 29.8% of Maine housing was built before 1950 as compared to a nationwide median of 17.1%, placing Maine 6th among the 50 states.[3] (Table 1) As a result, a higher proportion of Maine residents are at risk of exposure to lead hazards and lead poisoning. The Federal Centers for Disease Control and Prevention (CDC) guidelines urge universal screening where at least 27% of the housing stock was built before 1950.

Table 1. Percent of Housing Stock built before 1950 (Top 8 states and New Hampshire)

State	Percent of Housing Built before 1950	Universal Screening	Year Adopted
New York	41.0%	✓	1992
Massachusetts	39.5%	✓	1987
Rhode Island	38.3%	✓	1991
Pennsylvania	34.4%	✗	n/a
Iowa	31.8%	✓	2008
Maine	29.8%	✗	n/a
Connecticut	29.5%	✓	2008
Vermont	29.2%	✓	2011
New Hampshire (ranked #14)	24.2%	✓	2018
United States Median	17.1%	n/a	n/a

The devastating effects of lead exposure on children are undisputed and range from developmental delays that can affect lifelong achievement, to serious muscular and nervous system damage, to immediate or premature death. The most recent empirical research demonstrates that even the lowest levels of exposure can result in permanent brain damage.[4] The severity of the damage correlates with both the level and duration of exposure. The American Academy of

[1] ME. REV. STAT. ANN. TIT. 22, § 1314-A (1991).
[2] Cluett, R; Fleisch, A; Decker, K; Frohmberg, E, Smith, A. *Findings of a Statewide Environmental Lead Inspection Program Targeting Homes of Children with Blood Lead Levels as Low as 5μg/dl.* J. PUB. HEALTH MANAGEMENT & PRACTICE. 25():S76-S83, Jan 2019 doi: 10.1097/PHH.0000000000000869
[3] American Community Survey (www.census.gov/programs-surveys/acs/)
[4] Bruce P. Lanphear et al., *Low-Level Environmental Lead Exposure and Children's Intellectual Function: An International Pooled Analysis*, 113 ENVTL. HEALTH. PERSP. 894, 897–99 (2005).

Pediatrics, CDC, and the scientific and medical communities have stated that there is no safe level of lead in the blood,[5] yet most state and federal policies require that a child be lead poisoned before mandating any lead hazard remediation.

Although Maine updated its lead poisoning definition in 2015 to match the CDC reference value of 5 micrograms per deciliter (µg/dL), many state lead poisoning action levels lag behind prevailing scientific evidence and are set well above the CDC reference value. At the same time, the majority of lead poisoning prevention and targeted screening strategies focus on lead-based paint hazards. Scientific research is also focused on the danger of lead exposures in the environment, including soil and water. The 2014 water crisis in Flint, Michigan[6] and the 2017 soil crisis in East Chicago, Indiana[7] highlight the multiple exposures to lead that threaten the health and well-being of many children in the United States.

Costs of lead exposure, both economic and societal, extend well beyond individual children. For example, in Flint, "total related social costs could reach nearly $400 million" according to research conducted by Dr. Peter Muennig at Columbia University's Mailman School of Public Health.[8] In addition to medical costs associated with co-morbidities, lead poisoning results in enormous social costs due to reduced IQ, lowered economic productivity, greater dependence on welfare programs, and increased engagement with the criminal justice system. In a *JAMA Pediatrics* study from 2009, Dr. Muennig estimated that reducing blood lead levels to less than 1 µg/dL would result in "societal benefits amounting to $50,000 per child annually and overall savings of $1.2 trillion by reduced crime and increased rates of on-time high school graduation."[9] In Maine, a 2010 study entitled "Economic Assessment of Children's Health and the Environment in Maine," conducted by Dr. Mary Davis, concluded that "at current levels of lead exposure, each new cohort of babies born in Maine annually will suffer on average a one-point loss in IQ score and, as a result, can expect to earn an aggregate $270 million less over their lifetimes."[10]

An accurate national count of children with lead poisoning is unavailable due to screening rates that are historically low. Many children are not identified until their lead levels surpass the CDC reference value. One mechanism to identify children with elevated blood lead levels as early as possible and to prevent prolonged exposure to lead hazards is through annual mandatory blood

[5] American Academy of Pediatrics, *Childhood Lead Exposure*, https://www.aap.org/en-us/ImagesGen/Lead_infographic.jpg
[6] Merrit Kennedy, *Lead-laced Water in Flint: A Step-By-Step Look at the Makings of a Crisis*, NPR (Apr. 20, 2016) https://www.npr.org/sections/thetwo-way/2016/04/20/465545378/lead-laced-water-in-flint-a-step-by-step-look-at-the-makings-of-a-crisis.
[7] Sarah Reese and Lauren Cross, *Righting an 'Injustice': An Environmental Threat: The East Chicago Crisis One Year Later,* NORTHWEST INDIANA TIMES (Aug. 15, 2017) https://www.nwitimes.com/news/special-section/ec-lead/an-environmental-threat-the-east-chicago-lead-crisis-one-year/article_d19a5de7-5bc0-5292-9fe7-29a6e999ade4.html
[8] Columbia University Mailman School of Public Health, *Lead Poisoning in Flint Could Cost Up to $400 Million,* https://www.mailman.columbia.edu/public-health-now/news/lead-poisoning-flint-could-cost-400-million
[9] Peter Meunnig, *The Social Costs of Childhood Lead Exposure in the Post-Lead Regulation Era,* Arch Pediatr. Adolesc. Med. 844-849 (2009), https://jamanetwork.com/journals/jamapediatrics/fullarticle/382153.
[10] Davis, Mary E. *Economic Assessment of Children's Health and the Environment in Maine*. MAINE POL'Y REV. 19.1(2010):36-44, https://digitalcommons.library.umaine.edu/mpr/vol19/iss1/6

lead level screening in the form of venous or capillary (finger prick) testing. The Centers for Medicare and Medicaid Services (CMS) requires any child enrolled in Medicaid or the Children's Health Insurance Program to receive annual screens at one- and two-years of age, but some states are not in compliance with this mandate and are, thus, leaving children vulnerable to lead poisoning and continued exposure to lead hazards. As discussed in section four, state policies to identify non-Medicaid eligible children with lead poisoning range from universal screening, to targeted screening based on risk, to minimal recommendations or no screening requirement at all. To increase screening rates and the identification of children exposed to lead hazards, twelve states—including all of New England (except Maine), New York, New Jersey, Iowa, Delaware, Louisiana, Maryland—and the District of Columbia have adopted universal screening requirements for all children. These states recognize the well-studied lifelong harms of lead poisoning to children and the economic costs to taxpayers and society as a whole. This is especially relevant to states with older housing inventories (i.e., higher percentages of houses built before 1950) that increase the risk of lead poisoning among children.

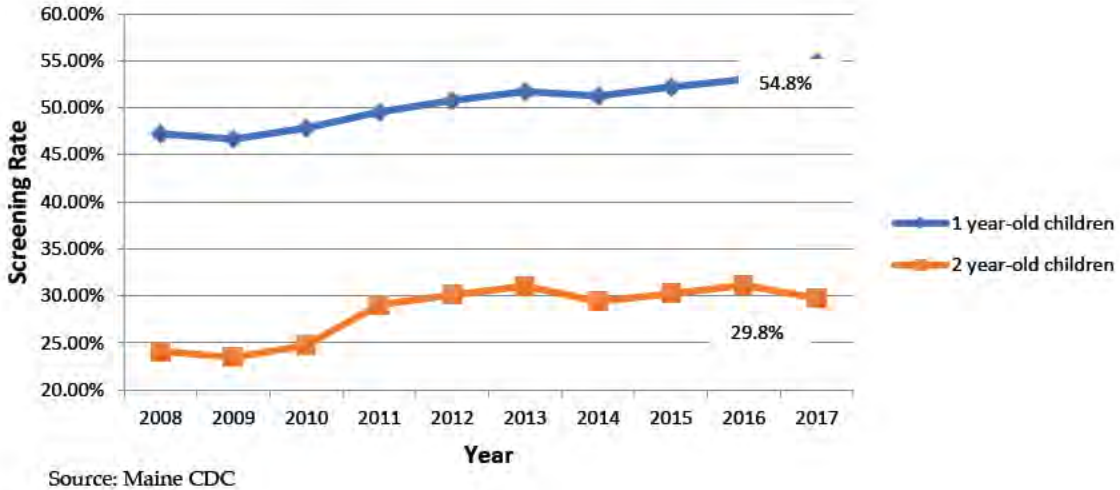
The remainder of this report will document current screening and lead poisoning rates in Maine, provide comparisons to other New England states with universal screening policies, estimate a high-level economic impact, and compare and contrast state laws and practices across New England.

3. Maine & New England State Screening Rates

Maine Screening Rates

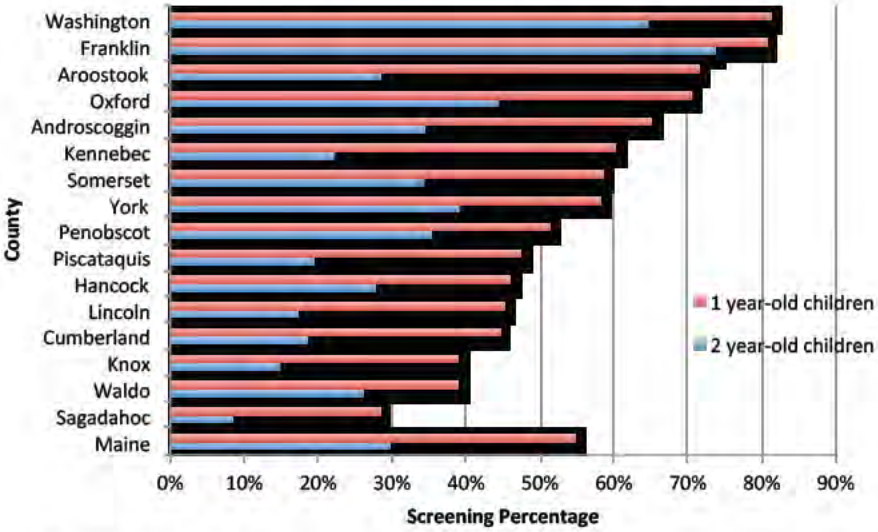
Screening rates in Maine are highly variable depending on the child's location and age. Lead screening rates for 1-year-old children increased from 47.3% in 2008 to 54.8% in 2017. Statewide screening rates for 2-year-old children increased slightly from 24.2% to 29.8%. (Figure 1) Countywide rates were also highly variable in 2017 for both 1- and 2-year-old children, ranging from 28.4% in Sagadahoc County to 81.2% in Washington County for 1-year-old children and from 8.5% in Sagadahoc County to 73.7% in Franklin County for 2-year-old children. (Figure 2)

Figure 1. Statewide Screening Rates, by Calendar Year, 2008-2017



Source: Maine CDC

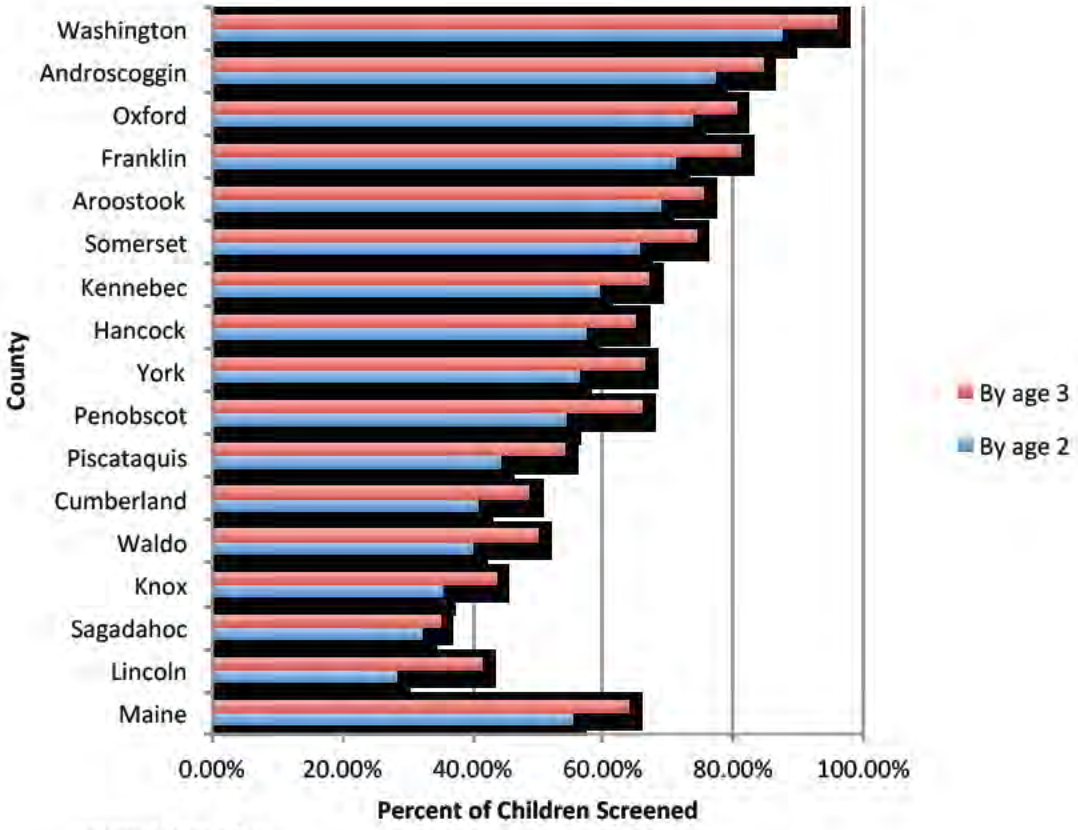
Figure 2. 2017 Screening Rates, by County, 1 and 2 year-old children



Source: Maine CDC

Screening rates can also be examined from a birth cohort perspective. The birth cohort method calculates the screening rate for a cohort of children born in the same year whereas annual screening rates represent the percentage of children screened in a given year. Birth cohort screening rates were also very low. For children born in 2014, lead-screening rates ranged from 28.8% (Lincoln) to 83.7% (Washington) by the time the children reached the age of 2 (2016) and ranged from 34.8% (Sagadahoc) to 95.8% (Washington) by the time the children reached the age of 3 (2017). In the five counties with the highest number of births (Androscoggin, Cumberland, Kennebec, Penobscot, and York), screening rates ranged from 37.4% (Cumberland) to 76.1% (Androscoggin) by the time the children reached age 2 and from 43.5% (Cumberland) to 85.0% (Androscoggin) by the time the children reached age 3. (Figure 3)

Figure 3. Percent of Children Screened for Lead by Age 2 and 3, 2014 Birth Cohort

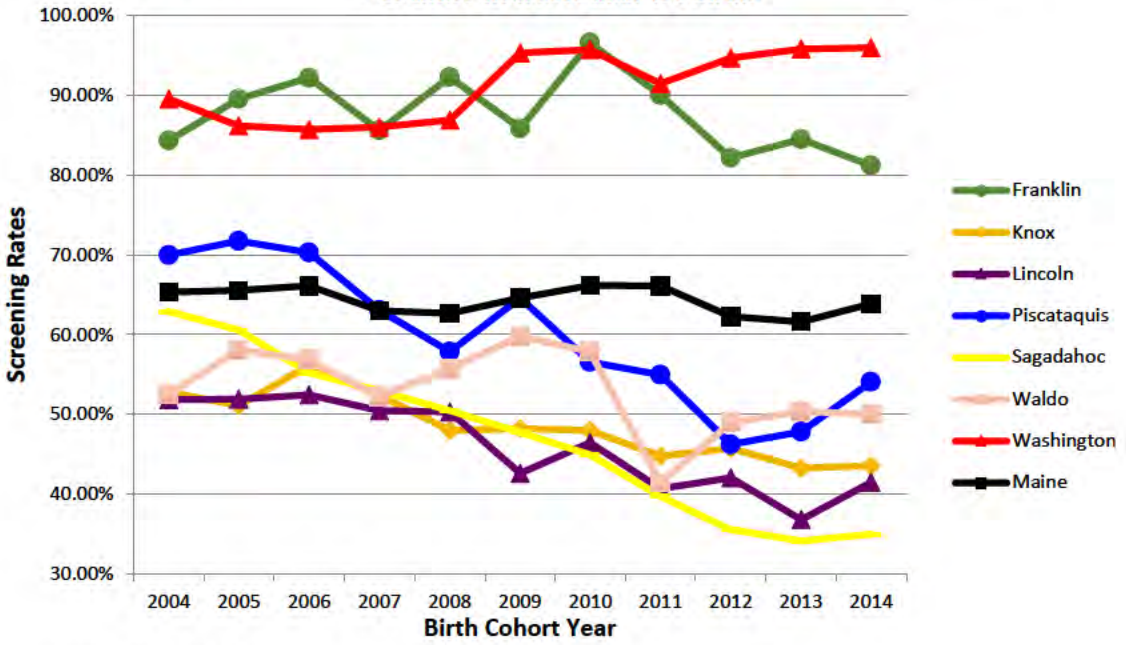


Source: Maine CDC

Maine Screening Rate Trends

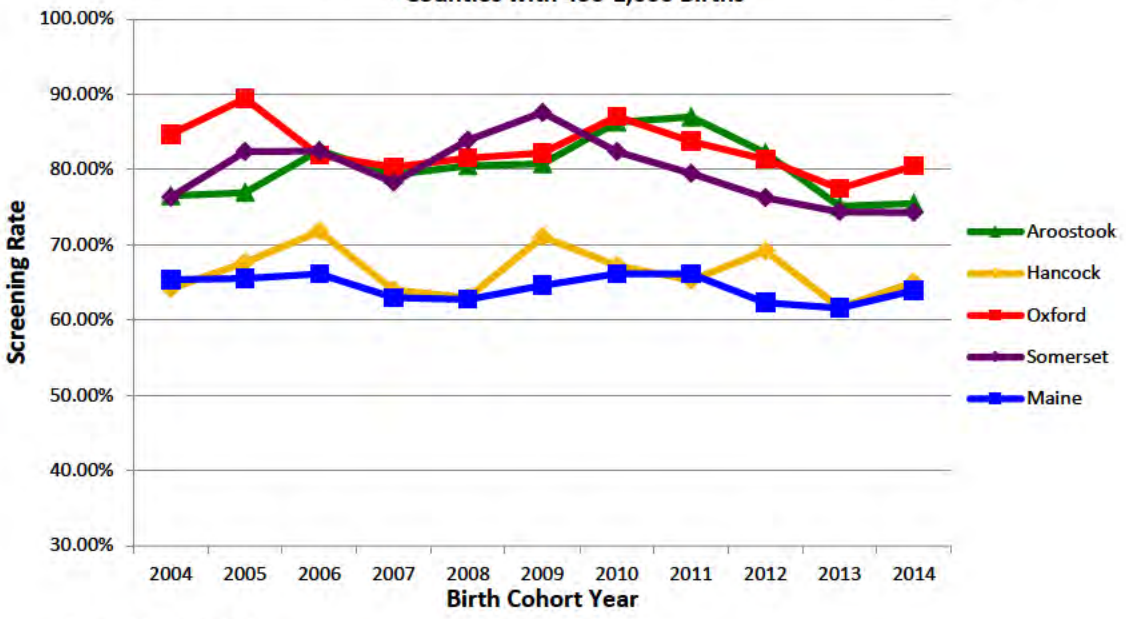
Trends in screening rates are highly variable, with screening rates in the most populous county (Cumberland) actually dropping for the 2004 to 2014 birth cohorts. Very few counties have increased screening rates. (Figures 4a, counties with less than 450 births; 4b, counties with 450-1,000 births; and 4c, counties with greater than 1,000 births)

Figure 4a. Percent of Children Screened before Age 3, by Birth Cohort, 2004-2014 - Counties with Less than 450 Births



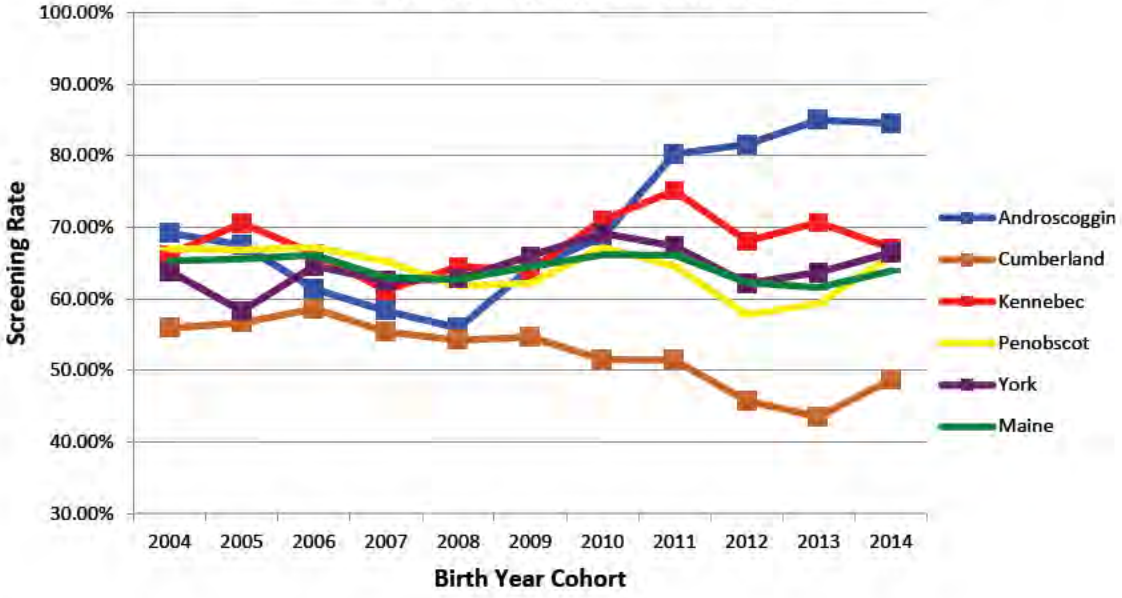
Source: Maine CDC

Figure 4b. Percent of Children Screened before Age 3, by Birth Cohort, 2004-2014 - Counties with 450-1,000 Births



Source: Maine CDC

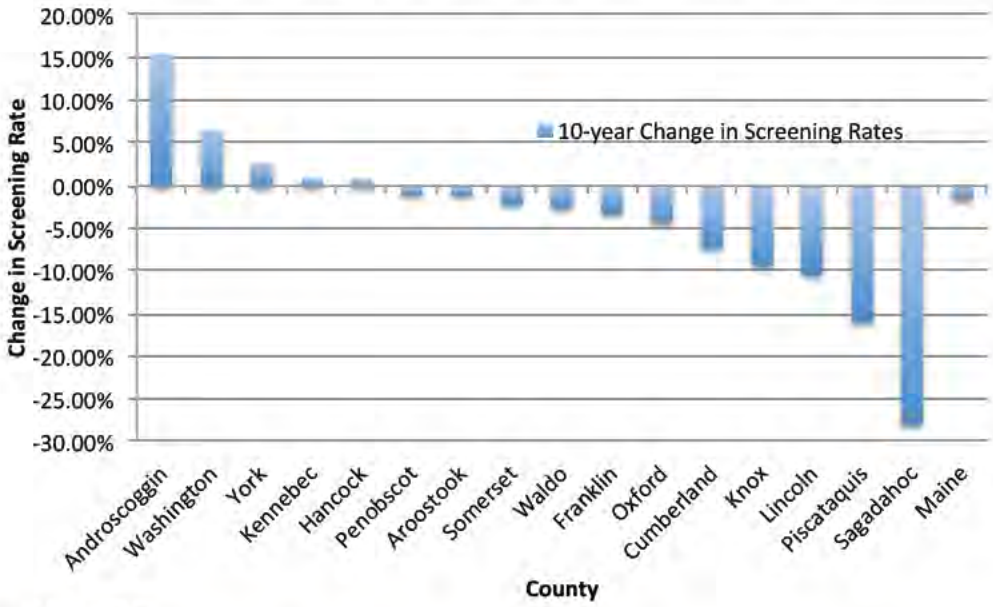
Figure 4c. Percent of Children Screened before Age 3, by Birth Cohort, 2003-2013, Counties with more than 1,000 births



Source: Maine CDC

Androscoggin County stands out as compared to all other counties, with an overall increase in screening rates from 69.2% for the 2004 birth year cohort to 84.6% for the 2014 birth year cohort. Further highlighting the large increase in screening rates in Androscoggin County is the fact that the screening rate declined to a low of 55.9% for the 2008 birth year cohort before increasing by nearly 30 percentage points up to the 2014 birth cohort. See figure 5 for overall changes in screening rates from the 2004 to the 2014 birth cohorts.

Figure 5. Change in Screening Rates, 2004-2014 Birth Cohort Years

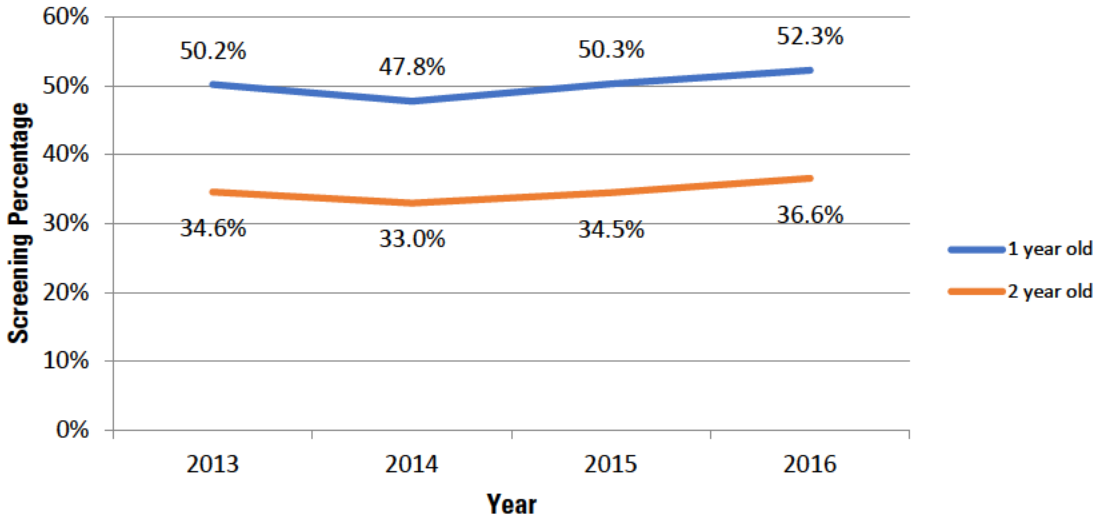


Source: Maine CDC

MaineCare Screening Trends

Given that Maine has not adopted universal screening, it is to be expected that current screening rates are as low as they are. For children enrolled in MaineCare, though, federal law *requires* lead testing be conducted at age 1 and age 2, and Maine is far out of compliance. From 2013 to 2016, the percentage of 1-year-old children that were screened was approximately 52% and the number of 2-year-old children screened was even lower, at around 37%. (Figure 6)

Figure 6. Blood Lead Screening Rates for MaineCare Children, 2013-2016



Source: Maine CDC

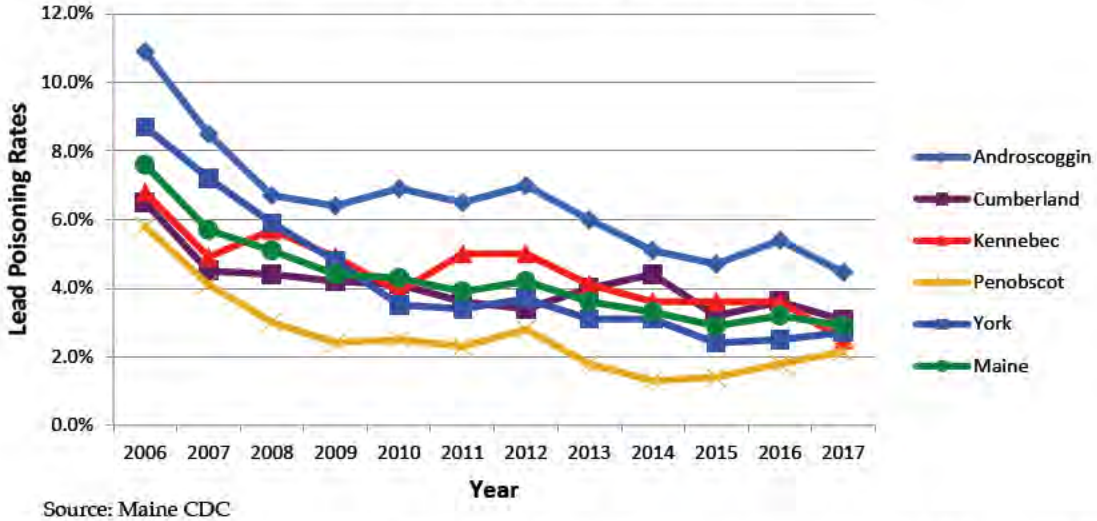
Analysis

Maine's current screening rates, when examined by county, could be described as sporadic. There is a high level of variability across counties, and the majority of counties have experienced a decrease in screening rates when examined by birth cohort. Androscoggin County stands out as an exemplar within the state and perhaps can be studied further to better understand strategies adopted to achieve high rates. As it relates to MaineCare, the state of Maine is not achieving the universal screening standard required by federal law. It will be important to examine the reasons providers are not complying with federal mandates. With screening rates that are relatively low overall and with the most populous county, Cumberland, experiencing declining screening rates based on birth cohort screening percentages, there is most likely a significant number of lead poisoned children who are not being identified and who will potentially suffer lifelong adverse health effects at a tremendous personal and public cost. The estimated cost effects of these "missed" cases are evaluated in section 5 of the report.

Lead Poisoning Rates

Lead poisoning rates fell dramatically from 2006 to 2009 in the 5 most populous counties and in the state. However, lead poisoning rates have remained relatively flat, around 2-4%, from 2009 to 2017. Androscoggin and York counties experienced the greatest decrease in lead poisoning rates, with 6.4 and 6.0 percentage point decreases, respectively, from 2006 to 2017. (Figure 7)

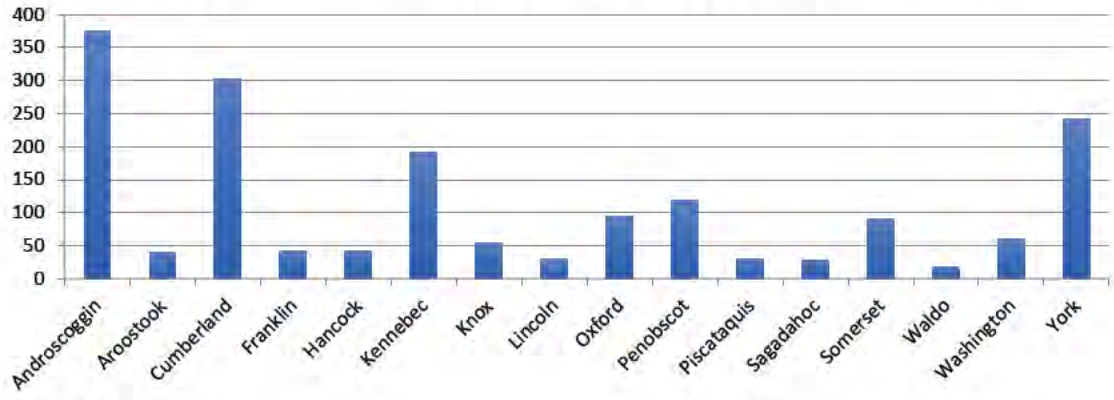
Figure 7. Lead Poisoning Rates, by Most Populous Counties, 2006-2017



Source: Maine CDC

Over the 5-year period from 2013 to 2017, the total estimated number of children with blood lead levels greater than or equal to 5 µg/dL in the state was 1,782. Androscoggin County had the highest number of lead poisoned children with 377, though its high screening rate likely contributes to the higher number of children identified. (See Figure 8 for the total number of children identified by county and screening rates.)

Figure 8. Estimated Lead Poisoned Children Ages 0-3, by County, 2013-2017



Source: Maine CDC

New England State Screening Rate Comparisons

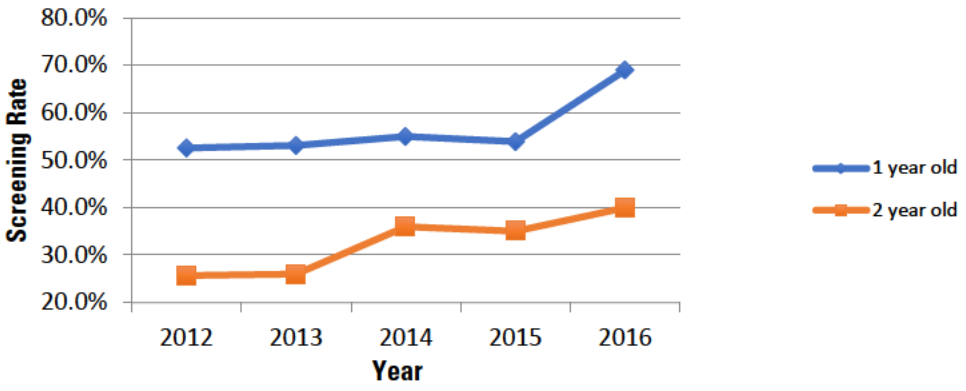
New Hampshire

Prior to 2016, New Hampshire's blood lead level testing rates were static and even declining, with an estimated 52% of 1-year-old children and 26% of 2-year-old children in high-risk, medically designated "universal testing" communities being tested. In 2016, the New Hampshire Division of Public Health Services' Healthy Homes and Lead Poisoning Prevention Program (HHLPPP) developed and implemented a five-part strategy to educate the medical community, increasing the availability of point-of-care blood lead level testing in the pediatric office. As a result of this outreach and education initiative, the HHLPPP observed that in 2016 an additional 2,604 children were tested from the previous year, a 19.4% increase. In 2016, 60.4% of 1-year-old and 33.2% of 2-year-old children statewide were tested.

In January 2018, New Hampshire passed Senate Bill 247, making significant changes to the state's lead laws, including adoption of universal blood lead level testing for all 1-year-old and all 2-year-old children. The state's low blood lead level testing rates, high percentage of pre-1978 housing stock, and large number of children identified each year as being exposed to lead were primary factors that led to New Hampshire's adoption of universal screening. The New Hampshire Chapter of the American Academy of Pediatrics and the pediatric health care community, having been educated on low testing rates, sources of exposure, and the state's prevalence of elevated blood lead levels, were strong advocates for a universal screening requirement.

New Hampshire's universal screening requirement became effective April 9, 2018. The HHLPPP expects the 2018 blood lead level testing surveillance data to demonstrate a greater increase in testing rates due to this change in the lead law.

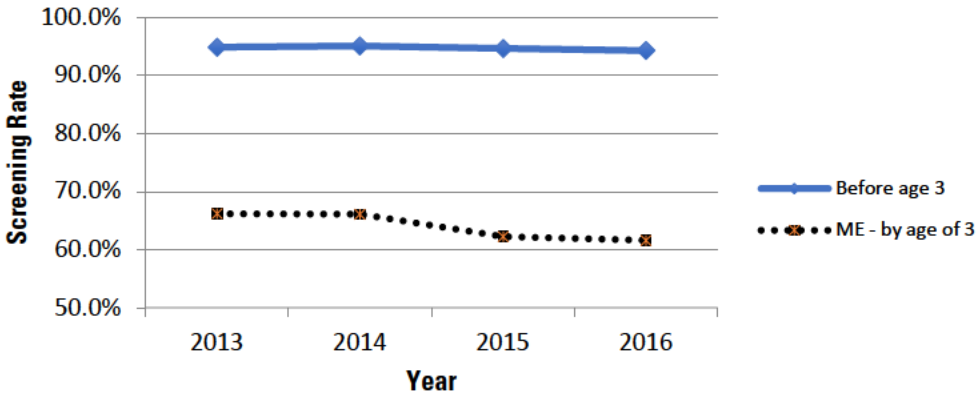
Figure 9. NH Screening Rates (high risk communities), 1 and 2 year olds, 2012-2016



Vermont

In 2005, the Vermont Attorney General and the Commissioner of Health worked with seventy Vermonters to develop a state lead poisoning action plan. The task force recommended the state adopt universal screening to improve identification of lead poisoned children.[11] Vermont adopted universal screening in 2011 and accepts a capillary test for confirmatory purposes. It is estimated that in 2017, 77% of 1-year-old and 68% of 2-year-old children were screened. Screening rates for children before age 3 (i.e., at least one test before turning 3) are around 95% and have remained consistently high since 2013.

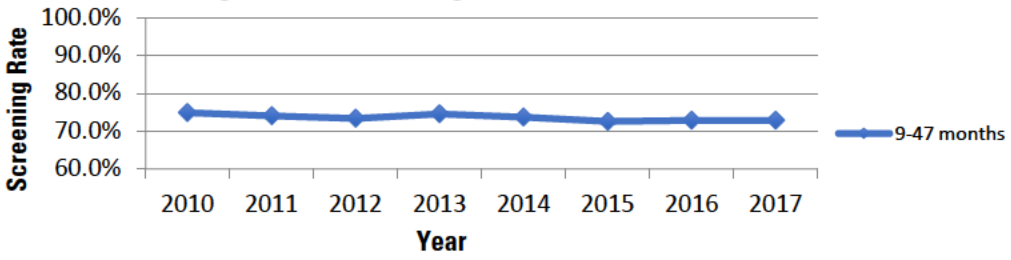
Figure 10. VT Screening Rates, before age of 3, 2013-2016



Massachusetts

Massachusetts enacted the first lead poisoning prevention law in the country in 1971 and adopted universal screening in 1987. The 1971 law emphasized primary prevention and required property owners to permanently control lead-based paint hazards in any house where a child under age 6 resides. The universal screening requirement went into effect in 1990 and requires screening of children once between the ages of 9 and 12 months, again at 2 years of age, and once more at 3 years of age. The state requires venous test sample confirmation of any capillary test that identifies a child with an elevated blood lead level. Since 2010, screening rates have hovered between 70-75% annually.

Figure 11. MA Screening Rates, 9-47 months, 2010-2017



[11] "Get the Lead Out of Vermont," Report to the Vermont Attorney General William H. Sorrell and Acting Commissioner of Health Saron Moffatt (2007).

Rhode Island

Rhode Island adopted universal screening in 1991. The high percentage of housing stock built before 1950 was a major factor in the passage of the universal screening law. For children born in 2015, the percentage of these children with at least one test by January 2019 (age 3-4) was 75.8% and the percentage of these children with two tests was 54.1%. (Figure 12a) For children born in 2012, the percent tested by the age of 3 was 86.1%, rising to 91.7% by the time these children turned 6. (Figure 12b) The CDC reported a slightly higher percentage of children screened at age 3 in 2012 of 91.1%. (Figure 15)

Figure 12a. RI Children born in 2015, testing status as of January 2019

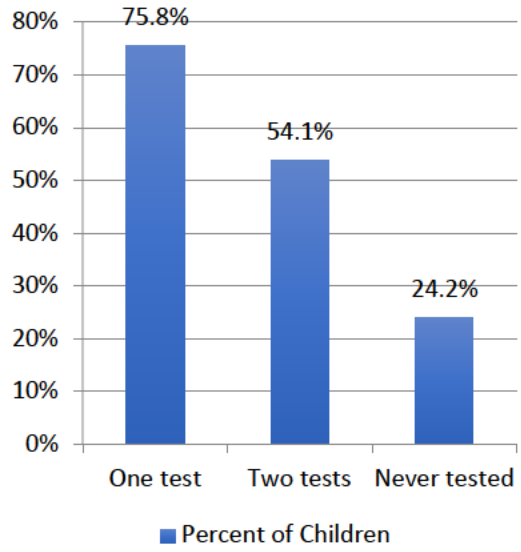
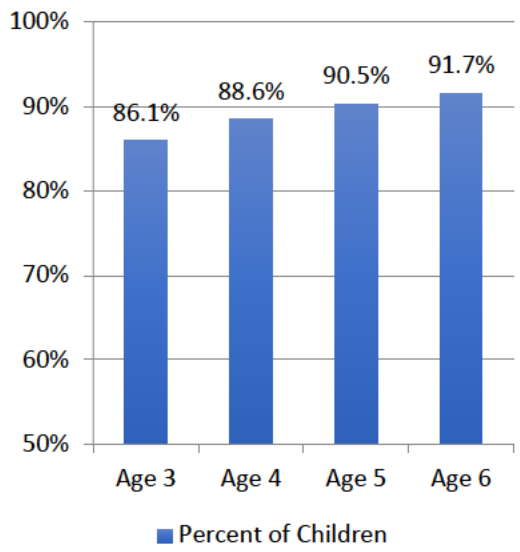


Figure 12b. RI Children born in 2012, testing status by age 3, 4, 5 and 6



Connecticut

Connecticut adopted universal screening in 2008 and the policy went into effect in 2009. Public health officials conducted significant outreach to providers to educate them about the new screening requirements. As a result, screening rates increased significantly. Since that time, screening rates for children 9-35 months old have steadily increased from just below 50% to 74.1% in 2015. To maintain high screening rates, Connecticut contracts with regional treatment centers, located in healthcare systems, that undertake provider and community education events, free medical consultation services, and other measures aimed at identification and primary prevention. Figure 14 shows that the percentage of children screened by the age of 2 in Connecticut has remained between 80 and 85% from 2011-2015 and by the time children reach age 3, the percentage screened is between 95 and 100%.

Figure 13. CT Screening Rates, 9-35 months, 2013-2017

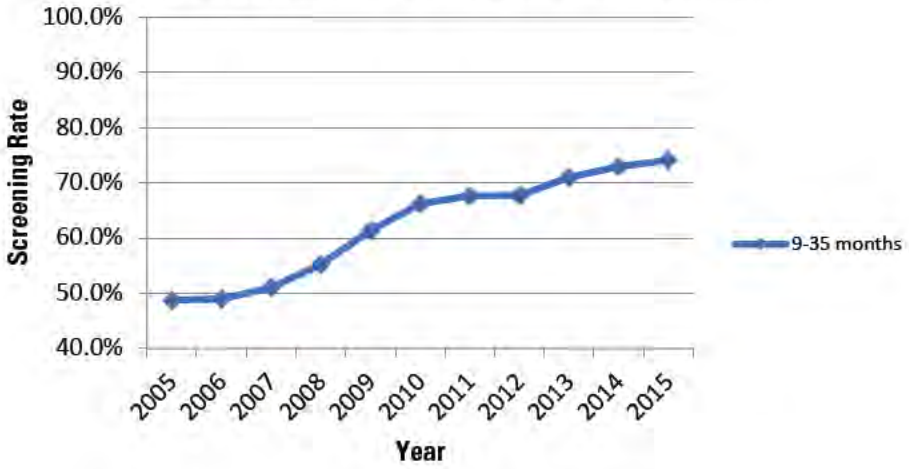
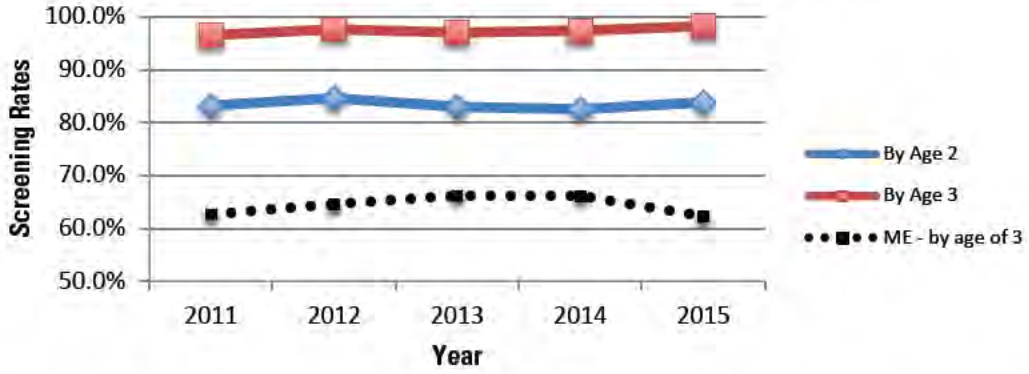
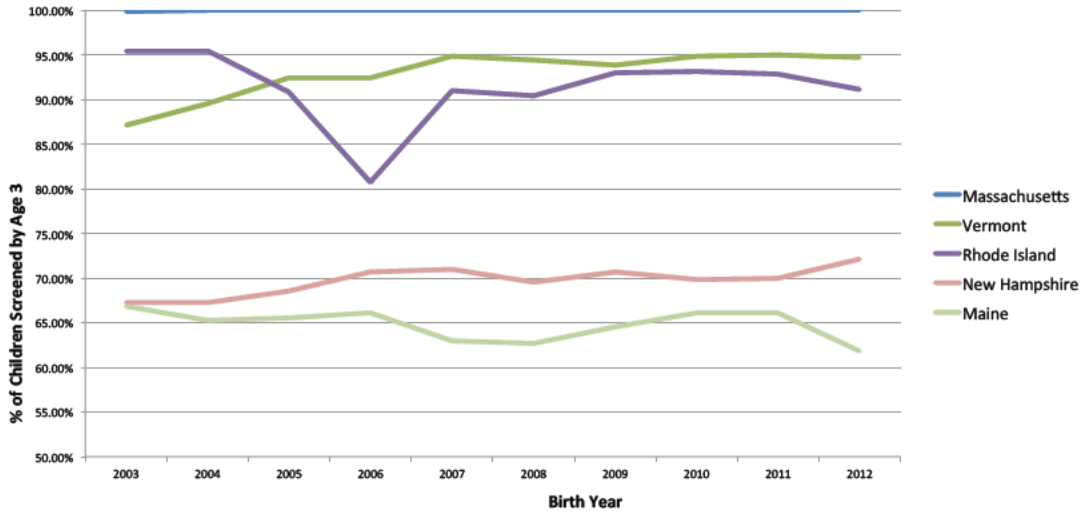


Figure 14. CT Children Screened by Ages 2 and 3, by Year



The federal CDC publishes screening data received from each state, including screening rates by the age of 3 for New England, with the exception of Connecticut, for which data was incomplete in the CDC database. When New England states are compared, Maine is at the bottom of screening rates across New England. (Figure 15) New Hampshire, the only other state in the same range as Maine, was also the only other state without a universal screening law during the time period reflected in the data. As described earlier in this section, New Hampshire adopted universal screening in 2018.

Figure 15. Percent of Children Screened before age 3, by Birth Cohort, 2003-2012



The comparative state analysis shows that where states have adopted universal screening, the overall screening rates are generally well above Maine's.

4. Best Practices & Legal Analysis

Federal Requirements and Recommendations

Since 1987, CMS has mandated that all children enrolled in Medicaid and the Children's Health Insurance Program[12] receive blood lead level screening at ages 12 and 24 months, or between the ages of 24 and 72 months if the child has no record of a past blood lead level screening.[13] If a child is identified with an elevated blood lead level, under "Early, Periodic, Screening, Diagnostic and Testing," Medicaid provides comprehensive coverage for any service that is "medically necessary to correct or ameliorate defects in physical and mental illnesses or conditions … whether or not such service is otherwise covered under the state plan."[14] This includes investigations in the child's home.[15] States also have an obligation to ensure that all Medicaid-eligible children under age 21 receive treatment and care for lead poisoning (even from past exposure), and all Medicaid beneficiaries suffering from the long-term effects of lead poisoning receive appropriate treatment and care, even those over the age of 21.[16]

As recently as the 1990s, the CDC recommended universal screening for all U.S. children, including those not enrolled in Medicaid. Today, CDC guidelines recommend universal screening in communities with at least 27% pre-1950 housing.[17]

State Lead Screening Requirements

State policies for children who are not enrolled in Medicaid range from 1) "universal screening," in which all children's blood lead level must be tested through a capillary or venous blood specimen, 2) "targeted screening," in which a questionnaire is administered and blood lead testing only occurs when a child is identified as high risk, 3) minimal non-mandatory recommendations, to 4) no screening requirement or recommendations at all. States with no formal lead screening policy have screening rates as low as 5% or do not have any reportable data on lead poisoning rates.[18] States that recommend, but do not require any screening have screening rates that range between 4% to 38% of children screened. Six states and Maine have "targeted" screening policies that focus on the

[12] Children under age six are qualify for Medicaid with income up to 160% of the Federal Poverty Line (FPL), or $38,880 for a family of four. MaineCare provides full benefits to children birth to 1-year-old up to 196% of the FPL and children age 0-18 up to 163% of the FPL.
[13] CMS, State Medicaid Manual 5123.2(D)(1).
[14] CMCS Informational Bulletin, November 30, 2016, Center for Medicaid and CHIP Services, *Coverage of Blood Lead Testing for Children Enrolled in Medicaid and the Children's Health Insurance Program at* https://www.medicaid.gov/federal-policy-guidance/downloads/cib113016.pdf.
[15] *Id.*
[16] 42 U.S.C. § 1396d(r)(5); 42 U.S.C. § 1396a(a)(30)(a)
[17] Advisory Committee on Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention, Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention, Jan. 4, 2012.
[18] Wyoming, Arkansas, Montana, North Dakota and South Dakota have no formal lead testing policy. SAFER CHEMICALS HEALTHY FAMILIES, CHILDREN AT RISK: GAPS IN STATE LEAD SCREENING POLICIES (2017) at https://saferchemicals.org/sc/wp-content/uploads/2017/01/saferchemicals.org_children-at-risk-report.pdf?x38790.

identification of high-risk children through the administration of a brief parental questionnaire.[19] These screening tools limit blood lead screening to children who meet risk factors in the questionnaire, such as the age of the child's primary residence. For example, the Maine Annual Risk Assessment Questionnaire poses four questions:

1. Does your child spend more than 10 hours per week in any house built before 1950?
2. Does your child spend more than 10 hours per week in any house built before 1978 that was renovated or remodeled within the last six months?
3. Does your child spend time with an adult whose job exposes him/her to lead? (Examples: construction, painting, metalwork)
4. Does your child have a sibling or playmate that has been diagnosed with lead poisoning?[20]

Like most targeted screening states, the questionnaire relies on parental or guardian knowledge, does not consider lead exposure due to lead in water from lead service lines or fixtures, lead in soil near current or former industrial areas or Superfund sites, or legacy lead from leaded gasoline in heavily trafficked areas, among other sources. As a result, children who are chronically exposed to lead hazards may not be screened or receive the interventions necessary to prevent further harm. Many public health experts believe this screening shortfall is one factor in the United States' inability to achieve the goal of eradicating lead poisoning among children.

Twelve states go beyond the targeted approach and require universal screening of all children.

Universal Screening Approaches & Best Practices

Universal screening that requires blood lead level testing of all children is in effect in almost all of New England (Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island), New Jersey, New York, Maryland, Delaware, Iowa, Louisiana and the District of Columbia. Public health officials in all New England states with universal screening cite to the high percentage of pre-1950 and pre-1978 housing as the primary reason for the adoption of universal screening policies. For states with universal screening, the policy becomes a part of routine well child visits, similar to immunizations, and leaves nothing to individual assessment or chance.

While approaches vary, there are common themes in the universal screening legal requirements among New England states:

- *Age of Screening*: Blood lead level screening typically applies to children at or around 1 and 2 years of age or between 3 and 6 years of age if never screened before. Multiple states extend screening time frames for refugee and migrant populations.

[19] In addition to Maine, Missouri, Illinois, Michigan, Ohio, Virginia, and West Virginia employ a targeted screening strategy. *Id.*

[20] Maine CDC Childhood Lead Poisoning Prevention Unit, Pediatric Blood Lead Screening Guidelines at https://www.maine.gov/dhhs/mecdc/environmental-health/eohp/lead/documents/screening_followup_guidelines_2018.pdf.

- *Proof for School Enrollment*: Almost all states require blood lead level screening prior to school, preschool, or daycare enrollment, though lack of screening is not always a barrier to enrollment.
- *Payer*: The majority of states require insurance policies to cover the cost of blood lead level screening, with one state exemption for small carriers. Where a child is uninsured, the public health department covers the cost of screening.
- *Reporting*: Every universal screening state mandates the reporting of lead screening results.
- *Exemptions*: Some states allow an exemption, and excuse the provider from liability, where a parent refuses the administration of the test.
- *Interventions*: The interventions offered at a positive screening vary from retest in a few months, to case management and parent education, to an environmental investigation.
- *Confirmation*: Some states accept a capillary test as sufficient to meet screening requirements, while others require a venous sample for confirmation.

As demonstrated in the New England state data comparison section of this report, the states with universal testing laws have achieved the highest rates of blood lead level screening nationwide. As a result, they are more likely to identify children with elevated blood lead levels and intervene earlier in the timeline of exposure, thereby preventing high blood lead levels among current and future occupants of a pre-1978 home. According to one public health epidemiologist in a jurisdiction with universal screening, "You know where to focus your efforts. We were able to provide primary prevention funding to the towns that needed it the most. It's important to know who is poisoned and where they are, and then you can focus efforts and tailor to the specific town's needs."[21]

Where New England states achieved high compliance and testing rates, it is attributed to state programs that educate providers and parents, social marketing campaigns, publications, direct outreach to providers, annual progress reports, and reminders about legal obligations through formal letters.[22] In New England states with universal screening, public health officials actively and regularly attempt to increase screening compliance, even when screening rates are high. As one public health official said, "If we are still chelating kids, we have a long way to go."[23] For example, in Vermont, the state is actively working with a marketing company to explore barriers to screening and develop a strategy to increase compliance with universal screening requirements.

All New England states with universal screening engage in constant collaboration with, and education of, healthcare providers. Many states credit the success of their program to a strong healthcare base and active and committed clinicians. None of the states issue penalties for failure to comply with universal screening requirements, opting for a collaborative and supportive approach

[21] Krista Venziano, Epidemiologist 4, Connecticut Lead & Healthy Homes Program, Environmental Licensure Program.
[22] Interviews Between Emily Benfer and New England State Public Health Representatives, December-2018-January 2019. *See* Gail Coppins Gettens & Beverly Baer Drouin, *Successfully Changing a State's Climate to Increase Blood Lead Level Testing, Journal of Public Health Management and Practice*. 25():S31-S36, Jan 2019.
[23] Lori Cragin, MS, PhD, Division Director & State Epidemiologist for Environmental Health, Vermont Department of Health.

to compliance. Multiple states work with primary care providers to identify screening best practices through focus groups, interviews, and surveys.

New England states with universal screening emphasize robust data collection as an important component of universal screening and lead poisoning prevention. Some states have entered into data sharing agreements to allow for constant communication between labs, state epidemiologists, healthcare providers, and care coordinators. The increased data access and analysis helps to raise awareness of strengths and deficiencies in universal screening and lead poisoning prevention programs. For example, some states use the data to create screening "report cards" for healthcare providers that show the provider's screening rate, as compared to the statewide average and the legal requirement. The report cards range from confidential and individual access, to publicly available and widely distributed.

Education is a major component of all New England universal screening programs. Provider education is aimed at correcting misinformation and updates on statewide policies that surpass federal requirements. In some states, like Connecticut, the providers are the teachers contracted to provide training programs for parents and other providers. In others, the public health department provides in person outreach and trainings. Multiple states cater outreach to community needs and hire marketing and media firms to develop appropriate education campaigns and strategies aimed at parents. Multiple states engage in direct outreach to property owners to ensure awareness of legal requirements. New Hampshire sends letters to 200-300 landlords every month. The outreach was considered highly successful, and in one case a property owner of multiple large buildings responded by arranging to certify all maintenance crews in the Renovation, Repair and Painting (RRP) Rule training.

States with the highest screening rates test children at their point of contact with the healthcare system. For example, when New Hampshire educated providers on point of care screening and the various capillary-testing devices available, the model was widely adopted and compliance rates increased. In Rhode Island, a pilot program offered blood lead level testing for clients not compliant with the universal lead screening requirements at Women, Infant and Children offices. Nearly 100% of participants offered the screen accepted.

Because blood lead level screening is covered by private insurance and Medicaid, adopting universal screening does not require significant state funding. However, universal screening does require outreach, education campaigns, and provider support. In addition, universal screening increases the number of children identified with lead poisoning who require interventions. New England states draw from a variety of funding sources, including litigation settlement funds, state budgets, low-interest bank loans for lead abatement or remediation, surcharges on home insurance, and federal funding streams from the U.S. Department of Housing and Urban Development, Environmental Protection Agency, Medicaid funding, and U.S. Department of Agriculture 503(c) rural development grants and low-interest loans, among other sources to respond to children identified with elevated blood lead levels.

New England Lead Poisoning Screening Laws

State	Definition of Lead Poisoning	Action Required	Year Universal Screening Effective	Testing Required	Exemption	Proof of Testing for School Enrollment	Testing Covered by Insurance
ME	5 µg/dL[24]	At 5 µg/dL "inspection of dwelling unit;" "environmental lead investigation"[25]	N/A	Targeted testing based on risk assessment tool[26]	Parent/ guardian refusal due to "sincerely held" religious or philosophical belief	N/A	N/A
CT	"Confirmed blood lead level" ≥5 µg/dL[27]	At 5 µg/dL (venous) and 10 µg/dL (capillary): provide educational materials (effective 2013) 20 µg/dL or 15-19 µg/dL in two tests taken at least three months apart: case management and environmental investigation[28]	2009 (adopted 2008)	Universal screening annually 9 through 35 mos. Children age 36-72 mos. must be tested if no prior test[29]	Parent/ guardian refusal due to religious beliefs[30]	Determined by local public health department	Testing and treatment are covered services for children and pregnant women[31]
MA	"Blood Lead Level of Concern" 5 µg/dL (venous) "Lead Poisoning" 10 µg/dL (venous)[32]	5 µg/dL (venous): follow up care, surveillance and outreach"[33] 10 µg/dL (venous): Lead inspection, case management[34]	1990 (adopted 1987)	Universal screening once between 9 and 12 months and at 2 and 3 years; children who live in high risk communities shall also be screened at age 4; children who are at high risk of exposure are screened at least every 6 months between 6 mos-3 years of age, and again at 4 and 5, and monthly during renovation projects in a pre-1978 home[35]	N/A	Must present evidence of screening prior to daycare, pre-K, Kindergarten enrollment[36]	Testing must be covered by insurance[37]

[24] ME. CODE R. § 10-144-292(3)(Y)
[25] ME. REV. STAT. ANN. TIT. 22, § 1320-A, ME. CODE R. § 10-144-292(4)
[26] ME. REV. STAT. ANN. TIT. 22, § 1317-D
[27] State of Connecticut Department of Public Health, Circular Letter # 2013-27, *Local Health Department Responsibilities as a result of the Updated Childhood Lead Screening Requirements* (April 19, 2013) *at* https://portal.ct.gov/DPH/Environmental-Health/Lead-Poisoning-Prevention-and-Control/-/media/Departments-and-Agencies/DPH/dph/environmental_health/lead/circular_letters/2013/201327LHDResponsibilitiespdf.pdf?la=en.
[28] CON. GEN. STAT. §§19A-110(D), 111(J)(B)-(C)
[29] CONN. GEN. STAT. §19A-11G(A). REQUIREMENTS AND GUIDANCE FOR CHILDHOOD LEAD SCREENING BY HEALTH CARE PROFESSIONALS IN CONNECTICUT, REVISED APRIL 2013 *AT* HTTP://WWW.CT.GOV/DPH/LIB/DPH/ENVIRONMENTAL_HEALTH/LEAD/PDF/SCREENING_REQUIREMENTS-2016.PDF
[30] CONN. GEN. STAT. §19A-11G(B).
[31] CONN. GEN. STAT. § 38A-490D.
[32] 105 MASS. CODE REGS. § 460.020
[33] 105 MASS. CODE REGS. §§ 460.050(F); 460.020
[34] 105 MASS. CODE REGS. §§ 460.020; 460.710
[35] MASS. ANN. LAWS ch. 111, § 193; 105 MASS. CODE REGS. § 460.050
[36] 105 MASS. CODE REGS. § 460.050(E)
[37] 105 MASS. CODE REGS. § 460.060

State	Definition of Lead Poisoning	Action Required	Year Universal Screening Effective	Testing Required	Exemption	Proof of Testing for School Enrollment	Testing Covered by Insurance
NH	3 µg/dL[38]	3 µg/dL: parent and property owner notification (2018)[39] 10 ug/dL (venous or two capillary): inspection of dwelling unit 7.5 µg/dL: inspection of dwelling unit (by July 2019) 5 ug/dL: inspection of dwelling unit; (by July 2021)[40]	2018	Universal screening of all one- and 2-year-old children. Provider may recommend additional testing as warranted[41]	Physician not liable where parental objection or no response to referral; or testing would be detrimental to child[42]	N/A	All insurance plans[43]
RI	5 µg/dL[44]	5 µg/dL: case management 10 ug/dL: comprehensive environmental lead inspection[45]	1991 (adopted)	Universal screening twice between 9-27 months, at least 12 mos. apart before 36 months of age; where elevated, child is tested up to age 6; refugee population screened up to age 16[46]	Sworn statement of parental refusal due to religion[47]	Public/private kindergarten, preschools, childhood education programs, day care centers, childcare programs[48]	All non-supplemental policies cover testing; health department covers testing for children without health insurance[49]
VT	5 µg/dL[50]	5 µg/dL (capillary): educate family[51] 10 µg/dL (capillary): inspection of unit[52]	2011	Universal screening at 12 and 24 months; 36-72 mos. if not previously; to age 16 for migrant children[53]	If parent/ guardian refuses test, provider not liable[54]	N/A	N/A

[38] N.H. REV. STAT. ANN. § 130-A:6;
see also S.B. 247, 2018 LEG., REG. SESS. (N.H. 2018)
[39] N.H. REV. STAT. ANN. § 130-A:6-a
[40] N.H. REV. STAT. ANN. § 130-A:5
see also S.B. 247, 2018 LEG., REG. SESS. (N.H. 2018)
[41] N.H. REV. STAT. ANN. § 130-A:5-a
[42] N.H. REV. STAT. ANN § 130-A:5-a
[43] N.H. REV. STAT. ANN. § 415:6-v.
[44] 216 R.I. CODE R. § 050-15-3.3A(7, 44)
[45] 216 R.I. CODE R. § 050-15-3.3A(50)
https://rules.sos.ri.gov/regulations/part/216-50-15-3
[46] 23 R.I. GEN. LAWS § 24.6; R.I. CODE R. § 3.1(b), 216 R.I. CODE R. §050-15-3.4.1(A)(1)(a) at https://rules.sos.ri.gov/regulations/part/216-50-15-3
[47] 216 R.I. CODE R. § 050-15-3.2.1(A)(4)
[48] 216 R.I. CODE R. § 050-15-3.2.1(A)(3)
[49] 216 R.I. CODE R. § 050-3.4.2.
[50] VT. STAT. ANN. TIT. 18, § 1751(b)(7)
[51] VT. STAT. ANN. TIT. 18, § 1757(b). *Case Management Vermont Department of Health, Pediatric Blood Lead Testing & Case Management Guidelines* (2017), http://www.healthvermont.gov/sites/default/files/documents/pdf/Env_CEH_BLTestingGuidelines.pdf.
[52] VT. STAT. ANN. TIT. 18,§ 1757(c), § 13 140 055(II)(14);(III)
[53] VT. STAT. ANN. TIT. 18, §1755; *Vermont Blood Lead Testing and Reporting Rule, 10-044.*
[54] 18 VSA 1755(c); 13 140 070(II)(1)(d)

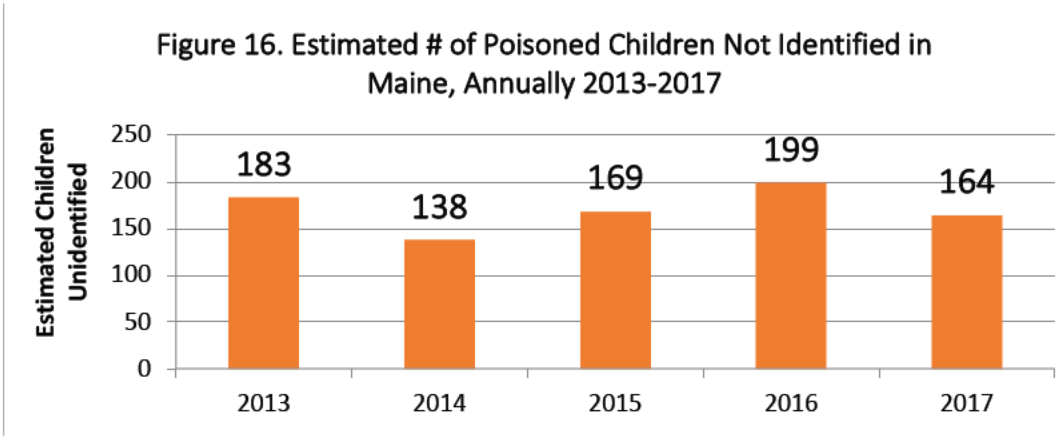
5. Estimated Number of Undiagnosed Children with Lead Poisoning & the Economic Impact

A report in Michigan conducted prior to the Flint crisis estimated that the annual cost of lead exposure was more than $270 million annually, including $112.5 million to tax payers.[55] The report went further and estimated that lead abatement for the 100,000 homes most at risk would cost a total of $600 million, yet would generate annual savings of $190 million annually, a payback period of just over 3 years. In Maine, a study from 2010 estimated the loss in lifetime earnings for lead exposure to be $270 million over the lifetimes of the children considered.[56]

The cost of lead exposure remains extremely high and includes costs related to special education, healthcare, crime, and decreased earnings. The return on investment for controlling lead hazards was estimated between $17 and $221 for every dollar spent, according to a 2009 study from the Economic Policy Institute.[57] More recently, a study from the Health Impact Project in 2017 estimated a return of $1.33 per dollar spent on removing lead hazards from drinking water, $1.39 per dollar spent on eradicating lead paint hazards from older homes, and $3.10 per dollar spent by ensuring contractors comply with the EPA's RRP Rule lead safe practices.[58]

If Maine achieved higher levels of screening, additional children would be confirmed with lead poisoning. To estimate the number of these unidentified children, we applied the screening rate of the highest performing county by the time children reached the age of 3 (Washington County, 95.8% in 2017 for the 2014 cohort) to the total number of children in Maine. Based on this estimate, approximately 164 more children in 2017 would have been identified as lead poisoned, a 50% increase over the actual 2017 confirmed cases. (Figure 16)

[55] Tracy Swinburn, *Costs of Lead Exposure and Remediation: Update* (2016) https://www.ecocenter.org/sites/default/files/Lead.Report.Designed.Final__0.pdf.
[56] Mary E. Davis, *Economic Assessment of Children's Health and the Environment in Maine*, 19 Maine Pol'y Rev. 1 (2010).
[57] Gould, E. Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control. Environ Health Perspect. 2009 Jul; 117(7): 1162-1167.
[58] Health Impact Project, *10 Policies to Prevent and Respond to Childhood Lead Exposure* (Aug. 2017), https://www.pewtrusts.org/-/media/assets/2017/08/hip_childhood_lead_poisoning_report.pdf.



It is estimated that lead poisoning results in an average loss of lifetime earnings of $723,000 per child.[59] Applying this to the estimated number of undiagnosed children results in a potential loss of earnings in the $77-$119 million range. If we apply the lost earnings to the total number of unidentified and confirmed lead poisoned children, the potential lost earnings falls in the range of $313-$355 million. Applied to the estimated 853 undiagnosed children in Maine, between 2013-2017 there was a potential loss of earnings of approximately $617 million. Applying these lost earnings to the total number of both confirmed and unidentified lead poisoned children in Maine between 2013-2017, the potential total loss is about $1.9 billion. In addition to the economic impact on affected individuals and society, research has demonstrated conclusively that lead poisoning continues to cause increases in health care and special education costs, among others, for communities in Maine and across the nation.

At current screening rates, there are many Maine children with lead poisoning who remain unidentified. The personal and societal costs of this missed public health intervention remain very high.

✦ ✦ ✦

"There is no cure, there is no treatment once the exposure has happened...[universal screening] is the best thing we've got to identify the child who has been exposed to lead and move them away from the hazards to prevent further damage."

~ Health Promotions Advisor, New Hampshire Division of Protective Health Services, Healthy Homes and Lead Poisoning Prevention

[59] National Center for Environmental Health, Centers for Disease Control and Prevention. Grosse et al., *Economic Gains Resulting from the Reduction in Children's Exposure to Lead in the United States,* ENVIRONMENTAL HEALTH PERSPECTIVES 110:563–569, June 2002.