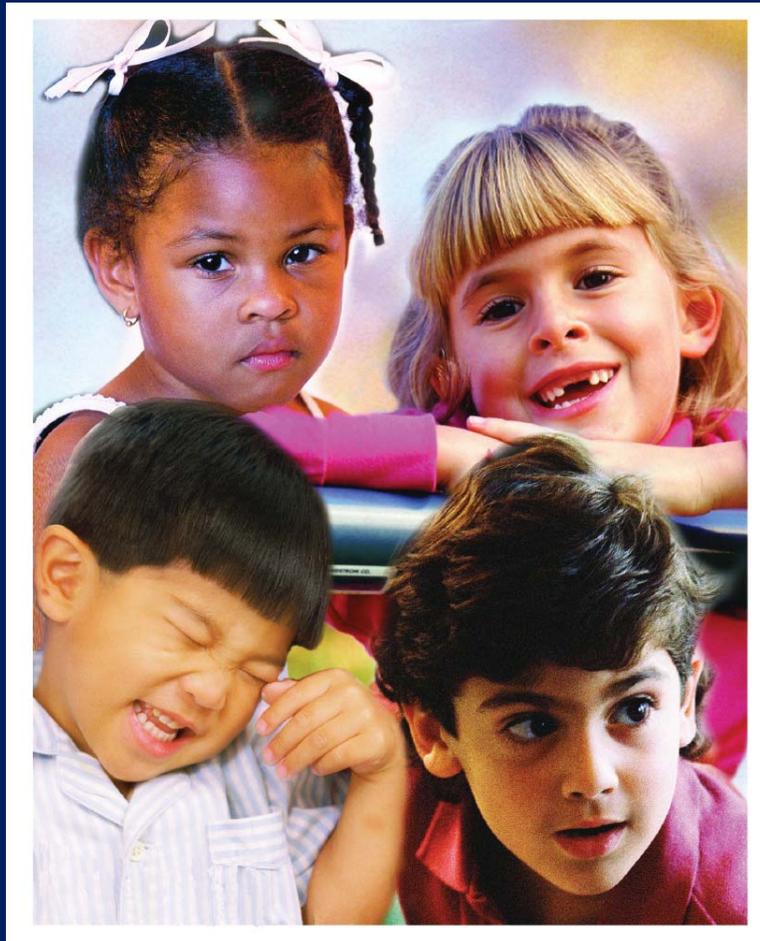


MISSISSIPPI STATE DEPARTMENT OF HEALTH



Childhood Lead Poisoning in Mississippi

Surveillance Report 2004 – 2009

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EXECUTIVE SUMMARY

The Lead Contamination Control Act of 1988 authorized the U.S. Centers for Disease Control and Prevention (CDC) to initiate program efforts to eliminate childhood lead poisoning in the United States. As a result, the Lead Poisoning Prevention Branch funded state and local health departments to:

- Develop and implement program policies to prevent childhood lead poisoning.
- Educate the general public and health-care providers about childhood lead poisoning.
- Determine the extent of childhood lead poisoning by screening children for elevated blood lead levels.
- Ensure that lead-poisoned children receive medical and environmental follow-up.
- Promote neighborhood-based efforts to prevent childhood lead poisoning to avoid the long term affects of lead poisoning.
- Develop a strategic plan and coordinate efforts of primary prevention and policy development among stakeholders.
- Support research to determine the effectiveness of prevention efforts at federal, state, and local levels.

This report provides information on the status of childhood lead poisoning in Mississippi and serves as a resource for stakeholders and others who are interested in eliminating childhood lead poisoning in the state. This report provides an overview on the number of children tested and confirmed with elevated blood lead levels (EBLLs) as well as the recommendations for follow-up activities.

MISSISSIPPI CHILDHOOD LEAD POISONING PREVENTION PROGRAM OVERVIEW

Healthy People 2010 Objectives

A goal of the United States Department of Health and Human Services' Healthy People 2010 is to eliminate childhood lead poisoning as a public health problem. In July 2006, the Mississippi Childhood Lead Poisoning Prevention Program (MSCLPPP) was awarded a five-year grant by the CDC. The grant required the program to develop a strategic plan to eliminate childhood lead poisoning in the state by 2010. The Mississippi State Department of Health (MSDH) has provided lead screening as a part of the Early Periodic Screening Diagnosis and Treatment (EPSDT) program for primary prevention since the early 1990's. The MSCLPPP convened the first Advisory Committee meeting to address childhood lead poisoning prevention issues in 1998. The Advisory Committee is divided into five key work groups: Surveillance and Analysis, Care Coordination, Primary Prevention Through Health Education, Primary Prevention Through Risk Reduction, and Evaluation. The committee consists of key stakeholders from federal, state, and local agencies, universities, and community and faith-based organizations who provide services for children and families.

MSCLPPP's Main Goal

The MSCLPPP's main goal is to coordinate statewide efforts to eliminate lead poisoning in children less than 72 months of age. To accomplish this goal, targeted initiatives were developed to protect children in Mississippi from lead exposure. The initiatives include: building strategic partnerships, development of primary prevention strategies, care coordination services, and increasing blood lead screening. The efforts of the MSCLPPP are focused on program management, evaluation, surveillance, technical assistance, strategic partnerships, and policy implementation.

Targeted Population

The MSCLPPP utilizes the following criteria to define high-risk populations for elevated blood lead levels (EBLLs):

- Medicaid enrolled or Medicaid eligible children
- Children whose parents answer "yes" or "don't know" to questions on the Lead Risk Assessment Questionnaire (See Appendix B)
- Pregnant women with persistent lead levels greater than or equal to (\geq) 20 micrograms per deciliter ($\mu\text{g}/\text{dL}$) which require medical management
- Children over age six with persistent lead levels $\geq 20 \mu\text{g}/\text{dL}$ which require medical management

The MSCLPPP identifies all children with a blood lead level (BLL) of $\geq 10\mu\text{g}/\text{dL}$ as being lead poisoned. From 2004 through 2009 there were 1,640 children with EBLLs in the

state. The 2009 Maternal Child Health (MCH) Portrait indicates that Mississippi tied for third place among other states with high levels of lead poisoning in children under five who live below the 129% poverty level.¹

Data Collection

Since 2000, the MSCLPPP has collected blood lead testing data on all children tested in the state. The blood lead data is maintained in the Systematic Tracking of Elevated Blood Lead Levels and Remediation (STELLAR) Database. STELLAR is a database supported by the Centers for Disease Control and Prevention (CDC) that stores data on children with elevated blood lead levels as a practical means of monitoring medical and environmental activities on lead poisoning cases. The staff monitors screening data for children with lead toxicity, identification and confirmation of cases, medical management, and investigation and abatement of lead hazards.

The MSCLPPP staff submits quarterly data reports to the CDC to identify areas of high prevalence for lead poisoning. The results allow the program to target education and outreach efforts and assist communities in developing health and safety policies to improve the health outcomes of children and families.

Reporting Requirements

The MSDH and the Mississippi Division of Medicaid (MDOM) require reporting of all venous BLLs $\geq 10\mu\text{g/dL}$ to the MSCLPPP within one week of diagnosis. Laboratories report all blood lead test results within one week of testing. The information below is required for surveillance and to help ensure an environmental assessment is completed:

- Patient's name
- Address
- Date of birth
- Phone number
- Type of specimen (venous or capillary)
- Date of test
- Result ($\mu\text{g/dL}$)
- Social Security number
- Parent/guardian name
- Name of clinic where specimen was drawn
- Clinic address
- Clinic phone number
- Clinic contact person for lead screening
- Medicaid/private insurance number

INTRODUCTION

Lead Poisoning as a Public Health Concern

Federal legislation in the 1970's removed lead from gasoline and decreased smokestack emissions from smelters and other sources, which helped to decrease lead poisoning exposure in children. In the 1970's the United States Consumer Product Safety Commission implemented regulations that paint for homes could contain no more than .06% lead by dry weight, a significant decrease from the 50% lead content allowed prior to the 1950's.

What is Lead Poisoning?

Lead poisoning is one of the most preventable environmental health problems in young children. Lead is a natural bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Most human exposure to lead comes from activities including burning fossil fuels, mining, and manufacturing. According to the Agency for Toxic Substances and Disease Registry (ATSDR), lead is also used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays.²

In 2007, the CDC reaffirmed the definition of lead poisoning and set the level of concern as a blood lead level ≥ 10 $\mu\text{g/dL}$ of whole blood. The only way to diagnose lead poisoning is through blood lead testing. Although concentrations of lead have decreased in most children, some disadvantaged children continue to have higher blood lead concentrations.

SOURCES OF LEAD POISONING

Lead is found in many places in the environment, especially in older homes where children may be easily exposed. High levels of lead can harm the brain, interfere with growth, cause learning disabilities, and may lead to death. Children can be exposed to lead from lead-based paint, dust, batteries, imported vinyl and plastic mini blinds made before 1997, and tap water that is delivered through lead pipes. Children who frequent older homes that contain lead components and have chipping and peeling paint are at higher risk of lead exposure. Possible sources of lead are:

- lead-based paint
- garden hoses
- soil and dust
- tap water
- glazed pottery
- electrical cords
- keys
- batteries
- imported canned foods
- metal jewelry
- outside water faucets

Lead-Based Paint in Residential Dwellings

The most common sources of lead poisoning in children are dust and chips from deteriorating lead paint on interior and exterior surfaces. Children who live in homes with deteriorating paint can have blood lead concentrations $\geq 20 \mu\text{g/dL}$ without frank pica. By the mid-1970's lead based paint was no longer used on interior surfaces in the United States.

According to the 2000 U.S. Census Bureau's Housing Characteristic Data, 135,350 homes in Mississippi were built prior to 1950, with an estimated 34,851 of the pre-1950 homes occupied by renters.³ From 2004 through 2009, the MSCLPPP conducted 329 environmental inspections; of these homes 148 were pre-1950 homes. In 2007, the MSCLPPP identified high-risk counties. These criteria are consistent with CDC and the American Academy of Pediatrics (AAP) recommendations for a risk based approach in high-risk counties.⁴ The criteria were based on a combination of the following factors:⁵

- Proportion of pre-1950 housing units
- Proportion of children in poverty
- Number of children less than six years of age
- Lead screening rate
- Total confirmed elevated blood lead level cases $\geq 10\mu\text{g/dL}$

- Number of addresses where multiple children had confirmed elevated blood lead levels within the past five years

There were 16 counties identified as high-risk based on the criteria: Adams, Coahoma, Forrest, Harrison, Hinds, Holmes, Humphreys, Jones, Lauderdale, Leflore, Pike, Sunflower, Tallahatchie, Warren, Washington, and Yazoo. Table 1 shows the number of pre-1950 through pre-1978 homes where environmental assessments were conducted by the MSCLPPP.

Table 1: Environmental Assessments in Homes, 2004-2009

Year	Total Homes	Pre-1950	1950-1959	1960-1969	1970-1977	After 1977	Unknown	Mobile Home
2004	57	26	7	2	3	3	3	13
2005	63	26	9	9	4	0	7	8
2006	82	43	5	3	0	15	4	12
2007	39	17	5	6	4	1	4	2
2008	39	10	7	3	4	5	0	10
2009	49	26	7	4	3	3	5	1
Total	329	148	40	27	18	27	23	46

Source: MSCLPPP STELLAR Database

SCOPE OF THE PROBLEM

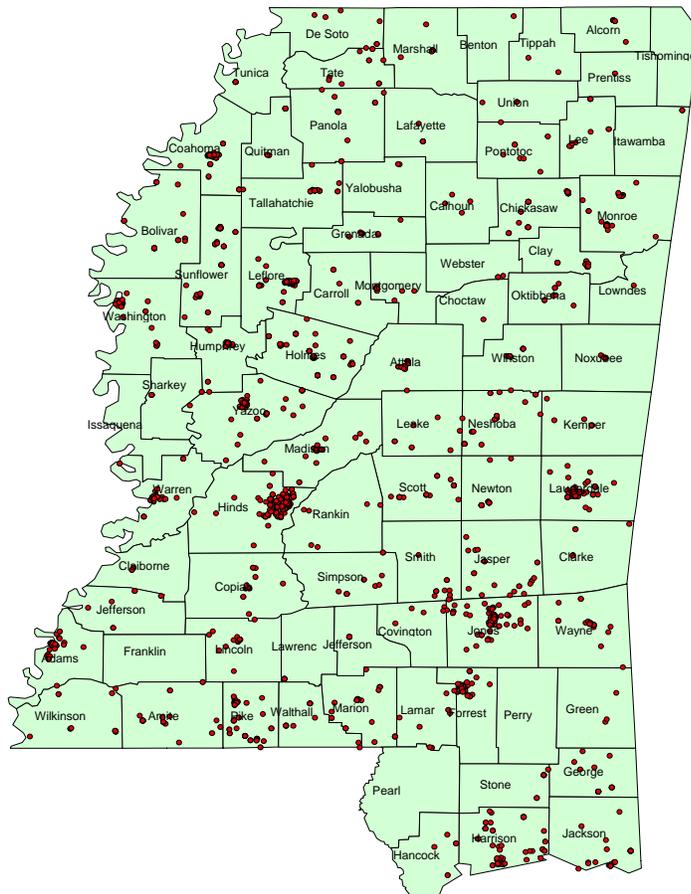
Lead is recognized as an environmental health hazard for children and their families. The problem of lead poisoning is not geographically uniform. In areas where childhood lead poisoning is prevalent, there are other complex problems that affect families. These problems include: poverty, poor housing, lack of family support, unstable community environment, and poor access to quality health care. Through the years of 2004 to 2009 MSCLPPP collected 290,083 records of blood lead tests. These data were used to identify problems that contribute to children's exposure to lead. The data for 2004 through 2009 revealed:

- Children with lead poisoning were identified in 77 of the 82 counties.
- There were 1,640 children identified with lead poisoning.
- There were 16 counties identified as high risk areas.
- Data showed that the 197,917 children that were screened for lead were associated with 161,592 addresses that contained environmental hazards.
- Among the homes of the 1,640 children identified with lead poisoning, 1,407 addresses inspected had some type of environmental hazards.
- Lead poisoned children represent 0.64% of all children under six who received a blood lead test.
- MSCLPPP conducted 329 environmental inspections, of which 148 were pre-1950 housing.
- Total average cost per child to screen and treat was approximately (\approx) \$190.
 - The estimated cost per child to screen and treat with a BLL 10-19 μ g/dL was \$69.
 - The estimated cost per child to screen and treat with a BLL \geq 20 μ g/dL was \$969.
- Estimated total cost to screen and treat children less than six years old with lead poisoning was \$309,360.
- In 2009, there were 166 children identified with lead poisoning who were associated with 172 addresses with environmental hazards.

Since lead poisoning is most often associated with lead-based paint in older homes, the majority of these addresses (n= 1,407) represent potential environmental hazards for future generations.

Figure 1 shows locations of children less than six years old with elevated blood lead levels in Mississippi.

Figure 1: Distribution of Children Less Than Six Years Old With Elevated Blood Lead Levels, 2004-2009



Source: MSCLPPP STELLAR Database

TARGETED SCREENING AND TESTING FOR CHILDHOOD LEAD POISONING

The Centers for Medicare and Medicaid Services (CMS) mandates lead screening and testing as a component of the EPSDT program for children who are Medicaid eligible. EPSDT is designed to improve the health of low-income children by providing appropriate and necessary pediatric services. Children are tested at 12 and 24 months and up to 72 months if they have not previously been tested for lead. Table 2 shows the total number of children in the state that were Medicaid enrolled and non-Medicaid children who were tested for lead poisoning.

Table 2: Number of Mississippi Children Less Than Six Years Old Who Are Medicaid-Enrolled and Non-Medicaid

Year	Children Less Than Six Years Old	Medicaid-Enrolled	Non-Medicaid	Total Children Tested	Medicaid-Enrolled Tested	Non-Medicaid Tested	Percent of Medicaid-Enrolled Tested	Percent of Non-Medicaid Tested
2004	248,111	195,966	52,145	42,587	37,546	5,041	19.2	9.7
2005	252,041	177,763	74,278	41,904	34,356	7,548	19.3	10.2
2006	251,741	182,427	69,314	41,807	31,496	10,311	17.3	14.9
2007	260,912	181,042	79,870	38,551	30,867	7,684	17.0	9.6
2008	262,622	185,224	77,398	42,566	33,759	8,807	18.2	11.4
2009	265,500	193,643	71,857	48,487	39,494	8,993	20.4	12.5

Source: U.S. Census Bureau, Mississippi Division of Medicaid, MSCLPPP STELLAR Database

Disclaimer: From 2004-2007, there were no requirements that all blood lead levels had to be reported to the MSCLPPP. Beginning in 2008, the Reportable Diseases and Conditions list was modified to require reporting of all blood lead levels.

Table 3 shows the number of children enrolled in Medicaid who were screened for lead poisoning and tested to confirm the elevated blood lead levels.

Table 3: Medicaid-Enrolled Children Less Than Six Years Old With Elevated Blood Lead Levels

	2004	2005	2006	2007	2008	2009
Medicaid Enrolled Children Tested for Lead	37,546	34,356	31,496	30,867	33,759	39,494
Medicaid Enrolled Children with EBLL	326	315	263	178	160	191
Percent of Children Tested for Lead with EBLL	0.87%	0.92%	0.84%	0.58%	0.47%	0.48%

Source: Mississippi Division of Medicaid, MSCLPPP STELLAR Database

Disclaimer: From 2004-2007, there were no requirements that all blood lead levels had to be reported to the MSCLPPP. Beginning in 2008, the Reportable Diseases and Conditions list was modified to require reporting of all blood lead levels.

Table 4 shows the number of non-Medicaid children who were screened for lead poisoning and tested to confirm the elevated blood lead levels.

Table 4: Non-Medicaid Children Less Than Six Years Old With Elevated Blood Lead Levels

	2004	2005	2006	2007	2008	2009
Non-Medicaid Children Tested for Lead	5,041	7,548	10,311	7,684	8,807	8,993
Non-Medicaid Children with EBLL	45	39	54	29	25	15
Percent of Children Tested for Lead with EBLL	0.89%	0.52%	0.52%	0.38%	0.28%	0.17%

Source: Mississippi Division of Medicaid, MSCLPPP STELLAR Database

Disclaimer: From 2004-2007, there were no requirements that all blood lead levels had to be reported to the MSCLPPP. Beginning in 2008, the Reportable Diseases and Conditions list was modified to require reporting of all blood lead levels.

Table 5 shows there were 1,640 children with elevated blood lead levels in the state.

Table 5: Children Less Than Six Years Old With Elevated Blood Lead Levels

Year	Total Children Tested	Percent of Children Tested	10-14 µg/dL	15-19 µg/dL	20-24 µg/dL	25-44 µg/dL	45-69 µg/dL	>=70 µg/dL	Grand Total	Percent of Children with Blood Lead Level >=10 µg/dl Among Children Tested
2004	42,587	17.2%	268	65	23	12	3	0	371	0.87%
2005	41,904	16.6%	235	67	32	16	3	1	354	0.85%
2006	41,807	16.6%	219	53	21	22	2	0	317	0.76%
2007	38,551	14.8%	145	39	11	11	1	0	207	0.54%
2008	42,566	16.2%	121	30	16	16	2	0	185	0.44%
2009	48,487	18.3%	131	37	20	17	1	0	206	0.43%
Grand Total	255,902	16.6%	1119	291	123	94	12	1	1,640	.64%

Source: U.S. Census Bureau, MSCLPPP STELLAR Database

Disclaimer: The 2004-2009 U.S. Census Bureau population data was used to calculate the percent of children tested.

Disclaimer: From 2004-2007, there were no requirements that all blood lead levels had to be reported to the MSCLPPP. Beginning in 2008, the Reportable Diseases and Conditions list was modified to require reporting of all blood lead levels.

Table 6 shows the number and rate of children in Mississippi with EBLs by the age at which they were tested.

Table 6: The Rate of Children in Mississippi With EBLs Among Children Tested by Age, 2004-2009

Year	Age Group	Number of Children Tested	EBLL	Percent
2004	<1	4,788	7	0.15
	1	13,529	98	0.72
	2	7,410	91	1.23
	3	6,708	83	1.24
	4	7,199	63	0.88
	5	2,953	29	0.98
2005	<1	4,844	11	0.23
	1	13,262	91	0.69
	2	7,298	88	1.21
	3	6,627	80	1.21
	4	7,018	65	0.93
	5	2,855	19	0.67
2006	<1	5,522	5	0.09
	1	12,117	85	0.70
	2	7,662	83	1.08
	3	6,563	62	0.94
	4	7,126	64	0.90
	5	2,817	18	0.64
2007	<1	4,840	7	0.14
	1	12,383	66	0.53
	2	6,996	54	0.77
	3	5,894	34	0.58
	4	5,797	28	0.48
	5	2,641	18	0.68
2008	<1	4,834	6	0.12
	1	13,148	54	0.41
	2	7,964	50	0.63
	3	6,599	44	0.67
	4	7,335	23	0.31
	5	2,686	8	0.30
2009	<1	5,128	6	0.12
	1	14,372	52	0.36
	2	9,756	72	0.74
	3	7,876	45	0.57
	4	8,201	26	0.32
	5	3,154	5	0.16

Source: MSCLPPP STELLAR Database

Disclaimer: From 2004-2007, there were no requirements that all blood lead levels had to be reported to the MSCLPPP. Beginning in 2008, the Reportable Diseases and Conditions list was modified to require reporting of all blood lead levels.

ADDRESSING THE ISSUE

The MSCLPPP Screening Plan was developed and published to support the efforts of the United States Department of Health and Human Services Healthy People 2010 objective to eliminate childhood lead poisoning in Mississippi. This document was also developed based on recommendations from CDC to provide guidance on lead poisoning prevention for children. The plan recommends that health care providers screen and test children under six years old who are Medicaid eligible. The MSCLPPP supports the utilization of the lead risk assessment questionnaire during the health care provider's evaluation of a child to assess risk factors for lead poisoning.⁵

Strategic Partnerships

The MSCLPPP convened the first Advisory Committee meetings to address childhood lead poisoning prevention issues in 1998. The committee consists of key stakeholders from federal, state, and local agencies, universities, and community and faith-based organizations who provide services for children and families. The Advisory Committee is divided into five key work groups: Surveillance and Analysis, Care Coordination, Primary Prevention Through Health Education, Primary Prevention Through Risk Reduction, and Evaluation. Over the years the focus of the Advisory Committee has enhanced community and environmental policies, safety, and education efforts to improve the quality of life for people in the state. The MSCLPPP Advisory Committee meets quarterly to strategize on efforts (policies, resources, education, and outreach) related to decreasing the risk of home health hazards for children and their families.

In August 2007, the MSCLPPP developed a Lead Poisoning Elimination Plan to reduce childhood lead poisoning. The key goals of the Plan are to reduce the number of children exposed to lead; to implement statewide lead and healthy housing education activities; and to ensure that all children with elevated blood lead levels receive appropriate medical, educational, nutritional, developmental, and lead hazard control interventions.⁶

Primary Prevention

The MSCLPPP promotes the incorporation of healthy housing principles into all program activities. The MSCLPPP conducts home visits and environmental inspections for children with EBLLs $\geq 15\mu\text{g/dL}$. During the home visits an environmental inspection and visual assessment are conducted to determine environmental risk factors that may affect the health of children and families. Some of these risk factors in the home may include asthma, mold, mildew, indoor pollutants, allergies, lead-based paint, lead contaminated dust, soil and water hazards, and pests. The MSCLPPP also assesses the home for risks for unintentional injuries. Staffs are trained to install smoke alarms and provide information on fires, falls, burns, asthma, mold, mildew, smoking, and Sudden Infant Death Syndrome (SIDS) risk reduction.

In 2009, the MSCLPPP adopted the Housing Health and Safety Rating System (HHSRS) of New England to assess potential health and safety hazards during home visits.⁷ The

health and safety components selected for the rating system are based on three of the “Seven Principles of Healthy Housing,” which include keeping the home clean, ventilated, and safe. Four of the HHSRS components are used to assess three of the seven healthy housing principles identified by physiological assessments (damp, mold, carbon monoxide, volatile organic compounds, excess cold and heat, and lead); psychological assessment (avoid over-crowding, inadequate lighting, and pest infestation); and protection against accidents (fires, falls, explosions, and structural soundness). Hazards in the home are scored using a pass or fail system. A high score indicates there are one to five hazards in the home and a low score indicates that there are five or more hazards in the home.

Care Coordination/Plan of Care

MSCLPPP provides care coordination services for children with venous blood lead levels $\geq 10\mu\text{g}/\text{dL}$. The services that are provided to children and their families include education and outreach, home visits, and environmental assessments to determine the sources of lead exposure and to help ensure proper medical follow-up. Upon identification of a child with an EBLL, the care coordinator will follow the six stages of care coordination: initial contact, first home visit, first home visit follow-up, second home visit, second home visit follow-up, and case closure. The initial contact is made to confirm the child’s EBLL by contacting the provider and caregiver based on the care coordination protocol. Case closure occurs when environmental hazards have been eliminated or the child’s blood lead level has decreased below $15\mu\text{g}/\text{dL}$ for at least six months and other indicators of the care coordination protocol have been achieved.⁸

Environmental investigations provide on-site assessments for detecting lead in paint as well as lead in elements of the environment to include soil, dust, and water. The environmental investigations include a visual assessment of home health hazards such as pest, mildew, mold, no smoke alarms, and other potential risks for injuries. Environmental investigations are important because the investigation offers insight to the source(s) of lead, lead-based paint, home health hazards, and provides the homeowner with knowledge regarding remediation or abatement. MSCLPPP provides environmental investigations for children with venous blood lead levels $\geq 20\mu\text{g}/\text{dL}$ or persistent $15\text{--}19\mu\text{g}/\text{dL}$ at least three months apart. Environmental investigations include collection of dust, soil, and water samples as well as X-Ray Fluorescence (XRF) readings from paint and other items that the child has touched.⁸ The care coordination process is used for lead follow-up and to build on other interventions (Healthy Homes Demonstration, smoke alarm installation, fire escape planning, and other referrals) which support the holistic approach to providing enhanced health, safety, and hazard free environments.

FUTURE DIRECTION

The MSCLPPP, along with stakeholders, will focus on promoting a healthy home and community for all Mississippians. Some activities to assist in reaching the goal of eliminating childhood lead poisoning involve developing additional partnerships and establishing policies and legislation to support improvements in screening, surveillance, and primary prevention. Early identification of elevated blood lead levels through blood screening is vital for prevention of childhood lead poisoning. Plans for continued progress are to implement the goals and objectives of the MSCLPPP Lead Poisoning Elimination Plan. The Plan highlights activities that are used to increase blood lead screening and provide targeted education. Collaboration between housing professionals, medical providers, and the public is also highlighted in the Plan. The overall goals of the MSCLPPP are to:

- Ensure all at risk children are screened for lead poisoning.
- Utilize surveillance data to document the incidence and prevalence of lead poisoning.
- Provide families, communities, and medical professionals with knowledge and tools needed to protect children from lead poisoning.
- Coordinate lead surveillance activities and target lead hazard remediation efforts to minimize childhood exposure to all lead hazards.
- Utilize data to support changes in regulations and policies for lead safe housing and environmental justice.

The MSCLPPP has enhanced its program implementation to address healthy homes and lead poisoning prevention through a holistic approach. The program, along with key stakeholders, will focus on the relationship between health and housing and explore practical methods to reduce health and safety risks in the home and other natural environments.

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APPENDIX A

Acronyms

AAP	American Academy of Pediatrics
≈	Approximately
ATSDR	Agency for Toxic Substances and Disease Registry
BLL	Blood Lead Level
CDC	Centers for Disease Control and Prevention
CMS	Centers for Medicare and Medicaid Services
EBLL	Elevated Blood Lead Level
EPSDT	Early Periodic Screening Diagnosis and Treatment
≥	Greater than or equal to
HHSRS	Housing Health and Safety Rating System
μg/dL	Micrograms per Deciliter
MSCLPPP	Mississippi Childhood Lead Poisoning Prevention Program
MSDH	Mississippi State Department of Health
MDOM	Mississippi Division of Medicaid
STELLAR	Systematic Tracking of Elevated Blood Lead Levels and Remediation
XRF	X-ray Fluorescence

APPENDIX B

Primary Care Provider Risk Assessment Questionnaire

Blood Lead Screening Summary

**Screen all children between the ages of 6 and 72 months at each well-child visit using the Risk Assessment Questionnaire below.*

Risk Assessment Questionnaire — ****Consider the child high risk with a “yes” or “don’t know” answer to any question.**

Child's Name	Date of Birth	Date													
		Yes	No												
1. Does your child live or regularly visit an old house built before 1960?															
2. Was your child's day care center/preschool/babysitter's home built before 1960?															
3. Does any pre-1960 home/school/day care where your child stays have peeling, chipping, dusting, or chalking paint?															
4. Does your child spend at least six hours a week at a house built before 1960 with recent, ongoing or planned renovation or remodeling?															
5. Have any of your children or their playmates had lead poisoning?															
6. Does your child frequently come in contact with an adult who works with lead? Examples: construction, welding, pottery, painting, soldering, radiator repair, metal recycling, oil rig work, wire/cable cutting, and manufacture of cable, wire, and batteries															
7. Have you seen your child mouthing electrical cords, keys, zipper pulls, or toy jewelry.															
8. Do you give your child any home or folk remedies which may contain lead? Examples: greta or azarcon (Hispanic), pay-loo-ah (SE Asia), and ayurvedic medicines (India)															
9. Does your child live or play near a street or highway with a lot of traffic when leaded gasoline (before 1986) was used? The soil may be contaminated with lead.															
10. Does your child drink well water?															
11. Have there ever been vinyl/plastic mini-blinds bought before 1997 in your home?															

Blood Lead Levels

	Date and Signature	Level	Dates and Initial	Comments
Initial specimen drawn Specify cap. or venous		Lead Education		
Confirmatory venous Specimen drawn		Nutritional Counseling		
Repeat venous Specimen drawn		Lead Hazard Prevention		
Repeat venous Specimen drawn		Nursing/Social work Home Visit		
Repeat venous Specimen drawn		Referral to Environmentalist		
Repeat venous Specimen drawn		Environmental Inspection		
Repeat venous Specimen drawn		Referral for Clinical Management		
Repeat venous Specimen drawn		Referral for Developmental Assessment		

APPENDIX C

Important Lead Issues

Key facts about lead

Some of the key facts about lead and childhood lead poisoning include:

- Lead poisoning is a dangerous condition that can occur if your child swallows or inhales substances that contain lead.
- Lead poisoning is preventable, and with the appropriate effort and commitment can be eliminated.
- Lead is found in many places in the environment, especially in older homes, where a child may be easily exposed.
- High levels of lead can harm the brain, interfere with growth, cause learning difficulties, and in extreme cases may even lead to death.
- Imported vinyl or plastic mini-blinds made and purchased before 1997 can contain lead.

Protect your child from lead:

- Clean your child's hands with soap and water or baby wipes after playing outside and before meals.
- Keep your child from eating paint chips, dust, or dirt. Keep children from touching window troughs (wells) in old homes and outside surfaces (steps and porch floors) near old homes. Use a wet mop or wet cloth with an all-purpose cleaner to clear areas of dust or paint chips on window sills, interior floors, porch floors, ledges, and outside steps. Keep children's hands and toys off these areas. Window sills that are not very smooth might be hard to clean and can be covered with contact paper or plastic. Surfaces that children touch often should be smooth and easily cleaned.
- Keep children from eating while sitting on floors or steps.

- Anyone in the household who works with lead should avoid wearing work shoes while walking on steps and floors and should avoid wearing work clothes while sitting on furniture or car seats where children put their hands.
- Wash your child's toys often.
- Give your child a diet rich in vitamin C, calcium, and iron. Some good sources are milk, oranges, tomatoes, green leafy vegetables, eggs, bread, cereal, and meat. Since children absorb more lead on an empty stomach, give your child something to eat every two to three hours.
- Have your home checked for lead before you remodel. Do not scrape or sand lead-based paint.

Is your child at risk for lead poisoning?

- Does your child live in, or regularly visit, an old home built before 1960?
- Was your child's day-care center/pre-school/baby-sitter's home built before 1960?
- Does the home have peeling or chipping paint?
- Does your child live in a home built before 1960 with recent, ongoing, or planned renovation or remodeling?
- Have any siblings or playmates of your child had lead poisoning?
- Does your child frequently come in contact with an adult who works with lead? Examples of job descriptions or locations include: construction and painting of buildings and houses; pottery and painting; car and truck radiator repairs, auto body work; manufacturing or working with cable, wire, and tire weights; working at a recycling center; welding and soldering; target shooting and handling of firearms, bullets, or explosives; electronic repair; furniture refinishing; construction and repair of ships, bridges, and water towers; working on oil rigs; working with rubber or plastics; or working with lead Babbitt.
- Do you give your child any home or folk remedies or Mexican candy which might contain lead?
- Does your child live near a heavily traveled highway or street?

- Does your child play with keys (which may contain lead)?
- Are there lead fishing sinkers in your home?
- Have items other than vegetation been burned outside near the home? The ashes left behind often contain lead.

If you answered “yes” to any of the questions above, please discuss the possibility of lead poisoning with your child’s physician or a nurse at your local health department.

APPENDIX D

The Cost of Lead Poisoning

In the state of Mississippi, lead poisoning expenditures for children include costs related to testing, treatment, and follow-up. Other direct expenditures include the cost of repeat blood testing and environmental investigations. From 2004 through 2009, Mississippi's estimated cost to screen and treat children less than six years old with lead poisoning was approximately \$309,360.

Average Cost of Testing and Treatment for Children <6 in Mississippi with Lead Poisoning, 2004-2009

Blood Lead Level	Number of Children Tested	Average Cost Per Child to Test and Treat	Estimated Total Cost
10-19 µg/dL	1422	\$69	\$98,118
≥20 µg/dL	218	\$969	\$211,242
TOTAL	1640	≈\$190	\$309,360

Source: MSCLPPP STELLAR Database

To calculate the costs the MSCLPPP used the “Cost-effectiveness Analysis of Lead Poisoning Screening Strategies Following the 1997 Guidelines of the Centers for Disease Control and Prevention”.¹⁰ All children listed in the STELLAR Database with an EBLL $\geq 10\mu\text{g/dL}$ were used to calculate the estimated total cost. The cost-effectiveness analysis from the perspective of the health care system was used to compare the targeted test of venous EBLs of 10-19 $\mu\text{g/dL}$ and $\geq 20\mu\text{g/dL}$ and the average cost of testing and treatment are included in the model.

The costs may be under-represented, because every child tested during that period whose BLL $> 10\mu\text{g/dL}$ was not included. The overall lead cost is slightly inflated, because some children did not receive the recommended follow-up due to disconnected phone numbers, inadequate addresses, lack of Medicaid recertification, and lack of transportation for follow-up services.

APPENDIX E

Time Frames for Intervention and Other Care Coordination Activities According to a Child's Blood Lead Level

Blood lead level ($\mu\text{g/dL}$)	Actions	Time Frame for Beginning Intervention
10-14	Provide caregiver lead education. Provide follow-up testing. Refer the child for social services if necessary.	Within 30 days
15-19	Above actions, plus: If BLLs persist (i.e., two venous BLLs in this range at least three months apart) or increase, proceed according to actions for BLLs 20-44.	Within 2 weeks
20-44	Above actions, plus: Provide coordination of care (case management). Provide clinical evaluation and care. Provide environmental investigation and control current lead hazards.	Within 1 week
45-70	Above actions.	Within 48 hours
70 or higher	All of the above actions plus hospitalize child for chelation therapy immediately.	Within 24 hours

Source: Centers for Disease Control and Prevention. Time Frames for Intervention and Other Care Coordination Activities According to a Child's Blood Lead Level.

APPENDIX F

Roles and Responsibilities for Providing Care Coordination Services

Public Health Department/ Cool Kids Provider Role	Primary Care Provider Role	Lead Care Coordination/MSCLPPP Role
Confirmed Blood Lead Levels 10 – 14 µg/dL		
<ol style="list-style-type: none"> 1. Inform family of EBLL. 2. Provide anticipatory guidance. 3. Provide hazard and risk reduction education to family. 4. Include history of EBLL as a part of permanent medical problem list in the child’s medical record. 5. Obtain developmental screening such as Denver II. 6. Evaluate iron status with Hct/Hgb testing and provide appropriate treatment as indicated. 7. Repeat BLL testing every three months, until two venous results < 10 µg/dL. 	<ol style="list-style-type: none"> 1. Include history of EBLL as part of permanent medical problem list in the child’s medical record. 2. If child is not receiving medical services through public health department, proceed as in steps 1-7. 3. Refer to nutritionist for nutritional counseling. 	<ol style="list-style-type: none"> 1. Inform primary care provider of EBLL results. 2. Encourage family compliance with BLL testing schedule.

Source: Centers for Disease Control and Prevention. Roles and Responsibilities for Providing Care Coordination Services.

Public Health Department/ Cool Kids Provider Role	Primary Care Provider Role	Lead Care Coordination/MSCLPPP Role
Confirmed Blood Lead Levels 15 – 19 µg/dL		
<ol style="list-style-type: none"> 1. Inform family of EBLL. 2. Provide anticipatory guidance. 3. Provide hazard and risk reduction education to family. 4. Include history of EBLL as a part of permanent medical problem list in the child’s medical record. 5. Obtain developmental screening such as Denver II. 6. Evaluate iron status with Hct/Hgb testing and appropriate treatment as indicated. 7. Repeat BLL testing every three months until two venous results, <10 µg/dL, or three < 15 µg/dL, then annually. If BLL remains 15 – 19 µg/dL after six months, repeat annually, and case should be treated as BLL 20-44 µg/dL. 	<ol style="list-style-type: none"> 1. Include history of EBLL as a part of permanent medical problem list in the child’s medical record. 2. If child is not receiving medical services through public health department, proceed as in steps 1-7. 3. Refer to nutritionist for nutritional counseling. 	<ol style="list-style-type: none"> 1. Consult with MSDH clinician and inform child’s primary care provider. 2. Inform primary care provider of EBLL results. 3. Within two weeks of receipt of EBLL results, a home visit by a qualified individual is conducted using the appropriate form. A copy of the assessment form will be forwarded to the MSCLPPP environmentalist and the child’s medical provider. 4. Encourage family compliance with BLL testing schedule. 5. For children with persistent BLLs 15-19 µg/dL or anything ≥ 20µg/dL, referrals will be made for environmental investigation. 6. If BLL persists at 15 – 19 µg/dL, Lead Care Coordinator initiates services specified for children with BLL 20 – 44 µg/dL.

Source: Centers for Disease Control and Prevention. Roles and Responsibilities for Providing Care Coordination Services.

Public Health Department/ Cool Kids Provider Role	Primary Care Provider Role	Lead Care Coordination/MSCLPPP Role
Confirmed Blood Lead Levels 20 – 44 µg/dL		
<ol style="list-style-type: none"> 1. Inform family of EBLL. 2. Provide anticipatory guidance. 3. Provide hazard and risk reduction education to family. 4. Include history of EBLL as a part of permanent problem list in child’s medical record. 5. Obtain developmental screening such as Denver II. 6. Evaluate iron status with Hct/Hgb testing and appropriate treatment as indicated. 7. Screen other children in household < six years old. 8. Repeat BLL within one to two month intervals for six months until these three conditions are met: a) BLL has remained < 15 µg/dL, for at least six month; b) lead hazards have been removed or child lives in a lead-safe environment, and c) no new exposure; then annually. 9. If BLL remains between 20 – 44 µg/dL, after six months, refer to the MSCLPPP for additional environmental follow-up. 	<ol style="list-style-type: none"> 1. Include history of EBLL as a part of permanent problem list in the child’s medical record. 2. If child is not receiving medical services through public health department, proceed as in steps 1-9. 3. Refer to nutritionist for nutritional counseling. 	<ol style="list-style-type: none"> 1. Consult MSDH clinician and inform child’s primary care provider. 2. Within two weeks of receipt of EBLL results, a home visit by a qualified individual is conducted using the appropriate form. A copy of the assessment form will be forwarded to the MSCLPPP environmentalist and the child’s medical provider. 3. Within one week, a referral will be made to the State Environmentalist for an environmental home investigation. The State Environmentalist will communicate the results of the investigation to the family. 4. MSCLPPP will develop a written Plan of Care for the family to include hazard education; encouragement of compliance with BLL testing schedule; and referrals for social, developmental, nutritional, housing remediation, and other services as appropriate. 5. Monitor progress toward achievement of Plan of Care goals at least quarterly. 6. Conduct a home visit before case closure. Review case and close case when criteria for discharge have been met. Notify primary care provider and family of discharge.

Source: Centers for Disease Control and Prevention. Roles and Responsibilities for Providing Care Coordination Services.

Public Health Department/ Cool Kids Provider Role	Primary Care Provider Role	Lead Care Coordination/MSCLPPP Role
Confirmed Blood Lead Levels 45 – 69 µg/dL		
<ol style="list-style-type: none"> 1. Inform family of EBLL. 2. Provide anticipatory guidance. 3. Provide hazard and risk reduction education to family. 4. Include history of EBLL as a part of permanent problem list in the child’s medical record. 5. Obtain developmental screening such as Denver II. 6. Evaluate iron status with Hct/Hgb testing and appropriate treatment as indicated. 7. Screen other children in household < six years old. 8. Repeat BLL within one to two month intervals for six months until these three conditions are met: a) BLL has remained < 15 µg/dL, for at least six months; b) lead hazards have been removed or child lives in a lead-safe environment; and c) no new exposure; then annually. 9. If BLL remains between 20-44 µg/dL, after six months, refer to the MSCLPPP for additional environmental follow-up. 10. Encourage compliance with BLL testing schedule. 	<ol style="list-style-type: none"> 1. Complete medical and history exam. 2. Evaluate iron status with Hct/Hgb testing and appropriate treatment as indicated. 3. Consider referral to a toxicologist or other physician in a tertiary care center (for children) who has experience with chelating agents. 4. Repeat BLL within one to two month intervals for six months until the following criteria are met: a) BLL has remained < 15 µg/dL for at least six months, and b) lead hazards have been addressed; annually after (a) and (b) have been met. 5. If BLL remains between 20-44 µg/dL after six months, refer to MSCLPPP for additional follow-up. 	<ol style="list-style-type: none"> 1. Consult MSDH clinician and inform child’s primary care provider of EBLL. 2. Immediately refer to primary care provider for complete medical history, physical exam, and developmental screening. 3. Within 48 hours of receipt of EBLL results, a home visit by a qualified individual is conducted using the appropriate form. A copy of the assessment form will be forwarded to the MSCLPPP environmentalist and the child’s primary care provider. 4. Refer to Early Intervention Program for developmental evaluations. 5. Results of all home assessments and evaluations will be forwarded to the primary care provider. 6. Within 48 hours, environmental investigation will be completed and the State Environmentalist will be responsible for communicating the results to the family and providing a copy of the report to the child’s primary care provider. 7. MSCLPPP will develop a written plan of care for the family including hazard education; encouragement of compliance with BLL testing schedule; and referrals for social, developmental, nutritional, housing remediation, and other services as appropriate. 8. Monitor progress toward achievement of Plan of Care quarterly. 9. Conduct a home visit before case closure. Review case and close case when criteria for discharge have been met.

Source: Centers for Disease Control and Prevention. Roles and Responsibilities for Providing Care Coordination Services.

Public Health Department/ Cool Kids Provider Role	Primary Care Provider Role	Lead Care Coordination/MSCLPPP Role
		Notify primary care provider and family of discharge.
Confirmed Blood Lead Levels $\geq 70 \mu\text{g/dL}$		
<ol style="list-style-type: none"> 1. Inform family of EBLL. 2. Provide anticipatory guidance. 3. Provide hazard and risk reduction education to family. 4. Include history of EBLL as a part of permanent problem list in the child's medical record. 5. Obtain developmental screening such as Denver II. 6. Evaluation of iron status and Hct/Hgb testing will be performed as part of medical management since lead level of $\geq 70 \mu\text{g/dL}$ is a medical emergency. Treatment as indicated. 7. Screen other children in household < six years old. 8. Encourage compliance with BLL testing schedule. 	<ol style="list-style-type: none"> 1. Refer to a toxicologist or other physician in a tertiary care center (for children) who has experience with chelating agents. 2. If chelation is involved, notify MSCLPPP immediately. 3. Repeat BLL within one to two month intervals for six months until the following criteria are met: <ol style="list-style-type: none"> a) BLL has remained < 15 $\mu\text{g/dL}$ for at least six months, and b) lead hazards have been addressed; annually after (a) and (b) have been met 4. If BLL remains between 20-44 $\mu\text{g/dL}$ after six months, refer to MSCLPPP for additional environmental follow-up. 5. Evaluate iron status with Hct/Hgb testing and appropriate treatment as indicated. 	<ol style="list-style-type: none"> 1. Medical Emergency – consult with MSDH clinician. 2. Notify child's primary care provider immediately. 3. Within 24 hours of receipt of EBLL results, a home visit by a qualified individual is conducted using the appropriate form. A copy of the assessment form will be forwarded to the MSCLPPP environmentalist and the child's primary care provider. 4. Refer to Early Intervention Program for developmental evaluations. 5. Results of all home assessments and evaluations will be forwarded to the primary care provider. 6. Within 48 hours, environmental investigation will be completed and the State Environmentalist will be responsible for communicating the results to the family and providing a copy of the report to the child's primary care provider. 7. MSCLPPP will develop a written plan of care for the family including hazard education; encouragement of compliance with BLL testing schedule; and referrals for social, developmental, nutritional, housing remediation, and other services as appropriate. 8. Monitor progress toward achievement of Plan of Care quarterly. 9. Conduct a home visit before case closure. Review and close case when criteria for discharge have been met. Notify primary care provider and family of discharge.

Source: Centers for Disease Control and Prevention. Roles and Responsibilities for Providing Care Coordination Services.

APPENDIX G

Case Closure

The ultimate objective of the care coordination process is to assure the medical treatment of the lead poisoned child and that the environmental exposure routes (sources) are addressed. There are potentially two different types of case closure:⁸

- **Medical closure:** The child's primary care provider and the MSCLPPP care coordination address medical closure defined as one venous BLL < 10µg/dL.
- **Administrative closure:** Indicates the child will no longer be followed. The case manager must determine if an administrative closure is appropriate.

Reasons for administrative closure include:

- The blood lead level has decreased appropriately.
- The child is not currently in a lead safe environment; however, steps are being taken to address lead exposure routes.
- Factors unrelated to the medical or environmental circumstances:
 - The child is lost to follow up after three varied attempts to locate*.
 - The child has missed three consecutive clinic appointments.
 - The child has moved out of the health jurisdiction.
 - The parent has refused services and was given information about EBLLs and lead hazard control.
 - Repeat visits are too dangerous due to weapons, drug dealings, etc. (Appropriate referrals should be made.)

*Three varied attempts to locate the child can include any of the following:

- Letter
- Certified letter
- Home visit
- Contact with other programs/agencies (Women, Infants and Children's Nutrition Program, Medicaid, healthcare provider)
- Contact with post office/providers for a forwarding address
- Consult with contact person given during admission

APPENDIX H

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