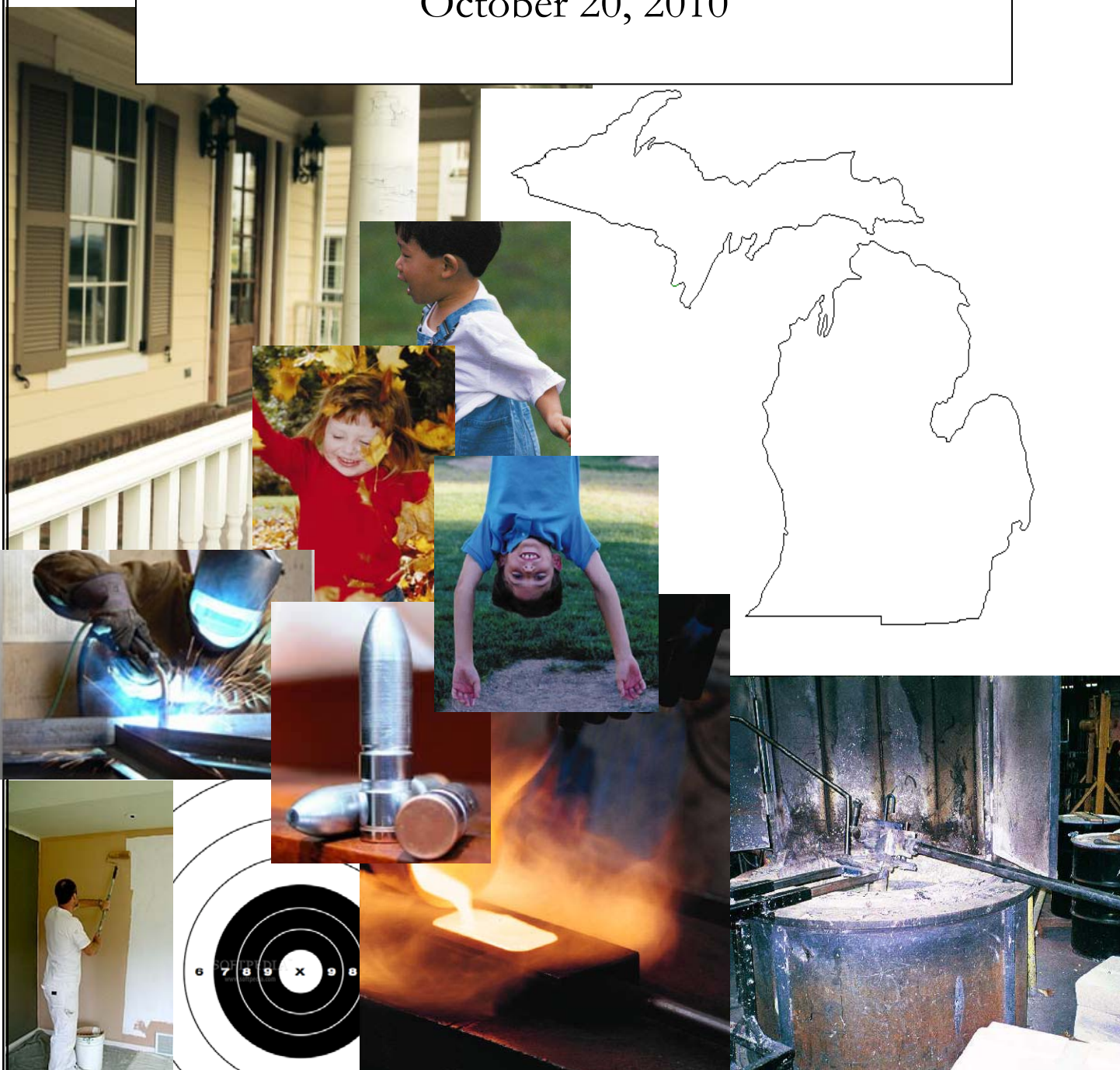


2009

Annual Report on Blood Lead Levels Among Adults and Children in Michigan

October 20, 2010



2009 ANNUAL REPORT ON BLOOD LEAD LEVELS AMONG ADULTS AND CHILDREN IN MICHIGAN

A Joint Report of

Michigan State University
Department of Medicine
117 W Fee Hall
East Lansing, Michigan 48824-1316
(517) 353-1846

Kenneth D. Rosenman, MD, Professor of Medicine
Amy L. Krizek, ABLES Project Coordinator

and

Michigan Department of Energy Labor and Economic Growth
Michigan Occupational Safety and Health Administration
P.O. Box 30643
Lansing, Michigan 48909-8143
(517) 322-1817

Douglas J. Kalinowski, Director
Michigan Occupational Safety and Health Administration

and

Michigan Department of Community Health
Division of Family and Community Health
Childhood Lead Poisoning Prevention Program
109 West Michigan Avenue
P.O. Box 30195
Lansing, Michigan 48909
(517) 335-8885

Brenda Fink, A.C.S.W., Program Director
Nancy Peeler, Ed.M., Program Supervisor
Jane Nickert, R.N., M.S.N., M.S.B.A., Program Coordinator
Debra Behringer, R.N., M.S.N., Nurse Consultant
Robert L. Scott, Ph.D., Program Data Manager

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2009 ANNUAL REPORT ON BLOOD LEAD LEVELS ON ADULTS AND CHILDREN IN MICHIGAN

Part I: Childhood Lead Poisoning Prevention

2009 brought challenges and opportunities to the Michigan Department of Community Health Childhood Lead Poisoning Prevention Program (CLPPP). The economic constraints faced by the state were mirrored in the lead program as well. Approximately \$1 million was cut from the Lead Prevention Program resulting in human resources and service reductions that have impacted both the state and local levels.

Opportunities included progress toward the 2010 goal of elimination of lead poisoning in Michigan and continued implementation of the seven priority recommendations from the Task Force to Eliminate Childhood Lead Poisoning. In the years since the 2003 development of the Lead Task Force, most of the priority recommendations have been fully or partly implemented, but others have gone unfulfilled through lack of funding, staff or political will. Organized by the seven priority recommendations, progress to date is outlined below:

Create capacity to assist target communities in building coalitions and obtaining funding to address lead poisoning.

In 2009, childhood lead coalitions continue to operate in several of Michigan's highest risk communities: Battle Creek, Benton Harbor, Detroit, Flint, Grand Rapids, Hamtramck, Highland Park, Kalamazoo, Lansing, Muskegon and Saginaw. Some have been limited in their activities as a result of insufficient funding. Coalition activities around the state include sponsoring testing events for children and toys, distribution of lead information in neighborhood door-to-door events, networking with local partners, and initiating community lead forums for parents and professionals. Coalitions in Flint and Kalamazoo have expanded collaborative efforts with local asthma and environmental groups. The Grand Rapids group has blossomed into a large coalition addressing a multitude of environmental health issues.

Assure case management for all children with EBLL at or above 20µg/dL.

CLPPP's nursing staff worked to revise the case management protocol and forms, with all 45 local public health departments receiving CD's of updated forms. CLPPP provided case management training for Detroit Health and Wellness Promotion (DHWP) nurses in 2009. Updates were also made to the statewide testing/screening plan in November 2009.

Establish a commission to evaluate and coordinate lead resources and activities statewide.

The Childhood Lead Poisoning Prevention and Control Commission convened in June 2005, pursuant to Public Act 431 of 2004. The Commission's focus has been to build on Michigan's previous efforts to prevent and control lead poisoning, rigorously evaluate continuing gaps and inefficiencies, and recommend strategies accordingly.

Its mission is to:

- Maximize the effectiveness of Michigan's public infrastructure,

- Mobilize and enable the private sector infrastructure
- Integrate the capacity and effects of public and private sector strategies to prevent and control childhood lead poisoning through public awareness, testing and treatment of lead poisoned children, and prevention and remediation of lead hazards. More information on the commission and meeting minutes can be found at: www.michigan.gov/leadsafe

The commission was re-convened in 2008 with restored funding and continued to function in 2009. The Childhood Lead Poisoning Prevention and Control Commission met in April and July 2009. Commission subcommittees include: Lead Hazard Remediation, Lead Testing, Landlord Liability, and New and Sustainable Funding. The combined sustainable funding and lead hazard abatement loans and credits subcommittee continues to meet on a regular basis with the focus being a fee on sales of residential paint. A draft position paper has been developed and disseminated to various stakeholders. The next step is to identify a state legislator to sponsor a bill.

Establish a public health trust, to provide a stable source of funding for lead prevention efforts.

The idea has not garnered the support of the legislature or momentum within state government as a whole and would be difficult to realize. The Lead Commission New and Sustainable Funding subcommittee working on this initiative agreed that pursuit of the trust fund was no longer a viable option for the commission.

Develop a lead-status housing registry.

The registry is functional and accessible to the public via the Web, at www.michigan.gov/ismyhomeleadsafe. It identifies lead hazards and abatement activities on rental properties statewide, and is one of only a handful of Web-based interactive housing registries in the nation. The registry is currently restricted to rental units.

Develop and implement a public awareness campaign

Due to funding constraints in 2009, a formal campaign was not developed. However, materials developed in 2008, with a message directed at do-it-yourself remodelers, continued to be distributed. CLPPP and Healthy Homes Section (HHS) were able to partner with the Ad Council for a national campaign on lead paint hazards for 2010 that will be offered at no cost. In addition, another no-cost campaign in 2010 regarding the Environmental Protection Agency (EPA) Remodeling, Renovating and Painting Rule will be provided nationally. This campaign will be directed to renovators, remodelers and rental property owners on working lead safe in structures with lead-based paint in homes, child care facilities, and schools built before 1978.

HHS: Expand the remediation and control of lead hazards in homes.

On December 15, 2009, the Michigan Department of Community Health, Healthy Homes Section was awarded Lead Hazard Control grant funding through the U.S. Department of Housing and Urban Development (HUD) in the amount of \$3,070,000 to be used over the course of 36-months to continue to support the Lead Safe Home Program. This funding

shall be utilized to identify lead-based paint hazards in homes and remediate these hazards using a combination of interim controls and abatement techniques in over 235 homes statewide; as of September 2010, 119 homes have been completed. The Lead Safe Home Program services low- and moderate- income families across the state, specifically within seven designated target areas including the counties of Calhoun, Ingham, Kalamazoo, Muskegon, Oakland, Saginaw and the city of Detroit, as well as non-target areas where a child with an Elevated Blood Lead (EBL) level resides. With this funding, the Program will also incorporate Healthy Homes practices and interventions including, but not limited to moisture control and roof repairs.

Part II: Efforts Toward Elimination in 2009

Reaching out to parents and communities

The fall of 2009 brought a unique opportunity to work with local health department (LHD) partners as they managed the H1N1 flu season. Many LHD's used H1N1 vaccination clinics as a venue to educate families and pregnant women about lead poisoning and to encourage testing. These clinics were held in high-risk communities, providing access to hundreds of families.

CLPPP continued to visit migrant camps throughout the state in 2009, providing information on lead testing and identifying potential hazards in four camp sites. We will continue to work with community partners to address the special needs of this population.

CLPPP partnered with Children's Television Workshop to provide 400 Sesame Street CD's across the state in a variety of settings including clinics, community centers, Head Start, provider offices, and Women, Infant and Children's clinics (WIC) to increase knowledge of childhood lead poisoning.

As CLPPP completes the final year of the CDC Lead Prevention grant, 2009-2010 begins the transition to a healthy homes focus. In 2009, CDC introduced the Healthy Homes Initiative, a coordinated, comprehensive, and holistic approach to preventing diseases and injuries that result from housing-related hazards and deficiencies. The focus of the initiative is to identify health, safety, and quality-of-life issues in the home environment and to act systematically to eliminate or mitigate problems. The initiative seeks to broaden the scope of single-issue public health programs, such as childhood lead poisoning prevention, to address multiple housing deficiencies that affect health and safety.

CLPPP continues the partnership with CLEARCorps/Detroit to serve families in the LESS (Lead Education and Safety Source) LEAD program. This housing-based primary prevention program is funded in part by CLPPP. Services are provided to pregnant women and families with children whose blood lead levels are between 5 and 9µg/dL. The program conducts a home visit with each family to provide a risk assessment and lead poisoning prevention education. In a limited number of homes they also provide "supercleans", other interim controls, and third party clearance, to assure lead hazards have been minimized. These services are provided to residents residing in the City of Detroit as well as Wayne, and Oakland counties. In 2009, CLEARCorps/Detroit sent over 10,000 letters to families in these areas, introducing the program and offering services. In addition, 553 lead hazard reduction applications have been mailed. In 2009, CLEARCorps has provided in-home primary prevention services to 46 families. CLPPP anticipates expanding CLEARCorps home-based primary prevention efforts to Saginaw in 2010.

On the west side of the state, Healthy Homes of West Michigan provided a similar primary prevention service (as Detroit Clear Corps) to 90 families in Grand Rapids, and added two new staff persons to coordinate with the City of Grand Rapids Housing and

Urban Development (HUD) grant program. CLPPP anticipates providing funding to Healthy Homes of West Michigan (HHWM) in 2010 to provide additional home-based primary prevention services in the high-risk target communities of Benton Harbor and Muskegon. Healthy Homes continue to partner with Grand Valley State University (GVSU) to provide home visits for cleaning demonstrations and lead education for families in the highest risk neighborhoods of metro Grand Rapids. GVSU and Calvin College students continue with the “Shake-Up Paint” program to encourage retailers to educate do-it-yourselfers on lead safe work practices.

The concept of making cities safe took on additional meaning in the communities of Detroit and Benton Harbor where housing ordinances were addressed. The City of Detroit passed the new Lead Property Enforcement Ordinance in late 2009. This ordinance requires that a lead inspection be performed and identified hazards be addressed before a Certificate of Occupancy for a rental property is issued. Hopefully, this ordinance will reduce the number of rental properties that poison multiple children, as hazards will be remediated before rental. Benton Harbor passed a similar ordinance on July 6, 2009 that requires a lead inspection and remediation of hazards prior to occupancy of rental properties.

Continuing on the same path to safe housing and cities, technical assistance and training opportunities are always available to community partners. In December 2009, HHS provided training to EBL investigators on Michigan’s revised EBL investigation protocol. The training was attended by over 30 participants from local public health and private businesses.

In October 2009, the CLPPP Secretary developed and disseminated the first edition of the *CLPPP News*. This electronic newsletter is designed to keep stakeholders and the general public up-to-date on lead-related happenings. The newsletter received positive feedback from recipients. CLPPP also provides bi-monthly updates via the Lead Alerts. This email listserv provides a plethora of lead and healthy homes information to stakeholders throughout the state.

Reaching out to providers

A total of 71 portable blood lead care analyzer providers are now located throughout the state. Filter paper testing trainings were conducted for five provider offices.

Transition to Healthy Homes

As CDC transitions to the healthy homes concept, CLPPP staff has also reviewed the healthy homes strategic plans from Environmental Protection Agency (EPA) and the Housing and Urban Development (HUD). CLPPP began preparations in 2009 for the 2010 transition to the CDC mandated data system, Healthy Homes Lead Program Surveillance System (HHLPSS). A brief survey regarding current status of the existing local data systems, STELLAR (software, database size and location, training needs, etc.), has been distributed to local public health users. In addition, the Program Coordinator and the Nurse Consultant, along with a number of staff members from HHS have been trained and credentialed as Healthy Homes Specialists through National Center for

Part III: Cases of Interest in 2009

Interesting cases/sources of childhood lead poisoning in 2009 include the following:

- A two year old child in Wayne County with a BLL over 150µg/dL, the highest level in CLPPP program history. This child continues to receive on going follow-up.
- A one year old child in Ingham County was poisoned due to ingestion of Sindoor powder, an orange-red substance used in traditional Indian ceremonies and symbolic practices.
- The trend, beginning in 2008, toward younger children (one and two years of age) requiring hospitalization and chelation therapy, continued in 2009. Of the thirty children hospitalized, fifteen were one and two year olds.

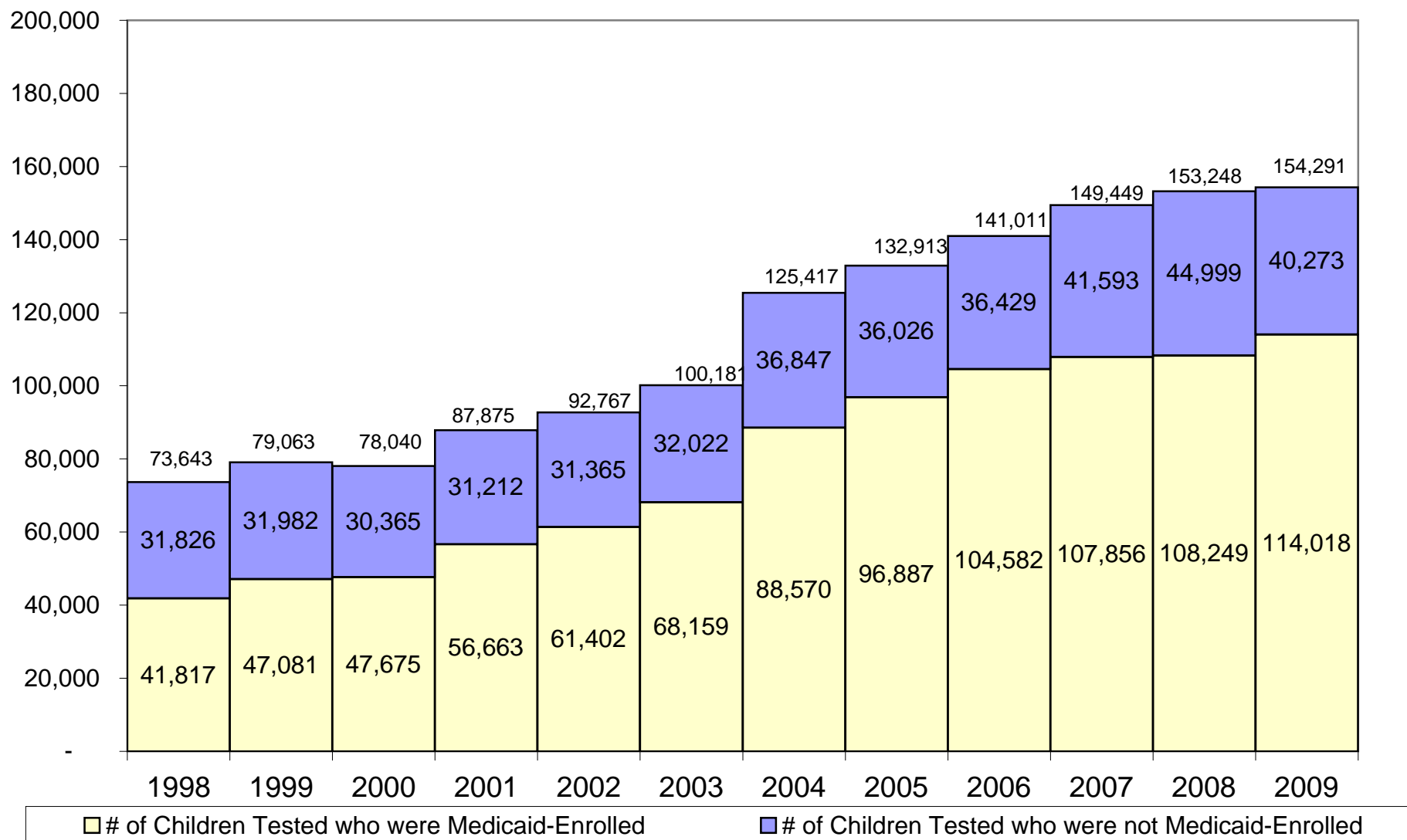
Michigan Department of Community Health
Childhood Lead Poisoning Prevention Program

2009 Data Report

on Blood Lead Testing and Elevated Levels

Blood Lead Testing in Michigan, 1998 - 2009

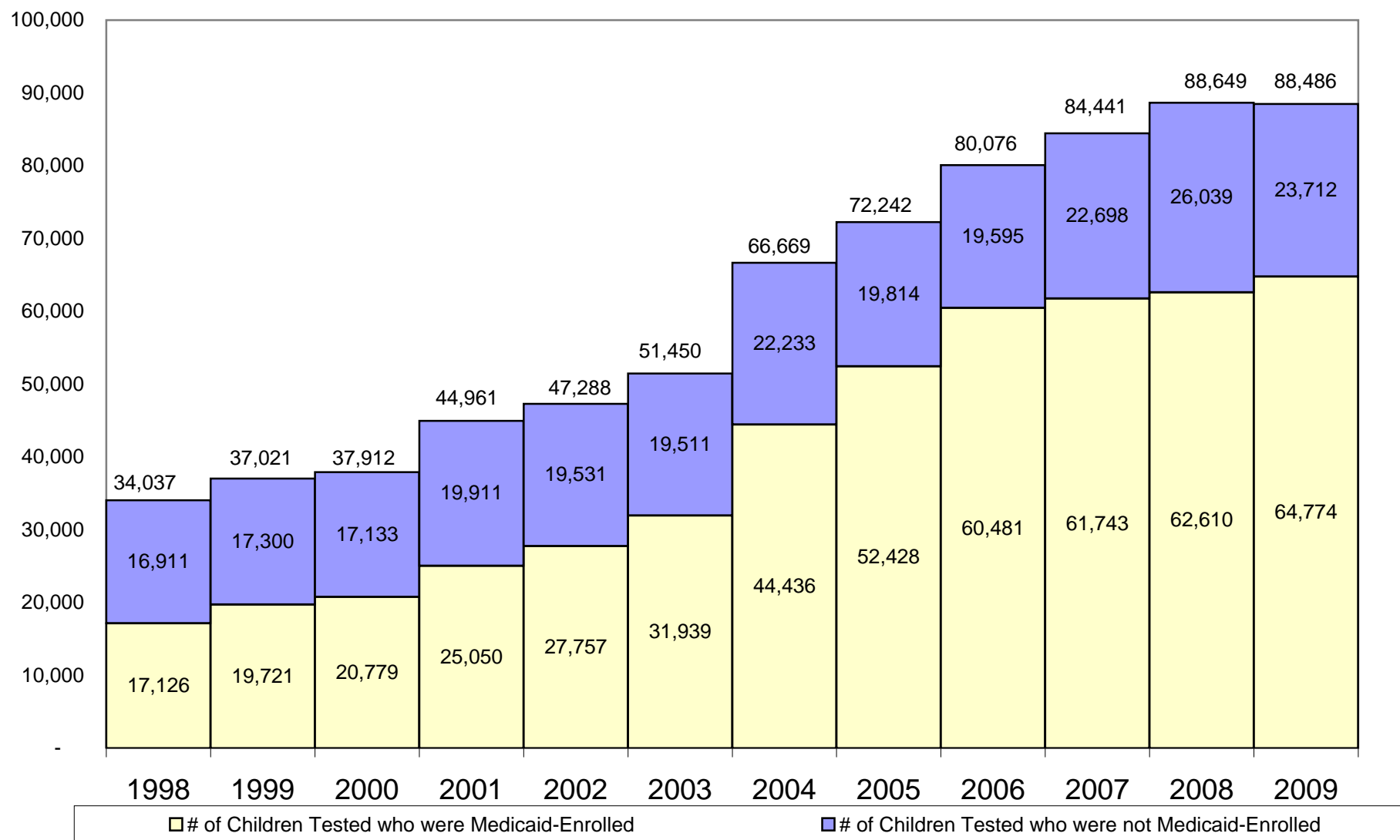
Children less than Six Years of Age



March 24, 2010 Source: MDCH Data Warehouse

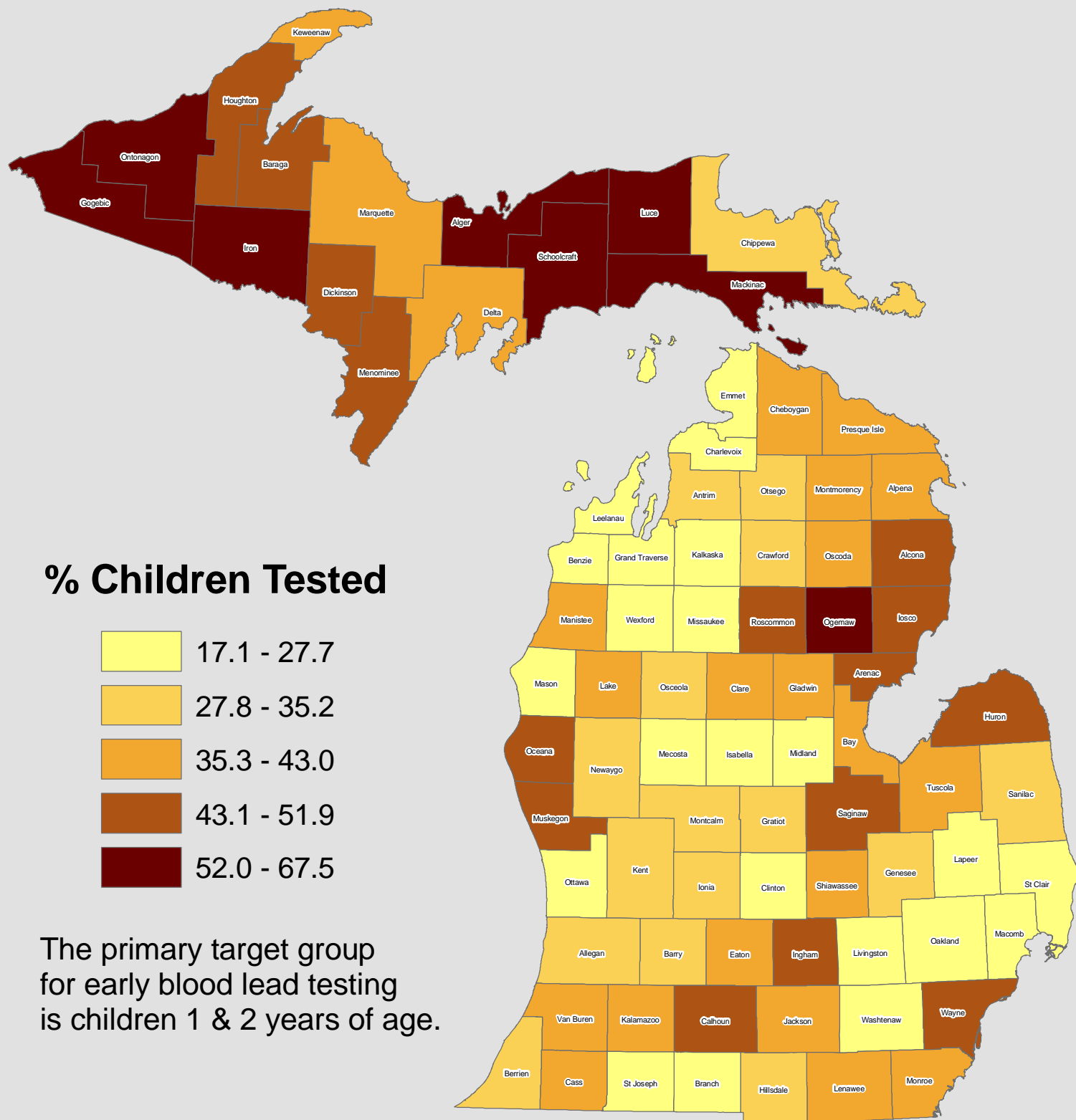
Blood Lead Testing in Michigan, 1998 - 2009

Children One and Two Years of Age



February 5, 2010 Source: MDCH Data Warehouse

Pct. of Children 1 & 2 years of age Tested for Lead Poisoning 2009



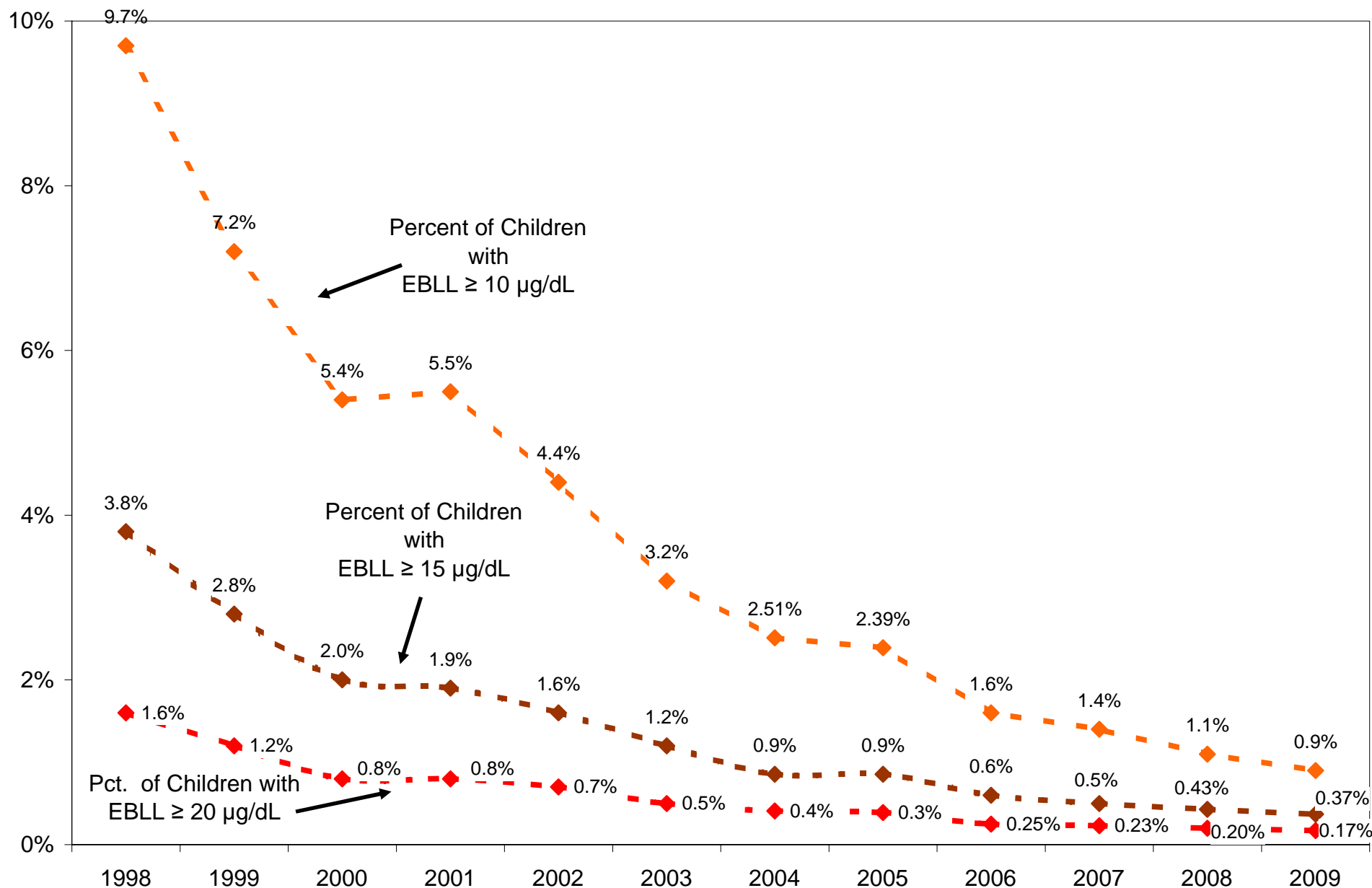
February 5, 2010

Sources: MDCH Data Warehouse &

U.S. Census Bureau, 2008 Population Estimates

Elevated Blood Lead Levels (EBLL) in Michigan 1998 - 2009

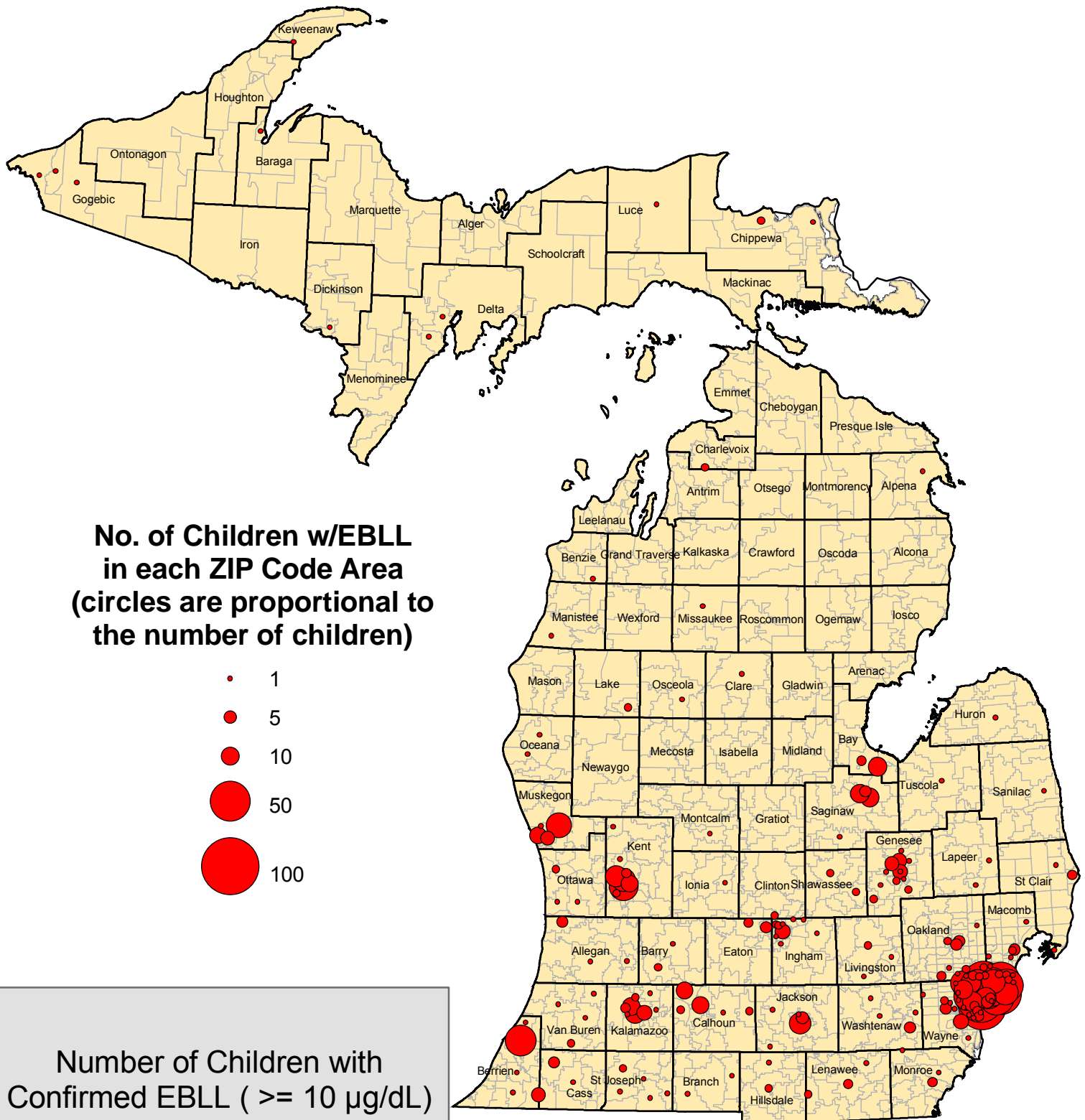
Children less than Six Years of Age



February 5, 2010

Source: MDCH Data Warehouse

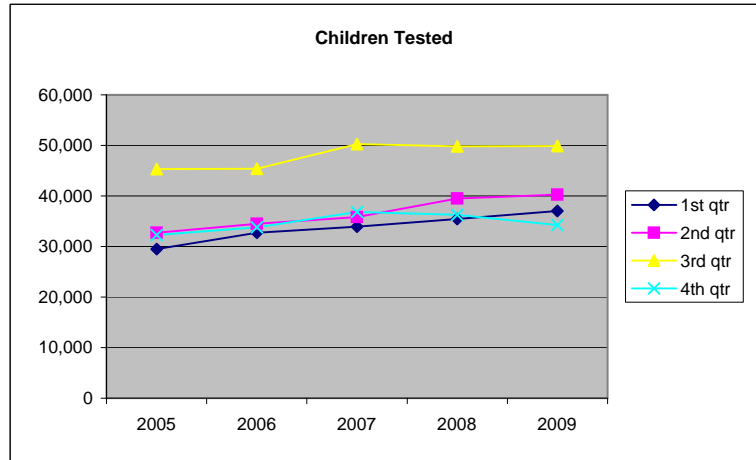
Children less than Six years of age with Confirmed Elevated Blood Lead Levels (EBLL) 2009



Trends in Testing and EBLL, Michigan statewide, by Quarter and Year 2005-2009

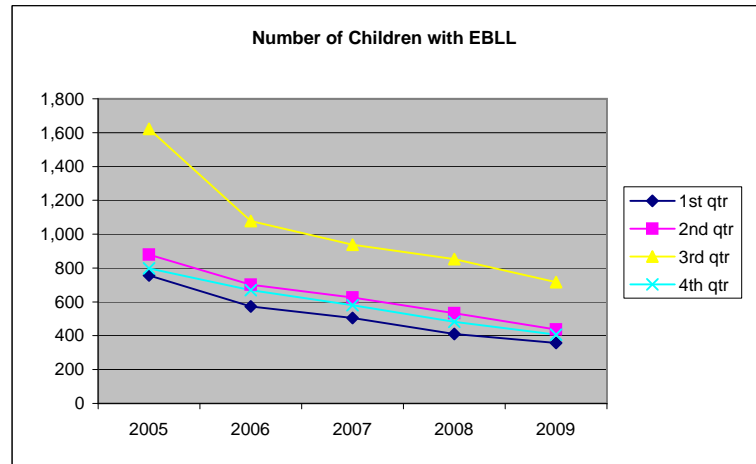
Children < 6, tested for lead poisoning

	1st qtr	2nd qtr	3rd qtr	4th qtr	year
2005	29,501	32,703	45,346	32,253	132,913
2006	32,733	34,489	45,387	33,817	141,011
2007	33,951	35,821	50,260	36,858	149,445
2008	35,469	39,502	49,792	36,270	153,248
2009	37,007	40,228	49,863	34,236	154,291



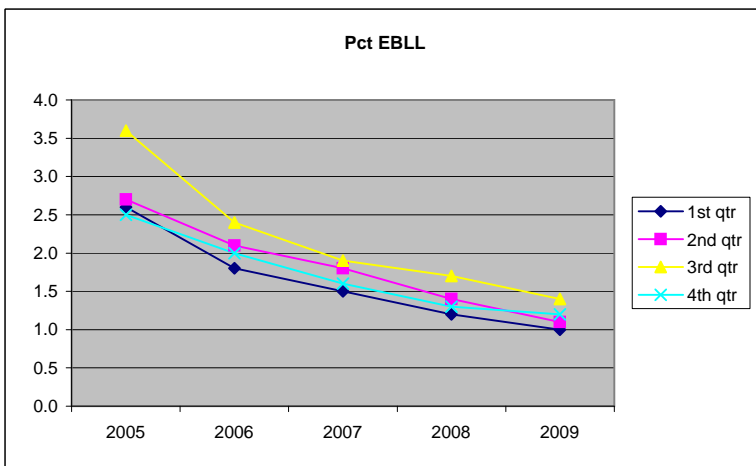
Children < 6, with confirmed EBLL

	1st qtr	2nd qtr	3rd qtr	4th qtr	year
2005	757	879	1,622	797	3,137
2006	572	702	1,077	670	2,309
2007	505	626	938	581	2,031
2008	411	534	853	482	1,686
2009	358	436	717	407	1,403



Percentage of children tested, with confirmed EBLL

	1st qtr	2nd qtr	3rd qtr	4th qtr	year
2005	2.6	2.7	3.6	2.5	2.4
2006	1.8	2.1	2.4	2.0	1.6
2007	1.5	1.8	1.9	1.6	1.4
2008	1.2	1.4	1.7	1.3	1.1
2009	1.0	1.1	1.4	1.2	0.9



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County	%Pre-1950 Housing	Children Under Age 6	Children < Age 6, Tested for Lead		% with BLL >= 5 ug/dL	% EBLL (>= 10 ug/dL venous only)	Children with Low-Level Exposure	Children with Confirmed Elevated Blood Lead Levels (EBLL)					Children with Elevated Capillary Tests, Not Confirmed by Venous				
			Number of Children Tested	% Tested			5 to 9 ug/dL (capillary, venous or unknown)	10-14 ug/dL (venous only)	15-19 ug/dL (venous only)	20-44 ug/dL (venous only)	>=45 ug/dL (venous only)	Total EBLL (>= 10 ug/dL)	Capillary 10-14, not confirmed by venous	Capillary 15-19, not confirmed by venous	Capillary 20-44, not confirmed by venous	Capillary >= 45, not confirmed by venous	Total Elevated Capillary, not confirmed by venous
Alcona	21.0	455	91	20.0	6.6	0.0	5	0	0	0	0	0	0	0	1	0	1
Alger	32.6	471	129	27.4	5.4	0.0	7	0	0	0	0	0	0	0	0	0	0
Allegan	27.4	9,075	1,381	15.2	7.6	0.1	100	2	0	0	0	2	3	0	0	0	3
Alpena	28.6	1,713	299	17.5	9.4	0.3	25	0	1	0	0	1	2	0	0	0	2
Antrim	22.6	1,480	224	15.1	4.0	0.0	9	0	0	0	0	0	0	0	0	0	0
Arenac	20.6	1,017	241	23.7	2.5	0.0	6	0	0	0	0	0	0	0	0	0	0
Baraga	34.9	546	151	27.7	2.6	0.7	3	1	0	0	0	1	0	0	0	0	0
Barry	29.4	4,276	659	15.4	9.0	0.5	51	3	0	0	0	3	4	1	0	0	5
Bay	37.1	7,495	1,369	18.3	9.6	1.0	118	11	3	0	0	14	0	0	0	0	0
Benzie	27.3	1,193	179	15.0	3.9	0.0	6	0	0	0	0	0	1	0	0	0	1
Berrien	32.7	12,449	2,252	18.1	13.1	1.7	244	22	8	9	0	39	12	0	0	1	13
Branch	36.5	3,546	487	13.7	14.6	0.4	63	2	0	0	0	2	4	2	0	0	6
Calhoun	36.4	10,748	2,598	24.2	8.8	1.0	194	16	5	5	0	26	8	0	0	0	8
Cass	30.4	3,278	595	18.2	11.9	0.7	64	2	0	2	0	4	2	0	1	0	3
Charlevoix	25.7	1,719	205	11.9	3.9	1.0	6	2	0	0	0	2	0	0	0	0	0
Cheboygan	21.7	1,604	256	16.0	4.3	0.0	11	0	0	0	0	0	0	0	0	0	0
Chippewa	28.4	2,328	437	18.8	2.5	0.7	7	2	1	0	0	3	0	1	0	0	1
Clare	13.1	1,998	370	18.5	5.4	0.3	19	1	0	0	0	1	0	0	0	0	0
Clinton	28.7	5,061	674	13.3	3.0	0.0	20	0	0	0	0	0	0	0	0	0	0
Crawford	19.6	808	114	14.1	3.5	0.0	4	0	0	0	0	0	0	0	0	0	0
Delta	37.7	2,420	447	18.5	7.6	0.4	30	2	0	0	0	2	2	0	0	0	2
Dickinson	41.6	1,660	324	19.5	2.5	0.3	7	1	0	0	0	1	0	0	0	0	0
Eaton	23.4	7,127	1,357	19.0	5.1	0.5	60	3	3	1	0	7	2	0	0	0	2
Emmet	27.7	2,231	212	9.5	3.3	0.0	6	0	0	0	0	0	0	0	1	0	1
Genesee	22.8	34,669	6,189	17.9	6.2	0.5	345	17	8	5	2	32	8	1	0	0	9
Gladwin	13.7	1,544	280	18.1	4.3	0.0	12	0	0	0	0	0	0	0	0	0	0
Gogebic	54.1	806	247	30.6	5.3	1.2	10	2	1	0	0	3	0	0	0	0	0
Grand Traverse	17.8	6,076	843	13.9	5.8	0.0	49	0	0	0	0	0	0	0	0	0	0
Gratiot	39.8	2,876	475	16.5	4.6	0.0	22	0	0	0	0	0	0	0	0	0	0
Hillsdale	39.0	3,360	744	22.1	13.8	0.5	94	1	1	2	0	4	4	1	0	0	5
Houghton	54.8	2,391	513	21.5	2.5	0.2	11	0	0	1	0	1	1	0	0	0	1
Huron	33.5	1,911	545	28.5	8.1	0.2	43	0	0	1	0	1	0	0	0	0	0
Ingham	25.9	20,871	5,310	25.4	9.3	0.4	473	9	4	6	0	19	2	0	1	0	3
Ionia	37.9	4,949	797	16.1	3.4	0.1	26	0	1	0	0	1	0	0	0	0	0
Iosco	19.8	1,419	310	21.8	6.8	0.0	19	0	0	0	0	0	2	0	0	0	2
Iron	44.5	572	164	28.7	3.0	0.0	4	0	0	0	0	0	1	0	0	0	1
Isabella	19.2	4,328	573	13.2	2.1	0.0	12	0	0	0	0	0	0	0	0	0	0
Jackson	35.7	12,204	2,404	19.7	13.3	1.0	283	8	6	9	0	23	13	0	1	0	14
Kalamazoo	24.6	18,863	4,121	21.8	11.3	0.9	409	17	6	14	0	37	17	2	2	0	21
Kalkaska	15.2	1,312	177	13.5	7.9	0.0	14	0	0	0	0	0	0	0	0	0	0
Kent	26.8	55,522	8,487	15.3	10.0	0.9	744	48	15	12	0	75	26	2	5	0	33
Keweenaw	54.9	145	25	17.2	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0
Lake	15.1	691	144	20.8	3.5	1.4	3	1	1	0	0	2	0	0	0	0	0
Lapeer	22.2	5,990	702	11.7	5.6	0.3	36	1	1	0	0	2	1	0	0	0	1

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			Number of Children Tested	% Tested			5 to 9 ug/dL (capillary, venous or unknown)	10-14 ug/dL (venous only)	15-19 ug/dL (venous only)	20-44 ug/dL (venous only)	>=45 ug/dL (venous only)	Total EBLL (>= 10 ug/dL)	Capillary 10-14, not confirmed by venous	Capillary 15-19, not confirmed by venous	Capillary 20-44, not confirmed by venous	Capillary >= 45, not confirmed by venous	Total Elevated Capillary, not confirmed by venous
Leelanau	22.0	1,156	172	14.9	2.3	0.0	3	0	0	0	0	0	1	0	0	0	1
Lenawee	38.6	7,293	1,546	21.2	10.5	0.3	150	2	1	2	0	5	7	0	1	0	8
Livingston	13.7	12,509	1,105	8.8	2.4	0.4	20	4	0	0	0	4	2	0	0	0	2
Luce	30.0	354	93	26.3	3.2	1.1	2	1	0	0	0	1	0	0	0	0	0
Mackinac	28.1	602	152	25.2	4.6	0.0	6	0	0	0	0	0	1	0	0	0	1
Macomb	10.9	60,618	9,044	14.9	2.6	0.2	213	8	3	4	0	15	5	1	1	0	7
Manistee	35.9	1,467	297	20.2	11.1	0.7	30	1	1	0	0	2	1	0	0	0	1
Marquette	32.6	3,801	703	18.5	3.4	0.0	24	0	0	0	0	0	0	0	0	0	0
Mason	31.1	1,931	436	22.6	13.1	0.0	53	0	0	0	0	0	3	1	0	0	4
Mecosta	22.0	2,675	382	14.3	4.7	0.0	17	0	0	0	0	0	0	0	1	0	1
Menominee	38.4	1,466	271	18.5	4.4	0.0	11	0	0	0	0	0	1	0	0	0	1
Midland	16.9	5,561	772	13.9	4.0	0.0	30	0	0	0	0	0	1	0	0	0	1
Missaukee	20.6	1,021	153	15.0	3.9	0.7	5	1	0	0	0	1	0	0	0	0	0
Monroe	28.3	10,702	1,783	16.7	4.7	0.3	78	4	1	0	0	5	1	0	0	0	1
Montcalm	28.1	4,907	853	17.4	4.0	0.1	31	1	0	0	0	1	1	0	1	0	2
Montmorency	18.4	520	93	17.9	6.5	0.0	6	0	0	0	0	0	0	0	0	0	0
Muskegon	29.8	13,998	3,904	27.9	9.7	0.9	336	30	3	3	0	36	2	2	1	0	5
Newaygo	22.7	3,783	572	15.1	4.5	0.0	25	0	0	0	0	0	1	0	0	0	1
Oakland	15.9	87,361	14,426	16.5	3.2	0.2	421	19	4	6	0	29	6	0	1	0	7
Oceana	26.8	2,328	674	29.0	4.7	0.3	28	1	0	1	0	2	1	1	0	0	2
Ogemaw	18.3	1,256	350	27.9	4.0	0.0	14	0	0	0	0	0	0	0	0	0	0
Ontonagon	43.4	274	71	25.9	8.5	0.0	5	0	0	0	0	0	0	0	1	0	1
Osceola	24.2	1,739	232	13.3	3.4	0.4	7	0	1	0	0	1	0	0	0	0	0
Oscoda	18.3	525	83	15.8	6.0	0.0	5	0	0	0	0	0	0	0	0	0	0
Otsego	12.6	1,634	280	17.1	3.6	0.0	9	0	0	0	0	0	0	1	0	0	1
Ottawa	18.0	21,703	2,545	11.7	4.8	0.3	113	4	1	3	0	8	1	1	0	0	2
Presque Isle	27.6	706	120	17.0	9.2	0.0	11	0	0	0	0	0	0	0	0	0	0
Roscommon	16.1	1,223	256	20.9	1.6	0.0	4	0	0	0	0	0	0	0	0	0	0
Saginaw	29.3	14,891	3,343	22.4	8.9	0.8	255	18	4	5	0	27	14	2	1	0	17
St Clair	29.6	12,078	1,530	12.7	7.6	0.3	103	2	3	0	0	5	5	2	2	0	9
St Joseph	34.8	5,545	965	17.4	8.8	0.6	77	3	2	1	0	6	0	1	1	0	2
Sanilac	34.7	3,101	630	20.3	10.3	0.2	61	1	0	0	0	1	2	1	0	0	3
Schoolcraft	33.1	440	135	30.7	9.6	0.0	13	0	0	0	0	0	0	0	0	0	0
Shiawassee	35.9	5,075	924	18.2	4.3	0.4	36	3	1	0	0	4	0	0	0	0	0
Tuscola	32.8	3,811	814	21.4	6.5	0.1	51	1	0	0	0	1	0	1	0	0	1
Van Buren	29.4	6,328	1,255	19.8	6.4	0.5	69	4	1	1	0	6	5	0	0	0	5
Washtenaw	19.3	24,977	2,642	10.6	4.3	0.3	103	4	2	1	0	7	3	0	1	0	4
Wayne ex Det	24.0	88,748	20,229	22.8	5.3	0.5	950	59	19	18	0	96	25	4	5	0	34
Wexford	26.2	2,458	386	15.7	3.4	0.0	13	0	0	0	0	0	0	0	0	0	0
Detroit, City of	56.0	67,991	31,969	47.0	16.5	2.6	4,279	493	186	143	10	832	120	21	14	0	155
MICHIGAN	27.0	753,753	154,291	20.5	8.5	0.9	11,341	838	298	255	12	1,403	324	49	43	1	417

Sources: Census 2000, U.S. Census Bureau (Pre-1950 housing); 2008 Population Estimates, U.S. Census Bureau (county populations);

MDCH Data Warehouse (children tested and elevated levels).

Note: %EBLL is calculated as follows: Number of Children w/EBLL divided by (Number of Children Tested minus Children w/elevated capillary tests, not confirmed by venous)

February 5, 2010

Childhood Lead Poisoning Data Facts

All Counties in Michigan -- Calendar Year 2009 -- Children One and Two Years of Age

			Children Age 1 & 2, Tested for Lead				Children with Low-Level Exposure	Children with Confirmed Elevated Blood Lead Levels (EBLL)					Children with Elevated Capillary Tests, Not Confirmed by Venous				
	%Pre-1950 Housing	Children Age 1 & 2	Number of Children Tested	% Tested	% with BLL >= 5 ug/dL	% EBLL (>= 10 ug/dL, venous only)	5 to 9 ug/dL (capillary, venous or unknown)	10-14 ug/dL (venous only)	15-19 ug/dL (venous only)	20-44 ug/dL (venous only)	>45 ug/dL (venous only)	Total EBLL (≥ 10 ug/dL)	Capillary 10-14, not confirmed by venous	Capillary 15-19, not confirmed by venous	Capillary 20-44, not confirmed by venous	Capillary >= 45, not confirmed by venous	Total Elevated Capillary, not confirmed by venous
County																	
Alcona	21.0	144	73	50.7	8.2	0.0	5	0	0	0	0	0	0	0	1	0	1
Alger	32.6	156	95	60.9	4.2	0.0	4	0	0	0	0	0	0	0	0	0	0
Allegan	27.4	3,025	862	28.5	7.4	0.1	61	1	0	0	0	1	2	0	0	0	2
Alpena	28.6	560	241	43.0	9.1	0.4	20	0	1	0	0	1	1	0	0	0	1
Antrim	22.6	488	157	32.2	4.5	0.0	7	0	0	0	0	0	0	0	0	0	0
Arenac	20.6	340	165	48.5	1.8	0.0	3	0	0	0	0	0	0	0	0	0	0
Baraga	34.9	182	89	48.9	2.2	1.1	1	1	0	0	0	1	0	0	0	0	0
Barry	29.4	1,417	425	30.0	8.2	0.5	29	2	0	0	0	2	3	1	0	0	4
Bay	37.1	2,495	981	39.3	10.4	1.0	92	8	2	0	0	10	0	0	0	0	0
Benzie	27.3	394	98	24.9	3.1	0.0	2	0	0	0	0	0	1	0	0	0	1
Berrien	32.7	4,162	1,465	35.2	13.4	1.9	161	16	4	7	0	27	9	0	0	0	9
Branch	36.5	1,194	289	24.2	14.5	0.4	37	1	0	0	0	1	2	2	0	0	4
Calhoun	36.4	3,597	1,783	49.6	8.7	1.0	131	9	4	4	0	17	7	0	0	0	7
Cass	30.4	1,078	420	39.0	13.8	1.0	51	2	0	2	0	4	2	0	1	0	3
Charlevoix	25.7	566	136	24.0	5.1	0.0	7	0	0	0	0	0	0	0	0	0	0
Cheboygan	21.7	523	201	38.4	4.0	0.0	8	0	0	0	0	0	0	0	0	0	0
Chippewa	28.4	780	254	32.6	2.0	1.2	1	2	1	0	0	3	0	1	0	0	1
Clare	13.1	660	256	38.8	6.6	0.4	16	1	0	0	0	1	0	0	0	0	0
Clinton	28.7	1,678	430	25.6	4.0	0.0	17	0	0	0	0	0	0	0	0	0	0
Crawford	19.6	265	79	29.8	3.8	0.0	3	0	0	0	0	0	0	0	0	0	0
Delta	37.7	802	326	40.6	8.6	0.6	24	2	0	0	0	2	2	0	0	0	2
Dickinson	41.6	552	254	46.0	2.8	0.4	6	1	0	0	0	1	0	0	0	0	0
Eaton	23.4	2,337	889	38.0	5.3	0.7	39	3	3	0	0	6	2	0	0	0	2
Emmet	27.7	732	140	19.1	4.3	0.0	5	0	0	0	0	0	0	0	1	0	1
Genesee	22.8	11,547	3,633	31.5	6.1	0.5	200	10	5	2	1	18	2	1	0	0	3
Gladwin	13.7	503	193	38.4	5.2	0.0	10	0	0	0	0	0	0	0	0	0	0
Gogebic	54.1	271	183	67.5	4.4	0.5	7	1	0	0	0	1	0	0	0	0	0
Grand Traverse	17.8	2,026	440	21.7	6.6	0.0	29	0	0	0	0	0	0	0	0	0	0
Gratiot	39.8	965	319	33.1	5.3	0.0	17	0	0	0	0	0	0	0	0	0	0
Hillsdale	39.0	1,110	385	34.7	17.7	0.5	61	0	0	2	0	2	5	0	0	0	5
Houghton	54.8	805	394	48.9	3.0	0.3	10	0	0	1	0	1	1	0	0	0	1
Huron	33.5	631	281	44.5	6.4	0.4	17	0	0	1	0	1	0	0	0	0	0
Ingham	25.9	7,032	3,055	43.4	9.4	0.4	274	6	2	5	0	13	0	0	1	0	1
Ionia	37.9	1,658	549	33.1	3.8	0.2	20	0	1	0	0	1	0	0	0	0	0
Iosco	19.8	464	241	51.9	7.9	0.0	17	0	0	0	0	0	2	0	0	0	2
Iron	44.5	188	113	60.1	2.7	0.0	2	0	0	0	0	0	1	0	0	0	1
Isabella	19.2	1,459	369	25.3	1.4	0.0	5	0	0	0	0	0	0	0	0	0	0
Jackson	35.7	4,088	1,674	40.9	14.3	1.1	209	6	5	8	0	19	11	0	0	0	11
Kalamazoo	24.6	6,310	2,480	39.3	12.4	1.0	274	9	5	10	0	24	9	0	1	0	10
Kalkaska	15.2	439	86	19.6	8.1	0.0	7	0	0	0	0	0	0	0	0	0	0
Kent	26.8	18,611	6,182	33.2	10.1	0.9	540	37	12	7	0	56	22	1	5	0	28
Keweenaw	54.9	49	18	36.7	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0
Lake	15.1	230	94	40.9	3.2	2.1	1	1	1	0	0	2	0	0	0	0	0
Lapeer	22.2	1,965	464	23.6	5.4	0.0	25	0	0	0	0	0	0	0	0	0	0

All Counties in Michigan -- Calendar Year 2009 -- Children One and Two Years of Age

County	%Pre-1950 Housing	Children Age 1 & 2	Children Age 1 & 2, Tested for Lead		% with BLL \geq 5 ug/dL	% EBL* (\geq 10 ug/dL, venous or only)	Children with Low-Level Exposure	Children with Confirmed Elevated Blood Lead Levels (EBLL)					Children with Elevated Capillary Tests, Not Confirmed by Venous				
			Number of Children Tested	% Tested			5 to 9 ug/dL (capillary, venous or unknown)	10-14 ug/dL (venous only)	15-19 ug/dL (venous only)	20-44 ug/dL (venous only)	\geq 45 ug/dL (venous only)	Total EBL* (\geq 10 μ g/dL)	Capillary 10-14, not confirmed by venous	Capillary 15-19, not confirmed by venous	Capillary 20-44, not confirmed by venous	Capillary \geq 45, not confirmed by venous	Total Elevated Capillary, not confirmed by venous
Leelanau	22.0	379	103	27.2	2.9	0.0	2	0	0	0	0	0	1	0	0	0	1
Lenawee	38.6	2,432	1,003	41.2	11.9	0.4	109	1	1	2	0	4	5	0	1	0	6
Livingston	13.7	4,068	697	17.1	2.7	0.6	14	4	0	0	0	4	1	0	0	0	1
Luce	30.0	120	80	66.7	5.0	1.3	3	1	0	0	0	1	0	0	0	0	0
Mackinac	28.1	202	115	56.9	5.2	0.0	5	0	0	0	0	0	1	0	0	0	1
Macomb	10.9	20,019	5,160	25.8	2.6	0.2	121	5	1	3	0	9	2	0	1	0	3
Manistee	35.9	482	205	42.5	9.8	0.5	19	1	0	0	0	1	0	0	0	0	0
Marquette	32.6	1,269	504	39.7	3.8	0.0	19	0	0	0	0	0	0	0	0	0	0
Mason	31.1	647	140	21.6	8.6	0.0	12	0	0	0	0	0	0	0	0	0	0
Mecosta	22.0	879	240	27.3	5.8	0.0	13	0	0	0	0	0	0	0	1	0	1
Menominee	38.4	477	211	44.2	4.7	0.0	10	0	0	0	0	0	0	0	0	0	0
Midland	16.9	1,822	505	27.7	4.6	0.0	22	0	0	0	0	0	1	0	0	0	1
Missaukee	20.6	335	87	26.0	4.6	0.0	4	0	0	0	0	0	0	0	0	0	0
Monroe	28.3	3,535	1,305	36.9	5.0	0.4	58	4	1	0	0	5	1	0	1	0	2
Montcalm	28.1	1,642	540	32.9	3.9	0.0	20	0	0	0	0	0	1	0	0	0	1
Montmorency	18.4	170	67	39.4	9.0	0.0	6	0	0	0	0	0	0	0	0	0	0
Muskegon	29.8	4,676	2,309	49.4	10.8	1.0	220	19	3	2	0	24	3	2	1	0	6
Newaygo	22.7	1,264	425	33.6	4.5	0.0	18	0	0	0	0	0	1	0	0	0	1
Oakland	15.9	28,722	7,750	27.0	3.3	0.2	235	9	3	2	0	14	4	0	1	0	5
Oceana	26.8	785	343	43.7	4.4	0.6	11	1	0	1	0	2	1	1	0	0	2
Ogemaw	18.3	414	240	58.0	4.6	0.0	11	0	0	0	0	0	0	0	0	0	0
Ontonagon	43.4	89	58	65.2	10.3	0.0	5	0	0	0	0	0	0	0	1	0	1
Osceola	24.2	582	167	28.7	4.8	0.6	7	0	1	0	0	1	0	0	0	0	0
Oscoda	18.3	176	66	37.5	7.6	0.0	5	0	0	0	0	0	0	0	0	0	0
Otsego	12.6	540	176	32.6	3.4	0.0	5	0	0	0	0	0	0	1	0	0	1
Ottawa	18.0	7,216	1,810	25.1	4.9	0.3	81	4	1	1	0	6	1	1	0	0	2
Presque Isle	27.6	230	91	39.6	8.8	0.0	8	0	0	0	0	0	0	0	0	0	0
Roscommon	16.1	397	175	44.1	2.3	0.0	4	0	0	0	0	0	0	0	0	0	0
Saginaw	29.3	4,946	2,226	45.0	9.0	0.8	170	13	3	1	0	17	12	0	1	0	13
St Clair	29.6	3,994	789	19.8	8.9	0.5	58	1	3	0	0	4	5	2	1	0	8
St Joseph	34.8	1,864	494	26.5	9.7	1.0	42	2	2	1	0	5	0	1	0	0	1
Sanilac	34.7	1,031	355	34.4	12.4	0.3	40	1	0	0	0	1	2	1	0	0	3
Schoolcraft	33.1	142	94	66.2	9.6	0.0	9	0	0	0	0	0	0	0	0	0	0
Shiawassee	35.9	1,680	626	37.3	5.1	0.6	28	3	1	0	0	4	0	0	0	0	0
Tuscola	32.8	1,266	497	39.3	6.4	0.2	30	1	0	0	0	1	0	1	0	0	1
Van Buren	29.4	2,114	796	37.7	6.9	0.4	48	1	1	1	0	3	4	0	0	0	4
Washtenaw	19.3	8,327	1,654	19.9	4.6	0.2	69	3	1	0	0	4	2	0	1	0	3
Wayne ex Det	24.0	29,489	11,103	37.7	5.4	0.4	529	31	6	12	0	49	15	3	4	0	22
Wexford	26.2	826	219	26.5	3.7	0.0	8	0	0	0	0	0	0	0	0	0	0
Detroit, City of	56.0	22,486	13,800	61.4	19.3	3.3	2,114	265	107	80	7	459	69	17	7	0	93
MICHIGAN	27.0	250,212	88,486	35.4	8.8	0.9	6,647	489	181	155	8	833	216	36	31	0	283

Sources: Census 2000, U.S. Census Bureau (Pre-1950 housing); 2008 Population Estimates, U.S. Census Bureau (county populations);

MDCH Data Warehouse (children tested and elevated levels).

Note: %EBLL is calculated as follows: Number of Children w/EBLL divided by (Number of Children Tested minus Children w/elevated capillary tests, not confirmed by venous)

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2009 LEAD ANNUAL REPORT
Childhood Lead Poisoning Data Facts
All Counties in Michigan - Comparing Calendar Year 2008 and Calendar Year 2009 - Children less than Six Years of Age

County	Kids<6*	Children Tested					Children with Elevated Blood Lead Levels (EBLL)				
		Number Tested		Percentage Tested			Number w/EBLL		Percentage w/EBLL		
		CY 2008	CY 2009	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	CY 2008	CY 2009	Δ %
Alcona	455	127	91	27.9	20.0	-7.9	1	0	0.8	0.0	-0.8
Alger	471	103	129	21.9	27.4	5.5	0	0	0.0	0.0	0.0
Allegan	9,075	1,515	1,381	16.7	15.2	-1.5	6	2	0.4	0.1	-0.3
Alpena	1,713	380	299	22.2	17.5	-4.7	1	1	0.3	0.3	0.1
Antrim	1,480	247	224	16.7	15.1	-1.6	0	0	0.0	0.0	0.0
Arenac	1,017	202	241	19.9	23.7	3.8	0	0	0.0	0.0	0.0
Baraga	546	159	151	29.1	27.7	-1.5	0	1	0.0	0.7	0.7
Barry	4,276	711	659	16.6	15.4	-1.2	4	3	0.6	0.5	-0.1
Bay	7,495	1,409	1,369	18.8	18.3	-0.5	10	14	0.7	1.0	0.3
Benzie	1,193	157	179	13.2	15.0	1.8	2	0	1.3	0.0	-1.3
Berrien	12,449	2,466	2,252	19.8	18.1	-1.7	39	39	1.6	1.7	0.1
Branch	3,546	512	487	14.4	13.7	-0.7	0	2	0.0	0.4	0.4
Calhoun	10,748	2,672	2,598	24.9	24.2	-0.7	28	26	1.0	1.0	0.0
Cass	3,278	551	595	16.8	18.2	1.3	3	4	0.5	0.7	0.1
Charlevoix	1,719	252	205	14.7	11.9	-2.7	2	2	0.8	1.0	0.2
Cheboygan	1,604	298	256	18.6	16.0	-2.6	0	0	0.0	0.0	0.0
Chippewa	2,328	451	437	19.4	18.8	-0.6	3	3	0.7	0.7	0.0
Clare	1,998	399	370	20.0	18.5	-1.5	0	1	0.0	0.3	0.3
Clinton	5,061	670	674	13.2	13.3	0.1	4	0	0.6	0.0	-0.6
Crawford	808	105	114	13.0	14.1	1.1	0	0	0.0	0.0	0.0
Delta	2,420	427	447	17.6	18.5	0.8	1	2	0.2	0.4	0.2
Dickinson	1,660	350	324	21.1	19.5	-1.6	1	1	0.3	0.3	0.0
Eaton	7,127	1,284	1,357	18.0	19.0	1.0	5	7	0.4	0.5	0.1
Emmet	2,231	238	212	10.7	9.5	-1.2	0	0	0.0	0.0	0.0
Genesee	34,669	6,532	6,189	18.8	17.9	-1.0	42	32	0.6	0.5	-0.1
Gladwin	1,544	272	280	17.6	18.1	0.5	0	0	0.0	0.0	0.0
Gogebic	806	226	247	28.0	30.6	2.6	1	3	0.4	1.2	0.8
Grand Traverse	6,076	693	843	11.4	13.9	2.5	1	0	0.1	0.0	-0.1
Gratiot	2,876	493	475	17.1	16.5	-0.6	2	0	0.4	0.0	-0.4
Hillsdale	3,360	713	744	21.2	22.1	0.9	6	4	0.8	0.5	-0.3
Houghton	2,391	547	513	22.9	21.5	-1.4	1	1	0.2	0.2	0.0
Huron	1,911	546	545	28.6	28.5	-0.1	1	1	0.2	0.2	0.0
Ingham	20,871	5,118	5,310	24.5	25.4	0.9	27	19	0.5	0.4	-0.2
Ionia	4,949	686	797	13.9	16.1	2.2	6	1	0.9	0.1	-0.8
Iosco	1,419	332	310	23.4	21.8	-1.6	0	0	0.0	0.0	0.0
Iron	572	202	164	35.3	28.7	-6.6	0	0	0.0	0.0	0.0
Isabella	4,328	705	573	16.3	13.2	-3.0	1	0	0.1	0.0	-0.1
Jackson	12,204	2,440	2,404	20.0	19.7	-0.3	21	23	0.9	1.0	0.1
Kalamazoo	18,863	4,230	4,121	22.4	21.8	-0.6	33	37	0.8	0.9	0.1
Kalkaska	1,312	190	177	14.5	13.5	-1.0	0	0	0.0	0.0	0.0
Kent	55,522	8,690	8,487	15.7	15.3	-0.4	119	75	1.4	0.9	-0.5
Keweenaw	145	24	25	16.6	17.2	0.7	0	0	0.0	0.0	0.0
Lake	691	96	144	13.9	20.8	6.9	1	2	1.0	1.4	0.3
Lapeer	5,990	759	702	12.7	11.7	-1.0	2	2	0.3	0.3	0.0

2009 LEAD ANNUAL REPORT
Childhood Lead Poisoning Data Facts
All Counties in Michigan - Comparing Calendar Year 2008 and Calendar Year 2009 - Children less than Six Years of Age

County	Kids<6*	Children Tested					Children with Elevated Blood Lead Levels (EBLL)				
		Number Tested		Percentage Tested			Number w/EBLL		Percentage w/EBLL		
		CY 2008	CY 2009	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	CY 2008	CY 2009	Δ %
Leelanau	1,156	155	172	13.4	14.9	1.5	0	0	0.0	0.0	0.0
Lenawee	7,293	1,799	1,546	24.7	21.2	-3.5	5	5	0.3	0.3	0.0
Livingston	12,509	1,042	1,105	8.3	8.8	0.5	0	4	0.0	0.4	0.4
Luce	354	90	93	25.4	26.3	0.8	0	1	0.0	1.1	1.1
Mackinac	602	130	152	21.6	25.2	3.7	0	0	0.0	0.0	0.0
Macomb	60,618	8,826	9,044	14.6	14.9	0.4	17	15	0.2	0.2	0.0
Manistee	1,467	290	297	19.8	20.2	0.5	3	2	1.0	0.7	-0.4
Marquette	3,801	578	703	15.2	18.5	3.3	0	0	0.0	0.0	0.0
Mason	1,931	412	436	21.3	22.6	1.2	2	0	0.5	0.0	-0.5
Mecosta	2,675	410	382	15.3	14.3	-1.0	5	0	1.2	0.0	-1.2
Menominee	1,466	267	271	18.2	18.5	0.3	2	0	0.7	0.0	-0.7
Midland	5,561	689	772	12.4	13.9	1.5	0	0	0.0	0.0	0.0
Missaukee	1,021	137	153	13.4	15.0	1.6	0	1	0.0	0.7	0.7
Monroe	10,702	1,778	1,783	16.6	16.7	0.0	5	5	0.3	0.3	0.0
Montcalm	4,907	810	853	16.5	17.4	0.9	4	1	0.5	0.1	-0.4
Montmorency	520	106	93	20.4	17.9	-2.5	0	0	0.0	0.0	0.0
Muskegon	13,998	3,653	3,904	26.1	27.9	1.8	45	36	1.2	0.9	-0.3
Nawaygo	3,783	591	572	15.6	15.1	-0.5	2	0	0.3	0.0	-0.3
Oakland	87,361	13,815	14,426	15.8	16.5	0.7	48	29	0.3	0.2	-0.1
Oceana	2,328	534	674	22.9	29.0	6.0	2	2	0.4	0.3	-0.1
Ogemaw	1,256	365	350	29.1	27.9	-1.2	1	0	0.3	0.0	-0.3
Ontonagon	274	67	71	24.5	25.9	1.5	0	0	0.0	0.0	0.0
Osceola	1,739	197	232	11.3	13.3	2.0	0	1	0.0	0.4	0.4
Oscoda	525	113	83	21.5	15.8	-5.7	0	0	0.0	0.0	0.0
Otsego	1,634	297	280	18.2	17.1	-1.0	0	0	0.0	0.0	0.0
Ottawa	21,703	2,588	2,545	11.9	11.7	-0.2	12	8	0.5	0.3	-0.2
Presque Isle	706	127	120	18.0	17.0	-1.0	0	0	0.0	0.0	0.0
Roscommon	1,223	315	256	25.8	20.9	-4.8	1	0	0.3	0.0	-0.3
Saginaw	14,891	3,287	3,343	22.1	22.4	0.4	37	27	1.1	0.8	-0.3
St Clair	12,078	2,080	1,530	17.2	12.7	-4.6	5	5	0.2	0.3	0.1
St Joseph	5,545	1,005	965	18.1	17.4	-0.7	9	6	0.9	0.6	-0.3
Sanilac	3,101	699	630	22.5	20.3	-2.2	0	1	0.0	0.2	0.2
Schoolcraft	440	125	135	28.4	30.7	2.3	0	0	0.0	0.0	0.0
Shiawassee	5,075	989	924	19.5	18.2	-1.3	1	4	0.1	0.4	0.3
Tuscola	3,811	907	814	23.8	21.4	-2.4	0	1	0.0	0.1	0.1
Van Buren	6,328	1,382	1,255	21.8	19.8	-2.0	9	6	0.7	0.5	-0.2
Washtenaw	24,977	2,334	2,642	9.3	10.6	1.2	5	7	0.2	0.3	0.1
Wayne ex Det	88,748	18,654	20,229	21.0	22.8	1.8	110	96	0.6	0.5	-0.1
Wexford	2,458	321	386	13.1	15.7	2.6	1	0	0.3	0.0	-0.3
Detroit, City of	67,991	32,105	31,969	47.2	47.0	-0.2	981	832	3.1	2.6	-0.5
MICHIGAN	753,753	153,248	154,291	20.3	20.5	0.1	1,686	1,403	1.1	0.9	-0.2

Sources: Census 2000, U.S. Census Bureau (Pre-1950 housing); 2008 Population Estimates, U.S. Census Bureau (county populations);

February 5, 2010

MDCH Data Warehouse (children tested and elevated levels).

Note: %EBLL is calculated as follows: Number of Children w/EBLL divided by (Number of Children Tested minus Children w/elevated capillary tests, not confirmed by venous)

2009 LEAD ANNUAL REPORT
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All Counties in Michigan - Comparing Calendar Year 2008 and Calendar Year 2009 - Children One and Two Years of Age

County	Kids 1&2*	Children Tested					Children with Elevated Blood Lead Levels (EBLL)				
		Number Tested		Percentage Tested			Number w/EBLL		Percentage w/EBLL		
		CY 2008	CY 2009	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	CY 2008	CY 2009	Δ %
Alcona	144	92	73	63.9	50.7	-13.2	1	0	1.1	0.0	-1.1
Alger	156	82	95	52.6	60.9	8.3	0	0	0.0	0.0	0.0
Allegan	3,025	940	862	31.1	28.5	-2.6	5	1	0.5	0.1	-0.4
Alpena	560	259	241	46.3	43.0	-3.2	1	1	0.4	0.4	0.0
Antrim	488	151	157	30.9	32.2	1.2	0	0	0.0	0.0	0.0
Arenac	340	147	165	43.2	48.5	5.3	0	0	0.0	0.0	0.0
Baraga	182	93	89	51.1	48.9	-2.2	0	1	0.0	1.1	1.1
Barry	1,417	469	425	33.1	30.0	-3.1	4	2	0.9	0.5	-0.4
Bay	2,495	919	981	36.8	39.3	2.5	8	10	0.9	1.0	0.1
Benzie	394	101	98	25.6	24.9	-0.8	1	0	1.0	0.0	-1.0
Berrien	4,162	1,510	1,465	36.3	35.2	-1.1	29	27	1.9	1.9	-0.1
Branch	1,194	284	289	23.8	24.2	0.4	0	1	0.0	0.4	0.4
Calhoun	3,597	1,837	1,783	51.1	49.6	-1.5	16	17	0.9	1.0	0.1
Cass	1,078	385	420	35.7	39.0	3.2	2	4	0.5	1.0	0.4
Charlevoix	566	185	136	32.7	24.0	-8.7	1	0	0.5	0.0	-0.5
Cheboygan	523	211	201	40.3	38.4	-1.9	0	0	0.0	0.0	0.0
Chippewa	780	276	254	35.4	32.6	-2.8	2	3	0.7	1.2	0.5
Clare	660	279	256	42.3	38.8	-3.5	0	1	0.0	0.4	0.4
Clinton	1,678	431	430	25.7	25.6	-0.1	4	0	0.9	0.0	-0.9
Crawford	265	70	79	26.4	29.8	3.4	0	0	0.0	0.0	0.0
Delta	802	330	326	41.1	40.6	-0.5	1	2	0.3	0.6	0.3
Dickinson	552	266	254	48.2	46.0	-2.2	1	1	0.4	0.4	0.0
Eaton	2,337	858	889	36.7	38.0	1.3	3	6	0.4	0.7	0.3
Emmet	732	172	140	23.5	19.1	-4.4	0	0	0.0	0.0	0.0
Genesee	11,547	3,919	3,633	33.9	31.5	-2.5	20	18	0.5	0.5	0.0
Gladwin	503	193	193	38.4	38.4	0.0	0	0	0.0	0.0	0.0
Gogebic	271	168	183	62.0	67.5	5.5	0	1	0.0	0.5	0.5
Grand Traverse	2,026	402	440	19.8	21.7	1.9	0	0	0.0	0.0	0.0
Gratiot	965	319	319	33.1	33.1	0.0	2	0	0.6	0.0	-0.6
Hillsdale	1,110	358	385	32.3	34.7	2.4	4	2	1.1	0.5	-0.6
Houghton	805	370	394	46.0	48.9	3.0	1	1	0.3	0.3	0.0
Huron	631	291	281	46.1	44.5	-1.6	1	1	0.3	0.4	0.0
Ingham	7,032	2,978	3,055	42.3	43.4	1.1	18	13	0.6	0.4	-0.2
Ionia	1,658	471	549	28.4	33.1	4.7	6	1	1.3	0.2	-1.1
Iosco	464	228	241	49.1	51.9	2.8	0	0	0.0	0.0	0.0
Iron	188	103	113	54.8	60.1	5.3	0	0	0.0	0.0	0.0
Isabella	1,459	424	369	29.1	25.3	-3.8	0	0	0.0	0.0	0.0
Jackson	4,088	1,573	1,674	38.5	40.9	2.5	16	19	1.0	1.1	0.1
Kalamazoo	6,310	2,706	2,480	42.9	39.3	-3.6	18	24	0.7	1.0	0.3
Kalkaska	439	118	86	26.9	19.6	-7.3	0	0	0.0	0.0	0.0
Kent	18,611	6,541	6,182	35.1	33.2	-1.9	82	56	1.3	0.9	-0.4
Keweenaw	49	18	18	36.7	36.7	0.0	0	0	0.0	0.0	0.0
Lake	230	62	94	27.0	40.9	13.9	1	2	1.6	2.1	0.5
Lapeer	1,965	513	464	26.1	23.6	-2.5	2	0	0.4	0.0	-0.4

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		Number Tested		Percentage Tested			Number w/EBLL		Percentage w/EBLL		
		CY 2008	CY 2009	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	CY 2008	CY 2009	Δ %
Leelanau	379	89	103	23.5	27.2	3.7	0	0	0.0	0.0	0.0
Lenawee	2,432	1,093	1,003	44.9	41.2	-3.7	3	4	0.3	0.4	0.1
Livingston	4,068	663	697	16.3	17.1	0.8	0	4	0.0	0.6	0.6
Luce	120	72	80	60.0	66.7	6.7	0	1	0.0	1.3	1.3
Mackinac	202	104	115	51.5	56.9	5.4	0	0	0.0	0.0	0.0
Macomb	20,019	5,269	5,160	26.3	25.8	-0.5	15	9	0.3	0.2	-0.1
Manistee	482	195	205	40.5	42.5	2.1	1	1	0.5	0.5	0.0
Marquette	1,269	421	504	33.2	39.7	6.5	0	0	0.0	0.0	0.0
Mason	647	234	140	36.2	21.6	-14.5	1	0	0.4	0.0	-0.4
Mecosta	879	287	240	32.7	27.3	-5.3	2	0	0.7	0.0	-0.7
Menominee	477	200	211	41.9	44.2	2.3	2	0	1.0	0.0	-1.0
Midland	1,822	398	505	21.8	27.7	5.9	0	0	0.0	0.0	0.0
Missaukee	335	79	87	23.6	26.0	2.4	0	0	0.0	0.0	0.0
Monroe	3,535	1,325	1,305	37.5	36.9	-0.6	4	5	0.3	0.4	0.1
Montcalm	1,642	492	540	30.0	32.9	2.9	3	0	0.6	0.0	-0.6
Montmorency	170	71	67	41.8	39.4	-2.4	0	0	0.0	0.0	0.0
Muskegon	4,676	2,039	2,309	43.6	49.4	5.8	25	24	1.2	1.0	-0.2
Newaygo	1,264	417	425	33.0	33.6	0.6	2	0	0.5	0.0	-0.5
Oakland	28,722	7,653	7,750	26.6	27.0	0.3	21	14	0.3	0.2	-0.1
Oceana	785	295	343	37.6	43.7	6.1	0	2	0.0	0.6	0.6
Ogemaw	414	243	240	58.7	58.0	-0.7	1	0	0.4	0.0	-0.4
Ontonagon	89	60	58	67.4	65.2	-2.2	0	0	0.0	0.0	0.0
Osceola	582	135	167	23.2	28.7	5.5	0	1	0.0	0.6	0.6
Oscoda	176	84	66	47.7	37.5	-10.2	0	0	0.0	0.0	0.0
Otsego	540	165	176	30.6	32.6	2.0	0	0	0.0	0.0	0.0
Ottawa	7,216	1,749	1,810	24.2	25.1	0.8	8	6	0.5	0.3	-0.1
Presque Isle	230	85	91	37.0	39.6	2.6	0	0	0.0	0.0	0.0
Roscommon	397	203	175	51.1	44.1	-7.1	1	0	0.5	0.0	-0.5
Saginaw	4,946	2,168	2,226	43.8	45.0	1.2	21	17	1.0	0.8	-0.2
St Clair	3,994	1,193	789	29.9	19.8	-10.1	3	4	0.3	0.5	0.3
St Joseph	1,864	610	494	32.7	26.5	-6.2	7	5	1.2	1.0	-0.1
Sanilac	1,031	399	355	38.7	34.4	-4.3	0	1	0.0	0.3	0.3
Schoolcraft	142	95	94	66.9	66.2	-0.7	0	0	0.0	0.0	0.0
Shiawassee	1,680	656	626	39.0	37.3	-1.8	1	4	0.2	0.6	0.5
Tuscola	1,266	542	497	42.8	39.3	-3.6	0	1	0.0	0.2	0.2
Van Buren	2,114	869	796	41.1	37.7	-3.5	5	3	0.6	0.4	-0.2
Washtenaw	8,327	1,374	1,654	16.5	19.9	3.4	4	4	0.3	0.2	0.0
Wayne ex Det	29,489	10,016	11,103	34.0	37.7	3.7	62	49	0.6	0.4	-0.2
Wexford	826	204	219	24.7	26.5	1.8	0	0	0.0	0.0	0.0
Detroit, City of	22,486	14,301	13,800	63.6	61.4	-2.2	542	459	3.8	3.3	-0.5
MICHIGAN	250,212	88,649	88,486	35.4	35.4	-0.1	984	833	1.1	0.9	-0.2

Sources: Census 2000, U.S. Census Bureau (Pre-1950 housing); 2008 Population Estimates, U.S. Census Bureau (county populations);

February 5, 2010

MDCH Data Warehouse (children tested and elevated levels).

Note: %EBLL is calculated as follows: Number of Children w/EBLL divided by (Number of Children Tested minus Children w/elevated capillary tests, not confirmed by venous)

Childhood Lead Poisoning Data Facts**All Counties in Michigan****CY 2009****Blood Lead Testing Among Children who are Insured by Medicaid**

County	Children age 1 & 2 years, Insured by Medicaid					Children age 3 through 5 years, Insured by Medicaid				
	# of Children Insured by Medicaid	# of Children Tested for Lead Poisoning	% Tested	# of Children Confirmed w/EBLL*	% EBLL*	# of Children Insured by Medicaid	# of Children Tested for Lead Poisoning	% Tested	# of Children Confirmed w/EBLL*	% EBLL*
Alcona	95	61	64.2	0	0.0	127	11	8.7	0	0.0
Alger	94	77	81.9	0	0.0	129	15	11.6	0	0.0
Allegan	1,621	624	38.5	1	0.2	2,223	286	12.9	0	0.0
Alpena	380	209	55.0	1	0.5	549	31	5.6	0	0.0
Antrim	324	140	43.2	0	0.0	452	42	9.3	0	0.0
Arenac	217	122	56.2	0	0.0	332	50	15.1	0	0.0
Baraga	105	70	66.7	1	1.4	161	36	22.4	0	0.0
Barry	716	311	43.4	2	0.6	931	83	8.9	1	1.2
Bay	1,408	686	48.7	8	1.2	1,896	238	12.6	2	0.8
Benzie	222	80	36.0	0	0.0	324	35	10.8	0	0.0
Berrien	2,635	1,288	48.9	26	2.0	3,589	521	14.5	12	2.3
Branch	762	229	30.1	1	0.4	1,026	120	11.7	1	0.8
Calhoun	2,448	1,176	48.0	17	1.4	3,243	343	10.6	7	2.0
Cass	807	358	44.4	2	0.6	1,059	124	11.7	0	0.0
Charlevoix	298	124	41.6	0	0.0	438	37	8.4	1	2.7
Cheboygan	392	195	49.7	0	0.0	524	40	7.6	0	0.0
Chippewa	488	201	41.2	1	0.5	613	108	17.6	0	0.0
Clare	499	227	45.5	1	0.4	659	86	13.1	0	0.0
Clinton	622	295	47.4	0	0.0	817	146	17.9	0	0.0
Crawford	175	70	40.0	0	0.0	243	24	9.9	0	0.0
Delta	476	291	61.1	1	0.3	674	74	11.0	0	0.0
Dickinson	353	218	61.8	1	0.5	463	43	9.3	0	0.0
Eaton	1,164	660	56.7	4	0.6	1,445	279	19.3	0	0.0
Emmet	411	131	31.9	0	0.0	604	39	6.5	0	0.0
Genesee	7,575	2,754	36.4	16	0.6	10,078	1,671	16.6	14	0.8
Gladwin	324	176	54.3	0	0.0	453	73	16.1	0	0.0
Gogebic	236	129	54.7	1	0.8	256	34	13.3	2	5.9
Grand Traverse	1,078	304	28.2	0	0.0	1,408	173	12.3	0	0.0
Gratiot	597	264	44.2	0	0.0	875	113	12.9	0	0.0
Hillsdale	729	317	43.5	2	0.6	972	100	10.3	2	2.0
Houghton	439	235	53.5	1	0.4	609	60	9.9	0	0.0
Huron	400	222	55.5	1	0.5	553	185	33.5	0	0.0
Ingham	3,874	2,431	62.8	11	0.5	5,149	1,623	31.5	6	0.4
Ionia	894	454	50.8	1	0.2	1,244	189	15.2	0	0.0
Iosco	331	214	64.7	0	0.0	494	48	9.7	0	0.0
Iron	142	97	68.3	0	0.0	199	41	20.6	0	0.0
Isabella	793	250	31.5	0	0.0	1,054	129	12.2	0	0.0
Jackson	2,470	1,224	49.6	16	1.3	3,249	380	11.7	2	0.5
Kalamazoo	3,422	1,725	50.4	23	1.3	4,548	637	14.0	12	1.9
Kalkaska	307	77	25.1	0	0.0	459	37	8.1	0	0.0
Kent	9,908	4,697	47.4	52	1.1	12,841	1,285	10.0	18	1.4
Keweenaw	21	11	52.4	0	0.0	25	5	20.0	0	0.0
Lake	184	88	47.8	1	1.1	253	36	14.2	0	0.0

Childhood Lead Poisoning Data Facts**All Counties in Michigan****CY 2009****Blood Lead Testing Among Children who are Insured by Medicaid**

County	Children age 1 & 2 years, Insured by Medicaid					Children age 3 through 5 years, Insured by Medicaid				
	# of Children Insured by Medicaid	# of Children Tested for Lead Poisoning	% Tested	# of Children Confirmed w/EBLL*	% EBLL*	# of Children Insured by Medicaid	# of Children Tested for Lead Poisoning	% Tested	# of Children Confirmed w/EBLL*	% EBLL*
Lapeer	989	349	35.3	0	0.0	1,480	144	9.7	2	1.4
Leelanau	152	69	45.4	0	0.0	203	26	12.8	0	0.0
Lenawee	1,391	733	52.7	2	0.3	1,796	255	14.2	0	0.0
Livingston	1,203	497	41.3	3	0.6	1,698	237	14.0	0	0.0
Luce	84	76	90.5	1	1.3	123	9	7.3	0	0.0
Mackinac	132	99	75.0	0	0.0	177	24	13.6	0	0.0
Macomb	9,012	3,131	34.7	7	0.2	12,273	2,057	16.8	6	0.3
Manistee	301	179	59.5	1	0.6	421	72	17.1	1	1.4
Marquette	693	376	54.3	0	0.0	876	101	11.5	0	0.0
Mason	440	132	30.0	0	0.0	597	97	16.2	0	0.0
Mecosta	549	186	33.9	0	0.0	790	73	9.2	0	0.0
Menominee	259	167	64.5	0	0.0	375	28	7.5	0	0.0
Midland	886	414	46.7	0	0.0	1,163	172	14.8	0	0.0
Missaukee	232	78	33.6	0	0.0	294	39	13.3	1	2.6
Monroe	1,724	820	47.6	4	0.5	2,174	238	10.9	0	0.0
Montcalm	983	439	44.7	0	0.0	1,387	241	17.4	1	0.4
Montmorency	122	60	49.2	0	0.0	165	20	12.1	0	0.0
Muskegon	3,180	1,748	55.0	23	1.3	4,299	1,111	25.8	12	1.1
Newaygo	824	291	35.3	0	0.0	1,117	72	6.4	0	0.0
Oakland	9,678	4,681	48.4	12	0.3	13,035	2,928	22.5	10	0.3
Oceana	641	285	44.5	1	0.4	829	216	26.1	0	0.0
Ogemaw	293	186	63.5	0	0.0	435	86	19.8	0	0.0
Ontonagon	58	42	72.4	0	0.0	101	9	8.9	0	0.0
Osceola	350	135	38.6	1	0.7	472	46	9.7	0	0.0
Oscoda	101	57	56.4	0	0.0	166	13	7.8	0	0.0
Otsego	391	163	41.7	0	0.0	512	76	14.8	0	0.0
Ottawa	2,993	1,134	37.9	4	0.4	3,974	417	10.5	2	0.5
Presque Isle	140	70	50.0	0	0.0	171	15	8.8	0	0.0
Roscommon	316	160	50.6	0	0.0	445	66	14.8	0	0.0
Saginaw	3,179	1,821	57.3	17	0.9	4,444	870	19.6	10	1.1
St Clair	2,258	597	26.4	2	0.3	3,117	331	10.6	0	0.0
St Joseph	1,211	374	30.9	4	1.1	1,709	197	11.5	0	0.0
Sanilac	597	315	52.8	1	0.3	903	200	22.1	0	0.0
Schoolcraft	100	82	82.0	0	0.0	156	17	10.9	0	0.0
Shiawassee	977	499	51.1	3	0.6	1,354	208	15.4	0	0.0
Tuscola	782	379	48.5	1	0.3	1,123	181	16.1	0	0.0
Van Buren	1,490	616	41.3	3	0.5	1,971	299	15.2	3	1.0
Washtenaw	2,954	1,051	35.6	2	0.2	3,881	654	16.9	3	0.5
Wayne ex Det	14,640	7,168	49.0	41	0.6	19,812	5,247	26.5	38	0.7
Wexford	643	205	31.9	0	0.0	826	71	8.6	0	0.0
Detroit, City of	20,150	11,451	56.8	417	3.6	27,461	13,485	49.1	344	2.6
MICHIGAN	137,534	64,827	47.1	742	1.1	185,545	40,278	21.7	513	1.3

*EBLL: elevated blood lead level--i.e., ≥ 10 ug/dL

Source: MDCH Data Warehouse

Childhood Lead Poisoning Data Facts - Calendar Year 2009**Blood Lead Testing Among Children Who Should Be Tested****in accordance with the Statewide Screening/Testing Plan***

County	Population of Children Who Should be Tested*	Children who were tested in 2009	% Tested	Children with confirmed Elevated Blood Lead Levels	% EBLL
Alcona	95	61	64.2	0	0.0
Alger	94	77	81.9	0	0.0
Allegan	1,621	624	38.5	1	0.2
Alpena	380	209	55.0	1	0.5
Antrim	324	140	43.2	0	0.0
Arenac	217	122	56.2	0	0.0
Baraga	105	70	66.7	1	1.4
Barry	716	311	43.4	2	0.6
Bay	1,408	686	48.7	8	1.2
Benzie	222	80	36.0	0	0.0
Berrien	2,612	1,300	49.8	26	2.0
Branch	762	229	30.1	1	0.4
Calhoun	2,764	1,467	53.1	17	1.2
Cass	807	358	44.4	2	0.6
Charlevoix	298	124	41.6	0	0.0
Cheboygan	392	195	49.7	0	0.0
Chippewa	488	201	41.2	1	0.5
Clare	499	227	45.5	1	0.4
Clinton	622	296	47.6	0	0.0
Crawford	175	70	40.0	0	0.0
Delta	476	291	61.1	1	0.3
Dickinson	353	218	61.8	1	0.5
Eaton	1,164	660	56.7	4	0.6
Emmet	411	131	31.9	0	0.0
Genesee	7,773	2,917	37.5	18	0.6
Gladwin	324	176	54.3	0	0.0
Gogebic	236	129	54.7	1	0.8
Grand Traverse	1,078	304	28.2	0	0.0
Gratiot	597	264	44.2	0	0.0
Hillsdale	729	317	43.5	2	0.6
Houghton	439	235	53.5	1	0.4
Huron	400	222	55.5	1	0.5
Ingham	4,777	2,736	57.3	12	0.4
Ionia	894	454	50.8	1	0.2
Iosco	331	214	64.7	0	0.0
Iron	142	97	68.3	0	0.0
Isabella	793	250	31.5	0	0.0
Jackson	2,444	1,335	54.6	17	1.3
Kalamazoo	3,946	1,913	48.5	24	1.3
Kalkaska	307	77	25.1	0	0.0
Kent	11,240	5,279	47.0	55	1.0
Keweenaw	21	11	52.4	0	0.0
Lake	184	88	47.8	1	1.1
Lapeer	989	349	35.3	0	0.0
Leelanau	152	69	45.4	0	0.0
Lenawee	1,391	733	52.7	2	0.3
Livingston	1,203	497	41.3	3	0.6
Luce	84	76	90.5	1	1.3
Mackinac	132	99	75.0	0	0.0
Macomb	9,012	3,131	34.7	7	0.2
Manistee	301	179	59.5	1	0.6
Marquette	693	376	54.3	0	0.0
Mason	440	132	30.0	0	0.0
Mecosta	549	186	33.9	0	0.0

2009 LEAD ANNUAL REPORT **Childhood Lead Poisoning Data Facts - Calendar Year 2009**

**Blood Lead Testing Among Children Who Should Be Tested
in accordance with the Statewide Screening/Testing Plan***

County	Population of Children Who Should be Tested*	Children who were tested in 2009	% Tested	Children with confirmed Elevated Blood Lead Levels	% EBLL
Menominee	259	167	64.5	0	0.0
Midland	886	414	46.7	0	0.0
Missaukee	232	78	33.6	0	0.0
Monroe	1,724	820	47.6	4	0.5
Montcalm	983	439	44.7	0	0.0
Montmorency	122	60	49.2	0	0.0
Muskegon	3,180	1,860	58.5	24	1.3
Newaygo	824	291	35.3	0	0.0
Oakland	9,717	4,828	49.7	12	0.2
Oceana	641	285	44.5	1	0.4
Ogemaw	293	186	63.5	0	0.0
Ontonagon	58	42	72.4	0	0.0
Osceola	350	135	38.6	1	0.7
Oscoda	101	57	56.4	0	0.0
Otsego	391	163	41.7	0	0.0
Ottawa	2,993	1,135	37.9	4	0.4
Presque Isle	140	70	50.0	0	0.0
Roscommon	316	160	50.6	0	0.0
Saginaw	3,113	1,920	61.7	17	0.9
St Clair	2,258	597	26.4	2	0.3
St Joseph	1,211	374	30.9	4	1.1
Sanilac	597	315	52.8	1	0.3
Schoolcraft	100	82	82.0	0	0.0
Shiawassee	977	499	51.1	3	0.6
Tuscola	782	379	48.5	1	0.3
Van Buren	1,490	616	41.3	3	0.5
Washtenaw	2,954	1,051	35.6	2	0.2
Wayne	38,361	21,684	56.5	503	2.3
Wexford	643	205	31.9	0	0.0
Totals by Category					
Children Who Should Be Tested* (portion of All Children)	144,302 0.58	69,904 0.79	48.4	796 0.96	1.1
Children Who Should Not Be Tested (portion of All Children)	105,910 0.42	18,582 0.21	17.5	37 0.04	0.2
Children Insured by Medicaid (portion of All Children)	137,534 0.55	64,827 0.73	47.1	513 0.62	0.8
All Children living in Target Communities (portion of All Children)	50,045 0.20	28,870 0.33	57.7	673 0.81	2.3
Children Insured by Medicaid AND Living in Target Communities (portion of All Children)	43,148 0.17	23,793 0.27	55.1	621 0.75	2.6
All Children	250,212	88,486	35.4	833	0.9

**Children who should be tested" is defined for this report as 1 & 2 year olds who are insured by Medicaid or live in one of the 14 Target Communities in Michigan (Battle Creek, Benton Harbor, Dearborn, Detroit, Flint, Grand Rapids, Hamtramck, Highland Park, Jackson, Kalamazoo, Lansing, Muskegon/Muskegon Heights, Pontiac, Saginaw). Due to temporary data access issues, this report does not include those children who are participating in WIC but are not in either of the other categories.

Childhood Lead Poisoning Data Facts
Fourteen Target Communities in Michigan
Calendar Year 2009
Children less than Six Years of Age

Target Community	%Pre-1950 Housing	%Pre-1978 Housing	Children < Age 6	Children < Age 6, Tested for Lead		% with BLL >= 5 ug/dL	% EBLL (>= 10 ug/dL venous only)	Children with Low- Level Exposure 5 to 9 ug/dL (capillary, venous or unknown)	Children with Confirmed Elevated Blood Lead Levels (venous only)					Children with Elevated Capillary Tests, Not Confirmed by Venous				
				Number of Children Tested	% Tested				10-14 ug/dL	15-19 ug/dL	20-44 ug/dL	≥45 ug/dL	Total EBLL (≥ 10 µg/dL)	Capillary 10-14	Capillary 15-19	Capillary 20-44	Capillary ≥ 45	Total Elevated Capillary, not confirmed by venous
Battle Creek	42.3	83.2	4,403	1,293	29.4	10.4	1.4	112	11	4	3	0	18	5	0	0	0	5
Benton Harbor	47.8	88.8	1,180	409	34.7	25.4	4.7	82	11	4	4	0	19	3	0	0	0	3
Dearborn	49.5	87.8	10,850	3,287	30.3	5.4	0.5	158	10	4	2	0	16	1	1	0	0	2
Detroit	56.0	95.2	67,991	31,969	47.0	16.5	2.6	4,279	493	186	143	10	832	120	21	14	0	155
Flint	40.9	93.7	10,294	2,321	22.5	10.5	1.0	214	13	5	4	2	24	5	1	0	0	6
Grand Rapids	48.9	84.9	17,349	4,084	23.5	17.3	1.7	613	44	13	12	0	69	21	2	3	0	26
Hamtramck	75.8	95.7	2,269	1,228	54.1	21.7	2.1	233	19	5	1	0	25	7	0	2	0	9
Highland Park	62.4	89.8	983	511	52.0	33.5	5.8	132	15	6	8	0	29	7	2	1	0	10
Jackson	65.9	92.6	3,101	995	32.1	20.3	1.8	173	3	6	9	0	18	10	0	1	0	11
Kalamazoo	40.0	81.5	5,785	1,598	27.6	19.0	1.9	257	14	4	12	0	30	12	2	2	0	16
Lansing	35.8	85.1	10,016	3,522	35.2	11.2	0.4	376	7	4	4	0	15	2	0	0	0	2
Muskegon/MuskHts	52.1	90.4	4,721	1,785	37.8	15.9	1.8	246	27	2	3	0	32	2	2	1	0	5
Pontiac	35.2	84.3	5,685	2,057	36.2	6.6	0.4	126	3	2	3	0	8	1	0	1	0	2
Saginaw	54.4	95.4	4,817	1,613	33.5	14.1	1.6	190	16	4	5	0	25	12	1	0	0	13
Subtotal	51.1	91.5	149,444	56,672	37.9	15.2	2.1	7,191	686	249	213	12	1,160	208	32	25	0	265
Michigan	27.0	71.3	753,753	154,291	20.5	8.5	0.9	11,341	838	298	255	12	1,403	324	49	43	1	417

Sources:

Pre-1950 Housing and Pre-1978 Housing calculated from U.S. Bureau, Census 2000

Target Community populations calculated from 2006-2008 American Community Survey 3-Year Estimates

Children Tested and EBLL from Michigan Department of Community Health, Data Warehouse

Note: %EBLL is calculated as follows: Total EBLL divided by (Number of Children Tested minus Total Elevated Capillary, not confirmed by venous)

February 5, 2010

Childhood Lead Poisoning Data Facts
Fourteen Target Communities in Michigan
Calendar Year 2009
Children One and Two Years of Age

Target Community	%Pre-1950 Housing	%Pre-1978 Housing	Children Age 1 & 2	Children Age 1 & 2, Tested for Lead		% with BLL \geq 5 ug/dL	% EBLL (\geq 10 ug/dL venous only)	Children with Low-Level Exposure	Children with Confirmed Elevated Blood Lead Levels (venous only)					Children with Elevated Capillary Tests, Not Confirmed by Venous				
				Number of Children Tested	% Tested			5 to 9 ug/dL (capillary, venous or unknown)	10-14 ug/dL	15-19 ug/dL	20-44 ug/dL	\geq 45 ug/dL	Total EBLL (\geq 10 μ g/dL)	Capillary 10-14	Capillary 15-19	Capillary 20-44	Capillary \geq 45	Total Elevated Capillary, not confirmed by venous
Battle Creek	42.3	83.2	1,514	895	59.1	9.9	1.3	73	6	4	2	0	12	4	0	0	0	4
Benton Harbor	47.8	88.8	397	240	60.5	27.1	5.5	49	8	2	3	0	13	0	3	0	0	3
Dearborn	49.5	87.8	3,644	1,806	49.6	5.6	0.6	87	7	3	1	0	11	1	1	1	0	3
Detroit	56.0	95.2	22,486	13,800	61.4	19.3	3.3	2,114	265	107	80	7	459	69	17	7	0	93
Flint	40.9	93.7	3,458	1,373	39.7	10.3	1.1	124	8	4	2	1	15	2	1	0	0	3
Grand Rapids	48.9	84.9	5,894	2,970	50.4	17.6	1.8	448	35	10	7	0	52	19	1	3	0	23
Hamtramck	75.8	95.7	728	591	81.2	24.2	1.9	128	10	1	0	0	11	4	0	0	0	4
Highland Park	62.4	89.8	321	233	72.6	39.1	6.6	70	7	2	6	0	15	3	2	1	0	6
Jackson	65.9	92.6	1,065	687	64.5	21.0	2.4	119	3	5	8	0	16	9	0	0	0	9
Kalamazoo	40.0	81.5	2,004	970	48.4	19.1	1.8	162	6	3	8	0	17	5	0	1	0	6
Lansing	35.8	85.1	3,456	2,032	58.8	11.2	0.5	218	5	2	3	0	10	0	0	0	0	0
Muskegon/MuskHts	52.1	90.4	1,627	1,030	63.3	18.2	2.1	160	17	2	2	0	21	3	2	1	0	6
Pontiac	35.2	84.3	1,887	1,195	63.3	7.1	0.4	79	2	2	1	0	5	0	0	1	0	1
Saginaw	54.4	95.4	1,564	1,048	67.0	14.2	1.5	123	12	3	1	0	16	10	0	0	0	10
Subtotal	51.1	91.5	50,045	28,870	57.7	16.6	2.3	3,954	391	150	124	8	673	129	27	15	0	171
Michigan	27.0	71.3	250,212	88,486	35.4	8.8	0.9	6,647	489	181	155	8	833	216	36	31	0	283

Sources:

Pre-1950 Housing and Pre-1978 Housing calculated from U.S. Bureau, Census 2000

Target Community populations calculated from 2006-2008 American Community Survey 3-Year Estimates

Children Tested and EBLL from Michigan Department of Community Health, Data Warehouse

Note: %EBLL is calculated as follows: Total EBLL divided by (Number of Children Tested minus Total Elevated Capillary, not confirmed by venous)

February 5, 2010

Childhood Lead Poisoning Data Facts
14 Target Communities in Michigan
Comparing CY2008 and CY2009
Children less than Six Years of Age

City	Children Under Age	Children Tested					Children with Elevated Blood Lead Levels (EBLL)						Children with Highly Elevated Blood Lead Levels					
		Number Tested		Percentage Tested			Number w/BLL >= 10 ug/dL			Percentage w/EBLL			Number w/BLL 20 to 44 ug/dL			Number w/BLL >= 45 ug/dL		
		CY 2008	CY 2009	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	Δ	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	Δ	CY 2008	CY 2009	Δ
Battle Creek	4,403	1,323	1,293	30.0	29.4	-0.7	14	18	4	1.0	1.4	0.4	2	3	1	0	0	0
Benton Harbor	1,180	529	409	44.8	34.7	-10.2	23	19	-4	4.4	4.7	0.2	2	4	2	0	0	0
Dearborn	10,850	3,219	3,287	29.7	30.3	0.6	22	16	-6	0.7	0.5	-0.2	2	2	0	0	0	0
Detroit	67,991	32,105	31,969	47.2	47.0	-0.2	981	832	-149	3.1	2.6	-0.5	155	143	-12	18	10	-8
Flint	10,294	2,372	2,321	23.0	22.5	-0.5	33	24	-9	1.4	1.0	-0.4	7	4	-3	0	2	2
Grand Rapids	17,349	4,296	4,084	24.8	23.5	-1.2	104	69	-35	2.4	1.7	-0.7	21	12	-9	1	0	-1
Hamtramck	2,269	1,163	1,228	51.3	54.1	2.9	19	25	6	1.7	2.1	0.4	4	1	-3	0	0	0
Highland Park	983	507	511	51.6	52.0	0.4	41	29	-12	8.2	5.8	-2.4	5	8	3	1	0	-1
Jackson	3,101	963	995	31.0	32.1	1.0	11	18	7	1.2	1.8	0.7	0	9	9	1	0	-1
Kalamazoo	5,785	1,659	1,598	28.7	27.6	-1.1	28	30	2	1.7	1.9	0.2	8	12	4	0	0	0
Lansing	10,016	3,330	3,522	33.3	35.2	1.9	18	15	-3	0.5	0.4	-0.1	3	4	1	0	0	0
Muskegon/MuskHts	4,721	1,593	1,785	33.7	37.8	4.1	41	32	-9	2.6	1.8	-0.8	4	3	-1	0	0	0
Pontiac	5,685	2,225	2,057	39.1	36.2	-3.0	17	8	-9	0.8	0.4	-0.4	5	3	-2	0	0	0
Saginaw	4,817	1,697	1,613	35.2	33.5	-1.7	33	25	-8	2.0	1.6	-0.4	7	5	-2	0	0	0
Subtotal	149,444	56,980	56,672	38.1	37.9	-0.2	1,384	1,160	-224	2.4	2.1	-0.3	225	213	-12	21	12	-9
Michigan	753,753	153,248	154,291	20.3	20.5	0.1	1,686	1,403	-283	1.1	0.9	-0.2	277	255	-22	23	12	-11

Sources:

Target Community populations calculated from 2006-2008 American Community Survey 3-Year Estimates

Children Tested and EBLL from Michigan Department of Community Health, Data Warehouse

Note: %EBLL is calculated as follows: Total EBLL divided by (Number of Children Tested minus Total Elevated Capillary, not confirmed by venous)

February 5, 2010

Childhood Lead Poisoning Data Facts
14 Target Communities in Michigan
Comparing CY2008 and CY2009
Children One and Two Years of Age

City	Children 1 & 2 yrs of	Children Tested					Children with Elevated Blood Lead Levels (EBLL)						Children with Highly Elevated Blood Lead Levels					
		Number Tested		Percentage Tested			Number w/BLL >= 10 ug/dL			Percentage w/EBLL			Number w/BLL 20 to 44 ug/dL			Number w/BLL >= 45 ug/dL		
		CY 2008	CY 2009	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	Δ	CY 2008	CY 2009	Δ %	CY 2008	CY 2009	Δ	CY 2008	CY 2009	Δ
Battle Creek	1,514	935	895	61.8	59.1	-2.6	8	12	4	0.9	1.3	0.5	2	2	0	0	0	0
Benton Harbor	397	262	240	66.1	60.5	-5.6	18	13	-5	7.0	5.5	-1.5	2	3	1	0	0	0
Dearborn	3,644	1,771	1,806	48.6	49.6	1.0	14	11	-3	0.8	0.6	-0.2	2	1	-1	0	0	0
Detroit	22,486	14,301	13,800	63.6	61.4	-2.2	542	459	-83	3.8	3.3	-0.5	102	80	-22	12	7	-5
Flint	3,458	1,473	1,373	42.6	39.7	-2.9	16	15	-1	1.1	1.1	0.0	6	2	-4	0	1	1
Grand Rapids	5,894	3,169	2,970	53.8	50.4	-3.4	73	52	-21	2.3	1.8	-0.6	15	7	-8	1	0	-1
Hamtramck	728	610	591	83.8	81.2	-2.6	11	11	0	1.8	1.9	0.0	3	0	-3	0	0	0
Highland Park	321	218	233	67.9	72.6	4.7	22	15	-7	10.2	6.6	-3.6	3	6	3	1	0	-1
Jackson	1,065	612	687	57.5	64.5	7.1	9	16	7	1.5	2.4	0.9	0	8	8	1	0	-1
Kalamazoo	2,004	975	970	48.7	48.4	-0.2	16	17	1	1.6	1.8	0.1	4	8	4	0	0	0
Lansing	3,456	1,943	2,032	56.2	58.8	2.6	13	10	-3	0.7	0.5	-0.2	3	3	0	0	0	0
Muskegon/MuskHts	1,627	874	1,030	53.7	63.3	9.6	23	21	-2	2.7	2.1	-0.6	1	2	1	0	0	0
Pontiac	1,887	1,309	1,195	69.4	63.3	-6.0	9	5	-4	0.7	0.4	-0.3	3	1	-2	0	0	0
Saginaw	1,564	1,106	1,048	70.7	67.0	-3.7	18	16	-2	1.6	1.5	-0.1	2	1	-1	0	0	0
Subtotal	50,045	29,559	28,870	59.1	57.7	-1.4	791	673	-118	2.7	2.3	-0.4	148	124	-24	15	8	-7
Michigan	250,212	88,649	88,486	35.4	35.4	-0.1	984	833	-151	1.1	0.9	-0.2	176	155	-21	17	8	-9

Sources:

Target Community populations calculated from 2006-2008 American Community Survey 3-Year Estimates

Children Tested and EBLL from Michigan Department of Community Health, Data Warehouse

Note: %EBLL is calculated as follows: Total EBLL divided by (Number of Children Tested minus Total Elevated Capillary, not confirmed by venous)

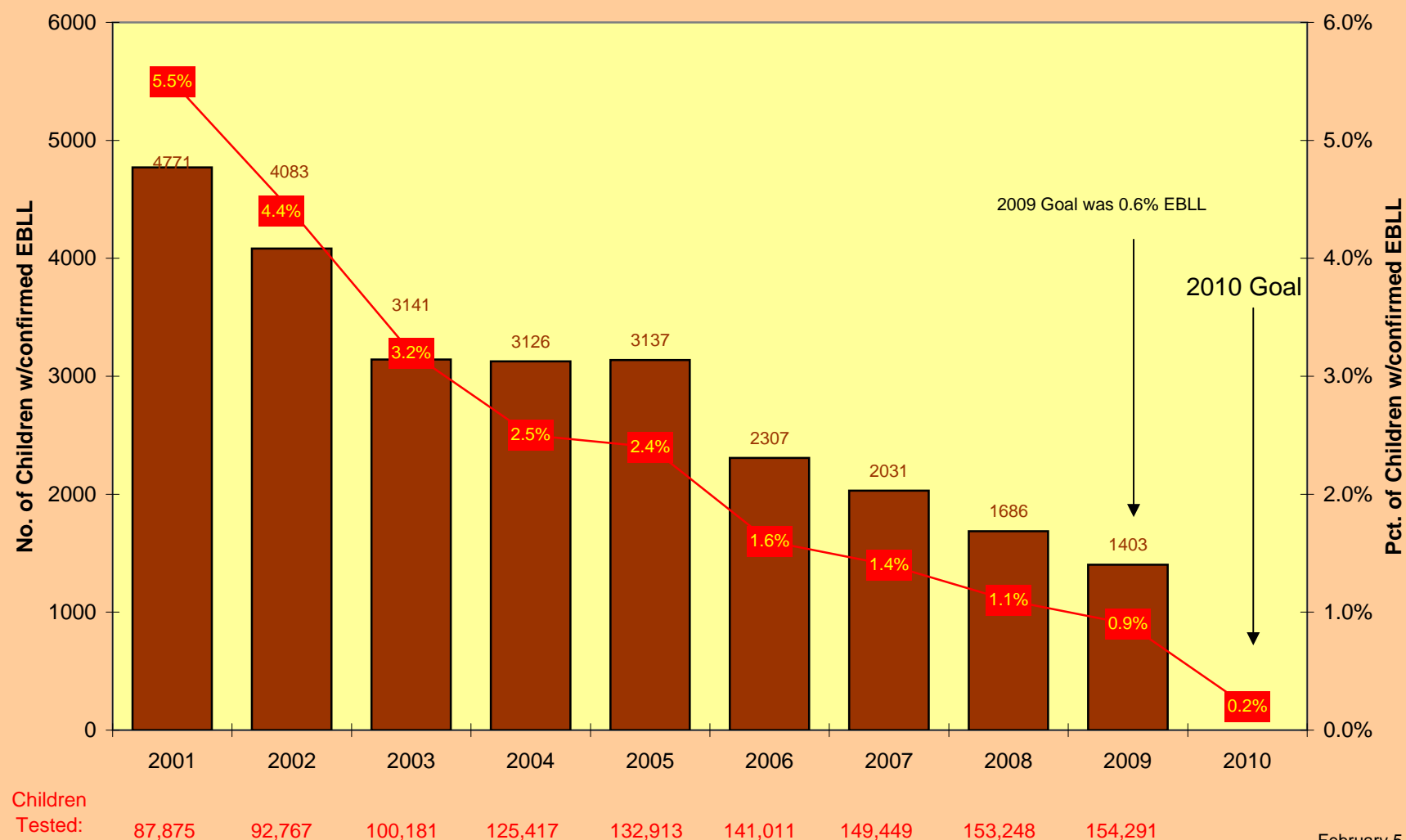
February 5, 2010

2009 LEAD ANNUAL REPORT

Laboratories Analyzing and Reporting Blood Lead Specimens to MDCH CLPPP
Specimens Drawn in Calendar Year 2009

		Number of Specimens Reported	% of Total Reported			Number of Specimens Reported	% of Total Reported
out-of-state private labs:				in-state private labs:			
ACL Industrial Tox Lab	West Allis, WI	28	<0.1	Biotech Clinical Labs	Farmington Hills	301	0.2
ACM Medical Lab	Rochester, NY	1	<0.1	1 Brentwood Pediatrics	Livonia	101	0.1
Advanced Toxicology Network	Memphis, TN	1,083	0.6	1 Capital Area Pediatrics	Lansing	66	<0.1
Assoc Reg & Univ Path	Salt Lake City, UT	13,780	7.0	1 Chass Center Inc	Detroit	50	<0.1
Bellin Hospital Lab	Green Bay, WI	48	<0.1	1 Child & Adolescent Center	Southgate	257	0.1
Labcorp of America	Dublin, OH	2	<0.1	1 Childrens Health Care PLLC	Mt Pleasant	43	<0.1
Labcorp of America	Burlington, NC	3,292	1.7	1 Clinton Preferred Pediatrics	Clinton Twp	194	0.1
Marshfield Lab	Marshfield, WI	12	<0.1	1 Day One Healthcare	Battle Creek	176	0.1
Mayo Medical Lab	Rochester, MN	9,326	4.7	DMC Laboratories	Detroit	31,128	15.8
2 Medtox Labs	St Paul, MN	6,886	3.5	Drug Analysis & Tox Lab	Ann Arbor	3,959	2.0
Pathology Labs	Toledo, OH	89	0.1	1 Eastman and Wozniak MDPC	Birmingham	47	<0.1
Pacific Toxicology	Chatsworth, CA	44	<0.1	1 Family Care Medical Center	Detroit	337	0.2
Promedica Health System	Toledo, OH	826	0.4	1 Forest Hills Pediatrics	Grand Rapids	180	0.1
Quest Diagnostics IL	Wood Dale, IL	191	0.1	1 Gerber Memorial Hlth	Fremont	273	0.1
Quest Diagnostics VA	Chantilly, VA	8	<0.1	1 Grand Traverse Band Family Health	Suttons Bay	17	<0.1
Quest Nichols Institute CA	San Juan Capistrano, CA	2	<0.1	1 Gunderson, Dr Paul	Manistee	203	0.1
South Bend Med Foundation	South Bend, IN	680	0.3	1 Hackley Community Care Center	Muskegon	217	0.1
Specialty Labs	Valencia, CA	639	0.3	1 Hackley Lakeshore Hospital	Shelby	260	0.1
St Vincent Mercy Med	Toledo, OH	60	<0.1	1 Hasan, Dr Kamal	Davison	101	0.1
2 Tamarac Medical	Littleton, CO	129	0.1	1 Health Specialists of Lenawee	Tecumseh	103	0.1
subtotal		37,126	18.8	Henry Ford Hospital Lab	Detroit	6,464	3.3
in-state public labs:				1 Jackson Pediatrics	Jackson	321	0.2
1 Bay County Hlth Dept EPSDT	Bay City	198	0.1	1 Kids Creek Children's Clinic	Traverse City	476	0.2
1 Bay County Hlth Dept Lab	Bay City	336	0.2	Marquette General Hospital	Marquette	1,984	1.0
1 City of Detroit Hlth Dept CLP	Detroit	3,908	2.0	Mt Clemens Reg Med Ctr	Mt Clemens	1,394	0.7
1 Detroit Hlth Dept lab	Detroit	1,318	0.7	1 Northside Pediatrics	Battle Creek	225	0.1
1 Genesee County Hlth Dept	Flint	10	<0.1	1 Pediatric & Adolescent Medicine	Ludington	296	0.2
1 Grand Traverse County Hlth Dept	Traverse City	258	0.1	1 Pediatric Care Corner	West Bloomfield	537	0.3
1 Guidance Ctr HS	Southgate	69	<0.1	1 Pediatric Healthcare	Sterling Hts	55	<0.1
1 Huron County Hlth Dept	Bad Axe	417	0.2	1 Pediatric Healthcare Association IHA	Ypsilanti	403	0.2
1 ICHD-Child Health Center	Lansing	127	0.1	1 Pullukat, Dr Annamma	Pontiac	281	0.1
1 ICHD-Well Child Clinic	Lansing	236	0.1	Quest Diagnostics MI	Auburn Hills	14,256	7.2
1 Ingham County Hlth Dept WIC	Lansing	4,234	2.1	1 Regional Medical Lab	Battle Creek	1,993	1.0
1 Kent County Hlth Dept Lab	Grand Rapids	3,308	1.7	1 Roth & Shah, Drs	Beverly Hills	518	0.3
2 MDCH Lab	Lansing	39,346	20.0	1 Sacred Heart Pediatrics	Grass Lake	44	<0.1
1 Mid Michigan Community Action Agency WIC	Midland	444	0.2	1 Shanavas, Dr T O	Adrian	62	<0.1
1 Mott Children's Hlth Ctr	Flint	239	0.1	1 Southwestern Med CC Lab	Berrien Springs	731	0.4
1 Muskegon County Hlth Dept	Muskegon	581	0.3	Sparrow Regional Lab	Lansing	3,312	1.7
1 Sanilac County Hlth Dept	Sandusky	392	0.2	2 Spectrum Hlth	Grand Rapids	6,509	3.2
1 St Johns Hlth System-Butzel	Detroit	41	0.2	1 Thorrez Medical Practice	Ypsilanti	103	0.1
1 St Johns Hlth System-Hazel Park	Ferndale	10	<0.1	1 Trestlewood Pediatrics	Portage	138	0.1
1 St John Hlth System-Nolan	Detroit	1	<0.1	Warde Medical	Ann Arbor	26,083	13.2
1 Starfish Family Svcs	Inkster	129	0.1	1 Zara, Dr S E	Riverview	39	<0.1
1 Stottlmyer Early C C	Westland	102	0.1	subtotal		104,237	52.8
1 Tuscola County Hlth Dept	Caro	425	0.2	Unidentified Labs	Various	30	<0.1
1 Western Wayne Fam Hlth Ctr	Inkster	16	<0.1	Total		197,571	100.0
1 YWCA Of West Wayne Co HS	Redford	33	<0.1				
subtotal		56,178	28.4				

Childhood Lead Poisoning in Michigan Progress toward Elimination of Elevated Blood Lead Levels (EBLL) among Children less than Six Years of Age



Part II -- Adult Blood Lead Epidemiology Surveillance (ABLES) Program

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*Part II- Adult Blood Lead
Epidemiology Surveillance*

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**Michigan State University
Department of Medicine**

117 West Fee Hall
East Lansing, MI 48824
517.353.1846
Kenneth D. Rosenman, MD
Amy Krizek

**Michigan Department of
Energy, Labor & Economic
Growth**

PO Box 30649
Lansing, MI 48909
517.322.1817
Douglas J. Kalinowski, MS CIH
Director MIOSHA

There are many resources available to help employers, employees, health care professionals and others understand more about lead exposure, prevention and medical management.

Acronyms

BLLs Blood Lead Levels
ABLES Adult Blood Lead Epidemiology Surveillance
MDCH Michigan Department of Community Health
CDC Centers for Disease Control and Prevention
CLPPP Childhood Lead Poisoning Prevention Program
CDC Centers for Disease Control and Prevention
MDELEG Michigan Department of Energy, Labor & Economic Growth
MIOSHA Michigan Occupational Safety & Health Administration
MSU Michigan State University
NAICS North American Industrial Classification System
NIOSH National Institute for Occupational Safety & Health
OSHA Occupational Safety & Health Administration (Federal)
PEL Permissible Exposure Limit
SIC Standard Industrial Classification System (1987)

In 2009, Michigan ABLES received 14,875 blood lead tests for 13,766 individuals \geq 16 years of age and older. There were 430 fewer blood lead tests but 84 more individuals reported in 2009 compared to 2008 .

Summary

This is the twelfth annual report on surveillance of blood lead levels (BLLs) of Michigan citizens. It is based on data collected as a result of regulations promulgated October 11, 1997 by the Michigan Department of Community Health (MDCH) to address the health hazard of exposure to inorganic lead.

MDCH regulations require laboratories to report all blood lead analyses, both among adults and children. The Adult Blood Lead Epidemiology and Surveillance (ABLES) Program was founded nationally in 1992 and tracks laboratory reports of elevated BLLs in U.S. adults.

This report summarizes BLLs of Michigan adults, defined as sixteen years and older. In 2009, Michigan

Summary, continued...

ABLES received 14,875 blood lead tests for 13,766 individuals ≥ 16 years of age. Six hundred and eight (4.4%) individuals had BLLs ≥ 10 $\mu\text{g}/\text{dL}$; 103 of those 608 had lead levels ≥ 25 $\mu\text{g}/\text{dL}$ and three of the 103 had BLLs ≥ 50 $\mu\text{g}/\text{dL}$.

There were 430 fewer blood lead tests but 84 more individuals reported in 2009 compared to 2008 (Figure 1). The number and the percent of individuals with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ decreased from 688 (5.0%) in 2008 to 609 (4.4%) in 2009. The number and percent of individuals with BLLs ≥ 25 $\mu\text{g}/\text{dL}$ dropped from 129 (0.94%) in 2008

to 103 (0.75%) in 2009 as did the number of individuals with BLLs ≥ 50 $\mu\text{g}/\text{dL}$, with 7 (0.1%) in 2008 and 3 (0.02%) in 2009. For eight consecutive years, from 1999 to 2006, the BLLs ≥ 25 $\mu\text{g}/\text{dL}$ showed a decrease from the previous year (Figure 2) and 2009 continues this trend. In 2007 and 2008 there was a slight increase in BLLs ≥ 25 $\mu\text{g}/\text{dL}$. These trends occurred among both occupational and non-occupational exposures (Figure 3).

The adults with BLLs ≥ 10 $\mu\text{g}/\text{dL}$ were likely to be men (93.7%) and white (89.4%). Their mean age was 44.6. They were most likely to live in Wayne (18.0%), Mont-

In Michigan the overall incidence rate of BLLs ≥ 10 $\mu\text{g}/\text{dL}$ was 14 times higher for men than for women.

calm (9.9%) or Oakland (8.0%) counties. Occupational exposure remains the predominant source of lead exposure (81.3%). In Michigan, lead exposure resulting in BLLs ≥ 10 $\mu\text{g}/\text{dL}$ typically occurs where individuals: perform abrasive blasting to remove lead paint on outdoor metal structures such as bridges, overpasses or water towers; cast brass or bronze fixtures; fabricate metal products; or

Occupational exposure remains the predominant source of lead exposure in Michigan adults. Lead exposure resulting in blood lead levels ≥ 10 $\mu\text{g}/\text{dL}$ typically occur where individuals perform abrasive blasting to remove lead paint on outdoor metal structures, cast brass or bronze fixtures; fabricate metal products; or are exposed to lead fumes or dust from firing guns or retrieving spent bullets at firing ranges.

Figure 1 Number of Adults Reported with Tests for Blood Lead, Michigan 1998-2009

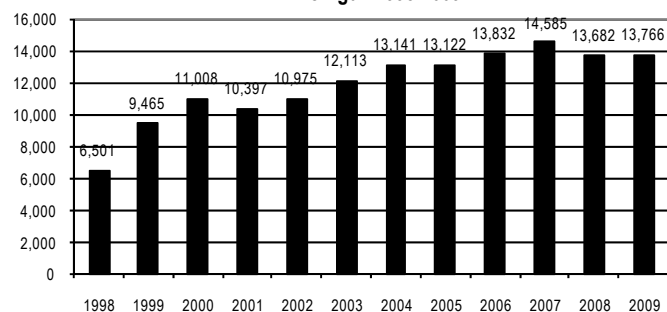


Figure 2 Number of Adult BLLs ≥ 10 $\mu\text{g}/\text{dL}$ and ≥ 25 $\mu\text{g}/\text{dL}$, Michigan 1998 - 2009

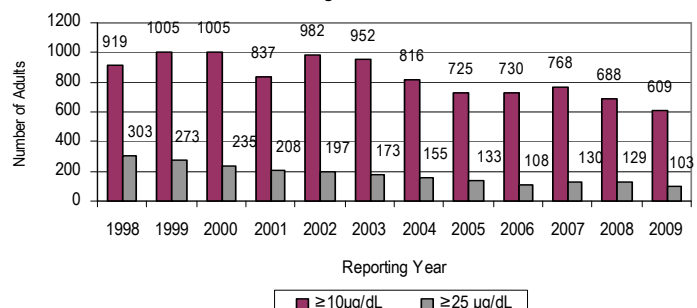
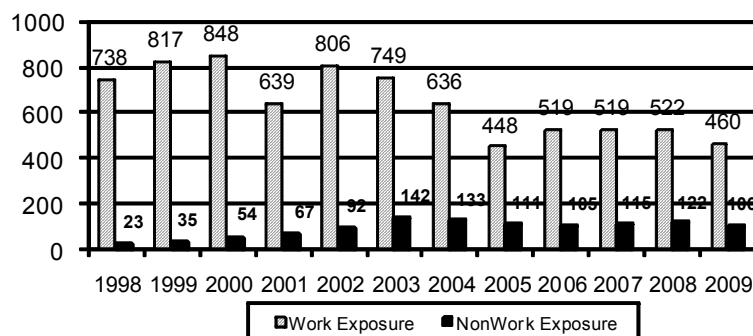


Figure 3 Exposure Type of Adult BLLs = 10 µg/dL, Michigan 1998 - 2009



are exposed to lead fumes or dust from firing guns or retrieving spent bullets at firing ranges.

Among Michigan adults with BLLs ≥ 10 µg/dL, lead exposure from firing ranges, as well as reloading and casting activities associated with firearms, is the most common cause of non-occupational exposure (72.6%) and 13.6% of all reported known exposure, both occupational and non-occupational. Firing ranges are a source of lead exposure where individuals qualify for both work and recreational marksmanship standards in commercial as well as private recreation ranges. Private gun clubs and ranges, run by members and volunteers, are not under the jurisdiction of State regulations as these regulations only cover businesses with paid employees. Outreach effort to educate this group of lead-exposed hobbyists remains a challenge.

The twelfth year of operation of an adult blood lead surveillance system in Michigan proved suc-

cessful in continuing to identify individuals with elevated BLLs and sources of exposures that could be remediated to reduce lead exposure. Outreach and intervention activities this past year included written contact with 276 individuals, follow-up interviews with 191 lead exposed individuals and distributing resources on diagnosis and management of lead exposure to 39 health care providers who tested patients with elevated blood lead levels. A “how to” guide for home maintenance and renovation from the U.S. Department of Housing and Urban Development was provided to individuals, when renovation was the source of exposure to lead. Three educational brochures continued to be distributed this past year: one on working safely with lead, the second on controlling lead exposure in firing ranges and a third brochure for reducing lead exposure when reloading firearms or casting lead as a hobby. Copies of these brochures and informational literature are at www.oem.msu.edu/Ables.asp.

In addition, collaboration with MDCH provided a brochure for

women of childbearing age with information on risk of take home lead exposure for occupationally-exposed adults identified with children under the age of six.

In 2009, MIOSHA inspections were conducted and reports completed at fourteen companies referred by ABLES due to elevated blood lead laboratory reports with ten (71%) resulting in lead related citations. As part of our effort to evaluate compliance with the OSHA regulation requiring blood lead testing of employees of companies using lead, eighteen facilities with industry codes indicating brass/bronze activities and not reporting BLLs were referred to MIOSHA for inspection. Details of completed inspections are included in this report.

Among Michigan adults with BLLs ≥ 10 µg/dL, lead exposure from firing ranges, as well as reloading and casting activities associated with firearms, is the most common cause of non-occupational exposure (72.6%) and 13.6% of all reported known exposure, both occupational and non-occupational.

Background

This is the twelfth annual report on surveillance of BLLs in Michigan residents. BLLs of Michigan residents, including children, have been monitored by the state since 1992. From 1992 to 1995, laboratories performing analyses of blood lead levels, primarily of children, voluntarily submitted reports to the State. The Michigan Department of Community Health (MDCH) promulgated regulations effective October 11, 1997, that require laboratories to submit reports of both children and adults to the MDCH for any blood testing for lead. Coincident with this in 1997, the Michigan Occupational Safety and Health Administration (MIOSHA) in the Michigan Department of Energy, Labor and Economic Growth (MDELEG) received federal funding from the Centers for Disease Control and Prevention (CDC), to monitor adult BLLs as part of the ABLES program. Beginning in 2006, the funds were provided directly to Michigan State University (MSU). Currently 40 states have established lead registries through the ABLES program for surveillance of adult

2009 is the twelfth year with complete laboratory reporting in Michigan since the lead regulations became effective on October 11, 1997.

lead absorption, primarily based on reports of elevated BLLs from clinical laboratories. The most recent report of adult blood lead surveillance from 38 states that was published in the *Morbidity and Mortality Weekly Report*, April 17, 2009 is in Appendix A.

THE MICHIGAN ADULT BLOOD LEAD REGISTRY

Reporting Regulations and Mechanism

Since October 11, 1997, laboratories performing blood lead analyses of Michigan residents are required to report the results of all blood lead tests to the MDCH (R325.9081-9087 – Appendix B). Prior to these regulations, few reports of elevated lead levels among adults were received.

The laboratories are required to report blood sample analysis results, patient demographics, and employer information on a standard MDCH Lead Reporting Form (Appendix B). The health care provider ordering the blood lead analysis is responsible for completing the patient information, the physician/provider information and the specimen collection information. Upon receipt of the blood sample for lead analysis, the clinical laboratory is responsible for completion of the laboratory information. All clinical laboratories conducting business in Michigan that analyze blood samples for lead must re-

All clinical laboratories conducting business in Michigan that analyze blood samples for lead must report all Michigan residents' blood lead results to the Michigan Department of Community Health, Childhood Lead Poisoning Prevention Program (MDCH/CLPPP) within five working days.

port all adult and child blood lead results to the MDCH, Childhood Lead Poisoning Prevention Program (CLPPP) within five working days.

All blood lead results on individuals 16 years or older are forwarded to MSU for a potential interview and then to the Michigan Occupational Safety and Health Administration (MIOSHA) in the MDELEG for a potential work-place follow-up. MSU is designated a bona fide agent of the State to conduct this activity. A summary of blood lead results from 2009 on children less than six years old is published in the first section of this report.

Laboratories

Employers providing blood lead analysis on their employees, as required by MIOSHA must use a laboratory which meets OSHA proficiency testing for blood lead analysis to be in compliance with the lead standard. Figure 4 details

the nine OSHA approved laboratories in Michigan.

Data Management

When BLL reports are received at the MDCH, they are reviewed for completeness. For those reports where information is missing, copies are returned to the physician/provider to complete. Lead Registry staff code the information on the lead reporting form using a standard coding scheme and enter this information into a computerized database. Each record entered into the database is visually checked for any data entry errors, duplicate entries, missing data, and illogical data. These quality control checks are performed monthly.

Case Follow-Up

Adults whose BLL is 25 µg/dL or

greater are contacted for an interview. Interviews are conducted of individuals with BLLs ranging from 10 to 24 µg/dL if the source of their lead exposure cannot be identified from the reporting form. A letter is sent to individuals explaining Michigan's lead surveillance program and inviting them to answer a 15-20 minute telephone questionnaire about their exposures to lead and any symptoms they may be experiencing. The questionnaire collects patient demographic data, work exposure and history information, symptoms related to lead exposure, information on potential lead-using hobbies and non-work related activities, and the presence of young children in the household to assess possible take-home lead exposures among these children. Trained interviewers administer the questionnaire.

MICHIGAN OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REQUIREMENTS

Medical Monitoring and Medical Removal

The MIOSHA requirements for medical surveillance (i.e., biological monitoring) and medical removal are identical to those of Federal OSHA. The requirements for medical removal differ for general industry and construction. For general industry, an individual must have two consecutive BLLs above 60 µg/dL or an average of three BLLs greater than 50 µg/dL before being removed (i.e., taken pursuant to the standard or the average of all blood tests conducted over the previous six months, whichever is longer). For construction, an individual needs to have only two consecutive blood lead level measurements taken pursuant to the standard above 50 µg/dL. However, an employee shall not be required to be removed if the last blood-sampling test indicates a blood lead level ≤ 40 µg/dL. If monitoring shows lead levels above 30 µg/m³ of air (MIOSHA's action limit) but below 50 µg/m³ of air (PEL), an employer also must repeat monitoring every six months, repeat training annually, provide medical surveillance, including blood sampling for lead and zinc protoporphyrin, medical exams and consultation, provide medical removal protection for

Figure 4 Michigan Laboratories meeting OSHA proficiency testing for blood lead analysis

MICHIGAN BLOOD LEAD LABORATORIES*

<i>Laboratory Name</i>	<i>City</i>
Detroit Health Department	Detroit
DMC University Laboratories	Detroit
Marquette General Health Systems	Marquette
Michigan Department of Community Health	Lansing
Mt Clemens General Hospital	Mt. Clemens
Quest Diagnostics	Auburn Hills
Regional Medical Laboratories	Battle Creek
Sparrow Regional Laboratories	Lansing
Warde Medical Laboratories	Ann Arbor

*Laboratories which meet OSHA's accuracy requirements in blood lead proficiency testing as of May 13, 2010. For a current listing of OSHA approved blood lead laboratories in the United States, visit the OSHA web site at <http://www.osha.gov/SLTC/bloodlead/program.html>

Background, continued . . .

employees with excessively elevated blood lead levels. See Appendix C for a more detailed description of the requirements. It should be noted that in the absence of a specific exposure to lead, 95% of BLLs in the adult general population in the U.S. are below 4.8 µg/dL for men and below 3.5 µg/dL for women (1).

Dissemination of Surveillance Data

Biannual data summaries, without personal identifiers, are forwarded to the Program's funding agency, the National Institute for Occupational Safety and Health (NIOSH). NIOSH compiles reports from all states that require reporting of

BLLs and publishes them in the Morbidity and Mortality Weekly Report (MMWR) (2). See Appendix A for the most recent publication of ABLES surveillance results for the period 2005 to 2007.

Results

This is the twelfth year with complete laboratory reporting in Michigan since the lead regulations became effective on October 11, 1997. A summary of all the reports of adult BLLs received in 2009 as well as more detailed information from all interviews completed since 1997 of those adults with BLL $\geq 25 \mu\text{g/dL}$ and greater are included in this report. Also included are the 2009 Michigan Occupational Safety and Health Ad-

ministration (MIOSHA) inspections at the work sites where these individuals were exposed to lead.

This report also provides information on individuals interviewed since 1997 who had BLLs ranging from 10-24 $\mu\text{g}/\text{dL}$ where the source of lead exposure was not identified in the original report submitted from the laboratories. Given the medical evidence of health effects at levels as low as 5 $\mu\text{g}/\text{dL}$ (3-7), analysis of available information on BLL ranging from 5-9 $\mu\text{g}/\text{dL}$ is also discussed in this report.

Table 1 Distribution of Highest Blood Lead Levels (BLL) Among Adults and Source of Exposure in Michigan: 2009

	Work BLLs		Non-Work BLLs		Source Not Yet Identified		All BLLs	
BLLs (ug/dL)	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<5	143	a	11	a	12148	a	12,302	89.4
5-9	164	a	18	a	674	a	856	6.2
10-24	389	50.7	74	54.8	42	0.3	505	3.7
25-29	35	4.6	18	13.3	0	0.0	53	0.4
30-39	21	2.7	10	7.4	0	0.0	31	0.2
40-49	12	1.6	4	3.0	0	0.0	16	0.1
50-59	2	0.3	0	0.0	0	0.0	2	0.0
≥ 60	1	0.1	0	0.0	0	0.0	1	0.0
TOTAL	767	85.0^e	135	14.9^e	12,864		13,766^b	100.0
TOTAL≥10ug/dL	460	81.3^c	106	18.7^c	42		608	
TOTAL≥25ug/dL	71	68.9^d	32	31.1^d	0		103	

^a No follow-up is conducted of individuals with blood leads < 10 ug/dL, but often information is known

^b In 2009, 14,875 BLL reports were received for 13,766 individuals. ^d percent of known exposures >25 ug/dL

^c percent of known exposures>10 ug/dL ^e percent of total known exposures

Blood Lead Levels Reported in 2009

Number of Reports and Individuals

Between January 1 and December 31, 2009, the State of Michigan received 14,875 blood lead test reports for individuals 16 years of age or older. Because an individual may be tested more than once each year, the 14,875 reports received were for 13,766 individuals (Table 1). Up to 2007, the overall trend for the number of individuals tested each year has shown a gradual increase (Figure 1, pg. 2). The initial steeper increase in 1999 and 2000 probably was secondary to better compliance by the laboratories to the 1997 reporting regulation. The increase in more recent years is assumed secondary to increased testing while the drop in numbers of tests noted in 2008 and 2009 is likely a reflection of the current Michigan economic downturn rather than reduced testing compliance.

The following descriptive statistics are based on adults (≥ 16 years) tested in 2009. Where more than one BLL result was reported in 2009, statistics are based on the highest BLL reported for each individual.

The drop in numbers of BLL test reports noted in 2009 is likely a reflection of the current Michigan economic downturn rather than reduced testing compliance.

Distribution of Blood Lead Levels

In 2009, 608 (4.4%) of the 13,766 adults reported had BLLs ≥ 10 $\mu\text{g}/\text{dL}$; 103 of those 608 (16.9%) had BLLs ≥ 25 $\mu\text{g}/\text{dL}$ and 3 of 103 (2.9%) had BLLs ≥ 50 $\mu\text{g}/\text{dL}$ (Table 1).

A total of 12,302 (89.4%) of adults reported in 2009 had BLL less than 5 $\mu\text{g}/\text{dL}$, and 856 (6.2%) were from individuals whose blood lead was 5 – 9 $\mu\text{g}/\text{dL}$. Individuals with BLL 5 – 9 $\mu\text{g}/\text{dL}$ are not routinely contacted, and when the source of lead exposure was identified, 164 of 856 (19.1%) individuals were identified as occupationally exposed. One hundred and fifteen (70.1%) of these 164 had been tested in previous years and 59 (51%) showed a marked decrease in their BLL.

Among the 505 individuals whose blood lead was 10 – 24 $\mu\text{g}/\text{dL}$, 389 (77.0%) individuals had their source of lead exposure identified as occupational as compared to the 103 individuals with BLLs ≥ 25 $\mu\text{g}/\text{dL}$ where 71 (68.9%) individuals had their source of lead exposure identified as occupational.

There was a marked decline in the overall number of individuals with elevated blood lead from occupational exposure from 2000 to 2005, with the number remaining unchanged from 2006 to 2009 (Figure 5). For non-work exposures, elevated blood lead showed a decline from 2003 to 2006, a slight increase in 2007 and 2008 and then in 2009 a return to the 2006 number. (Figure 6).

Figure 5 Number of Adults with Elevated BLLs due to WORK Exposure, Michigan 1998-2009

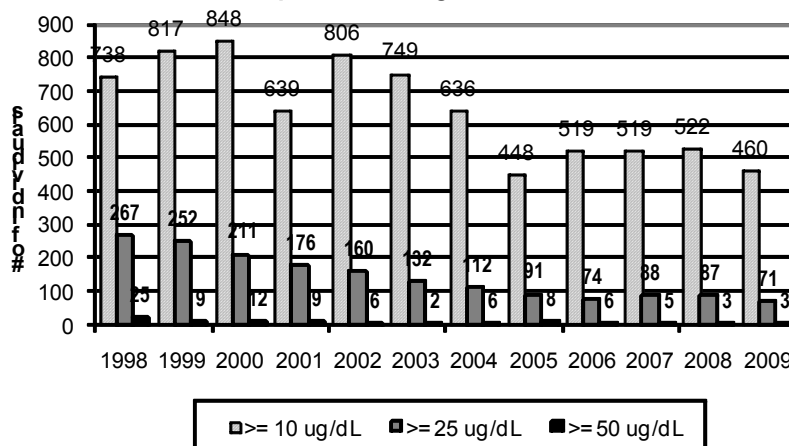
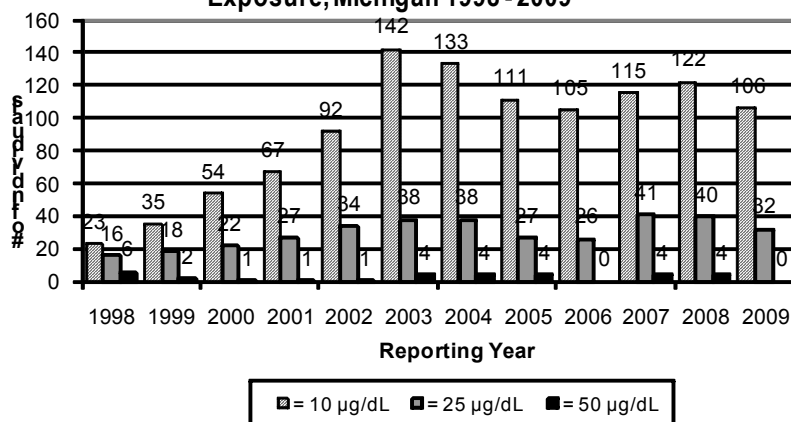


Figure 6 Adults with Elevated BLLs from NON-work Exposure, Michigan 1998 - 2009

Gender and Age Distribution

All Blood Lead Levels

Fifty-seven percent of the adults reported to the Registry were male, and 43 percent were females (Table 2). The mean age was 46 and average age 44.2. The age distribution is shown in Table 3.

BLLs ≥ 10 µg/dL

For the 608 adults reported to the Registry with BLLs ≥ 10 µg/dL, 570 (93.7%) were men and 38 (6.3%) were women. The mean age was 46.

RACE DISTRIBUTION

All Blood Lead Levels

Although laboratories are required to report the patients' race, this information is frequently not provided. Race was missing for 8,706 (63.2%) of the 13,766 adults reported. Where race was known, 4,265 (84.3%) were reported as Caucasian, 649 (12.8%) were reported as African American, 67 (1.3%) were reported as Asian/Pacific Islander, 51 (1.0%) were reported as Native American, and 28 (.6%) were reported as Multiracial/Other (Table 4).

BLLs ≥ 10 µg/dL

For adults with BLLs greater than or equal to 10 µg/dL where race was indicated, 395 (89.4%) were reported as Caucasian, 22 (5.0%) were re-

Table 2 Distribution of Gender Among Adults Tested for BLLs in Michigan: 2009

Gender	All Blood Lead Level Tests		Blood Lead Levels ≥ 10 µg/dL		Blood Lead Levels ≥ 25 µg/dL	
	Number	Percent	Number	Per-cent	Number	Per-cent
Male	7,806	56.8	570	93.7	101	98.1
Female	5,939	43.2	38	6.3	2	1.9
Total	13,745 *	100.0	608	100.0	103	100

*Gender was unknown for 21 additional individuals.

Table 3 Distribution of Age Among Adults Tested for Blood Lead in Michigan: 2009

Age Range	All Blood Lead Level Tests		Blood Lead Levels ≥ 10 µg/dL	
	Number	Percent	Number	Percent
16-19	1,193	8.7	12	2.0
20-29	2,271	16.5	84	13.8
30-39	2,296	16.7	119	19.6
40-49	2,665	19.4	142	23.4
50-59	2,605	18.9	160	26.3
60-69	1,486	10.8	77	12.7
70-79	808	5.9	13	2.1
80-89	414	3.0	1	0.2
90-99	28	0.2	0	0.0
100+	0	0.0	0	0.0
TOTAL	13,766	100.0	608	100.0

County of residence was determined for 11,395 of the 13,766 adults reported to the Registry. They lived in 82 of Michigan's 83 counties.

Table 4 Distribution of Race Among Adults Tested for Blood Lead in Michigan: 2009

Race	Blood Lead Levels			
	All Results		Results ≥ 10 ug/dL	
	Number	Percent	Number	Percent
Caucasian	4,265	84.3	395	89.4
African American	649	12.8	22	5.0
Native American	51	1.0	4	0.9
Asian/Pacific Islander	67	1.3	6	1.4
Multiracial/Other	28	0.6	15	3.4
TOTAL	5,060 *	100.0	442 **	100.0

*Race was unknown for 8,706 additional individuals.

**Race was unknown for 166 additional individuals.

ported as African American, 15 (3.4%) were reported as Multiracial/Other, 4 (.9%) were reported as Native American, and 6 (1.4%) were reported as Asian/Pacific Islander, (Table 4).

GEOGRAPHIC DISTRIBUTION

County of residence was determined for 11,359 of the 13,766 adults reported to the Registry. They lived in 82 of Michigan's 83 counties. The largest number of adults reported in 2009 lived in Wayne County (2,034, 17.9%), followed by Kent County (1,332, 11.7%) and Oakland County (881, 7.7%). The county was unknown for 2,407 adults. (Figure 7 and Table 5).

(Continued on page 44)

Figure 7 Distribution of Adults Tested for Blood Lead in Michigan by County of Residence, 2009

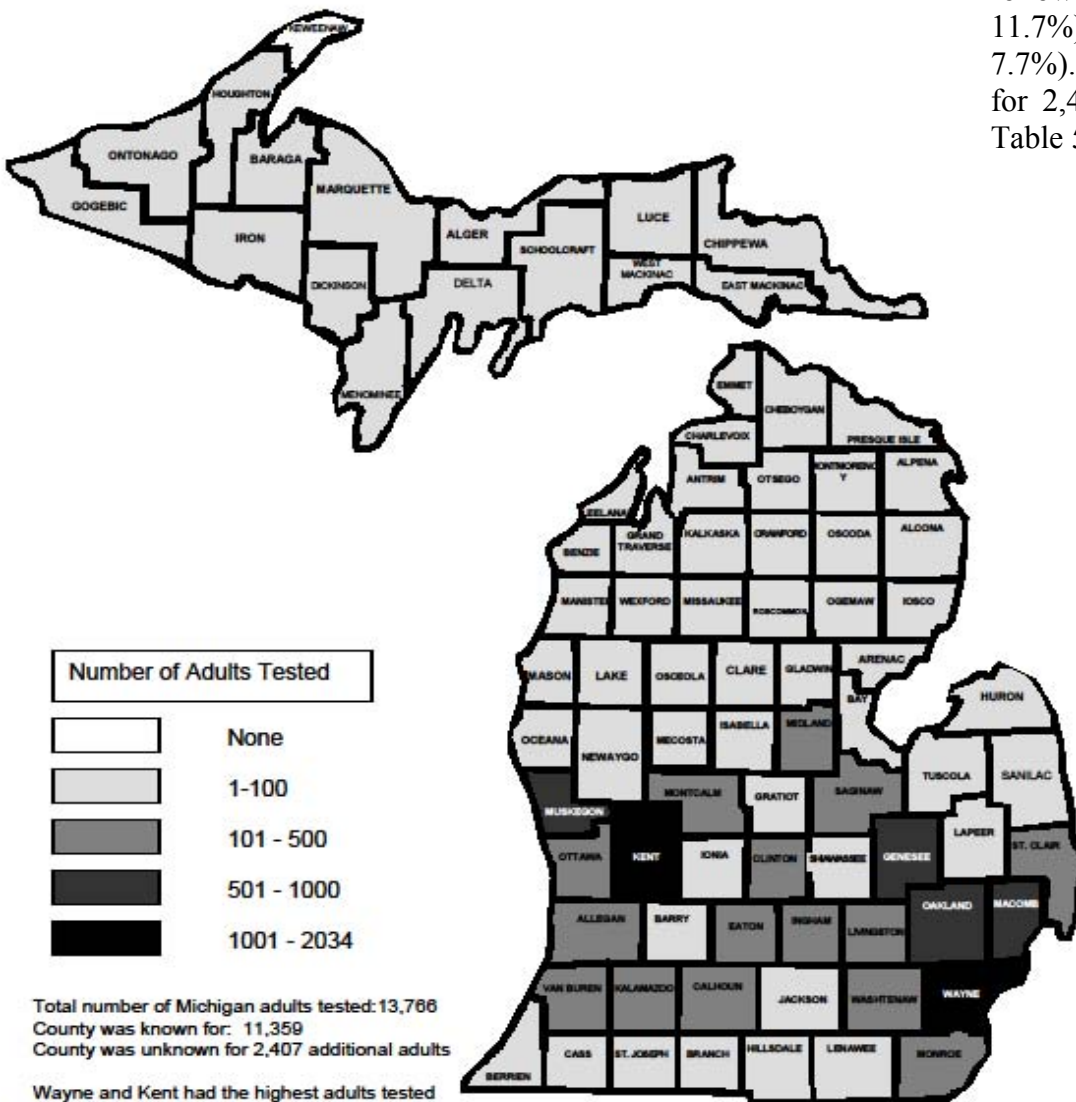


Table 5. Number and Percent of Adults With BLLs \geq 10 ug/dL and 25 ug/dL by County of Residence Among All Adults Tested for BLL in Michigan: 2009

County	All BLLs		BLLs \geq 10 ug/dL			BLLs \geq 25 ug/dL		
	Number	Percent	Number	Percent of all BLLs in State	Percent of all BLLs in County	Number	Percent of all BLLs in State	Percent of all BLLs in County
Alcona	9	0.08	1	0.18	11.11	0	0.00	0.00
Alger	13	0.11	0	0.00	0.00	0	0.00	0.00
Allegan	131	1.15	4	0.71	3.05	0	0.00	0.00
Alpena	25	0.22	0	0.00	0.00	0	0.00	0.00
Antrim	22	0.19	1	0.18	4.55	0	0.00	0.00
Arenac	14	0.12	2	0.35	14.29	0	0.00	0.00
Baraga	11	0.10	0	0.00	0.00	0	0.00	0.00
Barry	64	0.56	0	0.00	0.00	0	0.00	0.00
Bay	73	0.64	6	1.06	8.22	0	0.00	0.00
Benzie	4	0.04	0	0.00	0.00	0	0.00	0.00
Berrien	80	0.70	8	1.42	10.00	4	3.92	5.00
Branch	28	0.25	4	0.71	14.29	1	0.98	3.57
Calhoun	169	1.49	8	1.42	4.73	3	2.94	1.78
Cass	29	0.26	1	0.18	3.45	1	0.98	3.45
Charlevoix	18	0.16	1	0.18	5.56	0	0.00	0.00
Cheboygan	27	0.24	0	0.00	0.00	0	0.00	0.00
Chippewa	74	0.65	1	0.18	1.35	0	0.00	0.00
Clare	39	0.34	2	0.35	5.13	0	0.00	0.00
Clinton	101	0.89	2	0.35	1.98	1	0.98	0.99
Crawford	55	0.48	0	0.00	0.00	0	0.00	0.00
Delta	42	0.37	2	0.35	4.76	0	0.00	0.00
Dickinson	21	0.18	2	0.35	9.52	1	0.98	4.76
Eaton	120	1.06	6	1.06	5.00	0	0.00	0.00
Emmet	30	0.26	0	0.00	0.00	0	0.00	0.00
Genesee	560	4.93	28	4.96	5.00	3	2.94	0.54
Gladwin	24	0.21	0	0.00	0.00	0	0.00	0.00
Gogebic	7	0.06	0	0.00	0.00	0	0.00	0.00
Grand Traverse	74	0.65	5	0.88	6.76	1	0.98	1.35
Gratiot	89	0.78	0	0.00	0.00	0	0.00	0.00
Hillsdale	36	0.32	2	0.35	5.56	0	0.00	0.00
Houghton	26	0.23	2	0.35	7.69	0	0.00	0.00
Huron	22	0.19	5	0.88	22.73	0	0.00	0.00
Ingham	340	2.99	12	2.12	3.53	1	0.98	0.29
Ionia	91	0.80	24	4.25	26.37	0	0.00	0.00
Iosco	12	0.11	0	0.00	0.00	0	0.00	0.00
Iron	9	0.08	0	0.00	0.00	0	0.00	0.00
Isabella	69	0.61	1	0.18	1.45	0	0.00	0.00
Jackson	84	0.74	6	1.06	7.14	2	1.96	2.38
Kalamazoo	349	3.07	12	2.12	3.44	5	4.90	1.43
Kalkaska	20	0.18	0	0.00	0.00	0	0.00	0.00
Kent	1,332	11.73	34	6.02	2.55	6	5.88	0.45
Keweenaw	0	0.00	0	0.00	0.00	0	0.00	0.00
Lake	11	0.10	1	0.18	9.09	0	0.00	0.00
Lapeer	84	0.74	3	0.53	3.57	0	0.00	0.00

**Table 5 Number and Percent of Adults With BLLs \geq 10 ug/dL and 25 ug/dL by County of Residence
Among All Adults Tested for BLL in Michigan: 2009**

County	<u>All BLLs</u>		<u>BLLs >10 ug/dL</u>			<u>BLLs >25 ug/dL</u>		
	Number	Percent	Number	Percent of all BLLs in State	Percent of all BLLs in County	Number	Percent of all BLLs in State	Percent of all BLLs in County
Leelanau	13	0.11	0	0.00	0.00	0	0.00	0.00
Lenawee	87	0.77	1	0.18	1.15	0	0.00	0.00
Livingston	287	2.53	13	2.30	4.53	3	2.94	1.05
Luce	6	0.05	0	0.00	0.00	0	0.00	0.00
Mackinac	48	0.42	2	0.35	4.17	2	1.96	4.17
Macomb	787	6.93	39	6.90	4.96	12	11.76	1.52
Manistee	37	0.33	0	0.00	0.00	0	0.00	0.00
Marquette	45	0.40	2	0.35	4.44	0	0.00	0.00
Mason	22	0.19	2	0.35	9.09	0	0.00	0.00
Mecosta	28	0.25	1	0.18	3.57	0	0.00	0.00
Menominee	16	0.14	0	0.00	0.00	0	0.00	0.00
Midland	108	0.95	2	0.35	1.85	1	0.98	0.93
Missaukee	13	0.11	1	0.18	7.69	0	0.00	0.00
Monroe	283	2.49	12	2.12	4.24	2	1.96	0.71
Montcalm	146	1.29	56	9.91	38.36	11	10.78	7.53
Montmorency	8	0.07	2	0.35	25.00	1	0.98	12.50
Muskegon	587	5.17	19	3.36	3.24	1	0.98	0.17
Newaygo	34	0.30	1	0.18	2.94	1	0.98	2.94
Oakland	881	7.76	45	7.96	5.11	12	11.76	1.36
Oceana	29	0.26	1	0.18	3.45	0	0.00	0.00
Ogemaw	11	0.10	0	0.00	0.00	0	0.00	0.00
Ontonagon	8	0.07	1	0.18	12.50	0	0.00	0.00
Osceola	23	0.20	1	0.18	4.35	0	0.00	0.00
Oscoda	6	0.05	0	0.00	0.00	0	0.00	0.00
Otsego	26	0.23	0	0.00	0.00	0	0.00	0.00
Ottawa	155	1.36	5	0.88	3.23	0	0.00	0.00
Presque Isle	7	0.06	0	0.00	0.00	0	0.00	0.00
Roscommon	67	0.59	2	0.35	2.99	0	0.00	0.00
Saginaw	150	1.32	5	0.88	3.33	0	0.00	0.00
Saint Clair	248	2.18	38	6.73	15.32	1	0.98	0.40
Saint Joseph	52	0.46	3	0.53	5.77	1	0.98	1.92
Sanilac	45	0.40	7	1.24	15.56	1	0.98	2.22
Schoolcraft	5	0.04	0	0.00	0.00	0	0.00	0.00
Shiawassee	84	0.74	4	0.71	4.76	1	0.98	1.19
Tuscola	44	0.39	4	0.71	9.09	1	0.98	2.27
Van Buren	120	1.06	4	0.71	3.33	0	0.00	0.00
Washtenaw	346	3.05	4	0.71	1.16	1	0.98	0.29
Wayne	2,034	17.91	102	18.05	5.01	21	20.59	1.03
Wexford	25	0.22	0	0.00	0.00	0	0.00	0.00
TOTAL	11,359	* 100.00	565	** 100.00	4.97	102	*** 100.00	0.90

*County was unknown for 2,407 additional adults .

**County was unknown for 43 additional adults.

***One additional adult lived out of state.

Figure 8 and Table 5 show the county of residence of the 565 adults with BLLs ≥ 10 $\mu\text{g/dL}$ where county of residence could be determined. The largest number of adults reported with a BLL ≥ 10 $\mu\text{g/dL}$ were from Wayne County (102, 18.1%), followed by Montcalm County (56, 9.9%) and Oakland County (45,

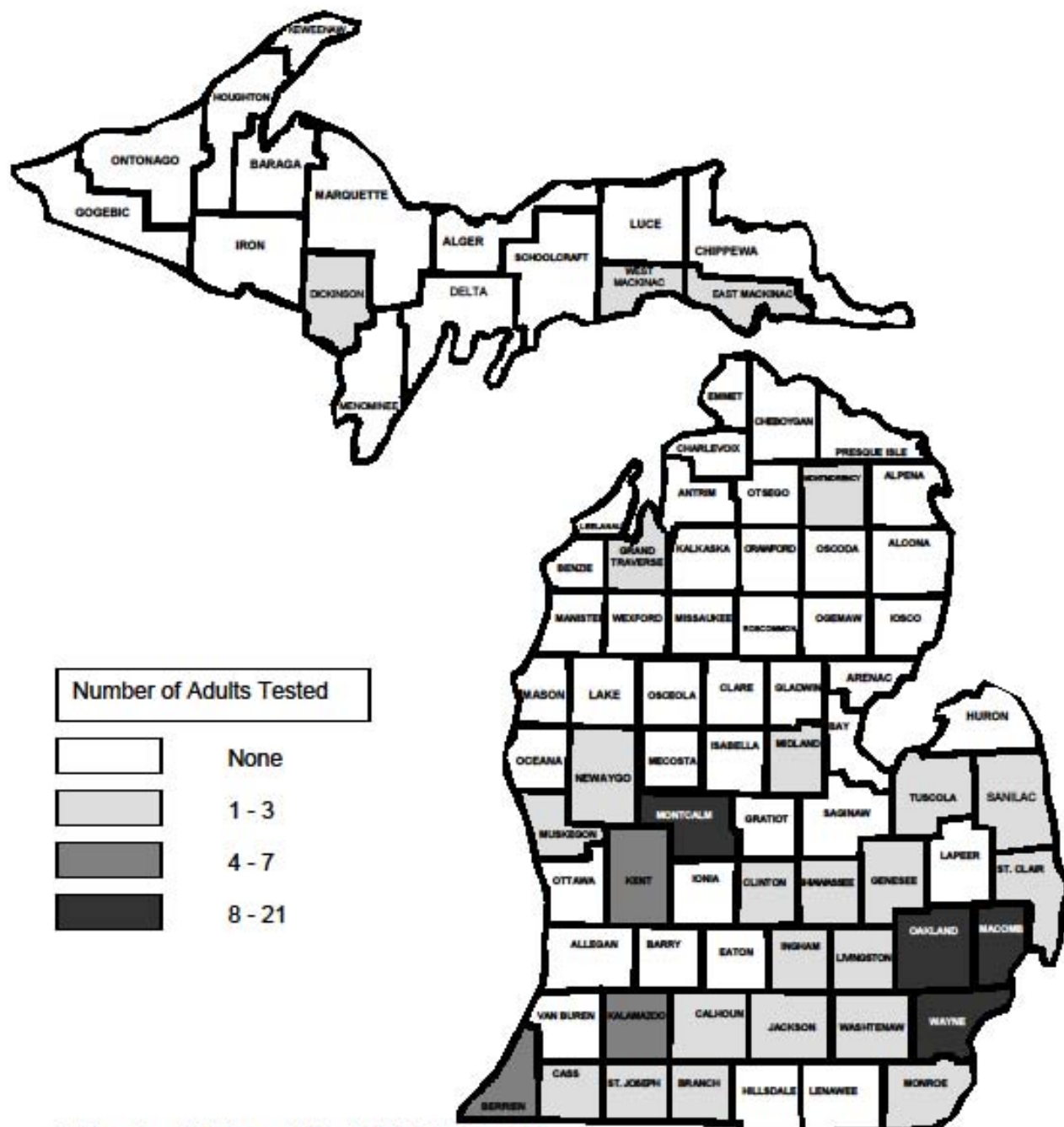
Figure 9 and Table 5 show the county of residence for the 102 adults with BLLs ≥ 25 $\mu\text{g/dL}$ where county of residence could be determined. The largest number of adults reported with a BLL ≥ 25 $\mu\text{g/dL}$ were from Wayne County (21, 20.6%), followed by Macomb

Number of Adults Tested

(White)	0
(Light Gray)	1 - 10
(Medium Gray)	11 - 40
(Dark Gray)	41 - 102

Part II: Adult Blood Lead Epidemiology Surveillance

Figure 9 **Geographic Distribution of Adults Tested with BLLs ≥ 25 $\mu\text{g/dL}$ In Michigan by County of Residence, 2009**



Total number of Michigan adults with BLL ≥ 25 $\mu\text{g/dL}$: 103

Michigan adults with BLL ≥ 10 $\mu\text{g/dL}$ where county was known: 102 (one additional adult lived out of state)

Wayne, Oakland and Macomb had the largest number with 21, 12 and 12 respectively

County (12, 11.8%). The county was unknown for one adult with BLLs ≥ 25 $\mu\text{g/dL}$.

Table 5 shows the percentage of adults, within each county, tested for blood lead with BLLs ≥ 10 $\mu\text{g/dL}$ and BLLs ≥ 25 $\mu\text{g/dL}$. Montcalm (56, 38.4%), Montmorency (2, 25.0%), Sanilac (7, 15.6%) and St. Clair (38, 15.3%) counties had the highest percentages of tested adults with BLL ≥ 10 $\mu\text{g/dL}$ within their respective counties, and Montmorency (1, 12.5%), and Montcalm (11, 7.5%) were the counties that had the highest percentage of test results of BLL ≥ 25 $\mu\text{g/dL}$.

GENDER DISTRIBUTION

Figure 10 and Table 6 show the incidence rates of BLL of 10 µg/dL and above, by county, for women. There were 36 women reported in 2009 with a BLL \geq 10 µg/dL, where county was known. Houghton (15/100,000), Mason (8/100,000), Sanilac (6/100,000) and Branch (6/100,000) had the four highest incidence rates.

Twelve women (44.4%) with elevated blood lead had their exposure from work: three from electric supply, three from public safety, two from stained glass, one from construction, one from metal forging and stampings, one

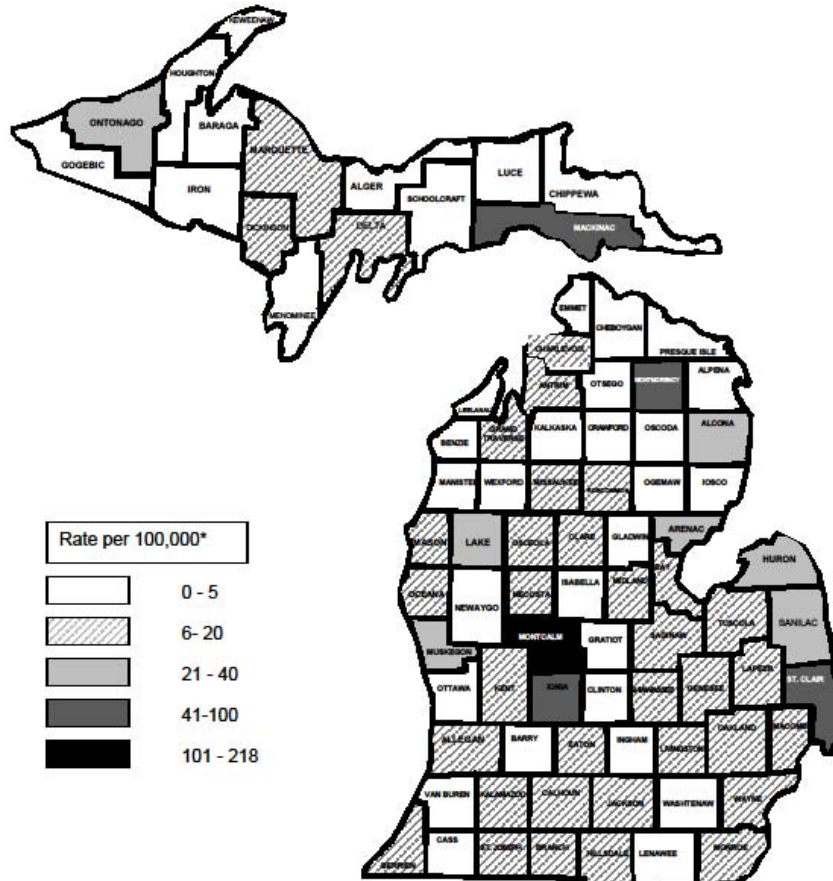
from extruding non-ferrous metal, and one unknown employer where work was the presumed source based on information from the lab.

Fifteen women (55.5%) with elevated blood leads had non-work exposures: three from remodeling performed in their homes, six from firearms, two from stained glass hobbies, one from other hobbies, one case of pica, and two from gunshot wounds.

Source of exposure was unknown for ten of the 37 women.

Figure 11 and Table 7 show the incidence rates of BLL of 10 $\mu\text{g}/\text{dL}$ and above by county, for

Figure 11 Annual Incidence of BLLs ≥ 10 $\mu\text{g/dL}$, Among Men in Michigan by County of Residence, 2009*



*Nonadministrative Rate per 100,000 Men Age 18+ from U. S. Census Bureau of County Resident Population. Annual Estimate for July 1, 2009

Table 7 Number and Rate of BLL ≥ 10 $\mu\text{g/dL}$ Among Men in Michigan by County of Residence : 2009

County	Number Reported	Michigan Population Men	Rate per 100,000 Men	County	Number Reported	Michigan Population Men	Rate per 100,000 Men
Alcona	1	4,839	21	Keweenaw	0	1,013	0
Alger	0	4,144	0	Lake	1	4,619	22
Allegan	4	43,822	9	Lapeer	3	36,306	8
Alpena	0	11,621	0	Leelanau	0	9,142	0
Antrim	1	9,695	10	Lenawee	1	39,779	3
Arenac	2	6,798	29	Livingston	12	72,106	17
Baraga	0	3,952	0	Luce	0	3,158	0
Barry	0	22,981	0	Mackinac	2	4,352	46
Bay	6	41,767	14	Macomb	38	321,703	12
Benzie	0	6,909	0	Manistee	0	10,480	0
Berrien	8	60,479	13	Marquette	2	27,652	7
Branch	3	18,024	17	Mason	1	11,377	9
Calhoun	8	51,669	15	Mecosta	1	17,408	6
Cass	1	20,015	5	Menominee	0	9,758	0
Charlevoix	1	10,255	10	Midland	2	32,002	6
Cheboygan	0	10,574	0	Missaukee	1	5,855	17
Chippewa	1	18,707	5	Monroe	11	59,882	18
Clare	2	11,956	17	Montcalm	56	25,631	218
Clinton	1	27,063	4	Montmorency	2	4,217	47
Crawford	0	6,140	0	Muskegon	18	67,705	27
Delta	2	14,741	14	Newaygo	1	18,882	5
Dickinson	2	10,651	19	Oakland	40	465,374	9
Eaton	6	41,335	15	Oceana	1	10,738	9
Emmet	0	13,253	0	Ogemaw	0	8,715	0
Genesee	27	156,405	17	Ontonagon	1	2,837	35
Gladwin	0	10,391	0	Osceola	1	8,775	11
Gogebic	0	7,248	0	Oscoda	0	3,524	0
Grand Traverse	4	34,385	12	Otsego	0	9,261	0
Gratiot	0	18,218	0	Ottawa	5	98,654	5
Hillsdale	2	18,008	11	Presque Isle	0	5,657	0
Houghton	0	15,748	0	Roscommon	2	10,298	19
Huron	5	13,059	38	Saginaw	5	75,194	7
Ingham	8	107,653	7	Saint Clair	37	65,246	57
Ionia	23	26,728	86	Saint Joseph	3	23,438	13
Iosco	0	10,520	0	Sanilac	6	16,517	36
Iron	0	4,924	0	Schoolcraft	0	3,272	0
Isabella	1	26,441	4	Shiawassee	4	27,120	15
Jackson	6	64,883	9	Tuscola	4	21,960	18
Kalamazoo	12	95,558	13	Van Buren	4	29,914	13
Kalkaska	0	6,746	0	Washtenaw	3	140,541	2
Kent	26	228,808	11	Wayne	98	709,942	14
				Wexford	0	12,354	0
				TOTAL	529 *	3,849,471 **	14

*County was unknown for 41 additional male adults.

**Total number of men in all 83 counties of Michigan age 16+ years; 7/1/2009 County Characteristics Resident Population Estimates, U.S. Census Bureau <http://www.census.gov/popest/counties/asrh/files/cc-est2009-agesex-26.csv>

Table 8 Non-Work Source of Exposure Among Adults with BLL \geq 10 μ g/dL in Michigan: 2009

Exposure Source Description	Number	% Among ALL Adults BLL \geq 10 μ g/dL	% Among Adults BLL \geq 10 μ g/dL Non Work Source
Work-Related	460	81.3	---
Non-Work Related	106	18.7	100.0
Firearms, Reloading, Casting	77	13.6	72.6
Gun Shot Wound	11	1.9	10.4
Remodeling	8	1.2	7.6
Hobby: Leather, Race Cars, Airplane Restoration, Diving Weights	5	1.1	4.7
Other, unidentified	1	0.2	0.9
Lab Error	1	0.2	0.9
Stained Glass	1	0.2	0.9
Sinkers	0	0.0	
Lead Paint Ingestion	2	0.4	1.9
TOTAL	566*	100.0	
*For 25 additional adults source is pending an interview; for 7 additional adults source is pending medical records review; for 4 additional adults source was inconclusive based on interview; for 6 additional adults, source was inconclusive and no			

based on the 7/1/2009 County Characteristics Resident Population Estimates from the U.S. Census Bureau. The overall incidence rate for men was 14 times higher than that for women (14/100,000 vs. 1/100,000).

SOURCE OF EXPOSURE

For 460 (81.3%) individuals, work was the identified source. For 106 (18.7%) individuals non-occupational activities were identified as the source of exposure. Table 8 shows the non-work related source of exposure of lead for 106 individuals with BLLs \geq 10 μ g/dL reported in 2009. Of those 106, two non-occupational activities predominated. Seventy-seven (72.6%) individuals were exposed from a hobby related to guns and eleven (10.4%) were exposed due to a retained bullet fragment. For an additional 32

men. There were 529 men reported in 2009 with a BLL \geq 10 μ g/dL where county of residence could be determined. Montcalm (218/100,000), St. Clair (57/100,000) and Ionia, (86/100,000) had the highest incidence rates per 100,000 men

Table 9 Industry Source of Exposure Among Adults with BLL \geq 10 μ g/dL in Michigan : 2009

Exposure Source -- Industry (SIC Code)*	Number	% Among ALL Adults BLL \geq 10 μ g/dL	% Among Adults BLL \geq 10 μ g/dL Work Source
Non Work Related	106	18.7	
Work Related	460	81.3	100.0
Mining (10)	1	.2	0.2
Construction (15-17)	179	31.6	39.3
Painting (17)	158		34.6
Manufacturing (20-39)	179	31.6	39.3
Fabricated and Primary Metals (33-34)	162		35.5
Transportation and Public Utilities (40-49)	31	5.5	6.8
Wholesale and Retail Trade (50-59)	10	1.8	2.2
Services (60-89)	26	4.6	5.7
Automotive Repair Services (75)	5		1.1
Public Administration (91-97)	30	5.3	6.6
Justice, Public Order, Safety (92)	23		5.0
TOTAL	456 **	100.0	
*Standard Industrial Classification.			
**Another 4 were work-related, however, the industry was unknown.			

Lead exposure from firing ranges, both commercial and private recreation ranges, as well as reloading and casting activities associated with firearms, is the most common cause of non-occupational exposure. Individuals with elevated blood lead from exposure at firing ranges may also be exposed as part of their work (i.e. police fire range instructors).

individuals, source of exposure is still being investigated. For eleven the source was still unknown after an interview with the individual or review of medical records.

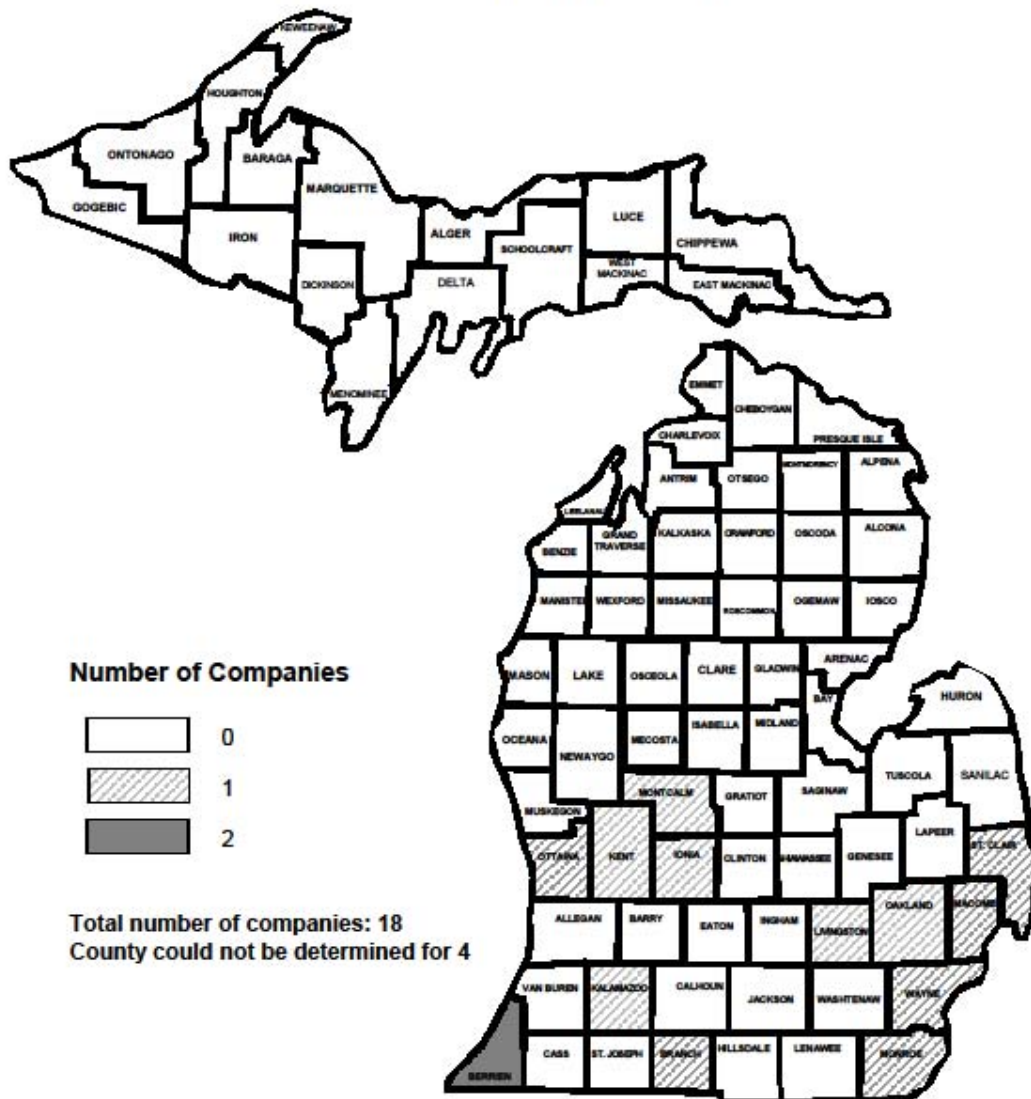
Table 9 shows the occupational sources of lead for individuals reported in 2009. The most frequent reports were on individuals

in the construction sector (39.3%), and manufacturing (39.3%).

Figure 12 shows the geographic distribution of the fourteen non-construction companies that reported at least one adult with a BLL of 25 µg/dL or greater in Michigan during 2009. For four additional companies we were unable to determine county.

These eighteen companies included wholesale trade scrap and waste operations, metal forging and stamping companies, brass/bronze casting operations, coating and engraving operations, radiator repair facilities, stained glass workshop and indoor firing ranges. Of the 460 individuals with blood lead ≥ 10 µg/dL where exposure occurred at work, 197

Figure 12 Geographic Distribution of Non-Construction Companies Reporting Adult Blood Lead Levels (BLL) ≥ 25 µg/dL in Michigan, 2009



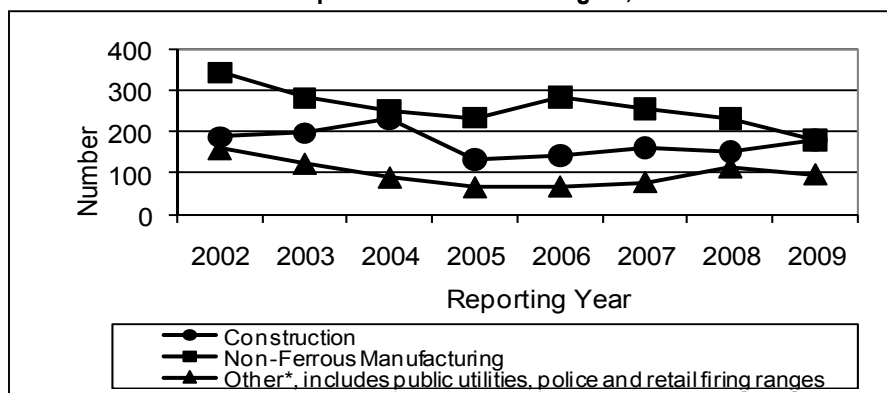
Industrial Hygiene Inspections 2009

(42.8%) were from these eighteen companies. Of the 71 individuals with blood lead $\geq 25\mu\text{g/dL}$ and exposure occurred at work, 44 (61.9%) were also from these eighteen companies.

The recent BLLs have generally been decreasing across all types of occupational sources, although some of this reduction is due to improvements in work place controls, some of the decrease is presumed to be secondary to Michigan's economic downturn with closure of facilities and reductions in production. A slight increase in the number of individuals with

Figure 13 Number of Individuals with BLLs $\geq 10\mu\text{g/dL}$ by Industry Where Exposed to Lead in Michigan, 2002-2009

This



lead exposure has been reported from category "Other" since 2006 although there was a decrease from 2008 to 2009 (Figure 13).

"other" category includes public utilities, police and public firing ranges.

SUMMARY OF INDUSTRIAL HYGIENE INSPECTIONS

Follow up of elevated blood lead testing --- 2009

In 2009 MIOSHA inspections were conducted and reports completed at fourteen companies referred by ABLES due to elevated blood lead laboratory reports. Ten of the fourteen (71%) received lead related citations for violation of lead-related standards.

Three of the fourteen inspections were conducted in the construction industry, five were of manufacturing, which included two brass/bronze foundries, three were of wholesale trade scrap and waste, one of a radiator shop, one of a stained glass shop and one of an employment outsourcing company.

The first construction inspection was conducted following an elevated BLL of $33\mu\text{g/dL}$ of a laborer removing a water tank. This company was cited for three lead violations as well as nine non-lead violations. The lead citations were for lack of evaluation, communication and interim protection from lead hazard exposure. eight paint chip samples from different locations contained on the average 14.6%

lead. (range .51% to 24%)

The second construction inspection was initiated by an employee complaint and a BLL of $29\mu\text{g/dL}$. The inspection revealed potential exposure to lead but determined levels to be below the action levels and resulted in no violations being cited. However, recommendations were made that the employer provide changing areas allowing employees to have specific work clothes so as to minimize the potential for taking lead home on clothes and shoes.

A third construction firm was inspected for a BLL of $25\mu\text{g/dL}$. No citations were issued and notes by the inspector show the construction company had good compliance with the lead standard on current demolition projects. It is possible this elevated BLL could be attributed to the company's demolition work of a lead oxide battery facility out of state in Fitzgerald, Georgia.

The first manufacturing company inspected was for a BLL of $27\mu\text{g/dL}$ of an employee who ran the lead bath heat treat process. This company of fifty employees had never been inspected before. Thirteen lead citations were issued including lack of a written

*Industrial Hygiene Inspections 2009****SUMMARY OF INDUSTRIAL HYGIENE INSPECTIONS, con't...***

compliance program, lack of engineering and work practice controls to reduce employee lead exposure, lack of appropriate respirators, clothing and equipment, lack of biological monitoring, training and communication of lead rules and appendices to affected employees. Following this inspection, one other report of a BLL of 31 µg/dL was received from an employee of this company.

A second manufacturing company was inspected for a BLL of 25 µg/dL from a retired worker. No violations of the lead standard were identified.

The third manufacturing company inspected sent employees off site to do equipment installation in

In 2009 MIOSHA inspections were conducted and reports completed at fourteen companies referred by ABLES due to elevated blood lead laboratory reports. Ten of the fourteen (71%) received lead related citations for violation of lead-related standards.

lead battery production facilities. ABLES received BLLs on employees from this company as high as 44 µg/dL. Air level samples for lead were below the permissible exposure limits (PEL) of 50 µg/m³ but the company was cited for not informing their employees of the potential exposure. Recommendations were made that blood lead and zinc protoporphyrin levels be taken before employees go off site to do equipment installation in lead battery production facilities and after returning from equipment installation. In addition, recommendations were made to retrain employees on the hazards of lead exposure and ways to minimize exposure at off site locations. Concurrent with this inspection, ABLES received BLLs on employees from this company as high as 44 µg/dL.

The fourth manufacturing inspection was of a non-ferrous cast foundry, conducted after a county

health department was alerted by a private physician of a patient who worked at that company and was experiencing severe abdominal pains and had a BLL of 33 µg/dL. Six lead citations were issued following the inspection and eight additional employees were tested for lead, one with a BLL of 99 µg/dL. The company was cited for respiratory protection violations, lack of labeling for contaminated clothing and equipment, improper cleaning, lack of air monitoring and lack of written lead compliance program to reduce exposures to at or below the PEL. Two work stations tested for lead fume and dust were above the PEL of lead. Air monitoring at the station used by the employee initially reporting a BLL of 33 µg/dL was below the PEL.

The fifth manufacturing inspection was of a non-ferrous cast foundry that had been previously inspected by MIOSHA three times in the last five years. This inspection resulted in 13 violations of the lead standard. A current employee, removed for 4 weeks from the lead exposure area, still had BLLs at 44 µg/dL, only a small decrease from the initial level of 47 µg/dL. Violations at this company were for air exhaust re-circulated into the work place, air exposures exceeding 75 µg/m³, lack of quarterly monitoring for air lead, lack of written notification of employee lead testing results, lack of implementation of administrative and engineering controls to reduce exposure and lack of measurement of the effectiveness of these controls. Surfaces were not maintained lead free as practicable, and methods used were not effective in removing lead accumulations. Body soap, clean towels and clean change rooms were not provided for employees who worked in areas where airborne exposures to lead were greater than PEL. Respiratory protection at this facility was deficient in seven areas including fit testing, cleaning, repair, written program for site specifications and periodic evaluation of the program. And blood lead monitoring did not follow

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the schedule specific rule 33 of Part 310 of the MIOSHA lead standard.

The first wholesale trade scrap and waste handling facility inspection was made because thirteen individuals had BLLs ≥ 25 $\mu\text{g/dL}$; the highest was 48 $\mu\text{g/dL}$. This company was reclaiming communication cable encased in lead sheath. Seven citations were issued, six for lead. Citations included one for exposure to work place air concentrations that were twice the allowable level of air lead of 50 $\mu\text{g/m}^3$, and one for air exhaust ventilation re-circulated into the work place without controls to monitor the concentration of lead in the return air. Other citations issued were for no written notification to employees of corrective action to be taken to reduce exposure to lead, surfaces not maintained free from accumulations of lead, showers not ensured at the end of the shift of employees exposed to lead higher than 50 $\mu\text{g/m}^3$ as well as lack of development, implementation and maintenance of a hazard communication program for hazardous chemicals known to be present.

The second wholesale trade scrap and waste handling facility inspection was for a BLL of 41 $\mu\text{g/dL}$. Employees were torch cutting ferrous and non-ferrous scrap metal. The inspection resulted in four lead citations. Citations were for lack of communication about the Lead Standard, lack of blood lead testing at the required frequency, and lack of monitoring data being made available to each employee who was exposed to lead above action levels, and lack of annual training for affected employees.

A third wholesale trade scrap and waste handling facility was inspected based on a BLL of 32 $\mu\text{g/dL}$ where a box of firearm target range dust fell from a lift truck, releasing sand and dust in the facility. Eight employees and some customers were exposed to that dust. Although two employees had personal samples taken, this company was cited for lack of personal sampling of each worker for each shift in that work area. In addition the disposal of range dust on various parts of the property were

referred to the Michigan Department Natural Resources and Environment.

A radiator repair shop was inspected for a BLL of 28 $\mu\text{g/dL}$. Although the company reported reduced repair activity involving lead since the time of BL testing, the employer received one lead citation for not providing effective methods for cleaning lead contamination in the lead operation area. The area used to eat lunch and two work areas had excessive accumulations of lead dust.

A stained glass studio was inspected based on a BLL of 21 $\mu\text{g/dL}$ where a contract employee had been tested as part of a prenatal screening. The studio location was transient and at least two apartments were identified where window renovation and lead solder activities had been performed. Two lead citations were issued for lack of air testing for lead and lack of communication to employees of the potential for lead exposure.

Five reports of BLL ≥ 25 $\mu\text{g/dL}$, with a high BLL of 31 $\mu\text{g/dL}$ were received on employees of a temporary employment agency who was assigning them to an Ohio battery production facility. Since the facility was outside of Michigan the request was made to the US Federal OSHA, Toledo, Ohio office. Our inspection request was based on OSHA's 2008 national emphasis program which states "Referrals received from States' Departments of Health, Labor or Industry alleging elevated employee blood lead levels (defined as blood lead levels at or above 25 $\mu\text{g/dL}$) and/or involving take home exposures, shall be considered high-gravity, serious and must be handled by inspection." In response to our notification of elevated lead levels,

When an individual from a company is identified with a blood lead value of 25 $\mu\text{g/dL}$ or greater, a MIOSHA enforcement inspection is conducted to assess that company's compliance with the lead standard.

*Industrial Hygiene Inspections 2009****SUMMARY OF INDUSTRIAL HYGIENE INSPECTIONS, con't...***

Federal OSHA sent a letter to this employer asking for verification of lead standard compliance. Federal OSHA considered the response to be satisfactory and no OSHA inspection was conducted.

Of the fourteen companies inspected in 2009, five were identified by an elevated blood lead report collected because of a required medical surveillance program, six were reported by a private health care provider and three had undetermined sources.

Evaluation of compliance to blood lead testing in Michigan brass/bronze facilities -- 2009

Review of the medical literature on evaluation of the testing provided to employees in lead-use industries estimates that only 15% of manufacturing companies provide testing and only 34% of employees exposed to lead are being tested for lead levels (8,9).

In 2002, Michigan evaluated whether radiator repair facilities were providing blood lead testing to their lead exposed employees. Results showed that 64% of the facilities inspected were in violation of at least one part of the MIOSHA lead standard, and one was not meeting the requirement to provide blood lead testing.

To evaluate completeness of medical surveillance, as required in the MIOSHA lead regulations, a special project with the brass/bronze industry was instituted. In 2009, thirty five percent of work-related BLLs ≥ 10 $\mu\text{g/dL}$ are from brass/bronze facilities. A special project was initiated to determine the completeness of blood lead testing in this industry. Thirty-two brass/bronze facilities were identified in Michigan using the Michigan Manufacturing Directory and web-based employer locator services. BLLs were being received from 8 of the 32 (25%) facilities. Twelve of the facilities had no activity which involved lead, were out of

business or had no production facilities in Michigan. Of the remaining twelve, four have been inspected and eight are scheduled to be inspected.

Lead air monitoring results from a brass and aluminum foundry showed exposure to airborne lead, but no medical surveillance was required as lead was below the air action threshold. Among the five citations for lack of hazard communication and lack of training were two lead citations issued for lack of training and lack of lead air monitoring.

A second brass casting facility inspected was also cited for lack of employee training on lead and no initial determination of lead air levels. Air sampling by the inspector determined lead below the action threshold.

Another casting facility received five citations including one for over exposure to noise and lack of hazard communication program identifying hazardous chemicals known to be present. No lead was detected from surface wipe samples.

An inspection at a gas valves and brass fittings manufacturing facility resulted in no citations. A surface wipe sample found lead detected below the action level.

In summary, results to date have not identified any additional brass/bronze facilities that are required to conduct blood lead testing on their employees. Inspections are still pending on eight facilities

Case Narratives

Three Individuals with a BLL ≥ 50 $\mu\text{g}/\text{dL}$ in 2009

An African-American male in his 60s presented multiple times to a hospital emergency room with abdominal pain, constipation and fatigue before he was admitted for a 40-day hospitalization in January 2009. He was diagnosed with lead toxicity. He had lead nephropathy, anemia with basophilic and cardiomyopathy. He was noted to have clouded sensorium. His exposure to lead was potentially from several sources: independent employment in renovating older homes, bullet fragments lodged near his spine since 1985, and the possibility of consumption of home distilled alcohol. His initial BLL was 93 $\mu\text{g}/\text{dL}$ with a high of 144 $\mu\text{g}/\text{dL}$ reported in late January. By early February his value was 42 $\mu\text{g}/\text{dL}$ but rebounded to 93 $\mu\text{g}/\text{dL}$. By July, BLLs were back up to 99 $\mu\text{g}/\text{dL}$ and communication with this patient in August revealed his doctors' intention to operate to remove the bullet fragments. October levels were reported as low as 4 $\mu\text{g}/\text{dL}$ but by the end of the year, BLL had rebounded to 52 $\mu\text{g}/\text{dL}$.

A Caucasian male in his 40s, employed as a field service technician for an engineering firm which designs and installs equipment for manufacturing batteries across the USA, received OSHA required lead testing from his company. He reported working in battery manufacturing plants in other states for several months prior to his BLL of 45 $\mu\text{g}/\text{dL}$ in August. In December his BLL was 51 $\mu\text{g}/\text{dL}$.

A Caucasian male in his 40s working in the airset room of a Brass/Bronze foundry had consistent BLLs of 40 to 50 $\mu\text{g}/\text{dL}$ or higher since 2004. In

July 2009 a level of 51 $\mu\text{g}/\text{dL}$ was reported. He was asymptomatic, did not drink alcohol, smoke or have a hobby that exposed him to lead. MIOSHA investigation of the foundry where he works resulted in 13 violations of the lead standard. He was removed from the job for four weeks due to his elevated blood lead level and a molten metal burn to his foot. After removal his BLL dropped to 35 $\mu\text{g}/\text{dL}$ by November.

In 2009, Michigan ABLES received 14,875 blood lead tests for 13,766 individuals ≥ 16 years of age. Six hundred and eight (4.4%) individuals had BLLs ≥ 10 $\mu\text{g}/\text{dL}$; 103 (16.9%) of those 608 had lead levels ≥ 25 $\mu\text{g}/\text{dL}$ and three (2.9%) of the 103 had BLLs ≥ 50 $\mu\text{g}/\text{dL}$.

*Twelve Years of Interviews of Adults: BLLs of 10 µg/dL or Greater**Twelve Years of Interviews of Adults with BLLs of 10 µg/dL or Greater*

Between October 15, 1997, and December 31, 2009, there were 1,806 reports received on adults with BLLs ≥ 10 µg/dL who completed an interview by telephone. The following summary of interview data is based on the 1,806 completed questionnaires.

Most of the 1,806 completed questionnaires were of males (90.1%), which parallels the gender distribution from the 2009 year lead level reports ≥ 10 µg/dL. Although based on small numbers, the very highest BLLs (≥ 60 µg/dL) showed a higher percentage of Af-

rican-Americans compared to lower blood lead levels. The percentage of ever or current smokers was higher among adults with the higher blood lead levels. The group with the highest lead levels had the youngest mean age of 37.5 (Table 10).

Table 10 Demographic Characteristics of Michigan Adults with BLLs ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/1997 to 12/31/2009 by Highest Reported BLLs

Demographic Characteristics	10-24 µg/dL		25-29 µg/dL		30-39 µg/dL		40-49 µg/dL		50-59 µg/dL		≥ 60 µg/dL		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Male	951	87.6	232	92.8	295	95.2	96	91.4	36	97.3	17	94.4	1627	90.1
Female	135	12.4	18	7.2	15	4.8	9	8.6	1	2.7	1	5.6	179	9.9
Hispanic Origin	58	5.6	11	4.7	11	3.7	13	12.7	1	2.8	0	—	94	5.4
Caucasian	910	85	216	88.2	269	88.2	89	84.8	34	91.9	14	77.8	1532	86
African American	93	8.7	15	6.1	20	6.6	8	7.6	3	8.1	4	22.2	143	8
Asian/Pacific Islander	5	0.5	1	0.4	2	0.7	0	—	0	—	0	—	8	0.4
Native American/Alaskan	10	0.9	4	1.6	8	2.6	0	—	0	—	0	—	22	1.2
Other	53	4.9	9	3.7	6	2	8	7.6	0	—	0	—	76	4.3
Mean Age	45	n=1086	43.6	n=250	41.9	n=310	44	n=105	42.6	n=37	37.5	n=18	44.1	n=1806
Ever Smoked	681	64	173	71.8	208	71.5	75	75.8	27	81.8	11	73.3	1175	67.4*
Now Smoke**	325	47.8	97	56.1	143	68.6	49	65.3	21	70	8	100	643	54.8*

*p < 0.05 for linear trend

** The percentages of now smoke are calculated using the denominator of those who ever smoked.

Table 11 Highest Education of Michigan Adults with BLLs ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/1997 to 12/31/2009 by Highest Reported BLLs

Highest Education	10-24 µg/dL		25-29 µg/dL		30-39 µg/dL		40-49 µg/dL		50-59 µg/dL		≥ 60 µg/dL		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
7 th Grade or less	24	2.4	6	3.4	3	1.8	4	6.9	0	—	0	—	37	2.6
8 th – 11 th Grade	123	12.2	11	6.2	22	13.2	9	15.5	2	12.5	3	33.3	170	11.9
High School Grad	341	33.9	65	36.7	63	37.7	14	24.1	7	43.8	3	33.3	493	34.4
1-3 yrs College/Tech	332	33	68	38.4	48	28.7	20	34.5	5	31.3	1	11.1	474	33.1
4+ yrs College/Tech	186	18.5	27	15.3	31	18.6	11	19	2	12.5	2	22.2	259	18.1

*Twelve Years of Interviews of Adults: BLLs of 10 µg/dL or Greater***Table 12 Symptoms of Michigan Adults with BLLs ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/97 to 12/31/09 by Highest Reported BLL**

Symptoms	10-24µg/dL		25-29 µg/dL		30-39µg/dL		40-49 µg/dL		50-59 µg/dL		≥ 60 µg/dL		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
GASTRO-INTESTINAL														
Lost 10+lbs w/o diet	116	10.9	20	8.3	34	11.1	23	22.3	7	20	5	31.3	205	11.6*
Continued loss of appetite	126	11.8	22	9	42	13.6	21	20.6	7	19.4	4	23.5	222	12.5*
Pains in belly	182	16.9	26	10.6	46	15.1	24	23.1	9	25	4	23.5	291	16.3
MUSCULOSKELETAL														
Frequent pin/soreness joint	361	34.1	83	34	111	36.5	50	50	14	38.9	9	52.9	628	35.7*
Muscle weakness	255	24.1	32	13.2	56	18.6	34	33.3	12	33.3	8	47.1	397	22.6
NERVOUS														
Headaches	184	17.1	32	13	64	20.8	26	25	11	29.7	5	29.4	322	18.0*
Dizziness	116	10.9	15	6.1	17	5.6	12	11.7	4	11.1	6	35.3	170	9.6
Depressed	164	15.4	25	10.3	47	15.6	20	19.6	10	27	7	41.2	273	15.5*
Tired	405	38.1	78	31.7	138	45.1	55	53.4	21	56.8	10	58.8	707	39.9*
Nervous	153	14.4	26	10.7	48	16	23	22.1	10	27.8	6	35.3	266	15.1*
Waking up night	320	29.9	52	21.1	99	32.5	34	33	15	40.5	7	43.8	527	29.7
Nightmares	82	7.7	6	2.5	15	5	7	6.9	4	11.1	4	23.5	118	6.7
Irritable	215	20.2	50	20.7	81	26.6	33	32	16	44.4	7	41.2	402	22.8*
Unable to concentrate	186	17.5	29	11.9	58	18.9	19	18.8	9	24.3	4	23.5	305	17.2
Gastro-Intestinal Symptoms	276	25.6	46	18.6	74	23.9	39	37.5	15	40.5	8	47.1	458	25.5*
Musculoskeletal Symptoms	426	39.9	86	35.1	120	39.2	56	54.4	16	44.4	10	58.8	714	40.2*
Nervous Symptoms	611	56.8	119	48.2	190	61.7	67	64.4	27	73	10	58.8	1024	57.3*
Any Symptoms	720	66.6	148	59.9	205	66.3	79	76	30	81.1	11	64.7	1193	66.5
Average No. Symptoms	2.69	n=1081	2.06	n=247	2.82	n=309	3.68	n=104	4.02	n=37	5.12	n=17	2.74	n=1795

*p < 0.05 for linear trend

The higher blood leads were most common in high school graduates without any college education, and in those who had not graduated high school. Highest blood leads were least common in those who had a 7th grade education or less or had completed 1-3 years of college (Table 11).

The types of lead-related symptoms reported during the interviews, by lead level, are presented

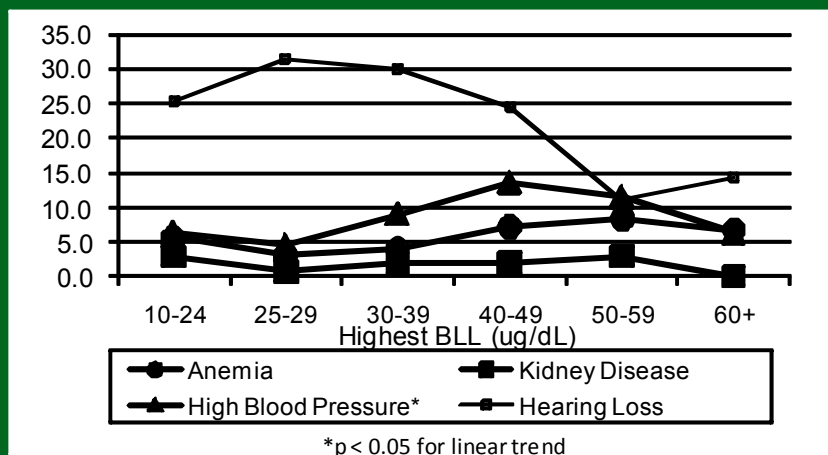
in Table 12. Only individuals who had daily or weekly symptoms were included in this table. Loss of 10+ pounds without dieting, continued loss of appetite, frequent joint pain/soreness, headache, depression, being tired, feeling nervous and being irritable were statistically significant as associated with increasingly higher levels of blood lead. Having any gastro-intestinal, muscu-

loskeletal or nervous symptoms was also statistically associated with increasingly higher levels of blood lead. Table 13 and Figure 14 show the reporting of other health conditions, anemia, kidney disease, high blood pressure and hearing loss, by lead level category. Of these health conditions, only high blood pressure was significantly associated with increasing blood lead levels.

Table 13 Lead Related Health Conditions of Michigan Adults with BLLs ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/97 to 12/31/09 by Highest Reported BLL

Lead Related Disease	10-24 ug/dL		25-29 ug/dL		30-39 ug/dL		40-49 ug/dL		50-59 ug/dL		≥60 ug/dL		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Anemia	58	5.6	7	3	12	4	7	7.1	3	8.3	1	6.7	88	5.1
Kidney Disease	31	2.9	2	0.8	6	2	2	2	1	2.9	0	—	42	2.4
High Blood Pressure	67	6.3	11	4.5	27	9	13	13.5	4	11.4	1	6.3	123	7.0*
Hearing Loss	220	25.4	35	31.5	32	29.9	9	24.3	1	11.1	1	14.3	296	26.2

*p < 0.05 for linear trend

*Twelve Years of Interviews of Adults: BLLs of 10 µg/dL or Greater***Figure 14 Percentage Reporting Lead Related Health Conditions by Highest Reported BLL, Interviewed Adults INCLUSIVE 10/15/97 to 12/31/09**

level. Workers with lower lead levels reported they were more likely to be tested at work as part of a company screening, have separate lockers, and have work clothing laundered at work, wash hands before eating, eat in a separate lunch room, and wear respirators as part of their lead work practices. As expected, workers more likely to have been removed from the job had the higher blood lead levels.

(Continued from page 57)

The number of years worked by highest lead level reported for the adults who completed a questionnaire (Table 14) show that higher blood lead level results were more likely to occur in shorter term workers (i.e. workers in a lead exposed job for five or fewer years). The type of industry by lead level reported among those interviewed overall shows that 32.1% worked in special trade construction and 20.8% worked in the primary metals industry (non-ferrous foundries). These two industries show the highest percentage workers for the higher blood leads (≥ 25 µg/dL), as well (Table 15). Table 16 lists the types of working conditions reported by the interviewed adults, again by highest reported lead

Of the types of lead-related symptoms reported during the interviews, loss of 10+ pounds without dieting, continued loss of appetite, frequent joint pain/soreness, headache, depression, being tired, feeling nervous and being irritable were statistically significant as associated with increasingly higher levels of blood lead. Having any gastro-intestinal, musculoskeletal or nervous symptoms was also statistically associated with increasingly higher levels of blood lead.

Table 14 Number of Years Worked of Michigan Adults with BLLs ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/97 to 12/31/09 by Highest Reported BLL

Number of Years Worked	10-24 µg/dL		25-29 µg/dL		30-39 µg/dL		40-49 µg/dL		50-59 µg/dL		≥ 60 µg/dL		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
≤ 5	358	58	116	64.8	136	56	43	58.1	17	54.8	9	64.3	679	58.6
6—10	84	13.6	30	16.8	38	15.6	9	12.2	8	25.8	2	14.3	171	14.8
11—20	88	14.3	23	12.8	35	14.4	11	14.9	4	12.9	2	14.3	163	14.1
21—30	50	8.1	9	5	28	11.5	3	4.1	1	3.2	1	7.1	92	7.9
≥ 30	37	6	1	0.6	6	2.5	8	10.8	1	3.2	0	—	53	4.6

Table 15 Industry of Michigan Adults with BLLs of ≥ 10 $\mu\text{g/dL}$ Interviewed INCLUSIVE 10/15/97 to 12/31/09 by Highest Reported BLL

Standard Industrial	10-24 $\mu\text{g/dL}$		25-29 $\mu\text{g/dL}$		30-39 $\mu\text{g/dL}$		40-49 $\mu\text{g/dL}$		50-59 $\mu\text{g/dL}$		≥ 60 $\mu\text{g/dL}$		Total
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
Metal Mining (10)	1	0.2											1
Construction, Gen Contractors(15)	18	2.9	3	1.6	1	0.4	0	—	0	—	1	6.7	23
Construction, Heavy (16)	22	3.6	1	0.5	4	1.7	1	1.3	1	3.1	0	—	29
Special Trade Construction (17)	195	31.7	48	26.1	78	32.6	30	40	13	40.6	7	46.7	371
Food and Kindred Products (20)	0	—	1	0.5	0	—	0	—	0	—	0	—	1
Lumber and Wood (24)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Furniture and Fixtures (25)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Printing, Publishing & Allied (27)	1	0.2	0	—	1	0.4	0	—	0	—	0	—	2
Chemicals and Allied Products (28)	0	—	0	—	1	0.4	0	—	0	—	0	—	1
Stone/Clay/Glass(32)	10	1.6	3	1.6	5	2.1	3	4	2	6.3	0	—	23
Primary Metals Industry (33)	59	9.6	52	28.3	85	35.6	23	30.7	8	25	4	26.7	231
Fabricated Metal Products (34)	65	10.6	23	12.5	18	7.5	5	6.7	0	—	0	—	111
Industrial, Comm. Machnry(35)	17	2.8	4	2.2	5	2.1	2	2.7	2	6.3	1	6.7	31
Electronics (36)	14	2.3	1	0.5	0	—	1	1.3	0	—	0	—	16
Transportation Equipment (37)	14	2.3	3	1.6	5	2.1	2	2.7	1	3.1	0	—	25
Measuring, Analyzing, Crtl Instr(38)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Misc. Manufacturing Industries (39)	2	0.3	1	0.5	0	—	0	—	0	—	0	—	3
Railroad Transportation (40)	2	0.3	3	1.6	3	1.3	0	—	0	—	0	—	8
Motor Freight Trans, Whs(42)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Water Transportation (44)	2	0.4	0	—	0	—	0	—	0	—	0	—	2
Trans.Electric,Gas&SanSvcs.(49)	36	5.8	8	4.3	6	2.5	4	5.3	0	—	0	—	54
Wholesale-Durable Goods (50)	16	2.6	1	0.5	2	0.8	0	—	0	—	0	—	19
Building Materials, Hardware (52)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Automotive Dealers, Gas (55)	1	0.2	3	1.6	2	0.8	0	—	0	—	0	—	6
Other Retail Trade (59)	4	0.6	0	—	1	0.4	0	—	0	—	0	—	5
Depository Institutions (60)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Finance, Insurance , Real Estate	2	0.3	0	—	0	—	0	—	0	—	0	—	2
Business Services (73)	12	1.9	0	—	0	—	0	—	0	—	0	—	12
Automotive repair Services (75)	22	3.6	7	3.8	6	2.5	4	5.3	2	6.3	0	—	41
Misc. Repair Services (76)	7	1.1	1	0.5	3	1.3	0	—	0	—	0	—	11
Amusement and Recreation (79)	15	2.4	5	2.7	4	1.7	0	—	3	9.4	2	13.3	29
Health Services (80)	2	0.3	0	—	0	—	0	—	0	—	0	—	2
Educational Services (82)	12	1.9	3	1.6	1	0.4	0	—	0	—	0	—	16
Social Services (83)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Museum, Art Galleries (84)	1	0.2	1	0.5	0	—	0	—	0	—	0	—	2
Engineering Services (87)	13	2.1	3	1.6	2	0.8	0	—	0	—	0	—	18
Services, NEC (89)	2	0.3	0	—	0	—	0	—	0	—	0	—	2
General Government (91)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Justice, Public Order, Safety (92)	29	4.7	8	4.3	5	2.1	0	—	0	—	0	—	42
Human resources (94)	0	—	0	—	1	0.4	0	—	0	—	0	—	1
Admin Environmental Quality (95)	1	0.2	0	—	0	—	0	—	0	—	0	—	1
Admin Economic Programs (96)	6	1	1	0.5	0	—	0	—	0	—	0	—	7
National Security Int'l Affairs (97)	5	0.8	0	—	0	—	0	—	0	—	0	—	5
TOTAL	616	100	184	100	239	100	75	100	32	100	15	100	1161

Twelve Years of Interviews of Adults: BLLs of 10 µg/dL or Greater

Figures 15 and 16 depict the trends in the percent of working conditions and personal habits reported by the interviewed adults, by interview year, for the last twelve years of surveillance. Figure 15 shows an increase since 2008 in the number of individuals reporting separate lockers for street and work clothes, available lunch room, providing shower facilities and eating in a designated lunch room but there has been no improvement in work clothes laundered at work. All of these working conditions or work practices are measures that reduce lead exposure. There appears to be little trend demon-

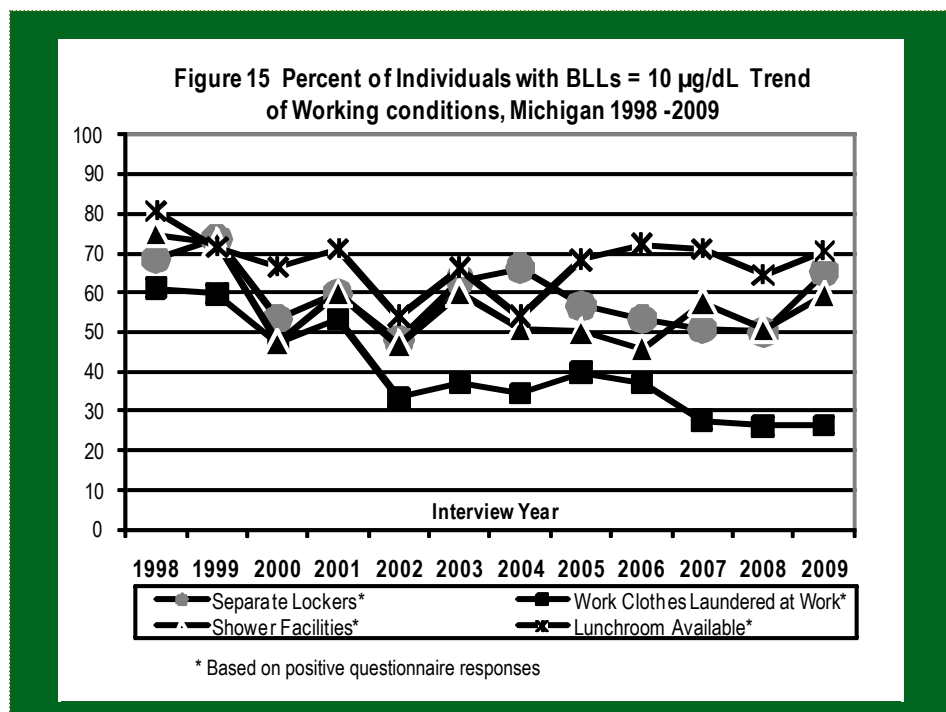


Table 16 Industry of Michigan Adults with BLLs of ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/97 to 12/31/09 by Highest Reported BLL

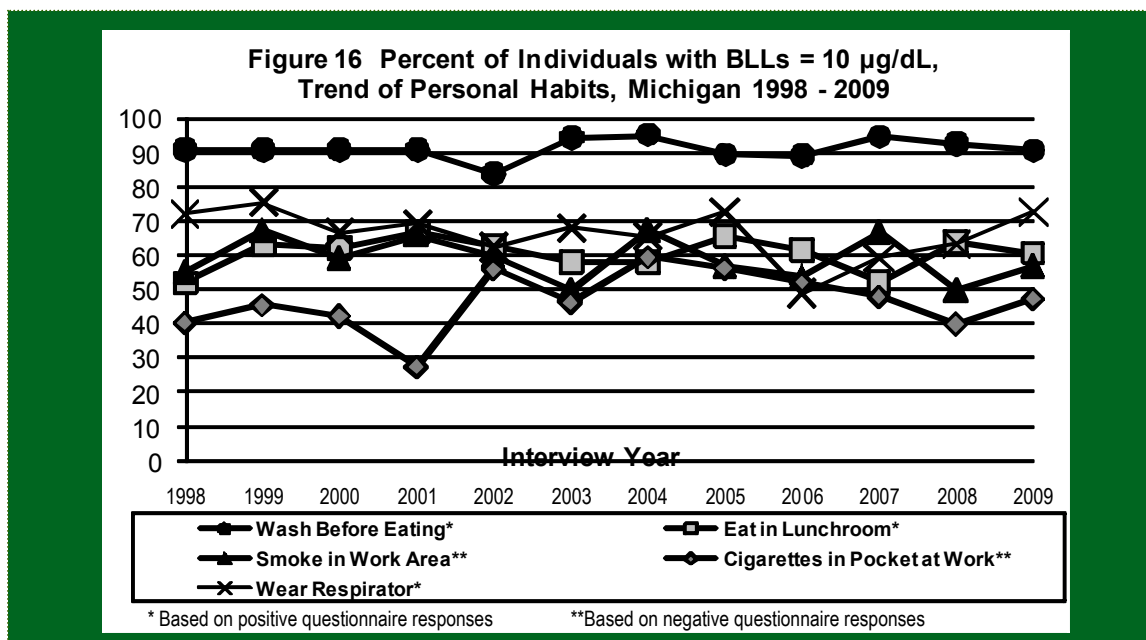
WORKING	10-24 µg/dL		25-29 µg/dL		30-39 µg/dL		40-49 µg/dL		50-59 µg/dL		≥ 60 µg/dL		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Separate Lockers: dirty and clean+	331	55.1	125	69.8	163	69.1	40	54.1	20	60.6	4	30.8	683	60.1
Work clothes laundered: work+	195	32.8	99	55.9	132	55.7	29	39.2	12	36.4	4	30.8	471	41.7*
Shower facility +	310	51.3	116	64.8	168	70.6	38	50	14	43.8	6	46.2	652	57.1
Lunch room available +	400	66.8	127	71.3	184	77.6	43	56.6	16	50	6	46.2	776	68.4
Clean off dust & wash hands before eating +	552	92.9	158	88.3	220	92.1	63	85.1	29	87.9	10	76.9	1032	91.2*
Eat in lunchroom +	264	59.5	99	70.2	124	63.3	35	54.7	9	34.9	4	36.4	535	60.7
Wear respirator +	381	62.8	129	72.1	180	74.7	60	80	22	66.7	10	76.9	782	68.1*
Smoke in work area ++	177	57.3	61	63.5	89	66.4	19	40.4	11	52.4	4	50	361	58.7
Keep cigarettes in pocket while working++	145	47.8	41	43.2	72	55	20	41.7	7	33.3	3	37.5	288	47.5
Exposed to lead now +	335	56.9	105	60.7	155	66	40	58	18	62.1	3	23.1	656	59.2
Removal from job +	29	4.7	14	7.9	31	13	18	24.7	9	27.3	5	38.5	106	9.2*
Tested as part of Co Med Screening+	468	43.3	158	63.5	211	68.5	56	53.8	24	64.9	8	44.4	925	51.5*

+ Based on positive questionnaire responses

*p<0.05 for linear trend

++ Based on negative questionnaire responses

Twelve Years of Interviews of Adults: BLLs of 10 µg/dL or Greater



stration over the years in personal habits (Figure 16). There is a slight increase in 2009 for percentage of workers reporting not smoking and not carrying cigarettes in exposed pockets into the work area.

The questionnaire also asks about children in the household, in order to document the potential for and extent of take-home lead. Twenty-six percent of the adults inter-

viewed reported children age 6 and younger living or spending time in the home (Table 17). Children from 135 of 410 (32.9%) households where an adult had an elevated lead level and young children who lived or frequently visited were tested for blood lead. Among the 127 households where the child's blood test results were reported, 44 (34.6%) households

had a child with an elevated blood lead level (≥ 10 µg/dL). Contact information for individuals reporting young children in their house-

Twenty-six percent of the adults interviewed reported children age 6 and younger living or spending time in the home (Table 17).

Table 17 Number of Households with Children (6 or under) Potentially Exposed to Take Home Lead from Michigan Adults with BLLs of ≥ 10 µg/dL Interviewed INCLUSIVE 10/15/97 to 12/31/09

Description of Households	10-24 µg/dL		25-29 µg/dL		30-39 µg/dL		40-49 µg/dL		50-59 µg/dL		≥ 60 µg/dL		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Households with Children Living or Spending Time	256	24.1	68	27.6	91	29.6	28	27.2	11	29.7	3	17.6	457	25.8
Households with Children Tested for Lead	80	35.7	17	26.2	19	22.9	13	54.2	4	36.4	2	66.7	135	32.9
Households Where Children had Elevated Lead	25	34.2	3	18.8	8	38.1	6	50	1	33.3	1	50.0	44	34.6

*Among individuals within blood lead category, percentage of their households with children living or spending time in house. n=1774

**Among individuals within blood lead category, percentage of "Households with Children Living/Spending Time", where the children were tested for lead.

Because of missing data, the denominator may be less than the number "Households w/ Children Living/Spending Time" in the first row. n=410

***Among individuals within blood lead category, percentage of "Households w/Children Living/Spending Time", where "Children Tested for Lead", had blood lead levels ≥ 10 µg/dL. Because of missing data, the denominator may be less than the "Children Tested for Lead" in the second row. n=127

DISCUSSION

An individual may have a blood lead test performed as part of an employer medical-screening program or as part of a diagnostic evaluation by their personal physician. Whatever the reason for testing, the results are then sent by the testing laboratories to the MDCH as required by law. If the individual reported is an adult, the report is then forwarded to MSU and maintained in the ABLES program lead registry. Individuals with a blood lead level of 25 µg/dL or greater, and individuals with BLLs of 10-24 µg/dL, where lead exposure source is not already known, are contacted by mail and then by a trained interviewer for a voluntary telephone interview. The interview includes detailed demographic information, exposure history and the presence and nature of lead related symptoms. When an individual with a blood lead value of 25 µg/dL or greater is occupationally exposed at a company that has not had a recent MIOSHA inspection, an enforcement inspection is conducted to assess that company's compliance with the lead standard.

In 2009, there were 608 adults reported in Michigan with BLLs ≥ 10 µg/dL. Approximately ninety-four percent were men. The mean age was 46. They were predominately white (89.4%) and lived in a band of counties stretching across the southern part of the state from Muskegon Montcalm to Wayne and Oakland. The source of exposure to lead was predominately occupational in origin (81.3%). Exposure occurred during the manufacture of non-ferrous metal parts such as plumbing fixtures, during abrasive blasting to remove paint from outdoor metal structures, during the fabricating of metal products or during work in indoor firing ranges.

Evaluation of twelve years of interviews show that individuals with the highest blood leads were more likely to be younger (Table 10). We attribute this finding to a higher percentage of younger

workers in construction doing abrasive blasting on metal structures. Also younger, less experienced workers may be given the dirtier, less desirable tasks.

In 2009 three Michigan adults were reported with BLLs over 50 µg/dL, the maximum blood lead level allowed in the workplace. Two of the three adults were exposed to lead exclusively at work (one from special industry machinery to fabricate batteries, one from foundry work). A retained bullet from a gun shot wound contributed to the third individual's blood lead level.

Lead exposure remains an important public health concern in the U.S. Environmental Protection Agency (EPA) regulations requiring removal of lead from commercial products such as gasoline, house paint and solder in plumbing pipes and food cans, have greatly reduced exposure to lead in the general population. Average BLLs in the general population have dropped from 15 µg/dL in the 1970s to the current 1.43 µg/dL (1).

Occupational exposure has not declined as steeply as environmental lead exposure. Data from 38 state lead surveillance systems shows that nationally, 95% of adult elevated lead exposure is work-related (2). Occupational Safety and Health Administration (OSHA) lead standards, established in 1978 for general industry and in 1993 for construction, set the level for removal of a worker from lead exposure in general industry at 60 µg/dL and construction at 50 µg/dL. These levels were established when general population levels from environmental exposure were much higher than they are today.

Michigan is one of 40 states conducting surveillance of elevated blood lead levels. Michigan requires the reporting of all BLL results, not just elevated levels. Major benefits for reporting all BLLs are the ability to calculate the rates of elevated BLLs in specific groups of interest, to monitor compliance with the testing requirements of the lead standard, and to facilitate the tracking of

reports from particular employers to monitor their progress in reducing workers' exposures to lead.

Based on the experience in other states we presume that the number of reports of elevated BLLs we receive is an underestimate of the true number of Michigan citizens with elevated BLLs (8, 9). For example, a study in California in the early 1990s reported that while 95% of lead battery employees had blood lead tests performed by their employers, only 8% of employees from radiator repair facilities and 34% of employees from secondary smelters of non-ferrous metal had blood lead testing performed by their employer (9). On a national basis it was estimated that less than 12% of companies using lead provided blood lead testing for their employees (8). Our survey performed 15 years later on 28 Michigan radiator repair facilities showed better results. While only three of thirty-one (25%) identified radiator repair shops were performing blood lead testing, MIOSHA inspections of eleven radiator repair facilities, not performing blood tests, found seven (64%) were in violation of at least one component of the MIOSHA lead standard, but only one (9%) of the facilities was cited for being over the action level which required blood lead testing of its employees.

As a 2009 evaluation of the blood lead testing compliance in Michigan's brass/bronze industry continues, with eight more inspections to be done in 2010, one of the major concerns documented by this special project is that employers are not required to conduct blood lead testing unless air levels of lead are above 25 mg/m³. Health professionals continue to call on OSHA to consider current epidemiologic studies which identify the need to lower the allowable workplace lead exposure (3).

Thirty years of lead toxicity research has demonstrated that lead exposure at levels previously thought to be of little concern can result in an increased risk of adverse chronic health effects, especially if the exposure is maintained for many years, thereby resulting in a progressively larger cumula-

tive dose (3-6). Levels as low as 5 ug/dL have been associated with adverse cardiovascular and neurologic health effects (3,6).

Our interviews with Michigan workers show that the current allowable level of lead is also associated with acute symptoms involving the gastrointestinal, musculoskeletal and nervous systems (Table 12). The presence of these symptoms is additional support for the need to lower allowable blood lead level. Eighty-three percent of individuals in Michigan with blood lead below the general industry allowable level of 60 µg/dL had daily or weekly symptoms consistent with lead toxicity (Table 12). Toxic effects of lead can occur without overt symptoms.

Michigan occupations that risk lead exposure include abrasive blasting to remove lead paint from outdoor metal structures such as bridges, overpasses or water towers; casting brass or bronze fixtures; fabricating metal products; or exposure to lead fumes or dust from firing guns or retrieval of spent bullets at firing ranges. While the use of lead in non-battery products has declined in the U.S. the use of lead worldwide continues to grow, especially in battery applications. Recycling the growing amount of "e-waste" created by discarded electronic and lead battery consumer products and the increased demand for raw metals and specifically recycled lead worldwide puts a new group of workers at risk to significant exposure to lead. The 2009 MIOSHA inspection of three Michigan recycling companies demonstrates the need to remain vigilant in relaying lead regulations and health and safety information to this emerging industry.

Since 2002 Michigan ABLES project has sent letters to laboratories which provide blood lead analysis for Michigan residents, recommending the laboratories lower their upper limit of normal blood lead levels to correspond with current medical knowledge of health effects of lead. Scientific articles on current medical knowledge of the adverse health effects of lead have also been provided to encour-

age changes to the interpretative language of reference ranges of lead on their laboratory reports. The change would conform with the recommendations on medical management and prevention of adult blood lead levels as outlined in Table 3 of an article published in *Environmental Health Perspectives* (7). This mini-monograph of articles documented the inadequacy of the current OSHA standard to protect against the health effects of lead. Physicians rely on laboratory reports to provide information based on the 95% confidence limit of a laboratory value in the general population in making medical recommendations for their patients. Often laboratory reports are their main source of information. The Fourth Annual CDC Report shows that blood leads in the general population are continuing to fall and the 95th confidence limit for the upper limit of normal is now at 4.2 µg/dl (1).

In 2009 follow-up continued on the information provided to these labs and letters were also sent to four national laboratories which provide almost fifty percent of Michigan's adult blood lead analyses. To date, one national lab has agreed to adopt these recommendations as have four Michigan laboratories. Three other national labs and six Michigan laboratories have given strong commitment to reevaluating the adult blood lead reference range language and potentially making changes in 2010. Laboratory changes to date represent ten percent of Michigan's adult lead laboratory reports.

A further problem for Michigan families is that adults working in lead occupations may bring lead home on their shoes or clothes and expose their spouse and children. Only one in three families with someone exposed to lead at work report that their young children are tested for elevated lead. When these children are tested, 35% are found to have an elevated blood lead level (Table 17). While the number of children being tested for lead statewide has markedly increased, there has only been a slight increase of blood lead testing for the children of lead exposed workers. Michigan's Childhood Lead Prevention Program reports in the 2007 Annual Report on Blood Lead Levels on Adults and

Children in Michigan a successful reduction of the percentage of confirmed elevated BLLs from 7.2% in 1999 to 1.4% in 2007. The main funding of Michigan's childhood lead program has been provided to economically dependent children who predominantly reside in older Michigan housing, most likely to contain lead paint or plumbing. Increased focus needs to be made on lead workers' children who, when tested, have confirmed BLLs ≥ 10 µg/dL 34.7% of the time. There has been on going collaboration with the Michigan Childhood Lead Prevention Program to improve this situation and workers exposed to lead should be encouraged to test their children for lead exposure when take-home lead is a potential risk.

In its twelfth year of operation, the surveillance system for lead continued to prove successful in identifying large numbers of adults with elevated lead levels and sources of exposure that could be remediated to reduce exposures in Michigan. The reduction in elevated blood lead levels, particularly from occupational exposures, has appeared to plateau (Figure 5). This plateau along with a plateau in the number of individuals who report preventive personal habits to reduce lead exposure at the facility where they are employed (Figure 16) has us concerned that the progress in previous years to reduce lead exposure has stalled.

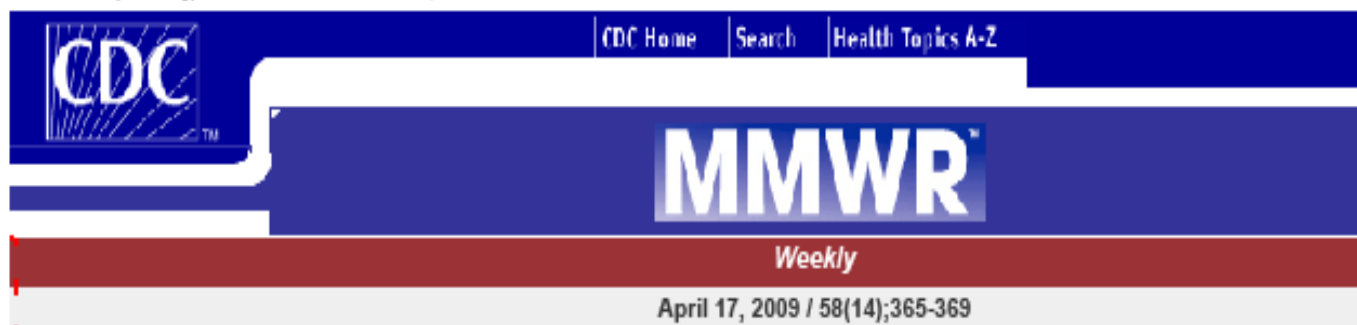
Continued outreach is planned to the medical community on the recognition and management of potential lead-related medical problems in both individuals and their young families. A new OSHA PEL, substitutes of safer compounds, along with expanding education and outreach for employers and workers and their families would all contribute to lower blood lead levels. Ongoing surveillance in future years will continue to target and evaluate intervention activity to reduce exposure to lead.

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APPENDICES

Appendix A	Morbidity and Mortality Weekly Report (MMWR): Adult Blood Lead Epidemiology Surveillance --- United States, 2005--2007
Appendix B	Blood Lead Analysis Reporting
Appendix C	Summary of Michigan's Lead Standards
Appendix D	Table 1: Health Based Management Recommendations for Lead Exposed Adults, Environmental Health Perspective Vol. 115, No. 3 March 2007.



Adult Blood Lead Epidemiology and Surveillance --- United States, 2005--2007

Overexposure to inorganic lead continues to be an important health problem worldwide. Furthermore, recent research has caused increased concerns about the toxicity of lead at low doses (1,2). Lead can cause acute and chronic adverse effects in multiple organ systems, ranging from subclinical changes in function to symptomatic, life-threatening intoxication. Since 1992, CDC's state-based Adult Blood Lead Epidemiology and Surveillance (ABLES) program has tracked laboratory-reported elevated blood lead levels (BLLs) in U.S. adults. The vast majority (95%) of reported elevated BLLs have been work related. One of the *Healthy People 2010* national public health objectives is to reduce to zero the prevalence of BLLs ≥ 25 $\mu\text{g}/\text{dL}$ among adults (objective 20-7) (3). ABLES surveillance results through 2004 have been published previously (4--6). This report summarizes results for the period 2005--2007. An overall decline in national rates of elevated BLLs among state residents plus nonresidents from 14.0 in 1994 to 7.8 in 2007 has been observed. The national rate of state resident adults with BLLs ≥ 25 $\mu\text{g}/\text{dL}$ was 7.2 per 100,000 employed adults in 2005 and 7.4 in 2006 and 2007. Industry subsectors with the highest numbers of lead-exposed workers were manufacturing of storage batteries, mining of lead and zinc ores, and painting and paper hanging. The most common nonoccupational exposures were shooting firearms; remodeling, renovating, or painting; retained bullets (gunshot wounds); and eating food containing lead. These findings indicate a need for increased preventive interventions to promote healthier workplaces and help move toward the *Healthy People 2010* objective.

ABLES reporting benchmarks include BLLs ≥ 25 $\mu\text{g}/\text{dL}$ and BLLs ≥ 40 $\mu\text{g}/\text{dL}$. State ABLES programs collect data on adult BLLs from laboratories and health-care providers through mandatory reporting requirements. ABLES states then intervene to prevent lead overexposures in worksites where elevated exposures occur. These interventions include 1) conducting follow-up interviews with physicians, employers, and workers; 2) investigating work sites; 3) providing technical assistance; 4) providing Occupational Safety and Health Administration (OSHA) referrals for consultation and enforcement; and 5) developing and disseminating educational materials and outreach programs.

A unique identifier is assigned to each person to account for multiple BLL reports. For BLLs ≥ 25 $\mu\text{g}/\text{dL}$, follow-up by telephone generally is conducted to ensure completeness of information on the industry where the

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person works, exposure source (occupational or nonoccupational), and other variables. The industry where the person worked is coded using the 1987 Standard Industrial Classification (SIC) or the 2002 North American Industry Classification System (NAICS). BLL reporting requirements vary among ABLES states, ranging from the reporting of all BLLs to BLLs $\geq 40 \mu\text{g/dL}$. * Most ABLES states submit data on all BLLs to CDC's National Institute for Occupational Safety and Health (NIOSH), including reports from persons whose BLLs fall below the state reporting requirement.

For this report, adults were considered to be all persons aged ≥ 16 years. For adults with more than one BLL result in a given year, only the highest BLL was included in this report. Elevated BLLs were defined as blood lead concentrations $\geq 25 \mu\text{g/dL}$. Rate numerators were "state resident" adults with elevated BLLs (adults residing in the reporting state) or "state residents plus nonresidents" adults with elevated BLLs (all adults reported by a state). Denominators were the annual employed population aged ≥ 16 years for the period 2005–2007 from the Current Population Survey.[†] To calculate yearly state prevalence rates, the numbers of adults with elevated BLLs from each state were divided by the state's annual employed population. The combined state numerators and denominators for each year were then used to calculate the national prevalence rate.[§]

Data were provided by 37 states in 2005, 38 states in 2006, and 38 states in 2007.[¶] Overall, national rates of elevated BLLs declined from 14.0 per 100,000 employed adults in 1994 to 7.8 in 2007 ([Figure 1](#)). ABLES states reported 8,902, 9,562, and 9,871 state resident adults with elevated BLLs in 2005, 2006, and 2007, respectively. The national rate per 100,000 state resident adults with elevated BLLs declined 4%, from 7.5 in 2004 to 7.2 in 2005, but increased 3%, from 7.2 in 2005 to 7.4 in 2006 and 2007. State annual prevalence for 2005 ranged from 0.5 (Hawaii) to 34.0 (Kansas); for 2006, from 0.2 (Montana) to 32.3 (Pennsylvania); and for 2007, from 0.8 (New Mexico) to 36.4 (Missouri). Prevalence rates in 2007 were < 10 in 29 states and ≥ 20 in six states ([Figure 2](#)).

Rates per 100,000 state resident adults with BLLs $\geq 40 \mu\text{g/dL}$, a second ABLES reporting benchmark, were 1.2 in 2004 and 2005, 1.1 in 2006, and 1.2 in 2007. In 2005, prevalence rates ranged from 0.1 (Arizona and New Mexico) to 9.5 (Alabama). In 2006, prevalence rates ranged from 0.2 (Arizona) to 7.5 (Alabama). In 2007, prevalence rates ranged from 0.1 (Oklahoma) to 9.1 (Alabama).

Data on industry and exposure source were submitted by 33 states (7,492 state resident adults) in 2005, 35 states (8,230 state resident adults) in 2006, and 35 states (8,246 state resident adults) in 2007.** For this analysis, adults exposed to both occupational and nonoccupational sources (17 in 2005, 24 in 2006, and 11 in 2007) were considered exposed at work only. Exposures at work accounted for 5,861 (78.2%), 6,643 (80.7%), and 6,463 (76.7%) elevated BLLs in 2005, 2006, and 2007, respectively. The majority of adults with elevated BLLs were employed in three large industry sectors: manufacturing (64.8% in 2005 and 71.8% in 2006 and 2007), construction (15.2% in 2005, 12.6% in 2006, and 11.4% in 2007), and mining (9.4% in 2005, 9.5% in 2006, and 10.5% in 2007). Specific industry subsectors with the highest numbers were manufacturing of storage batteries, mining of lead and zinc ores, and painting and paper hanging ([Table](#)). Nonoccupational exposures accounted for 330 (4.4%), 380 (4.6%), and 350 (4.2%) adults in 2005, 2006, and 2007, respectively. Among these, the most common exposures were shooting firearms; remodeling, renovating, or painting; retained bullets (gunshot wounds); and eating food containing lead ([Table](#)).

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Adult Blood Lead Epidemiology and Surveillance --- United States, 2005--2007

Reported by: WA Alarcon, MD, RJ Roscoe, MS, GM Calvert, MD, JR Graydon, Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC.

Editorial Note:

ABLES surveillance results indicate an overall decreasing trend in the national prevalence rate of elevated BLLs in adults since 1994 ([Figure 1](#)), with a slight increase in the 2006 and 2007 rates. Part of the overall decrease might be the result of a decline in the number of manufacturing jobs with potential for lead exposure over time, in addition to prevention measures that have been enacted since the early 1990s, including 1) improved interventions by ABLES states, worker-affiliated organizations, and federal programs (e.g., NIOSH's ABLES surveillance^{††} and OSHA's National Emphasis Program to reduce lead exposure^{§§}) and 2) measures implemented by industry (e.g., engineering controls, work practices, and respiratory protection). However, these rates might also reflect low employer compliance with testing and reporting requirements. A 2008 report using ABLES data found that only 29% of adults with BLLs requiring medical removal from work involving lead exposure received appropriate follow-up blood lead tests and met the eligibility criteria to return to their work (7). The slight increase in national rates in the ABLES data for 2006 and 2007 might have resulted from increased exposures at workplaces or improved testing and reporting. Changes in annual rates also might reflect increased or decreased surveillance activities by ABLES state programs.

ABLES data also indicate that excessive exposure to lead remains primarily an occupational health problem in the United States; 95% of adults with an identified exposure source were exposed at work. As in the past, during 2005--2007, these exposures occurred mainly in battery manufacturing, lead and zinc ores mining, and painting and paper hanging industry subsectors. The consistently higher proportions of adults with BLLs ≥ 40 $\mu\text{g}/\text{dL}$ among those with BLLs ≥ 25 $\mu\text{g}/\text{dL}$ observed in the painting and paper hanging, special trade contractors, and nonferrous foundries industries from 2005 through 2007 ([Table 1](#)) likely reflect higher lead exposures in these industries.

OSHA lead standards require removing a worker from lead exposure when the whole-blood lead concentrations ≥ 50 $\mu\text{g}/\text{dL}$ for construction workers or ≥ 60 $\mu\text{g}/\text{dL}$ for general industry workers, and permit return to work when their BLLs is ≤ 40 $\mu\text{g}/\text{dL}$ (8,9). The current CDC/NIOSH surveillance case definition for elevated BLLs in adults is BLL ≥ 25 $\mu\text{g}/\text{dL}$. Recent research has consistently demonstrated the toxicity of lead from chronic dose exposures < 30 $\mu\text{g}/\text{dL}$. Low-dose lead exposure can result in adverse effects in multiple organ systems, including effects in neurologic, cardiovascular, reproductive, and renal function (1,2).

CDC is making efforts to reduce occupational lead exposures through collaborations with state ABLES programs (by providing technical support and funding for surveillance); with worker-affiliated organizations (e.g., NIOSH cooperated with the Center for Construction Research and Training, formerly known as The Center to Protect Workers' Rights [CPWR], in analyzing lead exposures in the construction industry); and with OSHA. One of OSHA's National Emphasis Programs aims to reduce workplace lead exposure among all U.S. workers, and ABLES data are provided periodically to OSHA to help better target this program.

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The findings in this report are subject to at least one limitation. The number of adults with elevated BLLs reported to ABLES likely is underreported because some employers might not provide BLL testing to all lead-exposed workers as required by OSHA regulations and because some laboratories might not report all tests as required by state regulations (10); these factors likely vary across the 38 participating ABLES states.

To further prevent workplace lead exposures and help move toward the *Healthy People 2010* objective, the following efforts need to be strengthened, particularly in industries with higher exposures: 1) worker protection programs developed and maintained by employers; 2) government efforts, such as state ABLES programs, the OSHA National Emphasis Program to reduce lead exposure, and the NIOSH ABLES program; 3) research and interventions by worker-affiliated organizations, such as the Center for Construction Research and Training; and 4) education of the public to prevent nonoccupational exposures.

Acknowledgments

This report is based, in part, contributions by ABLES state coordinators and by J Li, Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC.

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Adult Blood Lead Epidemiology and Surveillance --- United States, 2005--2007

[state-contacts.html](#).

† Data extracted from <http://www.bls.gov/data>.

§ Information regarding interpretation of specific state ABLES data, definitions, and rate calculations is available at <http://www.cdc.gov/niosh/topics/ables/ables.html>.

¶ 38 states submitted data to ABLES in 2007: Alabama, Alaska, Arizona, California, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Washington, Wisconsin, and Wyoming. Tennessee data were not available for 2005. Louisiana data were not available for 2005 and 2006. Hawaii data were not available for 2007.

** States providing data on industry in 2007: Alaska, Arizona, California, Connecticut, Florida, Georgia, Illinois, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Washington, Wisconsin, and Wyoming. Industry data were not available for Louisiana for 2005 and 2006, Rhode Island for 2005, and Tennessee for 2005. Hawaii data were not available for 2007.

†† Information available at <http://www.cdc.gov/niosh/topics/ables/ables.html>.

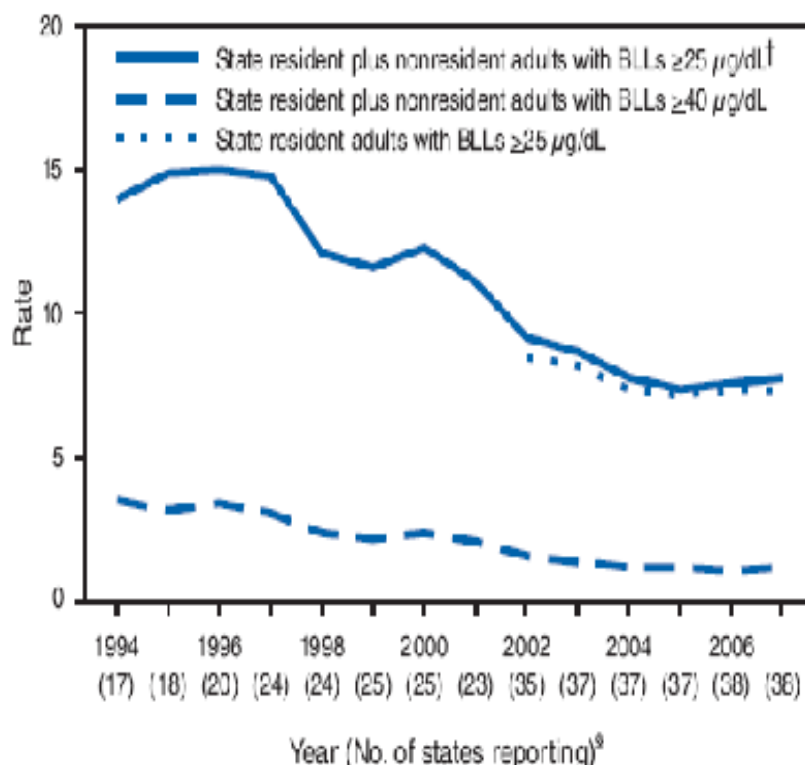
§§ Information available at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=directives&p_id=2572.

¶¶ Elements of worker protection programs should include 1) hazard determination, including exposure assessment; 2) engineering and work practice controls; 3) respiratory protection; 4) protective clothing and equipment; 5) housekeeping; 6) hygiene facilities and practices; 7) medical surveillance and provisions for medical removal; 8) training; 9) signs; and 10) recordkeeping. Additional information available at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=fact_sheets&p_id=161.

FIGURE 1. National prevalence rates* of adults with elevated blood lead levels (BLLs), by year - Adult Blood Lead Epidemiology and Surveillance program, United States, 1994--2007

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Adult Blood Lead Epidemiology and Surveillance — United States, 2005–2007



* Per 100,000 employed adults aged ≥ 16 years. Denominators for 2005–2007 extracted from 2008 U.S. Department of Labor, Bureau of Labor Statistics Current Population Survey, available at <http://www.bls.gov/data>.

† State residents are adults residing in the reporting state. State residents plus nonresidents are all adults reported by a state.

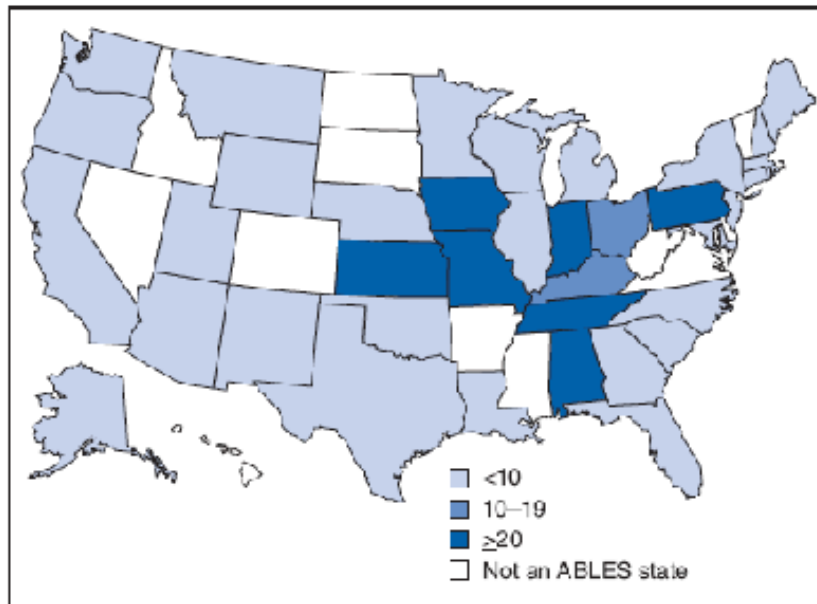
§ 38 states submitted data in 2007: Alabama, Alaska, Arizona, California, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Washington, Wisconsin, and Wyoming. Tennessee data were not available for 2005. Louisiana data were not available for 2005 and 2006. Hawaii data were not available for 2007.

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FIGURE 2. Annual state prevalence rate* categories for state resident adults† with elevated blood lead levels (≥ 25 $\mu\text{g/dL}$) - Adult Blood Lead Epidemiology and Surveillance (ABLES) program, United States, 2007§

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Adult Blood Lead Epidemiology and Surveillance — United States, 2005–2007



* Per 100,000 employed adults aged ≥16 years. Denominators for 2005–2007 extracted from 2008 U.S. Department of Labor, Bureau of Labor Statistics Current Population Survey, available at <http://www.bls.gov/data>.

† State residents are adults residing in the reporting state.

§ 38 states submitted data in 2007: Alabama, Alaska, Arizona, California, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Washington, Wisconsin, and Wyoming. Tennessee data were not available for 2005. Louisiana data were not available for 2005 and 2006. Hawaii data were not available for 2007.

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TABLE. Number and percentage of resident adults with elevated blood lead levels (BLLs), by industry subsector and nonoccupational source of exposure - Adult Blood Lead Epidemiology and Surveillance (ABLES) program, United States, 2005–2007

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Adult Blood Lead Epidemiology and Surveillance — United States, 2005–2007

Exposure type	2005 (33 states)				2006 (35 states)				2007 (34 states)			
	BLLs ≥ 25 $\mu\text{g}/\text{dL}$		BLLs ≥ 40 $\mu\text{g}/\text{dL}$		BLLs ≥ 25 $\mu\text{g}/\text{dL}$		BLLs ≥ 40 $\mu\text{g}/\text{dL}$		BLLs ≥ 25 $\mu\text{g}/\text{dL}$		BLLs ≥ 40 $\mu\text{g}/\text{dL}$	
	No.	(%)†	No.	(%)§	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Occupational (Industry subsector [SIC and NAICS codes] *)												
Manufacturing, storage batteries (SIC 3691, NAICS 335911)	1,916	(32.7)	90	(4.7)	2,636	(39.7)	179	(6.8)	2,524	(39.1)	207	(8.2)
Metal mining, lead and zinc ores (SIC 1031, NAICS 212231)	542	(9.2)	71	(13.1)	625	(9.4)	109	(17.4)	672	(10.4)	127	(18.9)
Construction, painting and paper Hanging (SIC 1721, NAICS 237310 part, 238320 part)	527	(9.0)	144	(27.3)	495	(7.5)	130	(26.3)	399	(6.2)	117	(29.3)
Manufacturing, primary batteries (dry and wet) (SIC 3692, NAICS 335912)	187	(3.2)	22	(11.8)	597	(9.0)	92	(15.4)	573	(8.9)	126	(22.0)
Manufacturing, secondary smelting and refining of nonferrous metals (SIC 3341, NAICS 331314 part, 331423 part, 331492 part)	355	(6.1)	51	(14.4)	370	(5.6)	37	(10.0)	447	(6.9)	60	(13.4)
Manufacturing, primary smelting and refining of nonferrous metals (SIC 3339, NAICS 33419)	134	(2.3)	19	(14.2)	129	(1.9)	24	(18.6)	128	(2.0)	21	(16.4)
Construction, special trade contractors NEC¶ (SIC 1799, various NAICS codes in construction and services)	135	(2.3)	34	(25.2)	93	(1.4)	23	(24.7)	96	(1.5)	20	(20.8)
Manufacturing, copper foundries (SIC 3366, NAICS 331525)	125	(2.1)	16	(12.8)	112	(1.7)	18	(16.1)	78	(1.2)	11	(14.1)
Construction, bridge, tunnel, and elevated highway construction (SIC 1622, NAICS 237310 part, 237990 part)	67	(1.1)	9	(13.4)	87	(1.3)	12	(13.8)	34	(0.5)	5	(14.7)

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Manufacturing, nonferrous foundries, except aluminum and copper (SIC 3369, NAICS 331528)	60	(1.0)	13	(21.7)	53	(0.8)	9	(17.0)	75	(1.2)	20	(26.7)
Manufacturing, rolling, drawing, and extruding of nonferrous metals (SIC 3356, NAICS 331491)	65	(1.1)	3	(4.6)	54	(0.8)	7	(13.0)	56	(0.9)	14	(25.0)
Services, automotive repair shops NEC (SIC 7539, NAICS 811118, 811198 part)	79	(1.3)	15	(19.0)	41	(0.6)	5	(12.2)	50	(0.8)	9	(18.0)
Manufacturing, steel works, blast furnaces (including coke ovens), and rolling mills (SIC 3312, NAICS 331111 part, 331221 part)	63	(1.1)	6	(9.5)	26	(0.4)	2	(7.7)	64	(1.0)	5	(7.8)
Other industries and unavailable information on industry**	1,606	(27.4)	302	(18.8)	1,325	(19.9)	207	(15.6)	1,267	(19.6)	215	(17.0)
Total exposed at work	5,861	(100.0)	795	(13.6)	6,643	(100.0)	854	(12.9)	6,463	(100.0)	957	(14.8)
Nonoccupational												
Shooting firearms (target shooting)	98	(29.7)	25	(25.5)	129	(33.9)	29	(22.5)	120	(34.3)	19	(15.8)
Remodeling/Renovation/Painting	58	(17.6)	15	(25.9)	49	(12.9)	9	(18.4)	51	(14.6)	15	(29.4)
Retained bullets (gunshot wounds)	17	(5.2)	4	(23.5)	30	(7.9)	15	(50.0)	35	(10.0)	10	(28.6)
Eating food containing lead	21	(6.4)	9	(42.9)	29	(7.6)	10	(34.5)	21	(6.0)	5	(23.8)
Casting (e.g., bullets and fishing weights)	14	(4.2)	5	(35.7)	13	(3.4)	4	(30.8)	20	(5.7)	6	(30.0)
Pica (i.e., the eating of nonfood items)	21	(6.4)	8	(38.1)	15	(3.9)	5	(33.3)	10	(2.9)	3	(30.0)
Complementary and alternative medicines	8	(2.4)	7	(87.5)	13	(3.4)	9	(69.2)	10	(2.9)	6	(60.0)
Retired††	11	(3.3)	2	(18.2)	3	(0.8)	2	(66.7)	8	(2.3)	1	(12.5)
Ceramics	-	-	-	-	-	-	-	-	3	(0.9)	2	(66.7)
Stained glass	3	(0.9)		-	-	-	-	-	-	-	-	-
Eating from leaded cookware	3	(0.9)	1	(33.3)	-	-	-	-	-	-	-	-
Drinking liquids containing lead (e.g., moonshine)	-	-	-	-	-	-	-	-	2	(0.6)	1	(50.0)

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Other nonoccupational exposure	3	(0.9)	2	(66.7)	3	(0.8)	2	(66.7)	6	(1.7)	2	(33.3)
Unavailable nonoccupational source of exposure	73	(22.1)	19	(26.0)	96	(25.3)	27	(28.1)	64	(18.3)	15	(23.4)
Total exposed at places other than work	330	(100.0)	97	(29.4)	380	(100.0)	112	(29.5)	350	(100.0)	85	(24.3)

* Standard Industry Classification and North American Industry Classification System. Correspondence tables between 2002 NAICS and 1987 SIC are available from the U.S. Census Bureau at <http://www.census.gov/epcd/naics02/index.html>.

† Percentage of the total cases reported per year.

§ Percentage cases with elevated BLLs in each industry or nonoccupational exposure source.

¶ Not elsewhere classified.

** Information on industry was unavailable for 265 adults with BLLs ≥ 25 $\mu\text{g}/\text{dL}$ and for three adults with BLLs ≥ 40 $\mu\text{g}/\text{dL}$ in 2005; and in 88 adults with BLLs ≥ 25 $\mu\text{g}/\text{dL}$ in 2006.

†† These adults might have been former lead workers. Available data show that two adults (BLLs 32 $\mu\text{g}/\text{dL}$ and 34 $\mu\text{g}/\text{dL}$) retired from a radiator repair shop, one retired from the police (BLL 39 $\mu\text{g}/\text{dL}$), and one retired from a tire manufacturing industry (BLL 37 $\mu\text{g}/\text{dL}$).

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APPENDIX B

DEPARTMENT OF COMMUNITY HEALTH

HEALTH LEGISLATION AND POLICY DEVELOPMENT

BLOOD LEAD ANALYSIS REPORTING

Filed with the Secretary of State on September 25, 1997. These rules take effect 15 days after filing with the Secretary of State.

(By authority conferred on the community public health agency by section 5111 of Act No. 368 of the Public Acts of 1978, as amended, section 8 of Act No. 312 of the Public Acts of 1978, and Executive Reorganization Order No. 1996-1, being §§333.5111 and 325.78, and 330.3101 of the Michigan Compiled Laws)

R 325.9081 Definitions.

Rule 1. (1) As used in these rules:

(a) "Blood lead analysis report form" means the form used to report the required reportable information for blood that has been analyzed for lead.

(b) "Agency" means the community public health agency.

(c) "Physician/provider" means a licensed professional who provides health care services and who is authorized to request the analysis of blood specimens. For this purpose, provider may also mean the local health department.

(2) The term "local health department," as defined in Act No. 368 of the Public Acts of 1978, as amended, being §333.1101 et seq. of the Michigan Compiled Laws, has the same meaning when used in these rules.

R 325.9082 Reportable information.

Rule 2. (1) Reportable information is specifically related to blood samples submitted to clinical laboratories for lead analysis.

(2) Upon initiating a request for blood lead analysis, the physician/provider ordering the blood lead analysis shall complete the client information (section I) and the physician/provider information (section II) of a blood lead analysis report form designated by the agency or shall complete another similar form that ensures the inclusion of the same required data and shall provide all of the following information:

(a) All of the following information with respect to the individual tested:

(i) Name.

(ii) Sex.

(iii) Racial/ethnic group.

(iv) Birth date.

(v) Address, including county.

(vi) Telephone number.

(vii) Social security number and Medicaid number, if applicable.

(viii) If the individual is a minor, the name of a parent or guardian and social security number of the parent or guardian.

(ix) If the individual is an adult, the name of his or her employer.

(b) The date of the sample collection.

(c) The type of sample (capillary or venous).

APPENDIX B

(3) The blood lead analysis report form or a document with the same data shall be submitted with the sample for analysis to a clinical laboratory that performs blood lead analysis.

(4) Upon receipt of the blood sample for lead analysis, the clinical laboratory shall complete the laboratory information (section III) and provide all of the information required and/or submitted by the physician/provider and the following:

- (a) The name, address, and phone number of the laboratory.
- (b) The date of analysis.
- (c) The results of the blood lead analysis in micrograms of lead per deciliter of whole blood rounded to the nearest whole number.

R 325.9083 Reporting responsibilities.

Rule 3. (1) All clinical laboratories doing business in this state that analyze blood samples for lead shall report all blood lead results, rounded to the nearest whole number, for adults and children to the Community Public Health Agency, Childhood Lead Poisoning Prevention Program (CPHA/CLPPP), 3423 N.M.L. King Jr. Blvd., Lansing, MI 48909. Reports shall be made within 5 working days after test completion.

(2) Nothing in this rule shall be construed to relieve a laboratory from reporting results of a blood lead analysis to the physician or other health care provider who ordered the test or to any other entity as required by state, federal, or local statutes or regulations or in accordance with accepted standard of practice, except that reporting in compliance with this rule satisfies the blood lead reporting requirements of Act No. 368 of the Public Acts of 1978, as amended, being §333.1101 et seq. of the Michigan Compiled Laws.

R 325.9084 Electronic communications.

Rule 4. (1) A clinical laboratory may submit the data required in R 325.9083 electronically to the agency.

(2) For electronic reporting, upon mutual agreement between the reporting laboratory and the agency, the reporting shall utilize the data format specifications provided by the agency.

R 325.9085 Quality assurance.

Rule 5. For purposes of assuring the quality of submitted data, each reporting entity shall allow the agency to inspect copies of the medical records that will be submitted by the reporting entity to verify the accuracy of the submitted data. Only the portion of the medical record that pertains to the blood lead testing shall be submitted. The copies of the medical records shall not be recopied by the agency and shall be kept in a locked file cabinet when not being used. After verification of submitted data, the agency shall promptly destroy the copies of the medical records.

R 325.9086 Confidentiality of reports.

Rule 6. (1) The agency shall maintain the confidentiality of all reports of blood lead tests submitted to the agency and shall not release reports or any information that may be used to directly link the information to a particular individual, unless the agency has received written consent from the individual, or from the individual's parent or legal guardian, requesting the release of information.

(2) Medical and epidemiological information that is released to a legislative body shall not contain information that identifies a specific individual. Aggregate epidemiological information concerning the public health that is released to the public for informational purposes only shall not contain information that identifies a specific individual.

R 325.9087 Blood lead analysis report form.

APPENDIX B

Rule 7. The blood lead analysis report form reads as follows:

**MICHIGAN DEPARTMENT OF COMMUNITY HEALTH
BLOOD LEAD ANALYSIS REPORT
DATA/INFORMATION REQUIRED BY ADMINISTRATIVE RULE # R325.9082 AND R 325.9083**

PATIENT INFORMATION <i>To be completed by Parent/Guardian or Patient</i> PLEASE PRINT				
Last Name _____	First Name _____	M. Initial _____		
Address – No PO Boxes, please _____	Apt. # _____	City _____	<div style="text-align: center;">MI</div> State _____ Zip _____	
() _____ Area Code and Phone Number	Birthdate (month/day/year) _____	Parent/Guardian Name (please print) _____		
Race (Check all that apply): <input type="checkbox"/> American Indian or Alaskan Native <input type="checkbox"/> Asian <input type="checkbox"/> Black or African American <input type="checkbox"/> Native Hawaiian or Other Pacific Islander <input type="checkbox"/> White <input type="checkbox"/> Hispanic or Latino <input type="checkbox"/> Middle Eastern or Arabic		Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female Funding Sources: <input type="checkbox"/> Self Pay/Insurance <input type="checkbox"/> Medicaid ID# (Medicaid only): _____		
<div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> If Patient is an adult (≥ 16 years): Employer: _____ Social Security #: _____ </div>				

PROVIDER/PHYSICIAN INFORMATION <i>To be completed by provider's office</i>			
Clinic, Hospital or Agency Name _____	Physician name _____		
Mailing Address _____	City _____	State _____	Zip _____
() _____ Area Code and Phone Number	Fax Number _____		

SPECIMEN COLLECTION INFORMATION <i>To be completed by person who draws specimen</i>	
Specimen Collection Date _____	Source of Specimen <input type="checkbox"/> Capillary <input type="checkbox"/> Venous <input type="checkbox"/> Filter Paper

LABORATORY INFORMATION <i>To be completed by testing laboratory</i>	
Laboratory Name _____	Specimen ID Number _____
() _____ Area Code and Phone Number	Analysis Date _____
BLOOD LEAD LEVEL in Micrograms per Deciliter _____ (round to nearest whole number, please)	

APPENDIX C

SUMMARY OF MICHIGAN'S LEAD STANDARDS

In 1981, under the authority of the Michigan Occupational Safety and Health Act (MIOSHA), Michigan promulgated a comprehensive standard to protect workers exposed to lead in general industry (i.e., R325.51901 - 325.51958). That standard was most recently amended in October, 2000. In October 1993, MIOSHA adopted by reference the federal Occupational Safety and Health Administration's (OSHA) Lead Standard for Construction (i.e., 29 CFR 1926.62). That standard was most recently amended October 18, 1999. Both the MIOSHA Lead Exposure in Construction Standard (Part 603) and the Lead Exposure in General Industry Standard (Part 310) establish an "action level" (30 micrograms of lead per cubic meter of air [$\mu\text{g}/\text{m}^3$] averaged over an eight-hour period) and a permissible exposure limit (50 $\mu\text{g}/\text{m}^3$ averaged over an eight hour period) for employees. Both standards require employers to conduct initial exposure monitoring and to provide employees written notification of these monitoring results. If employee exposure levels exceed the permissible exposure limit (PEL), employers are required to develop a written compliance program that addresses the implementation of feasible engineering and/or work practice controls to reduce and maintain employee exposures below the PEL. The Lead Exposure in Construction Standard (Part 603) also allows the use of administrative controls to achieve this objective. An employer's obligations concerning hygiene facilities, protective work clothing and equipment, respiratory protection, medical surveillance and training under the Lead Exposure in Construction Standard (Part 603) are triggered initially by job tasks and secondarily by actual employee exposure level to lead. Under the Lead Exposure in General Industry Standard (Part 310), these potential obligations are triggered by actual employee exposure levels to lead. Medical surveillance and training are triggered by exposures above the action level (AL), whereas protective clothing and equipment, respiratory protection and hygiene facilities are triggered by exposures above the PEL.

The medical surveillance program requirements for Michigan's Lead Exposure in General Industry Standard (Part 310) versus those required in Lead Exposure in Construction Standard (Part 603) do vary. Under the Lead Exposure in General Industry Standard (Part 310), a medical surveillance program must be implemented which includes periodic biological monitoring (blood tests for lead and zinc protoporphyrin [ZPP] levels), and medical exams/consultation for all workers exposed more than 30 days per year to lead levels exceeding the AL. Under the Lead Exposure in Construction Standard (Part 603), a distinction is made between "initial medical surveillance" (consisting of biological monitoring in the form of blood sampling and analysis for lead and ZPP levels) and secondary medical surveillance (consisting of follow-up biological monitoring and a medical examination/consultation). The initial medical exam is triggered by employee exposure to lead on any day at or above the AL. The secondary medical exam is triggered by employee exposures to lead at or above the AL for more than 30 days in any 12 consecutive months period.

Michigan's Lead Exposure in General Industry Standard (Part 310) mandates that employees exposed at or above the AL must be removed from the lead exposure when:

- A periodic blood test and follow-up blood test indicate that the blood lead level (BLL) is at or above 60 micrograms per deciliter ($\mu\text{g}/\text{dL}$) of whole blood.
- Medical removal is also triggered if the average of the last three BLL or the average of all blood sampling tests conducted over the previous six months, whichever is longer, indicates the employees blood lead level is at or above 50 $\mu\text{g}/\text{dL}$. Medical removal is not required however, if the last blood sampling test indicates a blood lead level at or below 40 $\mu\text{g}/\text{dL}$ of whole blood.
- When a final medical determination reveals that an employee has a detected medical condition which places that employee at an increased risk of material impairment to health from the lead exposure.

The Lead Exposure in Construction Standard (Part 603) mandates removal of an employee from a lead exposure at or above the AL when:

- A periodic and follow-up blood test indicates that an employee's BLL is at or above 50 $\mu\text{g}/\text{dL}$; or
- There is a final medical determination that an employee has a detected medical condition which places that employee at an increased risk of material impairment to health from the lead exposure.

APPENDIX C

When an employee can return to work at their former job also differs by standard. The Lead Exposure in General Industry Standard (Part 310) allows an employee to return to his or her former job status under any of the following circumstances:

- If the employee's BLL was at or above 70 µg/dL, then two consecutive blood tests must have the BLL at or below 50 µg/dL.
- If the employee's BLL was at or above 60 µg/dL or due to an average BLL at or above 50 µg/dL, then two consecutive BLL must be at or below 40 µg/dL.
- For an employee removed due to a final medical determination, when a subsequent medical determination no longer detects a medical condition which places the employee at an increased risk of material impairment to health from exposure to lead.

The Lead Exposure in Construction Standard (Part 603) allows the employer to return an employee to their former job status under these circumstances:

- If the employee's BLL was at or above 50 µg/dL, then two consecutive blood tests must have the employee's BLL at or below 40 µg/dL.
- For an employee removed due to a final medical determination, when a subsequent medical determination no longer has a detected medical condition which places the employee at an increased risk of material impairment to health from exposure to lead.

Both the Lead Exposure in General Industry (Part 310) and Lead Exposure in Construction (Part 603) Standards have a medical removal protection benefits provision. This provision requires employers maintain full earnings, seniority and other employment rights and benefits of temporarily removed employees up to 18 months on each occasion that an employee is removed from exposure to lead. This includes the right to their former job status as though the employee had not been medically removed from the job or otherwise medically limited.

Provisions of Lead Exposure in General Industry (Part 310) and Lead Exposure in Construction (Part 603) Standards

Workers exposed to lead have a right to: an exposure assessment, respiratory protection, protective clothing and equipment, hygiene facilities, medical surveillance, medical removal and training. The triggering mechanisms that activate these rights are primarily based upon employee lead exposure levels. However, under the Lead Exposure in Construction Standard (Part 603), many of these rights are initially triggered by the specific work activity being performed.

Exposure Assessment

Air monitoring must be conducted to determine employee airborne lead exposure levels when a potential lead exposure exists. Under the Lead Exposure in Construction Standard (Part 603), however, specific work activities are identified/categorized that require "interim protection" (i.e., respiratory protection, personal protective clothing and equipment, work clothes change areas, hand washing facilities, biological monitoring and training) until air monitoring has been performed that establishes that these lead exposure levels are within the acceptable limits (AL or PEL).

Respiratory Protection

Respiratory protection is required whenever employee exposure levels exceed the PEL and as an interim control measure under the Lead Exposure in Construction Standard (Part 603). The level of respiratory protection required is dependent upon the actual employee exposure level or by the job activities identified in the Lead Exposure in Construction Standard (Part 603).

APPENDIX C**Protective Clothing/Equipment**

Protective clothing/equipment (i.e., coveralls or similar full body clothing; gloves, hats, shoes or disposable shoe coverlets; and face shield, vented goggles, or other applicable equipment) is required whenever employee exposure levels exceed the PEL and as an interim protection measure under the Lead Exposure in Construction Standard (Part 603).

Hygiene Facilities

Hygiene facilities (i.e., clothing change areas, showers, eating facilities) are required whenever employee exposures to lead exceed the PEL. Except for shower facilities, these same hygiene facilities must be provided as interim protection under the Lead Exposure in Construction Standard (Part 603). The construction employer must, however, provide hand washing facilities in lieu of the shower facility as an interim protection.

Medical Surveillance

Medical surveillance (i.e., medical exam and consultation) is required when workers are exposed to lead at or exceeding the AL for more than 30 days a year. Biological blood sampling and analysis to determine lead and ZPP levels is required initially under the Lead Exposure in Construction Standard (Part 603) when employee lead exposure is at or exceeds the AL on any single day. Under the Lead Exposure in General Industry Standard (Part 310), it is required when employees are exposed to concentrations of airborne lead greater than the A.L. for more than 30 days per year.

Medical Removal

Workers covered by the Lead Exposure in General Industry (Part 310) Standard have the right to be removed from airborne lead exposures at or above the AL when their periodic and follow-up blood lead level is at or above 60 µg/dL or when an average of the last three BLLs or the average of all blood sampling tests conducted over the previous six months, whichever is longer, indicates the employee blood lead level is at or above 50 µg/dL. However, under this later removal criteria, they are not required to be removed if the last blood sampling test indicates a blood lead level at or below 40 µg/dL.

Workers covered by the Lead Exposure in Construction Standard (Part 603) have the right to be removed from airborne lead exposures at or above the AL on each occasion that a periodic and follow-up blood sample test indicate that the employee's blood lead level is at or above 50 µg/dL.

Under both the Lead Exposure in General Industry (Part 310) and Lead Exposure in Construction (Part 603) Standards, workers also have the right to be removed from airborne lead exposures at or above the AL whenever there is a final medical determination that has detected that they have a medical condition that places them at an increased risk of material impairment to health from exposure to lead.

Training

Under the Lead Exposure in General Industry Standard (Part 310) and Lead Exposure in Construction (Part 603), employees exposed to any level of airborne lead must be informed of the contents of appendices A and B from that standard.

Under both the Lead Exposure in General Industry (Part 310) and Lead Exposure in Construction (Part 603) Standards, employees who are exposed at or above the AL on any day or who are subject to exposure to lead compounds which may cause skin or eye irritation must be provided comprehensive training covering all topics specified in those standards.

Also, under the Lead Exposure in Construction Standard (Part 603), employees involved in any of the specified work activities requiring interim controls, must receive training prior to initiating those activities that addresses the recognition and avoidance of unsafe conditions involving lead and the specific regulations applicable to the worksite that have been established to control or eliminate the hazards associated with exposure to lead.

APPENDIX D

Table 1. **Health– based management recommendations for lead-exposed adults**

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Blood lead level (µg/dL)	Short-term risks (lead exposure <1 year)	Long-term risks (lead exposure ≥ 1 year)	Management
<5	None documented	None documented	None Indicated
5-9	Possible spontaneous abortion Possible postnatal developmental delay	Possible spontaneous abortion Possible postnatal developmental delay Possible hypertension and kidney dysfunction	Discuss health risks Reduce lead exposure for women who are or may become pregnant
10-19	Possible spontaneous abortion Possible postnatal developmental delay Reduced birth weight	Possible spontaneous abortion Possible postnatal developmental delay Hypertension and kidney dysfunction Reduced birth weight Possible subclinical neurocognitive deficits	Discuss health risks Reduce lead exposure for women who are or may become pregnant Decrease lead exposure Increase biological monitoring Consider removal from lead exposure to avoid long-term risks if exposure control over an extended period does not decrease BLL <10 µg/dL or if medical condition present that increases risk with continued exposure
20-29	Possible spontaneous abortion Possible postnatal developmental delay Reduced birth weight	Possible spontaneous abortion Possible postnatal developmental delay Hypertension and kidney dysfunction Reduced birth weight Possible subclinical neurocognitive deficits	Remove from lead exposure if repeat BLL measured in 4 weeks remains ≥20 µg/dL
30-39	Spontaneous abortion Possible postnatal developmental delay Reduced birth weight	Spontaneous abortion Possible postnatal developmental delay Hypertension and kidney dysfunction Reduced birth weight Possible subclinical neurocognitive deficits Possible nonspecific symptoms*	Remove from lead exposure
40-79	Spontaneous abortion Possible postnatal developmental delay Reduced birth weight Nonspecific symptoms* Neurocognitive deficits Sperm abnormalities	Spontaneous abortion Possible postnatal developmental delay Hypertension Kidney dysfunction/neuropathy Subclinical peripheral neuropathy Reduced birth weight Neurocognitive deficits Nonspecific symptoms* Sperm abnormalities Anemia Colic Possible gout	Remove from lead exposure Refer for prompt medical evaluation Consider chelation therapy for BLL > 50 µg/dL with significant symptoms or signs of lead toxicity
≥90	Spontaneous abortion Possible postnatal developmental delay Reduced birth weight Nonspecific symptoms* Neurocognitive deficits Sperm abnormalities Encephalopathy Anemia Colic	Spontaneous abortion Possible postnatal developmental delay Hypertension Neuropathy Peripheral neuropathy Reduced birth weight Neurocognitive deficits Nonspecific symptoms* Sperm abnormalities Anemia Colic Gout	Remove from lead exposure Refer for immediate/urgent medical evaluation Probable chelation therapy

*Medical conditions that may increase the risk of continued exposure include chronic renal dysfunctions (serum creatinine > 1.5 mg/dL for women or protein urial, hypertension, neurologic disorders and cognitive dysfunction. Non specific symptoms may include headache, fatigue, sleep disturbance, anorexia, constipation, orthralgia, myalgia, and decreased libido.

Michigan State University Department of Medicine
117 West Fee Hall
East Lansing, MI 48824
517.353.1846

Kenneth D. Rosenman, MD
Amy Krizek, ABLES Project Coordinator

Michigan Department of Energy, Labor & Economic Growth
PO Box 30649

Lansing, MI 48909
517.322.1817

Douglas J. Kalinowski, MS CIH
Director MIOSHA



Occupational exposure to lead accounts for 95% of adult elevated blood lead levels in the U.S. (2).

Michigan's 2009 lead surveillance show that of the 19% of individuals with elevated BLLs from non-occupational sources, 73% are exposed from a hobby related to guns.



The Adult Blood Lead Epidemiology and Surveillance (ABLES) Program is a state-based surveillance program of laboratory-reported adult blood lead levels. The public health objective of the ABLES program is objective 20.7 in Healthy People 2010, which is to reduce the rate of adults (age 16 or older) who have blood lead levels of 25 micrograms per deciliter (mcg/dL) or greater. The ABLES program aims to accomplish this objective by building state capacity to initiate or improve adult blood lead surveillance programs which can accurately measure trends in adult blood lead levels and which can effectively intervene to prevent lead over-exposures.



There are many resources available to help employers, employees, health care professionals and others understand more about lead exposure, prevention and medical management. Links to these resources can be found at: www.oem.msu.edu.

Michigan Department of Community Health
Division of Family and Community Health
Childhood Lead Poisoning Prevention Program
109 West Michigan Avenue
P.O. Box 30195
Lansing, Michigan 48909
(517) 335-8885

Brenda Fink, A.C.S.W., Program Director
Nancy Peeler, Ed.M., Program Supervisor
Jane Nickert, R.N., M.S.N., M.S.B.A., Program Coordinator
Debra Behringer, R.N., M.S.N., Nurse Consultant
Robert L. Scott, Ph.D., Program Data Manager

The Lead Contamination Control Act of 1988 authorized the Centers for Disease Control and Prevention (CDC) to initiate program efforts to eliminate childhood lead poisoning in the United States. As a result of this Act, the CDC Childhood Lead Poisoning Prevention Program was created, with primary responsibility to:

- *Develop programs and policies to prevent childhood lead poisoning.*
- *Educate the public and health-care providers about childhood lead poisoning.*
- *Provide funding to state and local health departments to determine the extent of childhood lead poisoning by screening children for elevated blood lead levels, helping to ensure that lead-poisoned infants and children receive medical and environmental follow-up, and developing neighborhood-based efforts to prevent childhood lead poisoning.*
- *Support research to determine the effectiveness of prevention efforts at federal, state, and local levels.*

The cost benefit is clear: resources spent to prevent lead poisoning are an investment in each child's life-long health, quality of life, learning, and earning potential. If lead hazards were remediated in every Michigan residence and daycare setting built prior to 1978, childhood lead poisoning from residential paint would be eliminated.



Links to Michigan Childhood Lead Prevention Program resources can be found at: www.michigan.gov/mdch/0,1607,7-132-2942_4911_4913---,00.html.