

2001

Annual Report on Blood Lead Levels in Michigan



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A Joint Report

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Part I

Blood Lead Levels Among *Adults* in Michigan

Summary:

This is the fourth annual report on surveillance of blood lead levels in Michigan citizens. It is based on regulations that went into effect on October 11, 1997 that require laboratories to report all blood lead levels analyzed. The report differs from previous years in that the section on elevated blood lead levels in children has been expanded. See Part II about the results of blood lead tests in children under the age of six.

In 2001, 11,227 reports were received for 10,328 individuals ≥ 16 years of age. Eight hundred thirty-seven (8.1%) individuals had blood lead levels greater than or equal to 10 $\mu\text{g}/\text{dL}$; 208 of those 837 had lead levels greater than or equal to 25 $\mu\text{g}/\text{dL}$ and 10 of the 208 had blood lead levels greater than or equal to 50 $\mu\text{g}/\text{dL}$.

There were 537 less reports (on 463 individuals) received in 2001 compared to 2000. Both the total number and percent of individuals with blood lead levels greater than or equal to 10 $\mu\text{g}/\text{dL}$ decreased from 1,005 (9.3%) in 2000 to 837 (8.1%) in 2001. The number and percent of individuals with blood lead levels greater than or equal to 25 $\mu\text{g}/\text{dL}$ also decreased; from 235 (2.2%) in 2000 to 208 (2.0%) in 2001. The number of individuals with blood lead levels greater than or equal to 50 $\mu\text{g}/\text{dL}$ decreased while the percent was unchanged, 13 (0.1%) in 2000 and 10 (0.1%) in 2001. This is the third year in a row that blood lead levels greater than or equal to 25 $\mu\text{g}/\text{dL}$ decreased from the previous year and the first year there was a decrease in blood leads greater than 10 $\mu\text{g}/\text{dL}$.

Individuals with blood lead levels greater than or equal to 10 $\mu\text{g}/\text{dL}$ were more likely to be men (92.7%), white (89.1%), and have an average age of 42. They were most likely to live in Wayne (19.8%), St. Clair (11.8%) and Macomb (6.3%) counties.

Occupational exposure was the predominant source of lead exposure in Michigan adults. These exposures typically occurred where individuals were casting brass or bronze fixtures, repairing car radiators, performing abrasive blasting on outdoor metal structures such as bridges, overpasses or water towers or exposed to lead fumes from guns at shooting ranges. Individuals with elevated blood lead from exposure at shooting ranges were exposed not as part of work, but from their involvement in the activity as recreation. This included individuals using commercial ranges and members of private clubs.

Recreational shooters and private clubs without employees are not covered by occupational health regulations. In order to assist individuals exposed to lead from recreational shooting activities, we developed and distributed a brochure on lead exposure and recreational shooting (Appendix I).

In 2001, inspection reports were finalized on 24 companies where employees had blood lead levels greater than or equal to 25 $\mu\text{g}/\text{dL}$. These reports showed that 17 of 24 (71%) were in violation of the lead standard. Initial evaluation of these inspections shows them to be effective relative to other types of workplace enforcement inspections and suggests that they play a role in helping to reduce blood lead levels¹. We will continue to evaluate and follow this trend to determine if the initial findings remain over a more prolonged period of time after a greater number of inspections have been completed.

The fourth year of operation of an adult blood lead surveillance system in Michigan proved successful in continuing to identify a large number of individuals with elevated blood lead levels and sources of workplace exposures that could be remediated to reduce lead exposure. Ongoing surveillance in future years will determine if the favorable trend in lower blood lead levels found from 1998-2001 will continue.

Background:

This is the fourth annual report on surveillance of blood lead levels in Michigan citizens. Blood lead levels 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, had been voluntarily submitting reports to the Michigan Department of Public Health and then beginning in 1996 to the Michigan Department of Community Health (MDCH). The Michigan Department of Community Health 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, the Occupational Health Division within the Michigan Department of Consumer and Industry Services (MDCIS; which formerly had been part of the Michigan Department of Public Health) received federal funding in 1997 from the Centers for Disease Control and Prevention (CDC) to monitor adult blood lead levels, as part of the Adult Blood Lead Epidemiology and Surveillance (ABLES) Program. Currently 35 states have established lead registries through the ABLES Program for surveillance of adult lead absorption, primarily based on reports of elevated blood lead levels (BLL) from clinical laboratories. Eight of the 35 states will be reporting for the first time starting January 2002.

The Michigan Adult Blood Lead Registry:

Reporting Regulations and Mechanism

Since 1978, Michigan has required clinics, labs, hospitals and employers to report any patient with a known or suspected work-related disease including lead poisoning to the MDCIS, under Part 56 of Public Act 368 of 1978. Since October 11, 1997, laboratories performing blood lead analyses of Michigan residents are required to report the results of all blood lead level tests (BLLs) to the Michigan Department of Community Health (R325.9081-.9087). Prior to these new 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 Michigan Department of Community Health Lead Reporting Form (Appendix II). The physician or health provider ordering the blood lead analysis is responsible for completing the patient information (section I), the physician/provider information (section II) and the specimen collection information (section IIa). Upon receipt of the blood sample for lead analysis, the clinical laboratory is responsible for completion of the laboratory information (section III). All clinical laboratories conducting business in Michigan that analyze blood samples for lead must report all adult and child blood lead results to the Michigan Department of Community Health, Childhood Lead Poisoning Prevention Program (MDCH/CLPPP) within 5 working days.

All blood lead results on individuals 16 years or older are forwarded to the Michigan Department of Consumer and Industry Services for potential follow-up. A summary of blood lead results from 2001 on children less than 6 years old is in Part II of this report.

Laboratories

Employers providing blood lead analysis on their employees as required by the Michigan Occupational Safety and Health Act (MIOSHA) are required to use a laboratory approved by OSHA to be in compliance with the lead standard. Appendix III lists the 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 higher are routinely contacted for an interview. This past year we continued to sample individuals with blood lead levels ranging from 10 to 24 µg/dL. A letter is sent to the individual 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 medical interviewers administer the questionnaire.

Michigan OSHA (MIOSHA) Requirements for Medical Monitoring and Medical Removal

MIOSHA requirements for medical surveillance (i.e. biological monitoring) and medical removal are identical to Federal OSHA's. The requirements for medical removal differ for general industry and construction. For general industry, an individual must have two consecutive blood lead levels above 60 µg/dL or an average of three blood lead levels 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, which ever 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 at or below 40 µg/dL. See Appendix IV for a more detailed description of the requirements.

In the absence of a specific exposure to lead, blood lead levels in the general population are typically below 10 µg/dL (2).

Dissemination of Surveillance Data

Quarterly data summaries, without personal identifiers, are forwarded to the Program's funding agency, the National Institute for Occupational Safety and Health (NIOSH). NIOSH compiles quarterly reports from all states that require reporting of BLLs and publishes them in the Morbidity and Mortality Weekly Report (MMWR).

Results:

2001 is the fourth year with complete laboratory reporting in Michigan since the lead regulations became effective on October 11, 1997. Accordingly, this report provides a summary of all the reports of adult blood lead levels received in 2001 as well as more detailed information from interviews of those adults with BLLs 25 µg/dL and greater and the sample of individuals interviewed who had blood lead levels ranging 10-24 µg/dL. It also describes the Michigan Occupational Safety and Health Act (MIOSHA) inspections at the work sites where these individuals were exposed to lead.

Blood Lead Levels Reported in 2001

Number of Reports and Individuals

Between January 1 and December 31, 2001, the State of Michigan received 11,227 blood lead level reports for individuals 16 years of age or older. Because an individual may be tested more than once each year, the

11,227 reports received were for 10,328 individuals (Table 1). The following descriptive statistics are based on the 10,328 individuals reported in 2001, and are based on the highest BLL reported for each of these adults.

Distribution of Blood Lead Levels

In 2001, 837 (8.1%) of the 10,328 adults reported had blood lead levels greater than or equal to 10 µg/dL; 208 of those 837 had blood lead levels greater than or equal to 25 µg/dL and 10 of those 208 had blood lead levels greater than or equal to 50 µg/dL (Table 1). A total of 9,491 (91.9%) of the adults reported in 2001 had BLLs less than 10 µg/dL.

Gender and Age Distribution

All Blood Lead Levels

Sixty percent of the adults reported to the Registry were male, with females representing forty percent of the reports. Gender was unknown for six adults reported (Table 2). The age distribution is shown in Table 3. The average age was 43.

Blood Lead Levels $\geq$ 10 µg/dL

For the 837 adults reported to the Registry with blood lead levels greater than or equal to 10 µg/dL, 775 (92.7%) were men and 61 (7.3%) were women (Table 2). Gender was unknown for one adult. The age distribution for these adults was similar to the reports of all BLLs (Table 3). The average age was 42.

Race Distribution

All Blood Lead Levels

Although laboratories are required to report the patients' race, this information is frequently not completed. Race was missing for 5,878 (56.9%) of the 10,328 adults reported. Where race was known, 3,608 (81.1%) were reported as white, 712 (16.0%) were reported as African American, 71 (1.6%) were reported as Native American, 30 (0.7%) were reported as Asian/Pacific Islander, and 29 (0.7%) were reported as multiracial/other (Table 4).

Blood Lead Levels $\geq$ 10 µg/dL

For adults with blood lead levels greater than or equal to 10 µg/dL where race was indicated, 514 (89.1%) were reported as white, 43 (7.5%) were reported as African American, 8 (1.4%) were reported as Native American, 4 (0.5%) were reported as Asian/Pacific Islander, and 8 (1.4%) were reported as multiracial/other (Table 4). Although the percentage of African-Americans with blood leads levels $\geq$ 10µg/dL decreased as compared to all blood lead levels, African Americans had a greater percentage of the extremely high blood leads $\geq$ 60µg/dL (Table 12).

Geographic Distribution

County of residence was determined for 9,343 of the 10,328 adults reported to the Registry. They lived in 81 of Michigan's 83 counties. The largest number of adults reported in 2001 lived in Wayne County (2,248,

24.1%), followed by Oakland (737, 7.9%), Kalamazoo (579, 6.2%) and Ingham (498, 5.3%). County was unknown for 985 adults (Figure 1 and Table 5).

Figure 2 and Table 5 show the county of residence of the 797 adults with blood lead levels greater than or equal to 10 µg/dL where county of residence could be determined. The largest number of adults reported with a BLL of 10 µg/dL and greater were from Wayne County (158, 19.8%), followed by St. Clair (94, 11.8%), Macomb (50, 6.3%), Montcalm (40, 5.0%), and Oakland (36, 4.5%). County was unknown for 40 adults.

Figure 3 and Table 5 show the county of residence for the 196 adults with blood lead levels greater than or equal to 25 µg/dL where county of residence could be determined. The largest number of adults reported with a BLL of 25 µg/dL and above were from St. Clair County (50, 25.5%), followed by Wayne (33, 16.8%), Macomb (12, 6.1%) and Montcalm (12, 6.1%). County was unknown for 12 adults.

Figure 4 and Table 6 show the percentage of adults tested for blood lead within each county with BLLs of 10 µg/dL or greater. Ionia (32, 55.2%), Alger (4, 50.0%), St. Clair (94, 43.5%), Gogebic (2, 40.0%), and Montcalm (40, 39.2%) counties had the highest percentages of adults with BLLs of 10 µg/dL or greater.

Figure 5 and Table 6 show the percentage of adults tested for blood lead within each county with BLLs of 25 µg/dL or greater. St. Clair (50, 23.1%), Dickinson (4, 14.8%), Ionia (8, 13.8%) and Iron (1, 12.5%) counties had the highest percentage of adults with BLLs of 25 µg/dL or greater.

Figure 6 and Table 7 show the incidence rates of BLLs of 10 µg/dL and above, by county, for women. There were 58 women reported in 2001 with a BLL of 10 µg/dL or greater. Ontonagon (31/100,000), Alpena (16/100,000), and Clare (16/100,000) had the three highest incidence rates.

Figure 7 and Table 8 show the incidence rates of BLLs of 10 µg/dL and above, by county, for men. There were 739 men reported in 2001 with a BLL of 10 µg/dL or greater. Montcalm (167/100,000), St. Clair (151/100,000) and Ionia (125/100,000) had the three highest incidence rates. The overall incidence rate for men was 20 times higher than that for women (20/100,000 vs 1/100,000).

Industry

Figure 8 shows the distribution of non-construction companies that reported at least one adult with a BLL of 25 µg/dL or greater in Michigan during 2001. These companies primarily perform brass/bronze casting operations or radiator repair activities.

Summary of All Industrial Hygiene Inspections

Since the 2000 report, the statewide surveillance system identified 41 companies where MIOSHA had not performed an inspection for lead in at least three years (Table 9). Twenty-four of these companies have now been inspected. Inspections are planned for the other 17 companies. Inspections of these 24 companies resulted in 17 of the 24 (71%) companies receiving citations for a violation of an occupational health standard (Table 10). Seventeen of the 24 (71%) companies were issued citations for violations of the lead standard. Violations of the lead standard by industry type is shown in Table 11.

Of the 41 companies identified 25 were identified by elevated blood lead reports collected because of a company's medical surveillance program and 13 from an individual having the test performed by their personal health care provider. For three we are unable at this time to determine why the blood lead sample was collected. Seven of the 13 companies identified because an individual had the blood lead test performed

by their personal health care provider were inspected. Six of the seven (86%) companies were cited for a lead violation.

Interviews of Adults with Blood Lead Levels of 10 µg/dL or Greater

Between October 15, 1997 and December 31, 2001, there were 564 reports received on adults with blood lead levels ≥ 10 µg/dL that completed an interview by telephone. The following summary of interview data is based on the 564 questionnaires completed by telephone. These 564 adults were reported to the Registry from October 15, 1997 to December 31, 2001.

Table 12 lists the demographic characteristics of the 564 adults with completed questionnaires by highest lead level reported. Most of the completed questionnaires were of males (93.4%), which parallels the gender distribution of the number of lead level reports ≥ 10 µg/dL submitted for adults in 2001. There was no difference in gender by highest blood lead level. The percentage of African-Americans was greater among adults with higher 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.

Table 13 presents the types of lead-related symptoms reported during the interviews, by lead level. Only individuals who had daily or weekly symptoms were included in this table. Loss of 10+ pounds without dieting, continued loss of appetite, frequent pain/soreness, muscle weakness, headache, feeling depressed, being tired, feeling nervous, having nightmares, waking up at night, being irritable, and unable to concentrate were associated with a statistically significant increasingly higher levels of blood lead. Having any gastro-intestinal, musculoskeletal, nervous system symptom or any symptom was associated with a statistically significant increasingly higher levels of blood lead. Table 14 shows the reporting of anemia, kidney disease and high blood pressure by lead level category.

Table 15 presents the type of industry by lead level reported among those interviewed. Overall, 31.0% worked in brass/bronze foundries, followed by 30.5% working in construction. Among individuals with the highest blood leads (≥ 40 µg/dL), the most common exposure was from construction at the highest lead levels reported, compared to foundries. Table 16 presents the number of years worked by highest lead level reported for the adults who completed a questionnaire. Higher blood lead level results were more likely to occur in shorter-term workers (i.e. worked in a lead exposed job for 5 or fewer years).

Table 17 lists the types of working conditions reported by the interviewed adults, again by highest lead level reported. Workers with lower lead levels were more likely to report having their work clothing laundered at work, having a showering facility and having a separate lunch room. They also were more likely to report eating in the lunch room. As expected, workers with higher blood lead levels were more likely to have been removed from the job. In 11 companies we had responses to the working condition questions before and after an inspection of the facility. Generally the responses post-inspection indicated improvements in working conditions had occurred after the time of the inspection (Table 18).

The questionnaire also asks about children in the household, in order to document the potential for and extent of take-home lead. One-third of the adults interviewed reported children age 6 and younger living or spending time in the home (Table 19). Children from only 37 of the 179 (22.4%) households where an adult had an elevated lead level and young children lived or frequently visited were tested for blood lead among the 34 households where we know the child's blood test results, 14 (43.8%) households had a child with an elevated blood lead level. A letter was sent to all adults with young children who had not been tested for lead encouraging them to test the child for lead.

Case Histories

The most common sources of workplace lead exposure in Michigan are from removing paint from outdoor metal structures, such as overpasses, bridges and water towers (32% of individuals) and, casting brass or bronze parts (31% of individuals) and repairing radiators (5% of individuals). The 2000 annual report highlighted a case of adult lead poisoning from exposure to lead during renovation of an office building.

Exposure to lead at shootings ranges is also a major cause of elevated lead levels in adults in Michigan. Approximately, 12% of adults with elevated lead were exposed to lead at firing ranges (3% as part of work and 9% as a hobby). Inspections continue to be performed at ranges but for private clients without paid employees there are no regulations to protect individuals from lead exposure. Copper jacketed or lead-free ammunition and primer eliminate the risk of lead exposure that occurs during firing and clean up. Two case histories involving shooting ranges identified through blood lead testing by personal physicians are outlined below. The third case history reveals a problem at a “junk yard,” identified again through blood lead testing performed by a patient’s personal physician.

Case History #1

A pregnant woman in her early 30’s was reported with a blood lead level of 28µg/dL. She went to her doctor with symptoms of headache, abdominal pain and memory loss. She also had symptoms of being tired, waking up at night, being irritable, unable to concentrate, frequent pain in her joints, and muscle weakness. She worked at a shooting range for three years prior to the testing and had not been tested by her employer during the three years. Her husband had worked at the same range for three years and also had never been tested. The baby’s blood lead was 7µg/dL at birth.

The shooting range was inspected and revealed 1) that air levels to lead were above the occupational standard of 50µg/m³ over an 8-hour period; 2) the range had done no air monitoring on its own; 3) did not have a respiratory protection program; 4) did not provide protective equipment; 5) did not adequately clean the facility (surface areas in offices were contaminated with lead and a scrap pile was found to be 94% lead); 6) did not clean change rooms or showers; 7) did not provide medical testing; 8) did not provide education to the workers about the hazards of lead or controlling its exposure; and 9) had not assessed the ventilation system to control lead exposure.

Case History #2

A man in his late 30’s was reported with a blood lead level of 25µg/dL. He had gone to his personal physician because he wasn’t “feeling right.” He had symptoms of abdominal pain with constipation, being tired, waking up at night, nightmares, being irritable and being unable to concentrate. He was a police officer and for the last four years had worked at the city’s shooting range.

Inspection of the firing range led to seven citations of the lead standard involving the following categories: 1) inadequate air sampling to evaluate exposure; 2) no education of workforce of lead hazards and controls; 3) no program to reduce lead exposure; 4) no evaluation of adequacy of ventilation system; and 5) allowing the use of compressed air to clean surfaces with dust/dirt containing lead.

Case History #3

A man in his late 50’s was reported with a blood lead level of 49µg/dL. He went to his personal doctor because he was “not feeling well.” He had lost more than 10 pounds without dieting, had abdominal pain, loss of appetite, pain/soreness in his joints, muscle weakness, headaches, dizziness, fatigue, waking up at

night, nightmares, and irritability. He had worked at a scrap metal yard, cutting and shredding metal for 40 years. He had high blood pressure for which he was able to stop his medication after being chelated for lead.

The scrap yard had, for the past year, been receiving metal storage tanks coated with several layers of paint and had been torch cutting the tanks into smaller pieces. The company was inspected and cited for: 1) not performing air monitoring; 2) not providing medical examinations or blood lead testing; 3) not educating the work force on the hazards of leads or controls; 4) not keeping records of occupational injuries and illnesses; and 5) not having an adequate respirator program.

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 the MDCIS and maintained in the ABLES Program Lead Registry. Individuals with a blood lead level of 25 µg/dL or greater, and a sample of individuals with blood lead levels of 10-24 µg/dL, are interviewed by a trained medical interviewer by telephone. The interview details demographic information, exposure history and the presence and nature of lead related symptoms. A MIOSHA enforcement inspection is conducted to document current exposures to lead at work and the company's compliance with the lead standard when an individual from the company is identified with a blood lead value of 25 µg/dL or greater.

Michigan is one of 35 states conducting surveillance of elevated blood lead levels. Michigan requires the reporting of all blood lead level results. Major benefits for reporting all blood lead levels are: the ability to calculate the rates of elevated blood lead levels in specific groups of interest; the ability to monitor compliance with the testing requirements of the lead standard; and facilitating the tracking of reports from particular employers to monitor their progress in reducing workers' exposures to lead.

Data from the state surveillance systems shows that elevated lead levels from occupational exposures are an important public health problem in the United States (3). It is well-documented that exposure to lead may cause serious health effects in adults, including injury to the nervous system, kidneys, and blood-forming and reproductive systems in men and women. The level of lead in the blood is a direct index of a worker's recent exposure to lead as well as an indication of the potential for adverse effects from that exposure (4). A further problem is that workers can bring lead home on their clothes and expose children to lead. Thirty-eight percent of households with children under the age of 6 where the adult had an elevated blood lead level and the child was tested had an elevated blood level (Table 19). Children can experience serious adverse effects on neurological and intellectual development from lead exposure.

Average blood lead levels in the United States general population range from 2.1 to 3.4 µg/dL with 1.5 to 4.6% of adults tested for blood lead having blood lead levels greater than or equal to 10 µg/dL (2). On the average, blood lead levels are higher in the elderly, in men, and in African-Americans and Hispanics. Despite these differences, the mean blood lead levels and the percentage greater than 10 µg/dL for these sub populations are not clinically significantly different (2). A blood lead level greater than or equal to 10 µg/dL is an indication of exposure and increased absorption of lead regardless of age, race and gender. Laboratories performing blood lead analyses in the state have reported normal ranges that vary from 9-39 µg/dL. This variation in normal ranges between laboratories has been confusing. Values above 9 µg/dL indicate exposure to lead beyond that found in the background environment. An effort was made in the previous years to get all laboratories to use the same normal ranges. All but one of the labs now used 10 µg/dL as the upper limit for a "normal" blood lead level.

Symptoms involving the gastrointestinal, musculoskeletal and nervous systems occurred at levels within the allowable MIOSHA and OSHA standards (Table 13). The presence of these symptoms supports the need to lower the blood lead level which mandates medical removal. The current allowable level is up to 50 µg/dL. Seventy percent of individuals had daily or weekly symptoms with blood lead below this level.

In 2001, there were 837 adults reported in Michigan with blood lead levels greater than or equal to 10 µg/dL. Ninety-three percent were men. The average age was 42. They were predominately white (89.1%). They predominately resided in a band of counties stretching across the state from Muskegon and Oceana to Wayne and Macomb. The counties with the highest percentage of elevated blood leads were counties with brass/bronze foundries. The exposure was predominately occupational in origin, occurring during the casting of brass/bronze parts or among abrasive blasters removing paint from outdoor metal structures, among workers repairing car radiators or individuals who work in indoor firing ranges.

Individuals with the highest blood leads were more likely to be younger (Table 12). We attribute this finding to a higher percentage of younger workers in construction doing abrasive blasting on metal structures. Also younger, less experienced workers maybe given the dirtier less desirable tasks.

Based on the experience in other states we presume that the number of reports of elevated blood lead levels we receive is an underestimate of the true number of Michigan citizens with elevated blood leads (5,6). For example, in a study in California while 95% of lead battery employees had blood leads 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 leads performed by their employer (6). Overall it was estimated that less than 3% of employees in California exposed to lead were provided blood lead testing by their employer (6). On a national basis it was estimated that less than 12% of companies using lead provided blood lead testing for their employees (5).

Ten adults had blood lead levels above 50 µg/dL, which is the maximum blood lead level allowed in the work place. One of the 10 adults was exposed to lead from abatement, one from blasting/painting, one from casting, one as a groover/machinist, one from firearm sales and one as a supervisor in a foundry. Four are still being investigated; one is suspected to be from abrasive blasting on outdoor metal structures and another is suspected to be from demolition.

An inspection was conducted at 24 companies where a worker was reported with a blood lead level ≥ 25 µg/dL. Seventeen of 24 (71%) of these companies were cited for violations of the lead standard (Table 11).

In its fourth year of operation the surveillance system for lead proved successful in continuing to identify large numbers of adults with elevated lead levels and sources of exposure that could be remediated to reduce exposures. We are encouraged both by the increased compliance of the reporting law and by the reduction in blood lead levels greater than or equal to 10 and to 25 µg/dL (Figure 9). We will continue to monitor for this trend in the year 2002.

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Appendices

Appendix I	Lead Hazards at Indoor Firing Ranges
Appendix II	Blood Lead Analysis Reporting
Appendix III	OSHA Blood Lead Laboratories
Appendix IV	Summary of Michigan's Lead Standards

Table 1. Distribution of Highest Blood Lead Levels (BLLs) Among Adults in Michigan: 2001

<u>BLLs (µg/dL)</u>	<u>Number</u>	<u>Percent</u>
<10	9,491	91.9
10-24	629	6.1
25-29	88	0.9
30-39	84	0.8
40-49	26	0.3
50-59	8	0.1
≥ 60	2	0.0
TOTAL	10,328 *	100.1 **

*In 2001, 11,227 BLL reports were received for 10,328 individuals.

**Percentages do not add to 100% due to rounding.

Table 2. Distribution of Gender Among Adults Tested for Blood Lead in Michigan: 2001

<u>Gender</u>	All Blood Lead Level Tests		Blood Lead Levels ≥ 10 $\mu\text{g/dL}$	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Male	6,269	60.7	775	92.7
Female	4,053	39.3	61	7.3
TOTAL	10,322*	100.0	836**	100.0

*Gender was unknown for 6 additional individuals.

**Gender was unknown for 1 additional individual.

**Table 3. Distribution of Age Among Adults Tested
for Blood Lead in Michigan: 2001**

<u>Age Range</u>	All Blood Lead Level Tests		Blood Lead Levels ≥ 10 $\mu\text{g/dL}$	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
16-19	730	7.1	18	2.2
20-29	1,813	17.6	117	14.0
30-39	2,172	21.0	228	27.2
40-49	2,344	22.7	254	30.3
50-59	1,571	15.2	151	18.0
60-69	732	7.1	45	5.4
70-79	609	5.9	18	2.2
80-89	294	2.8	5	0.6
90-99	41	0.4	1	0.1
100 +	22	0.2	0	0.0
TOTAL	10,328	100.0	837	100.0

**Table 4. Distribution of Race Among Adults Tested
for Blood Lead in Michigan: 2001**

<u>Race</u>	All Blood Lead Level Tests		Blood Lead Levels ≥ 10 $\mu\text{g/dL}$	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Caucasian	3,608	81.1	514	89.1
African American	712	16.0	43	7.5
Native American	71	1.6	8	1.4
Asian/Pacific Islander	30	0.7	4	0.5
Multiracial/Other	29	0.7	8	1.4
TOTAL	4,450*	100.1***	577**	99.9***

*Race was unknown for 5,878 additional individuals.

**Race was unknown for 260 additional individuals.

***Percentages do not add to 100% due to rounding.

Table 5. Distribution of Adults with All Blood Lead Levels (BLLs), BLLs ≥ 10 ug/dL, and BLLs ≥ 25 ug/dL, Michigan by County of Residence: 2001

<u>County</u>	<u>All BLLs</u>		<u>BLLs ≥ 10 ug/dL</u>		<u>BLLs ≥ 25 ug/dL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Alcona	5	0.05	0	0.00	0	0.00
Alger	8	0.09	4	0.50	0	0.00
Allegan	68	0.73	5	0.63	2	1.02
Alpena	44	0.47	5	0.63	2	1.02
Antrim	14	0.15	1	0.13	0	0.00
Arenac	19	0.20	1	0.13	0	0.00
Baraga	5	0.05	0	0.00	0	0.00
Barry	31	0.33	2	0.25	0	0.00
Bay	94	1.01	10	1.25	2	1.02
Benzie	8	0.09	0	0.00	0	0.00
Berrien	96	1.03	11	1.38	3	1.53
Branch	13	0.14	1	0.13	0	0.00
Calhoun	124	1.33	6	0.75	1	0.51
Cass	9	0.10	1	0.13	1	0.51
Charlevoix	28	0.30	2	0.25	0	0.00
Cheboygan	31	0.33	1	0.13	0	0.00
Chippewa	75	0.80	5	0.63	1	0.51
Clare	57	0.61	2	0.25	0	0.00
Clinton	85	0.91	29	3.64	2	1.02
Crawford	17	0.18	0	0.00	0	0.00
Delta	23	0.25	1	0.13	0	0.00
Dickinson	27	0.29	4	0.50	4	2.04
Eaton	49	0.52	2	0.25	0	0.00
Emmet	58	0.62	3	0.38	1	0.51
Genesee	430	4.60	37	4.64	5	2.55
Gladwin	15	0.16	1	0.13	0	0.00
Gogebic	5	0.05	2	0.25	0	0.00
Grand Traverse	97	1.04	3	0.38	0	0.00
Gratiot	40	0.43	12	1.51	1	0.51
Hillsdale	23	0.25	3	0.38	0	0.00
Houghton	20	0.21	0	0.00	0	0.00
Huron	37	0.40	9	1.13	1	0.51
Ingham	498	5.33	15	1.88	2	1.02
Ionia	58	0.62	32	4.02	8	4.08
Iosco	15	0.16	0	0.00	0	0.00
Iron	8	0.09	1	0.13	1	0.51
Isabella	19	0.20	3	0.38	1	0.51
Jackson	104	1.11	5	0.63	1	0.51
Kalamazoo	579	6.20	10	1.25	2	1.02
Kalkaska	12	0.13	2	0.25	0	0.00
Kent	381	4.08	37	4.64	10	5.10
Keweenaw	1	0.01	0	0.00	0	0.00
Lake	0	0.00	0	0.00	0	0.00
Lapeer	68	0.73	3	0.38	0	0.00

Table 5. Distribution of Adults with All Blood Lead Levels (BLLs), BLLs ≥ 10 ug/dL, and BLLs ≥ 25 ug/dL, Michigan by County of Residence: 2001

<u>County</u>	<u>All BLLs</u>		<u>BLLs ≥ 10 ug/dL</u>		<u>BLLs ≥ 25 ug/dL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Leelanau	8	0.09	0	0.00	0	0.00
Lenawee	79	0.85	3	0.38	3	1.53
Livingston	63	0.67	4	0.50	1	0.51
Luce	4	0.04	0	0.00	0	0.00
Mackinac	38	0.41	2	0.25	0	0.00
Macomb	500	5.35	50	6.27	12	6.12
Manistee	43	0.46	2	0.25	0	0.00
Marquette	103	1.10	15	1.88	4	2.04
Mason	36	0.39	4	0.50	1	0.51
Mecosta	28	0.30	2	0.25	0	0.00
Menominee	12	0.13	0	0.00	0	0.00
Midland	63	0.67	1	0.13	0	0.00
Missaukee	9	0.10	1	0.13	0	0.00
Monroe	182	1.95	11	1.38	1	0.51
Montcalm	102	1.09	40	5.02	12	6.12
Montmorency	4	0.04	0	0.00	0	0.00
Muskegon	501	5.36	35	4.39	9	4.59
Newaygo	30	0.32	4	0.50	0	0.00
Oakland	737	7.89	36	4.52	8	4.08
Oceana	14	0.15	2	0.25	0	0.00
Ogemaw	16	0.17	1	0.13	0	0.00
Ontonagon	16	0.17	1	0.13	0	0.00
Osceola	14	0.15	0	0.00	0	0.00
Oscoda	0	0.00	0	0.00	0	0.00
Otsego	17	0.18	0	0.00	0	0.00
Ottawa	140	1.50	16	2.01	2	1.02
Presque Isle	5	0.05	0	0.00	0	0.00
Roscommon	21	0.22	0	0.00	0	0.00
Saginaw	112	1.20	13	1.63	2	1.02
Saint Clair	216	2.31	94	11.79	50	25.51
Saint Joseph	32	0.34	1	0.13	0	0.00
Sanilac	33	0.35	4	0.50	2	1.02
Schoolcraft	9	0.10	0	0.00	0	0.00
Shiawassee	53	0.57	8	1.00	2	1.02
Tuscola	42	0.45	3	0.38	0	0.00
Van Buren	62	0.66	5	0.63	1	0.51
Washtenaw	316	3.38	6	0.75	1	0.51
Wayne	2,248	24.06	158	19.82	33	16.84
Wexford	37	0.40	4	0.50	1	0.51
TOTAL	9,343 *	100.00	797 **	100.00	196 ***	100.00

*County was unknown for 985 additional adults.

**County was unknown for 40 additional adults.

***County was unknown for 12 additional adults.

Table 6. Percentage* of Adults with Blood Lead Levels (BLLs) ≥ 10 ug/dL and ≥ 25 ug/dL, Michigan by County of Residence: 2001

<u>County</u>	<u>BLLs ≥ 10 ug/dL</u>		<u>BLLs ≥ 25 ug/dL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Alcona	0	0.0	0	0.0
Alger	4	50.0	0	0.0
Allegan	5	7.4	2	2.9
Alpena	5	11.4	2	4.5
Antrim	1	7.1	0	0.0
Arenac	1	5.3	0	0.0
Baraga	0	0.0	0	0.0
Barry	2	6.5	0	0.0
Bay	10	10.6	2	2.1
Benzie	0	0.0	0	0.0
Berrien	11	11.5	3	3.1
Branch	1	7.7	0	0.0
Calhoun	6	4.8	1	0.8
Cass	1	11.1	1	11.1
Charlevoix	2	7.1	0	0.0
Cheboygan	1	3.2	0	0.0
Chippewa	5	6.7	1	1.3
Clare	2	3.5	0	0.0
Clinton	29	34.1	2	2.4
Crawford	0	0.0	0	0.0
Delta	1	4.3	0	0.0
Dickinson	4	14.8	4	14.8
Eaton	2	4.1	0	0.0
Emmet	3	5.2	1	1.7
Genesee	37	8.6	5	1.2
Gladwin	1	6.7	0	0.0
Gogebic	2	40.0	0	0.0
Grand Traverse	3	3.1	0	0.0
Gratiot	12	30.0	1	2.5
Hillsdale	3	13.0	0	0.0
Houghton	0	0.0	0	0.0
Huron	9	24.3	1	2.7
Ingham	15	3.0	2	0.4
Ionia	32	55.2	8	13.8
Iosco	0	0.0	0	0.0
Iron	1	12.5	1	12.5
Isabella	3	15.8	1	5.3
Jackson	5	4.8	1	1.0
Kalamazoo	10	1.7	2	0.3
Kalkaska	2	16.7	0	0.0
Kent	37	9.7	10	2.6
Keweenaw	0	0.0	0	0.0
Lake	0	0.0	0	0.0
Lapeer	3	4.4	0	0.0

Table 6. Percentage* of Adults with Blood Lead Levels (BLLs) ≥ 10 ug/dL and ≥ 25 ug/dL, Michigan by County of Residence: 2001

<u>County</u>	<u>BLLs ≥ 10 ug/dL</u>		<u>BLLs ≥ 25 ug/dL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Leelanau	0	0.0	0	0.0
Lenawee	3	3.8	3	3.8
Livingston	4	6.3	1	1.6
Luce	0	0.0	0	0.0
Mackinac	2	5.3	0	0.0
Macomb	50	10.0	12	2.4
Manistee	2	4.7	0	0.0
Marquette	15	14.6	4	3.9
Mason	4	11.1	1	2.8
Mecosta	2	7.1	0	0.0
Menominee	0	0.0	0	0.0
Midland	1	1.6	0	0.0
Missaukee	1	11.1	0	0.0
Monroe	11	6.0	1	0.5
Montcalm	40	39.2	12	11.8
Montmorency	0	0.0	0	0.0
Muskegon	35	7.0	9	1.8
Newaygo	4	13.3	0	0.0
Oakland	36	4.9	8	1.1
Oceana	2	14.3	0	0.0
Ogemaw	1	6.3	0	0.0
Ontonagon	1	6.3	0	0.0
Osceola	0	0.0	0	0.0
Oscoda	0	0.0	0	0.0
Otsego	0	0.0	0	0.0
Ottawa	16	11.4	2	1.4
Presque Isle	0	0.0	0	0.0
Roscommon	0	0.0	0	0.0
Saginaw	13	11.6	2	1.8
Saint Clair	94	43.5	50	23.1
Saint Joseph	1	3.1	0	0.0
Sanilac	4	12.1	2	6.1
Schoolcraft	0	0.0	0	0.0
Shiawassee	8	15.1	2	3.8
Tuscola	3	7.1	0	0.0
Van Buren	5	8.1	1	1.6
Washtenaw	6	1.9	1	0.3
Wayne	158	7.0	33	1.5
Wexford	4	10.8	1	2.7
TOTAL	797*	8.5 **	196*	2.1 ***

*Denominator used was the total number of adults tested for blood lead within each county (Table 5).

**County was unknown for 40 additional adults.

***County was unknown for 12 additional adults.

**Table 7. Annual Incidence of Blood Lead Levels (BLLs)
 ≥ 10 ug/dL Among Women in Michigan
by County of Residence: 2001**

<u>County</u>	<u>Number Reported</u>	<u>Michigan Population Women</u>	<u>Rate per 100,000 women</u>
Allegan	1	39,720	3
Alpena	2	12,900	16
Calhoun	1	55,391	2
Charlevoix	1	10,273	10
Clare	2	12,496	16
Clinton	1	24,818	4
Genesee	3	174,273	2
Grand Traverse	1	31,300	3
Ingham	1	116,096	1
Jackson	1	59,987	2
Kalamazoo	2	98,198	2
Kent	4	221,310	2
Macomb	4	320,054	1
Manistee	1	9,732	10
Mecosta	1	16,032	6
Muskegon	3	65,667	5
Oakland	6	479,049	1
Ontonagon	1	3,202	31
Ottawa	3	91,080	3
Saginaw	1	84,855	1
St Clair	2	64,248	3
Shiawassee	2	28,183	7
Van Buren	1	29,420	3
Washtenaw	2	131,310	2
Wayne	11	816,907	1
TOTAL	58 *	3,939,649 **	1 ***

*County was unknown for 3 additional female adults.

**Total number of women in all 83 counties of Michigan age 16+ years; 2000 US. Census population data.

***Rate per 100,000 women, age 16+ years.

**Table 8. Annual Incidence of Blood Lead Levels (BLLs)
≥10 ug/dL Among Men in Michigan
by County of Residence: 2001**

<u>County</u>	<u>Number Reported</u>	<u>Michigan Population Men</u>	<u>Rate per 100,000 Men</u>	<u>County</u>	<u>Number Reported</u>	<u>Michigan Population Men</u>	<u>Rate per 100,000 Men</u>
Alcona	0	4,897	0	Keweenaw	0	1,015	0
Alger	4	4,432	90	Lake	0	4,840	0
Allegan	4	38,907	10	Lapeer	3	33,294	9
Alpena	3	11,940	25	Leelanau	0	8,199	0
Antrim	1	8,967	11	Lenawee	3	37,872	8
Arenac	1	7,006	14	Livingston	4	58,520	7
Baraga	0	3,728	0	Luce	0	3,267	0
Barry	2	21,439	9	Mackinac	2	4,768	42
Bay	10	41,323	24	Macomb	46	298,569	15
Benzie	0	6,221	0	Manistee	1	9,947	10
Berrien	11	59,386	19	Marquette	15	26,345	57
Branch	1	17,848	6	Mason	4	10,866	37
Calhoun	5	50,858	10	Mecosta	1	16,425	6
Cass	1	19,607	5	Menominee	0	9,888	0
Charlevoix	1	9,844	10	Midland	1	30,559	3
Cheboygan	1	10,312	10	Missaukee	1	5,469	18
Chippewa	5	17,815	28	Monroe	11	54,135	20
Clare	0	12,012	0	Montcalm	40	24,010	167
Clinton	28	23,906	117	Montmorency	0	4,149	0
Crawford	0	5,651	0	Muskegon	32	62,948	51
Delta	1	14,862	7	Newaygo	4	17,519	23
Dickinson	4	10,324	39	Oakland	30	446,356	7
Eaton	2	38,281	5	Oceana	2	10,111	20
Emmet	3	11,857	25	Ogemaw	1	8,454	12
Genesee	34	155,127	22	Ontonagon	1	3,260	31
Gladwin	1	10,160	10	Osceola	0	8,660	0
Gogebic	2	7,163	28	Oscoda	0	3,668	0
Grand Traverse	2	28,998	7	Otsego	0	8,778	0
Gratiot	12	17,444	69	Ottawa	13	86,189	15
Hillsdale	3	17,632	17	Presque Isle	0	5,854	0
Houghton	0	15,630	0	Roscommon	0	10,231	0
Huron	9	13,958	64	Saginaw	12	75,532	16
Ingham	14	105,117	13	Saint Clair	92	61,051	151
Ionia	32	25,566	125	Saint Joseph	1	23,088	4
Iosco	0	10,658	0	Sanilac	4	16,668	24
Iron	1	5,317	19	Schoolcraft	0	3,540	0
Isabella	3	24,492	12	Shiawassee	6	26,463	23
Jackson	4	62,265	6	Tuscola	3	22,068	14
Kalamazoo	8	89,177	9	Van Buren	4	28,019	14
Kalkaska	2	6,391	31	Washtenaw	4	127,697	3
Kent	33	208,349	16	Wayne	146	724,014	20
				Wexford	4	11,349	35
TOTAL				739 *	3,688,521 **	20 ***	

*County was unknown for 36 additional male adults.

**Total number of men in all 83 counties of Michigan age 16+ years; 2000 US. Census population data.

***Rate per 100,000 men, age 16+ years.

Table 9. Inspection Status of Forty-One New Companies that were Identified Since the 2000 Annual Analysis from a Blood Lead Report of ≥ 25 $\mu\text{g/dL}$ in Michigan

<u>Inspection Status</u>	<u>Number</u>	<u>Percent</u>
Completed Inspections	24 *	58.5
Scheduled for Inspection	11 **	26.8
No Follow-Up Planned	6 ***	14.6
Total	41	99.9 ****

- * Three completed inspections were the result of blood lead reports ranging 18-19 $\mu\text{g/dL}$; one inspection was completed under Federal OSHA.
- ** One inspection was referred to another OSHA state plan for follow up.
- *** Two facilities closed; one facility had no employees; one facility was referred to another OSHA state plan, but will not be inspected; two facilities had no follow up for other reasons.
- **** Percentages do not add to 100% due to rounding.

Table 10. Results of Twenty-Four New Companies that were Inspected Since the 2000 Annual Analysis from a Blood Lead Report of ≥ 25 $\mu\text{g/dL}$ in Michigan

<u>Inspection Results</u>	<u>Number</u>	<u>Percent</u>
Cited for Lead Standard Violation(s) Only	3 *	12.5
Cited for Lead Standard and Other Violation(s)	14 **	58.3
Not Cited for any Violation(s)	7 ***	29.2
Total	24	100.0

- * One completed inspection was the result of a blood lead report of 18 $\mu\text{g/dL}$.
- ** Two completed inspections were the result of blood lead reports of 18 $\mu\text{g/dL}$ and 19 $\mu\text{g/dL}$.
- *** One facility was completed under Federal OSHA.

Table 11. Twenty-Four New Companies Inspected Since the 2000 Annual Analysis Resulting from Michigan Adults with Blood Lead Levels (BLLs) of ≥ 25 $\mu\text{g/dL}$

<u>Industry (SIC)*</u>	<u>Companies Number</u>	<u>Cited for Violation of Lead Standard</u>	
		<u>Number</u>	<u>Percent</u>
Construction (15-17)			
Special Trade Construction (17)	3	1	33
Manufacturing (20-39)			
Primary Metals (33)	1	1	100
Machinery (35)	1	1	100
Metal Fabrication (34)	1	1	100
Transportation (37)	2	1	50
Miscellaneous Mfg Industries (39)	2	2	100
Transp., & Public Utilities (40-49)	2	1	50
Wholesale and Retail Trade (50-59)			
Wholesale-Durable Goods (50)	1	1	100
Services (70-89)			
Automotive Repair (75)	1	1	100
Recreation (79)	2	2	100
Education (82)	1	1	100
Engineering Services (87)	3	1	33
Government (91-97)			
Police (92)	4	3	75
Total	24	17	** 71

* Standard Industrial Classification.

** Seven facilities were not cited in violation of the Lead Standard.

Table 12. Demographic Characteristics of Michigan Adults with Blood Lead Levels (BLLs) of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001, by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)

Demographic Characteristics	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	Percent
Male	149	(90.9)	112	(93.3)	177	(95.7)	56	(91.8)	23	(95.8)	10	(100)	527	(93.4)
Female	15	(9.1)	8	(6.7)	8	(4.3)	5	(8.2)	1	(4.2)	0	--	37	(6.6)
Hispanic Origin	6	(4.2)	5	(4.5)	3	(1.7)	5	(8.5)	1	(4.2)	0	--	20	(3.8)
White	138	(84.7)	108	(90.8)	162	(88.0)	52	(85.2)	22	(91.7)	7	(70.0)	489	(87.2)
African American	14	(8.6)	7	(5.9)	14	(7.6)	6	(9.8)	2	(8.3)	3	(30.0)	46	(8.2)
Asian/Pacific Islander	1	(0.6)	0	--	1	(0.5)	0	--	0	--	0	--	2	(0.4)
Native American/Alaskan	1	(0.6)	1	(0.8)	5	(2.7)	0	--	0	--	0	--	7	(1.2)
Other	9	(5.5)	3	(2.5)	2	(1.1)	3	(4.9)	0	--	0	--	17	(3.0)
Average Age	43	n=164	43	n=120	43	n=185	47	n=61	48	n=24	38	n=10	44	n=564
Ever Smoked	97	(62.6)	80	(69.6)	124	(74.7)	44	(80.0)	17	(85.0)	7	(77.8)	369	(71.0)*
Now Smoke	52	(53.6)	48	(60.0)	92	(74.2)	35	(79.5)	13	(76.5)	5	(71.4)	245	(66.4)*

*P= < 0.05 for linear trend.

**Table 13. Symptoms of Michigan Adults with Blood Lead Levels (BLLs)
of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001,
by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)**

<u>Symptoms</u>	<u>10-24 $\mu\text{g/dL}$</u>		<u>25-29 $\mu\text{g/dL}$</u>		<u>30-39 $\mu\text{g/dL}$</u>		<u>40-49 $\mu\text{g/dL}$</u>		<u>50-59 $\mu\text{g/dL}$</u>		<u>≥ 60 $\mu\text{g/dL}$</u>		<u>TOTAL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
GASTRO-INTESTINAL														
Lost 10+ lbs without diet	16	(10.2)	9	(7.8)	28	(15.6)	16	(26.7)	4	(18.2)	1	(11.1)	74	(13.6)*
Continued loss of appetite	17	(10.7)	14	(11.9)	33	(18.0)	15	(24.6)	5	(21.7)	2	(20.0)	86	(15.5)*
Pains in belly	34	(21.3)	15	(12.8)	34	(18.8)	20	(32.8)	6	(26.1)	1	(10.0)	110	(19.9)
MUSCULOSKELETAL														
Frequent pain/soreness	62	(39.2)	37	(31.6)	73	(40.1)	37	(61.7)	12	(52.2)	5	(50.0)	226	(41.1)*
Muscle weakness	39	(24.7)	19	(16.4)	40	(22.3)	25	(41.0)	10	(43.5)	5	(50.0)	138	(25.2)*
NERVOUS														
Headaches	28	(17.5)	13	(10.9)	43	(23.5)	20	(32.8)	7	(29.2)	3	(30.0)	114	(20.5)*
Dizziness	13	(8.2)	8	(6.7)	12	(6.7)	11	(18.3)	2	(8.7)	3	(30.0)	49	(8.9)*
Depressed	23	(14.6)	14	(12.1)	30	(16.8)	10	(16.9)	97	(37.5)	5	(50.0)	91	(16.7)*
Tired	62	(39.2)	41	(34.7)	98	(53.8)	40	(66.7)	15	(62.5)	6	(60.0)	262	(47.5)*
Nervous	21	(13.1)	11	(9.4)	29	(16.1)	15	(24.6)	8	(34.8)	4	(40.0)	88	(16.0)*
Waking up at night	43	(27.4)	26	(22.0)	65	(35.9)	26	(43.3)	11	(45.8)	4	(44.4)	175	(31.9)*
Nightmares	6	(3.8)	1	(0.9)	76	(3.9)	5	(8.3)	2	(8.7)	2	(20.0)	23	(4.2)*
Irritable	26	(16.4)	30	(25.9)	58	(32.2)	25	(41.7)	11	(47.8)	5	(50.0)	155	(28.3)*
Unable to concentrate	21	(13.3)	17	(14.7)	37	(20.2)	13	(22.0)	6	(25.0)	3	(30.0)	97	(17.6)*
REPRODUCTIVE														
Unable to have an erection	8	(18.2)	5	(8.2)	10	(8.1)	5	(12.8)	7	(36.8)	0	--	35	(11.9)
Trouble having a child	13	(8.2)	7	(6.1)	9	(5.2)	1	(1.8)	0	--	1	(12.5)	31	(5.8)
Gastro-Intestinal Symptoms	44	(27.3)	24	(20.2)	57	(31.0)	27	(44.3)	11	(45.8)	4	(40.0)	167	(29.9)*
Musculoskeletal Symptoms	69	(43.1)	40	(34.2)	80	(44.0)	41	(67.2)	13	(56.5)	6	(60.0)	249	(45.0)*
Nervous Symptoms	87	(54.4)	61	(51.3)	126	(68.9)	45	(73.8)	19	(79.2)	6	(60.0)	344	(61.8)*
Reproductive Symptoms	17	(30.9)	9	(14.1)	16	(12.6)	4	(10.0)	2	(10.5)	1	(14.3)	49	(15.7)
Any Symptoms	109	(67.7)	76	(63.9)	134	(72.8)	51	(83.6)	22	(91.7)	7	(70.0)	399	(71.4)*
Average Number Symptoms	2.7	n=161	2.2	n=119	3.3	n=184	4.6	n=61	4.6	n=24	5.0	n=10	3.1	n=559

*P= < 0.05 for linear trend.

Table 14. Lead Related Health Conditions of Michigan Adults with Blood Lead Levels (BLLs) of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001, by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)

<u>Lead Related Disease</u>	<u>10-24 $\mu\text{g/dL}$</u>		<u>25-29 $\mu\text{g/dL}$</u>		<u>30-39 $\mu\text{g/dL}$</u>		<u>40-49 $\mu\text{g/dL}$</u>		<u>50-59 $\mu\text{g/dL}$</u>		<u>≥ 60 $\mu\text{g/dL}$</u>		<u>TOTAL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Anemia	12	(7.7)	3	(2.6)	6	(3.4)	3	(5.2)	2	(8.3)	0	--	26	(4.8)
Kidney Disease	4	(2.5)	0	--	4	(2.2)	1	(1.6)	1	(4.2)	0	--	10	(1.8)
High Blood Pressure	14	(8.9)	7	(5.9)	23	(12.9)	11	(19.3)	4	(17.4)	1	(11.1)	60	(11.1)*

*P= < 0.05 for linear trend.

**Table 15. Industry of Michigan Adults with Blood Lead Levels (BLLs)
of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001,
by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)**

<u>Industry (SIC Code*)</u>	<u>10-24 $\mu\text{g/dL}$</u>		<u>25-29 $\mu\text{g/dL}$</u>		<u>30-39 $\mu\text{g/dL}$</u>		<u>40-49 $\mu\text{g/dL}$</u>		<u>50-59 $\mu\text{g/dL}$</u>		<u>≥ 60 $\mu\text{g/dL}$</u>		<u>TOTAL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Mining (13)	0	--	0	--	1	(0.6)	0	--	0	--	0	--	1	(0.2)
Construction, Building (15)	0	--	1	(1.1)	0	--	0	--	0	--	0	--	1	(0.2)
Construction, Heavy (16)	6	(5.0)	0	--	1	(0.6)	0	--	0	--	0	--	7	(1.5)
Special Trade Construction (17)	39	(32.2)	18	(20.5)	49	(30.0)	21	(39.6)	8	(38.1)	4	(44.4)	139	(30.5)
Lumber and Wood (24)	1	(0.8)	0	--	0	--	0	--	0	--	0	--	1	(0.2)
Furniture and Fixtures (25)	1	(0.8)	0	--	0	--	0	--	0	--	0	--	1	(0.2)
Printing and Publishing (27)	1	(0.8)	0	--	1	(0.6)	0	--	0	--	0	--	2	(0.4)
Chemicals (28)	2	(1.7)	0	--	0	--	0	--	0	--	0	--	2	(0.4)
Stone/Clay/Glass (32)	2	(1.7)	1	(1.1)	4	(2.5)	1	(1.9)	0	--	0	--	8	(1.8)
Foundries (33)	8	(6.6)	32	(36.4)	72	(44.2)	19	(35.8)	7	(33.3)	3	(33.3)	141	(31.0)
Fabricated Metal Products (34)	7	(5.8)	8	(9.1)	12	(7.4)	5	(9.4)	0	--	0	--	32	(7.0)
Machinery (35)	4	(3.3)	2	(2.3)	2	(1.2)	1	(1.9)	2	(9.5)	1	(11.1)	12	(2.6)
Electronics (36)	7	(5.8)	1	(1.1)	0	--	0	--	0	--	0	--	8	(1.8)
Automobile (37)	7	(5.8)	3	(3.4)	5	(3.1)	2	(3.8)	0	--	0	--	17	(3.7)
Other Durables (39)	2	(1.7)	1	(1.1)	1	(0.6)	0	--	0	--	0	--	4	(0.9)
Transportation, Railroad (40)	0	--	1	(1.1)	1	(0.6)	0	--	0	--	0	--	2	(0.4)
Transportation, Air (45)	0	--	0	--	1	(0.6)	0	--	0	--	0	--	1	(0.2)
Trans., Electric, Gas & San. Svcs. (49)	4	(3.3)	3	(3.4)	2	(1.2)	0	--	0	--	0	--	9	(2.0)
Wholesale-Durable Goods (50)	1	(0.8)	1	(1.1)	1	(0.6)	0	--	0	--	0	--	3	(0.7)
Automotive Dealers, Gas (55)	1	(0.8)	1	(1.1)	0	--	0	--	0	--	0	--	2	(0.4)
Eating and Drinking Places (58)	1	(0.8)	0	--	0	--	0	--	0	--	0	--	1	(0.2)
Other Retail Trade (59)	1	(0.8)	0	--	1	(0.6)	0	--	0	--	0	--	2	(0.4)
Finance, Insurance, Real Estate (65)	1	(0.8)	0	--	0	--	0	--	0	--	0	--	1	(0.2)
Automotive Repair (75)	5	(4.1)	6	(6.8)	2	(1.2)	4	(7.5)	3	(14.3)	0	--	20	(4.4)
Repair (76)	1	(0.8)	0	--	1	(0.6)	0	--	0	--	0	--	2	(0.4)
Recreation (79)	1	(0.8)	0	--	1	(0.6)	0	--	1	(4.8)	1	(11.1)	4	(0.9)
Health (80)	1	(0.8)	0	--	0	--	0	--	0	--	0	--	1	(0.2)
Education (82)	8	(6.6)	1	(1.1)	1	(0.6)	0	--	0	--	0	--	10	(2.2)
Engineering Services (87)	4	(3.3)	0	--	0	--	0	--	0	--	0	--	4	(1.0)
General Government (91)	1	(0.8)	0	--	0	--	0	--	0	--	0	--	1	(0.2)
Police (92)	2	(1.7)	7	(8.0)	2	(1.2)	0	--	0	--	0	--	11	(2.4)
Human Resources (94)	0	--	0	--	1	(0.6)	0	--	0	--	0	--	1	(0.2)
Admin Of Economic Programs(96)	1	(0.8)	1	(1.1)	0	--	0	--	0	--	0	--	2	(0.4)
Military (97)	1	(0.8)	0	--	1	(0.6)	0	--	0	--	0	--	2	(0.4)
TOTAL	121	(100)	88	(100)	163	(100)	53	(100)	21	(100)	9	(100)	455	(100)

*Standard Industrial Classification.

Table 16. Number of Years Worked of Michigan Adults with Blood Lead Levels (BLLs) of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001, by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)

<u>Number of Years Worked</u>	<u>10-24 $\mu\text{g/dL}$</u>		<u>25-29 $\mu\text{g/dL}$</u>		<u>30-39 $\mu\text{g/dL}$</u>		<u>40-49 $\mu\text{g/dL}$</u>		<u>50-59 $\mu\text{g/dL}$</u>		<u>≥ 60 $\mu\text{g/dL}$</u>		<u>TOTAL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
≤ 5	75	(57.7)	62	(60.8)	87	(51.5)	30	(55.6)	13	(59.1)	6	(60.0)	273	(56.1)
6 – 10	19	(14.6)	17	(16.7)	25	(14.8)	6	(11.1)	6	(27.3)	2	(20.0)	75	(15.4)
11 – 20	23	(17.7)	16	(15.7)	27	(16.0)	10	(18.5)	1	(4.5)	1	(10.0)	78	(16.0)
21 – 30	7	(5.4)	7	(6.9)	25	(14.8)	2	(3.7)	1	(4.5)	1	(10.0)	43	(8.8)
≥ 31	6	(4.6)	0	--	5	(3.0)	6	(11.1)	1	(4.5)	0	--	18	(3.7)

Table 17. Working Conditions Reported by Michigan Adults with Blood Lead Levels (BLLs) of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001, by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)

<u>Working Conditions</u>	<u>10-24 $\mu\text{g/dL}$</u>		<u>25-29 $\mu\text{g/dL}$</u>		<u>30-39 $\mu\text{g/dL}$</u>		<u>40-49 $\mu\text{g/dL}$</u>		<u>50-59 $\mu\text{g/dL}$</u>		<u>≥ 60 $\mu\text{g/dL}$</u>		<u>TOTAL</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Separate lockers: dirty and clean*	62	(50.4)	73	(70.9)	117	(72.2)	30	(56.6)	14	(60.9)	3	(33.3)	299	(63.2)
Work clothes laundered: work*	52	(43.0)	65	(64.4)	103	(62.8)	25	(47.2)	10	(43.5)	2	(22.2)	257	(54.6)
Shower facility*	59	(47.6)	66	(65.3)	127	(77.0)	28	(51.9)	11	(50.0)	4	(44.4)	295	(62.1)
Lunch room*	88	(69.8)	74	(73.3)	133	(81.1)	30	(55.6)	12	(52.2)	4	(44.4)	341	(71.5)
Clean off dust and wash hands before eating*	116	(92.8)	89	(88.1)	154	(92.8)	45	(84.9)	20	(87.0)	9	(100)	433	(90.8)
Eat in lunchroom*	65	(59.1)	59	(67.8)	92	(63.4)	25	(53.2)	7	(35.0)	3	(37.5)	251	(60.2)
Wear respirator*	78	(62.4)	67	(66.3)	127	(77.0)	42	(77.8)	15	(65.2)	8	(88.9)	337	(70.6)
Smoke in work area**	36	(65.5)	32	(66.7)	58	(64.4)	15	(44.1)	6	(46.2)	4	(80.0)	151	(61.6)
Keep cigarettes in pocket while working**	26	(50.0)	11	(22.4)	42	(47.2)	12	(35.3)	4	(30.8)	3	(60.0)	98	(40.5)
Exposed to Lead now*	70	(57.9)	61	(61.6)	116	(71.6)	27	(55.1)	16	(80.0)	2	(22.2)	292	(63.5)
Removal from job*	9	(7.1)	10	(9.7)	24	(14.6)	14	(26.9)	8	(34.8)	4	(44.4)	69	(14.5)

*Based on positive questionnaire responses.

**Based on negative questionnaire responses.

Table 18. Changes in Response to Questions on Working Conditions in Facilities Before and After a MIOSHA Enforcement Inspection

<u>Working Conditions</u>	Number of Facilities Where Working Conditions Needed <u>Improvement</u>	Status of Working Conditions			
		<u>Improvement</u>		<u>No Change</u>	
		<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Separate lockers: dirty and clean*	5	3	(60)	2	(40)
Work clothes laundered: work*	8	1	(13)	6	(75)
Shower facility*	6	3	(50)	3	(50)
Lunch room*	3	2	(67)	1	(33)
Clean off dust and wash hands before eating*	1	1	(100)	0	--
Eat in lunchroom*	5	2	(40)	3	(60)
Smoke in work area**	5	3	(60)	2	(40)
Keep cigarettes in pocket while working**	5	4	(80)	1	(20)

*Based on positive questionnaire responses.

**Based on negative questionnaire responses.

Table 19. Number of Households with Children (6 or under) Potentially Exposed to Take-Home Lead from Michigan Adults with Blood Lead Levels (BLLs) of ≥ 10 $\mu\text{g/dL}$, Interviewed from 10-15-1997 to 12-31-2001, by Highest Reported Blood Lead Level ($\mu\text{g/dL}$)

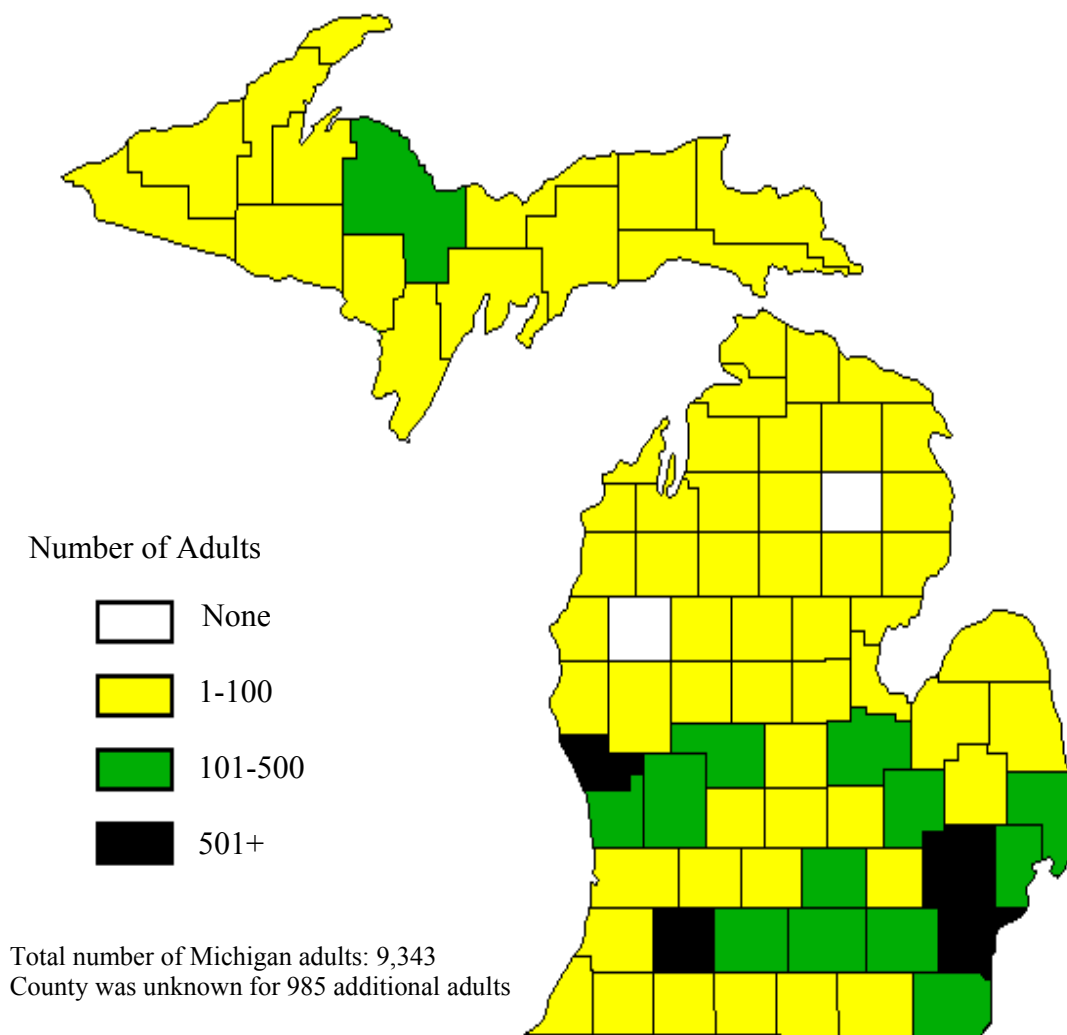
Description of Households	10-24 $\mu\text{g/dL}$		25-29 $\mu\text{g/dL}$		30-39 $\mu\text{g/dL}$		40-49 $\mu\text{g/dL}$		50-59 $\mu\text{g/dL}$		≥ 60 $\mu\text{g/dL}$		TOTAL	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Households with Children living or spending time in house	52	(32.3)*	41	(34.5)	61	(33.2)	15	(25.0)	8	(33.3)	2	(20.0)	179	(32.1)
Households with Children tested for Lead	10	(21.7)**	7	(18.4)	10	(16.9)	6	(50.0)	3	(37.5)	1	(50.0)	37	(22.4)
Households where Children had elevated Lead levels	4	(50.0)***	1	(16.7)	6	(60.0)	2	(40.0)	0	--	1	(100)	14	(43.8)

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

** Among individuals within blood lead category, percentage of households with children living or spending time in house where the children were tested for lead. Because of missing data the denominator may be less than the number with children living or spending time in house in the first row of the table.

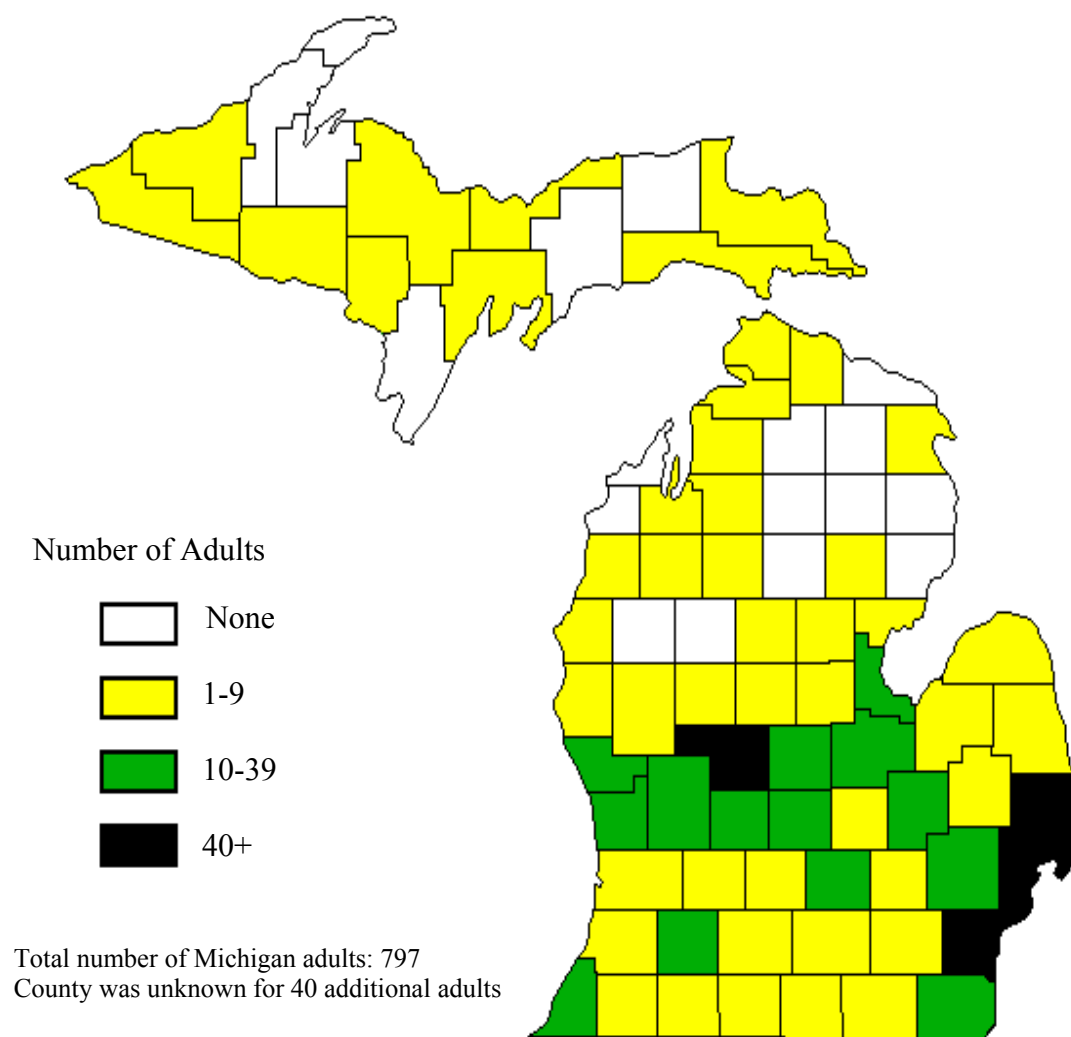
*** Among individuals within blood lead category, percentage of households with children living or spending time in house where children, who had blood lead tests, had blood lead levels ≥ 10 $\mu\text{g/dL}$. Because of missing data, the denominator may be less than the number tested for lead in the second row of the table.

Figure 1. Distribution of Adults Tested for Blood Lead in Michigan by County of Residence: 2001



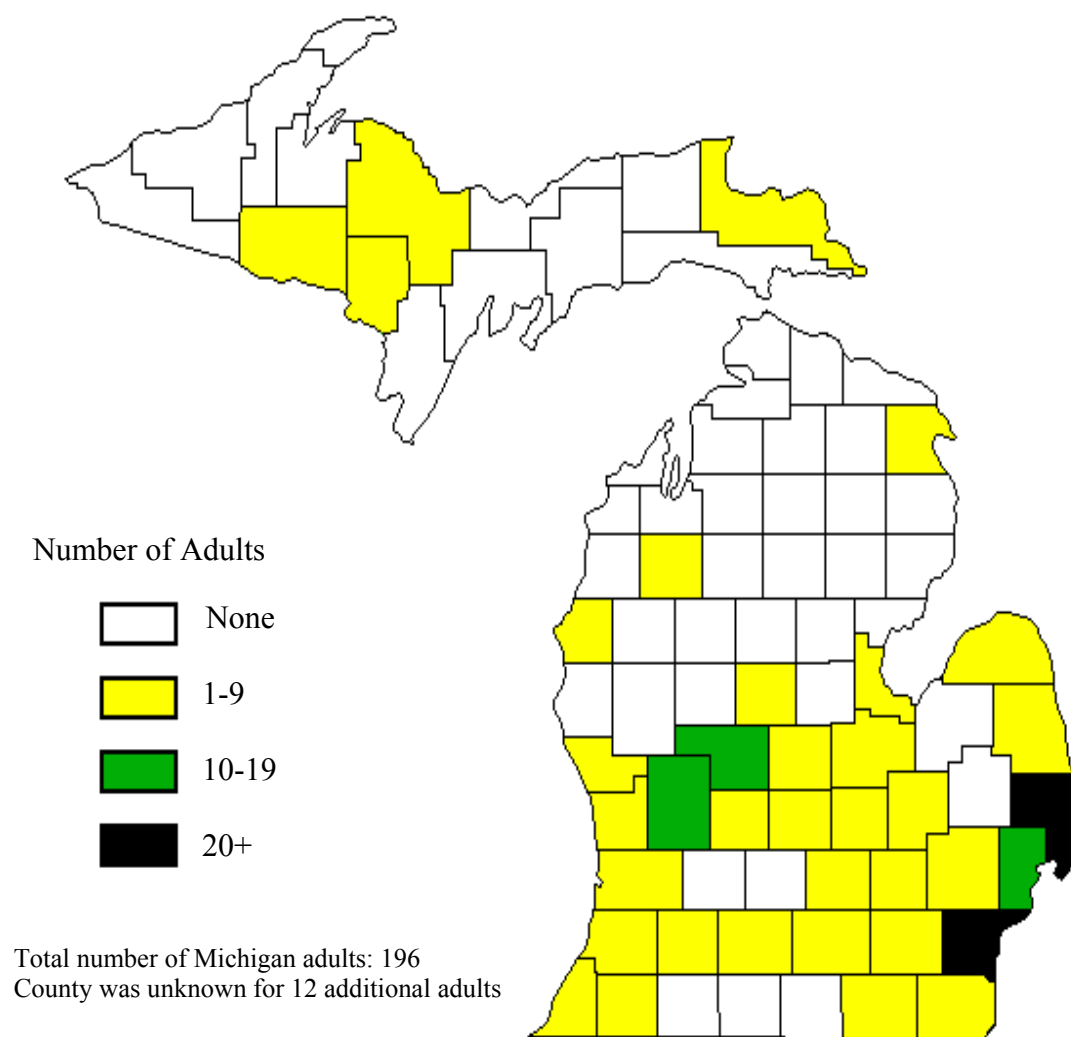
Oakland and **Wayne** counties had the highest number of adults reported, with 737 and 2,248, respectively.

Figure 2. Distribution of Adults with Blood Lead Levels (BLLs) ≥ 10 ug/dL in Michigan by County of Residence: 2001



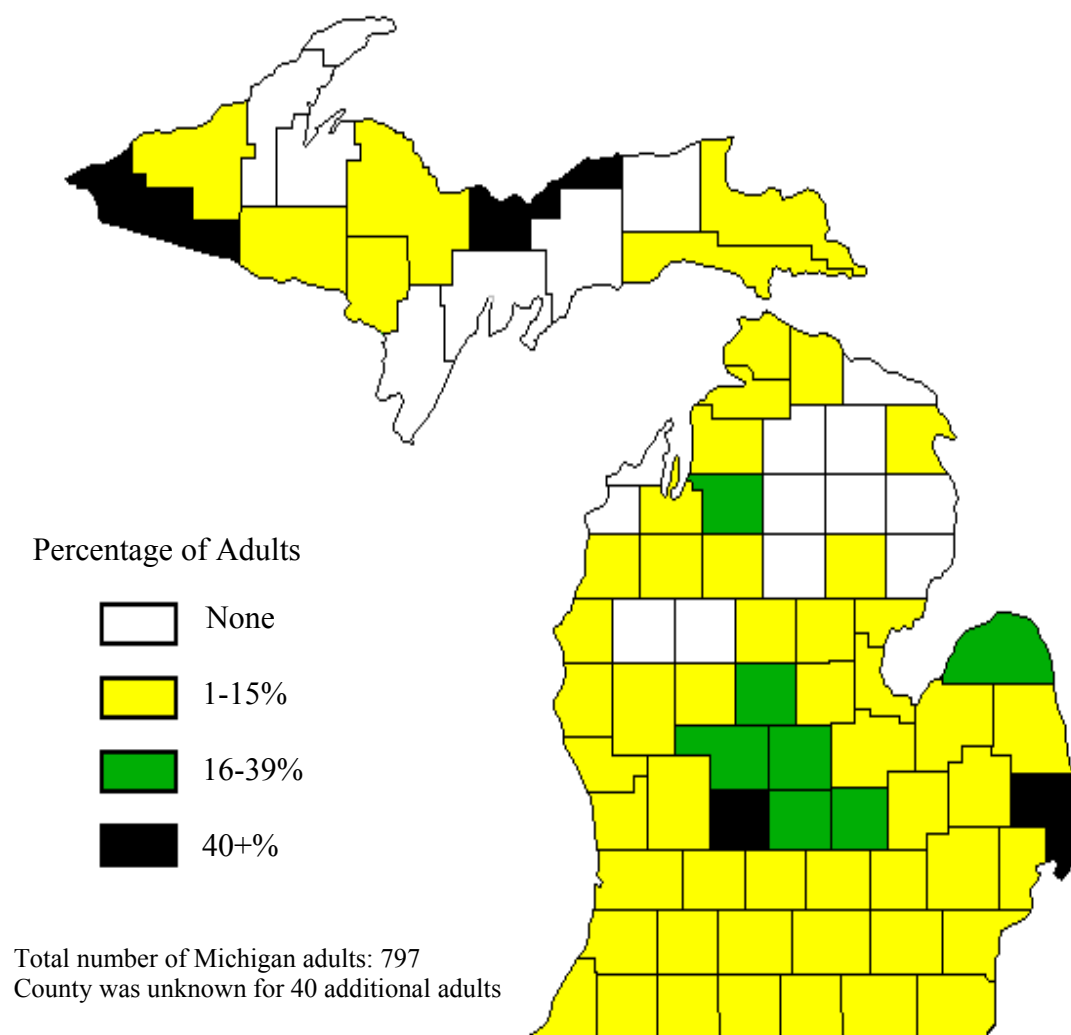
St. Clair and **Wayne** counties had the highest number of adults with blood lead levels of 10 ug/dL or greater reported, with 94 and 158, respectively.

Figure 3. Distribution of Adults with Blood Lead Levels (BLLs) ≥ 25 ug/dL in Michigan by County of Residence: 2001



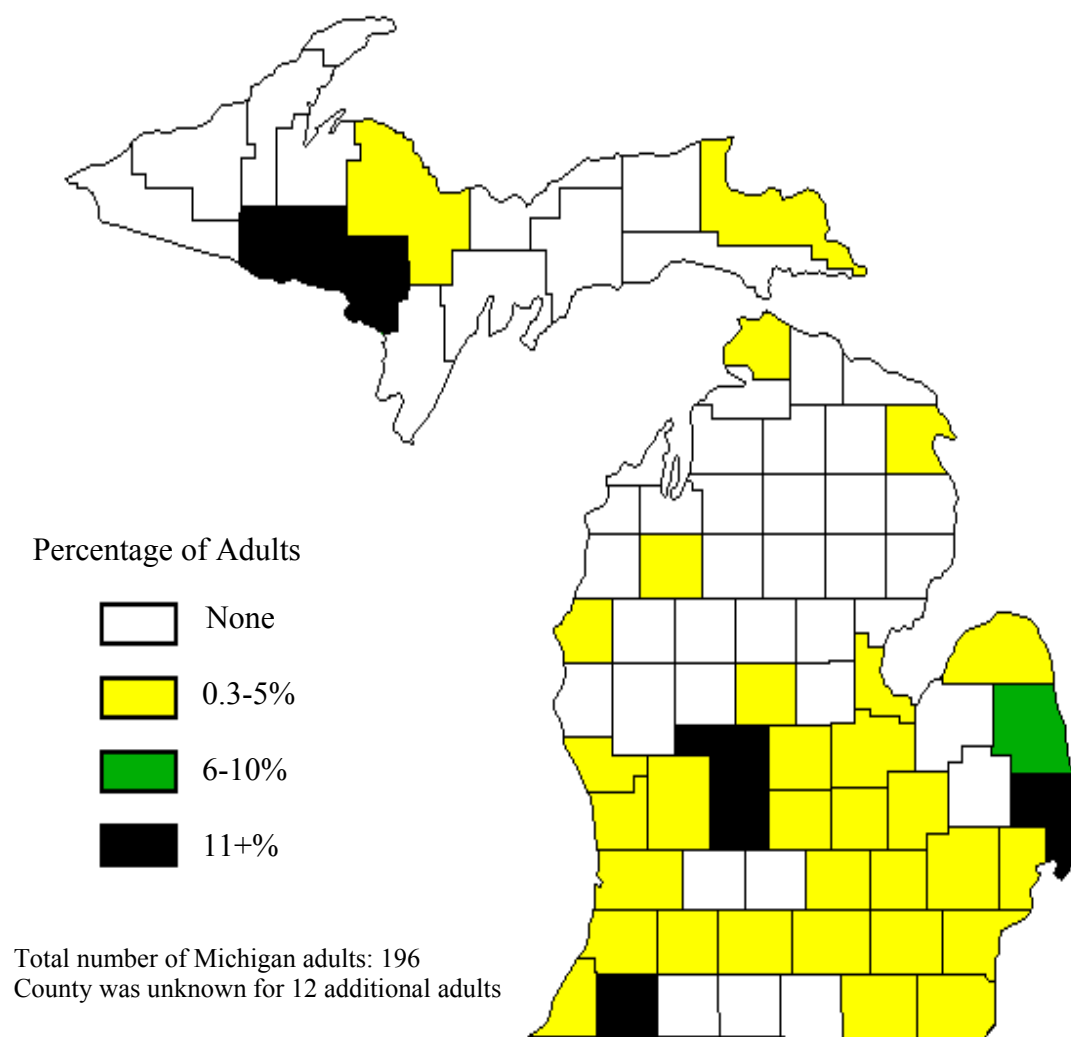
Wayne and St. Clair counties had the highest number of adults with blood lead levels of 25 ug/dL or greater reported, with 33 and 50 adults, respectively.

Figure 4. Percentage of Adults with Blood Lead Levels (BLLs) ≥ 10 ug/dL in Michigan by County of Residence: 2001*



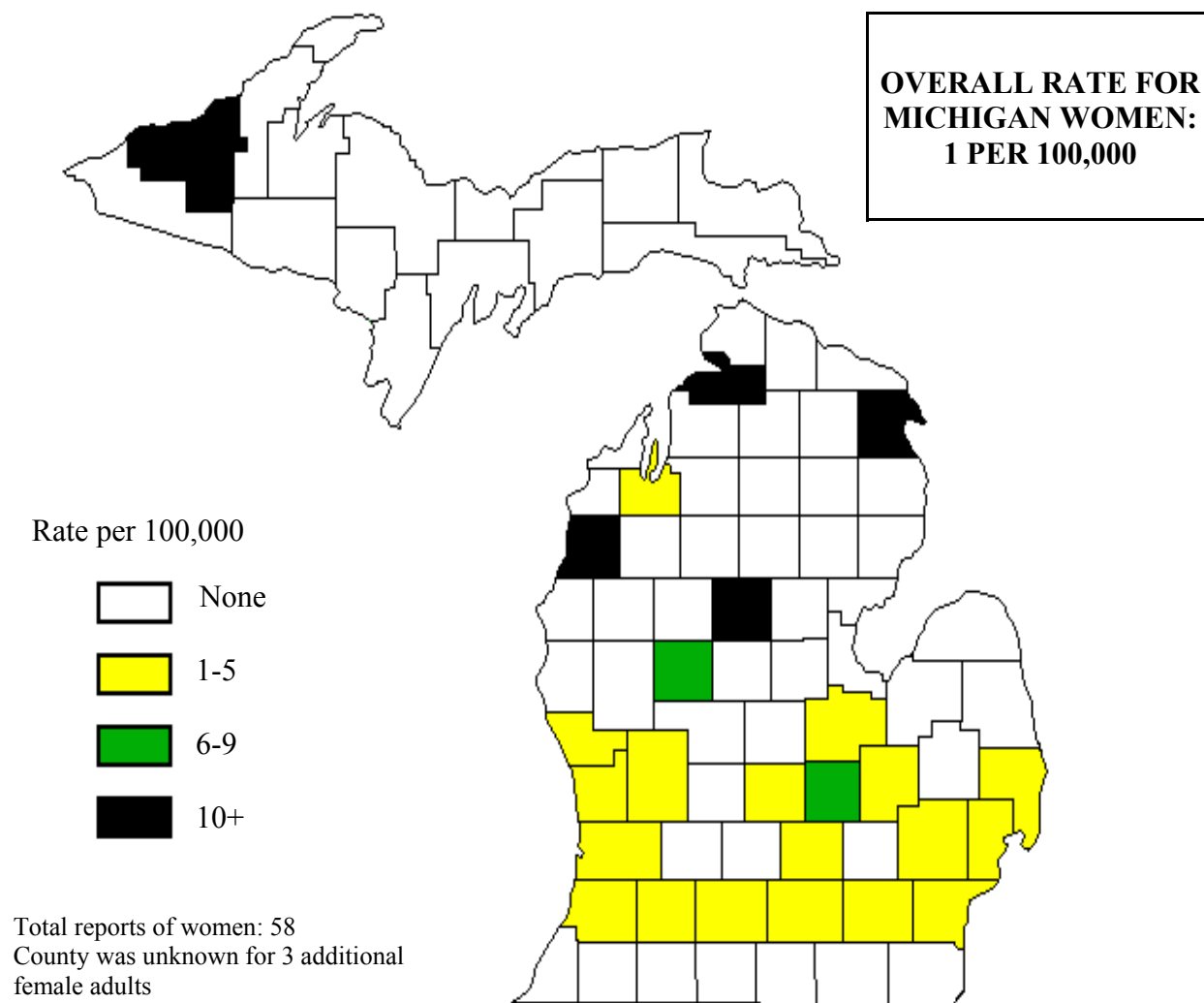
*Denominator used was the total number of adults tested for blood lead within each county.

Figure 5. Percentage of Adults with Blood Lead Levels (BLLs) ≥ 25 ug/dL in Michigan by County of Residence: 2001*



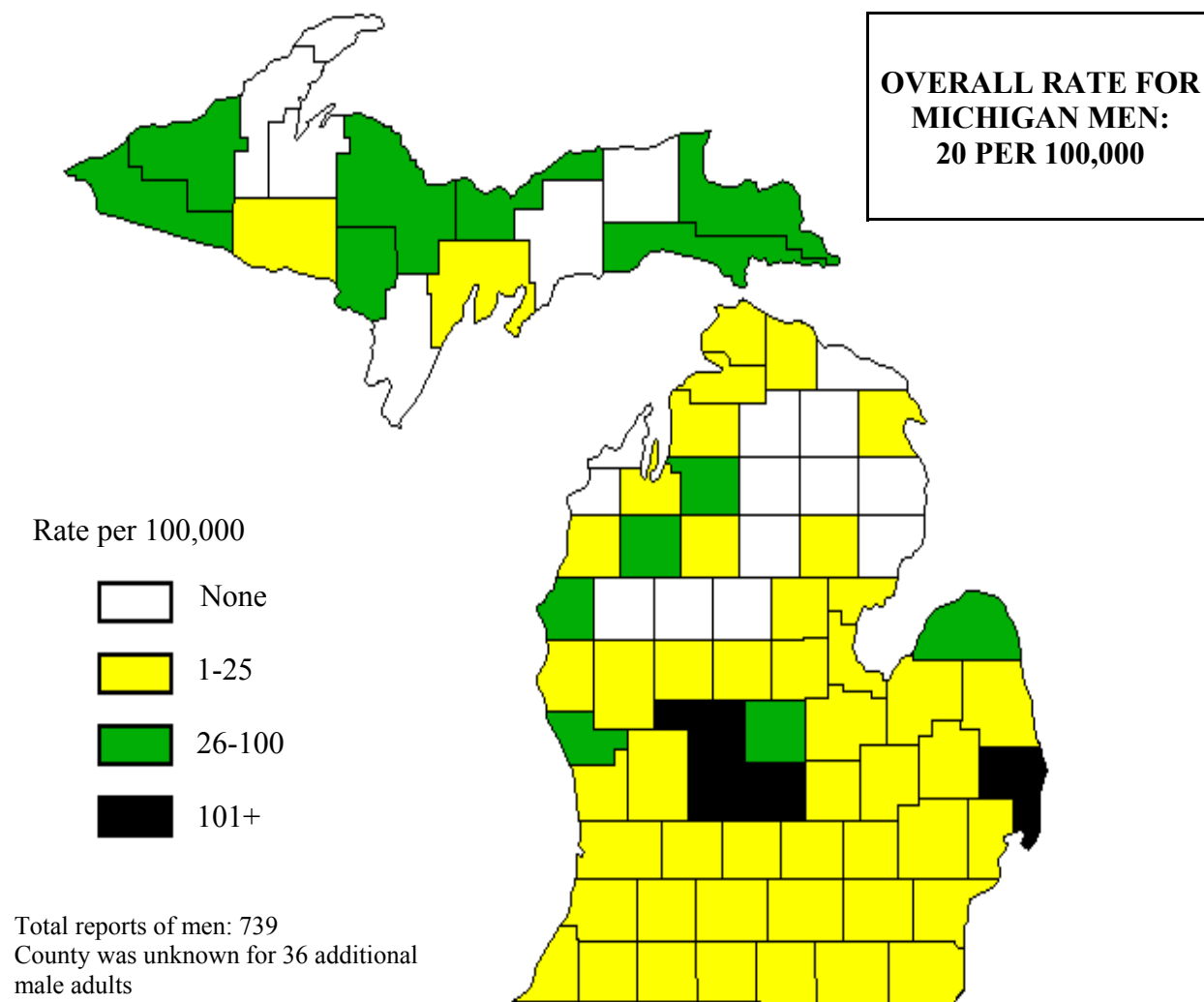
*Denominator used was the total number of adults tested for blood lead within each county.

Figure 6. Annual Incidence of Blood Lead Levels (BLTs) ≥ 10 ug/dL Among Women in Michigan by County of Residence: 2001*



*Rate per 100,000 women age 16+; denominator is the 2000 US. Census population data.

Figure 7. Annual Incidence of Blood Lead Levels (BLLs) ≥ 10 ug/dL Among Men in Michigan by County of Residence: 2001*



*Rate per 100,000 men age 16+; denominator is the 2000 US. Census population data.

Figure 8. Geographic Distribution of Non-Construction Companies Reporting Adults with Blood Lead Levels (BLLs) ≥ 25 ug/dL in Michigan: 2001

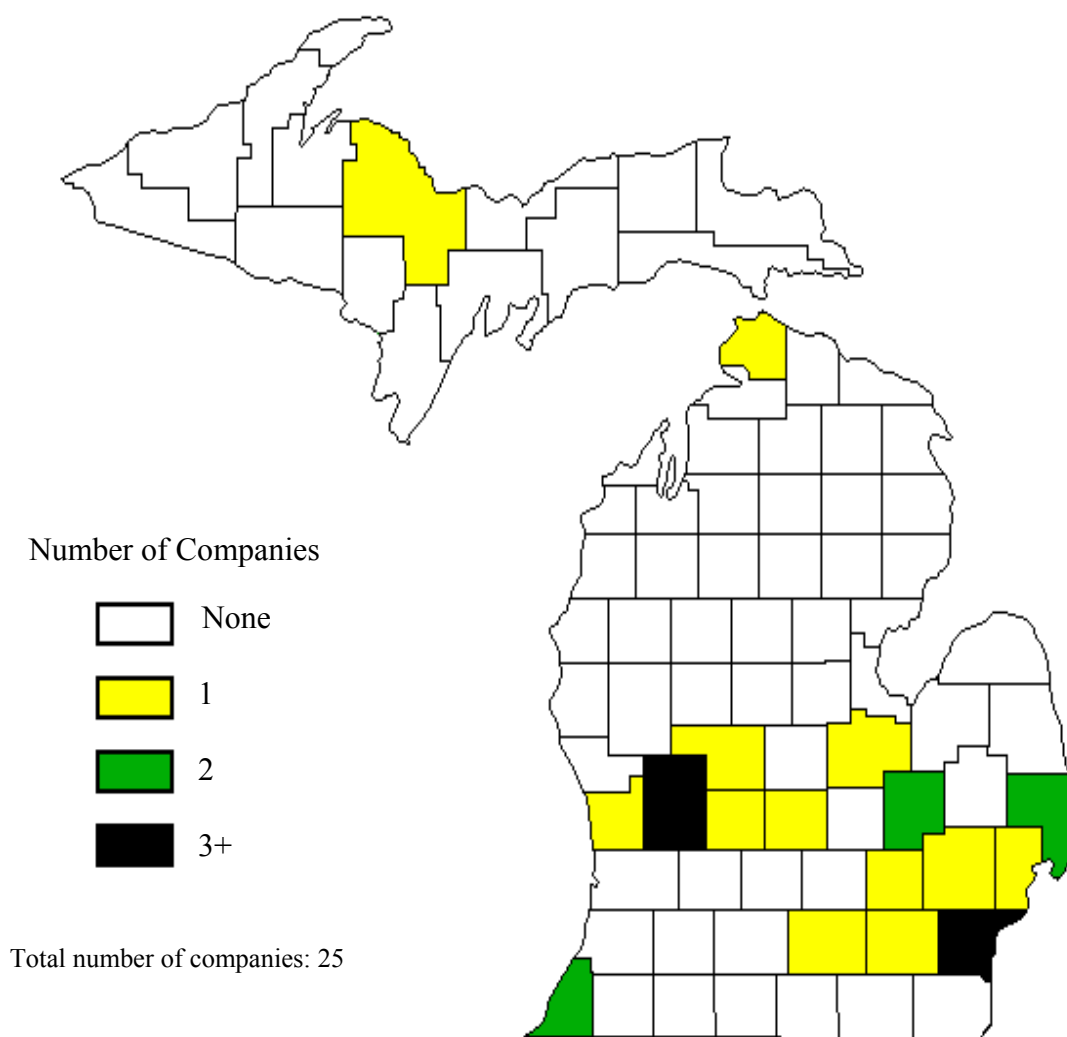
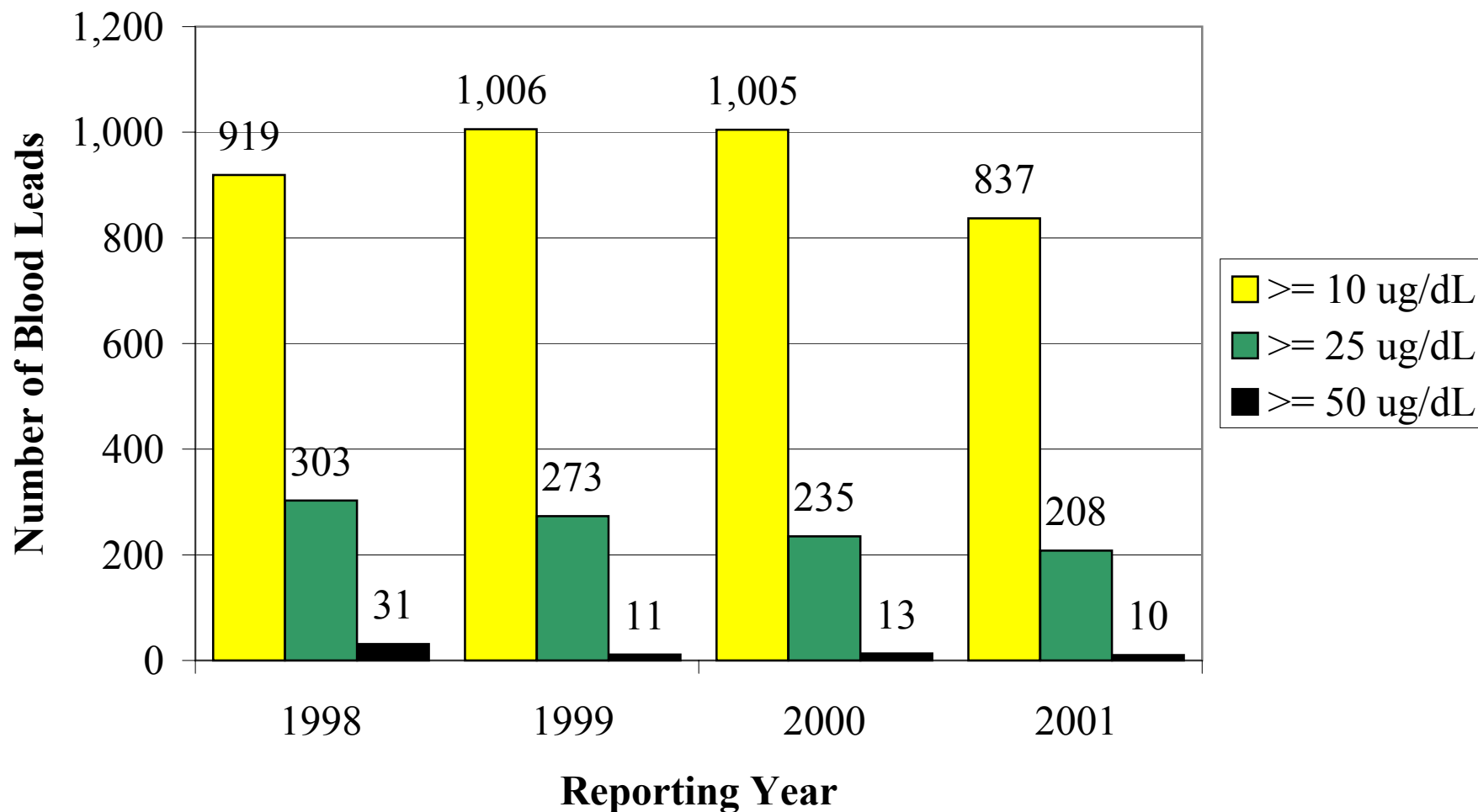


Figure 9. Number of Adult Blood Lead Levels ≥ 10 ug/dL, ≥ 25 ug/dL and ≥ 50 ug/dL, Michigan: 1998-2001



Part II

Blood Lead Levels Among *Children* in Michigan

Michigan Department of Community Health Childhood Lead Poisoning Prevention Project

Overview:

The Michigan Department of Community Health (MDCH) Childhood Lead Poisoning Prevention Project (CLPPP) focuses its efforts on children less than six years of age. These efforts include: 1) implementation of the statewide plan for childhood blood lead testing; 2) maintaining the statewide surveillance system, including collection, analysis and dissemination of testing data, as well as prevalence of elevated blood lead (EBL) levels, sources of lead exposure, and follow-up care for children; 3) overseeing policy development to bring about follow-up care of identified EBL children; 4) developing public and professional health education materials and strategies for a variety of targeted audiences; and 5) continuing to develop policies for primary prevention of childhood lead poisoning, providing oversight of primary prevention activities in selected sites that have proven to be effective, and working with housing authorities, rental property owners and others to provide safe housing for children.

CLPPP works with local health departments and other agencies throughout the state on each of these efforts. CLPPP also provides funding for prevention programs in several local agencies: the health departments of Delta/Menominee District, Detroit city, District #10 (ten counties in western Michigan), Genesee County, Ingham County, Kent County, Oakland County & Wayne County, as well as Field Neurosciences Institute in Saginaw County.

The primary source of lead exposure for children in Michigan is old paint, especially in homes where paint is chipping, peeling or crumbling. Deteriorating lead paint creates a fine lead dust that lands on windowsills, floors, porches, and dirt areas close to the house. Young children ingest this lead dust through normal hand-to-mouth activity. Because a young child's nervous systems is still developing, the effects of lead are particularly devastating and are for the most part irreversible. Long-term effects of lead poisoning in children include reduced IQ, learning disabilities, behavioral problems, hearing loss, reduced potential and an increased tendency toward violence.

2001:

In Michigan in 2001, 4,771 children under six years had confirmed elevated blood lead levels (≥ 10 Fg/dL). Given that only 11% of that age group were tested in 2001, and that at best about one-quarter of those at highest risk were tested, the actual number of children with elevated levels is certainly much higher.

The number of children under six years of age tested statewide (87,875) increased by 13% over calendar year 2000 (78,040 children tested). The percentage of children found to have elevated blood lead (EBL), increased slightly from 5.4% to 5.5%, but the increase in testing means that 528 more children were identified than in the previous year. The percentage of children with blood lead levels of 20 Fg/dL and greater remained steady at 0.8%, but 83 more children were identified at that level than in the previous year.

The Centers for Disease Control and Prevention (CDC) strongly urges that extra attention be focused on the Medicaid population, because of a documented correlation between Medicaid status and elevated blood lead levels in children. MDCH CLPPP is closely monitoring the numbers of children enrolled in Medicaid who are being tested for lead. The schedule for the required testing

has been distributed to Medicaid providers on several occasions (see Statewide Screening/Testing Plan). In FY2001, 25.0% of Medicaid-eligible one- and two-year-olds in Michigan were tested for lead poisoning; that percentage is up from 19.6% in FY2000, but still far too low. A March 2000 Medicaid bulletin made it possible for local health departments to test children for lead at other child health visits (e.g., WIC clinics) and to bill Medicaid directly for the blood draw if a referral from the child's primary care physician is obtained. In approximately two years, however, local health departments have been reimbursed for only 144 blood lead draws under this arrangement. An adjustment of this policy may remove the need for referral but would direct local health departments to bill the child's qualified health plan rather than Medicaid.

High risk ZIP code testing data have been reviewed separately to determine whether sufficient numbers of children in those ZIP codes are being tested. In high-risk ZIP codes where at least 100 children have been tested, testing rates vary from 3% of the children under six years of age to 48%. Currently, ZIP codes are determined to be high risk based on old housing, poverty and prevalence of elevated levels (see Statewide Screening/Testing Plan for details). In the next year, MDCH CLPPP will shift to a plan that designates high-risk areas by census tract or block group, thereby increasing the accuracy of high-risk designations, narrowing the focus of prevention efforts and resources, and, it is hoped, increasing the level of cooperation among health providers.

In 2001, a dramatic improvement in blood lead testing in the City of Detroit was seen, where 33% of the children under six were tested. This increase (up from 22% in 2000) was aided by a city-wide publicity campaign--supported by the health department and a coalition of other city agencies, health providers and community groups--emphasizing the need to have young children tested for lead. Testing in Detroit resulted in the identification of 3,228 children with elevated blood lead levels, approximately two-thirds of Michigan's total. The rate of children with EBL in Detroit was 10.7% of the children tested.

During 2001, MDCH CLPPP staff made improvements in many of their documents and training materials:

- , The Statewide Screening/Testing Plan was revised for clarification.
- , A one page (front and back) lead poisoning "primer" for identifying, treating and prevention childhood lead poisoning was also completely revised, updated and laminated for distribution.
- , A set of data exercises, used by MDCH CLPPP staff and local health department (LHD) staff to measure progress toward program objectives, was updated in collaboration with the LHD subgrantees.
- , The annual statewide survey was updated to include information the Lead Hazard Remediation Program (LHRP) wanted to gather from local health departments. The process by which the results of the survey are compiled and presented was also revised.
- , The MDCH CLPPP poster was revised to emphasize screening/testing the right children, and was presented at the Michigan Chapter of the American Academy of Pediatrics (AAP), and the Women Infants and Children (WIC) conference.
- , In cooperation with LHRP staff, CLPPP staff designed a four-hour training session that was approved for continuing education units (CEUs) for nurses. This was presented at six different locations last year, and many more are planned. It includes a PowerPoint presentation that has been well received by participants, according to their written evaluations.

- , In addition to these trainings, MDCH CLPPP staff have written a capillary blood lead sampling training session which has been given at several different locations. These trainings give an overview of the scope of the lead poisoning problem in Michigan and in each local area, as well as hands-on demonstration and return demonstration of the actual capillary blood lead collection procedure.
- , Another evaluation tool that MDCH CLPPP is now using is an “Individual Annual Report” for each county and/or district to be used to evaluate the numbers and percentages of children who are tested for lead in high-risk ZIP codes.
- , Elevated Blood Lead (EBL) Investigation forms have been designed in collaboration with the LHRP staff, and are currently being piloted in two local health departments. The efficacy of the new forms will be evaluated after a short trial period.

Other highlights:

- , MDCH CLPPP has continued to conduct quarterly CLPPP Advisory Committee and Subcommittee meetings at the Department, as well as quarterly Subgrantee Meetings. In addition, the CLPPP coordinator attended the national lead education conference in Atlanta.
- , Site visits were made to all nine subgrantees during the year.
- , This year, a special effort was made to collaborate with other departments and agencies to integrate childhood lead poisoning prevention with other child health efforts-- e.g., Michigan Department of Consumer and Industry Services (MDCIS) Occupational Health Division-Adult Blood Lead Epidemiology and Surveillance (ABLES) program, Michigan State Housing Development Authority, LHRP, Family Independence Agency, WIC, Michigan Childhood Immunization Registry, Asthma Coalition, MDCH Medicaid staff, and MDCH Epidemiology staff. Joint projects with each of these agencies continue.
- , MDCH CLPPP drafted “Recommendations to Prevent Fetal Exposure to Lead,” which has been reviewed and accepted by the CLPPP Advisory Committee. It is now being distributed for education and review purposes to the MCH subcommittee of the Michigan State Medical Society, and to the Michigan section of the American College of Obstetricians & Gynecologists. Subsequently, CLPPP will collaborate with physicians on recommendations for practitioners attending births in Michigan.
- , The most notable accomplishment of 2001 was the increase in numbers of children tested for lead poisoning, especially in high-risk ZIP codes, and the increase in the numbers of children found to be lead poisoned. While efforts to increase blood lead testing will continue, the challenge now becomes increasing the infrastructure to accommodate the increase in case load for field staff to assure follow-up services and treatment, while a more comprehensive and effective primary prevention program is set into motion. Our long term goal remains to eliminate lead poisoning in Michigan by 2010.

**Michigan Department of Community Health,
Childhood Lead Poisoning Prevention Project
Statewide Screening/Testing Plan**

I. There are four criteria for testing a child for lead poisoning:

- A. Medicaid--all Medicaid-enrolled children, regardless of place of residence in Michigan, must be tested. No exceptions or waivers exist. Authority: Health Care Financing Agency (HCFA), through their agent Medical Services Administration (MSA). MIChild-enrolled children should be tested if any risk factors exist (or at health care provider's discretion).
- B. Geography--all non-Medicaid children living within certain areas (see reverse for a list of high risk ZIP codes) should be tested.
- C. Questionnaire--the parents or guardians of children not in one of the previous two categories should be asked specific questions to determine each child's risk. If the answer is "Yes" or "Don't know" to any of the questions, that child should be tested.
- D. Provider's discretion--if a child does not meet any of the above criteria, the health care provider always has the option of testing if he/she believes that it is warranted.

II. Specifics of each criterion:

- A. Medicaid: Michigan's Medical Services Administration states that a blood lead test is REQUIRED for any Medicaid-eligible child at 12 and 24 months, or between 36 and 72 months if not tested previously. A venous sample is considered confirmatory; an elevated capillary sample will require confirmation with a venous sample.
- B. Geographical specifics for evaluating ZIP codes:
 - 1. ZIP codes in Michigan where testing is recommended for all children: Any ZIP code with 12% or greater incidence of lead poisoning among children ages 12 to 36 months, in 2000.
Any ZIP code where a combination of percentage of pre-1950 housing, number of children under age six, and percentage of children under age six living in poverty ranks high.
Any ZIP code with 27% or greater pre-1950 housing.
 - 2. ZIP codes are re-evaluated annually, based on the prevalence of childhood poisoning in that ZIP code for the prior year, and the Screening/Testing Plan adjusted where appropriate.
- C. Specifics of questionnaire (subject to change annually):
 - 1. Does the child live in (or often visit) a house built before 1950 with peeling or chipping paint? This could include a day care, preschool, or home of a relative.
 - 2. Does the child live in (or often visit) a house built before 1978 that has been remodeled within the last year?
 - 3. Does the child have a brother or sister (or playmate) with lead poisoning?
 - 4. Does the child live with an adult whose job or hobby involves lead?
 - 5. Does the child's family use any home remedies that may contain lead?

Childhood Lead Poisoning High-Risk ZIP Code Areas in Michigan

Alcona	Barry	Calhoun	Clinton	Genesee	Houghton	Iosco	Kent
48728	48849	49011	48808	48418	49905	48739	48838
48740	48897	49015	48822	48436	49913	48743	49318
48742	49017	49017	48823	48458	49916	48763	49330
	49021	49021	48831	48502	49921	48770	49331
Alger	49046	49029	48835	48503	49930		49503
49806	49050	49033	48837	48504	49931	Iron	49504
49822	49058	49034	48845	48505	49943	49920	49505
49825	49060	49051	48848	48506	49945	49927	49506
49826	49073	49068	48866	48507	49952	49935	49507
49839	49080	49076	48879	48529	49958		49509
49862	49325	49092	48894		49965	Isabella	
49891	49333	49094	48906	Gladwin		48617	Keweenaw
	49348	49224		48612	Huron	48618	49901
Allegan		49245	Delta	48618	48413	48858	49950
49010	Bay	49284	49807	48624	48432	48878	
49070	48650		49818		48441	48883	Lake
49078	48706	Cass	49829	Gogebic	48445	49310	49623
49080	48708	49031	49835	49911	48456		49642
49090	48747	49045	49837	49938	48468	Jackson	49677
49328		49047	49878	49947	48470	49201	49688
49344	Benzie	49061	49880	49968	48475	49202	
49348	49613	49067	49894	49969	48720	49203	Lapeer
49408	49616	49093			48731	49233	48003
49419	49635	49095	Dickinson	Gr Traverse	48754	49234	48416
49423	49640	49099	49801	49620	48755	49237	48435
49450		49111	49815	49649	48759	49240	48444
49453	Berrien	49120	49834			49241	48461
	49022		49870	Gratiot	Ingham	49254	48464
Alpena	49038	Charlevoix	49881	48615	48819	49264	48727
49707	49085	49712	49892	48662	48823	49265	48744
49744	49098	49720		48801	48827	49269	48760
49753	49101	49727	Eaton	48806	48854	49272	
49776	49102	49729	48813	48807	48872	49277	Leelanau
	49103	49770	48827	48832	48892	49284	49630
Antrim	49106		48837	48847	48895	49285	49636
49615	49107	Cheboygan	48849	48856	48906		49653
49622	49111	49721	48861	48871	48910	Kalamazoo	49670
49629	49113	49755	48890	48877	48912	49001	
49712	49116		48906	48880	48915	49004	Lenawee
49720	49117	Chippewa	49021	48889	48933	49007	49220
49727	49120	49710	49073		49251	49008	49221
49729	49125	49728	49076	Hillsdale	49264	49012	49228
	49126	49752	49096	49082	49285	49034	49229
Arenac	49128	49774	49264	49227		49052	49233
48658	49129	49783		49232	Ionia	49053	49235
48659			Emmet	49242	48809	49060	49236
48766	Branch	Clare	49718	49247	48815	49080	49238
	49011	48612	49740	49250	48845	49087	49247
Baraga	49028	48617	49755	49252	48846	49088	49248
49861	49030	48624	49769	49255	48849	49097	49253
49908	49036	48625	49770	49262	48851		49256
49919	49082			49266	48860		49265
49946	49089			49271	48865		49267
49958	49092			49274	48873		49268
49962	49094			49288	48875		49275
49970	49255				48881		49276
					48890		49279
					49325		49286
							49287

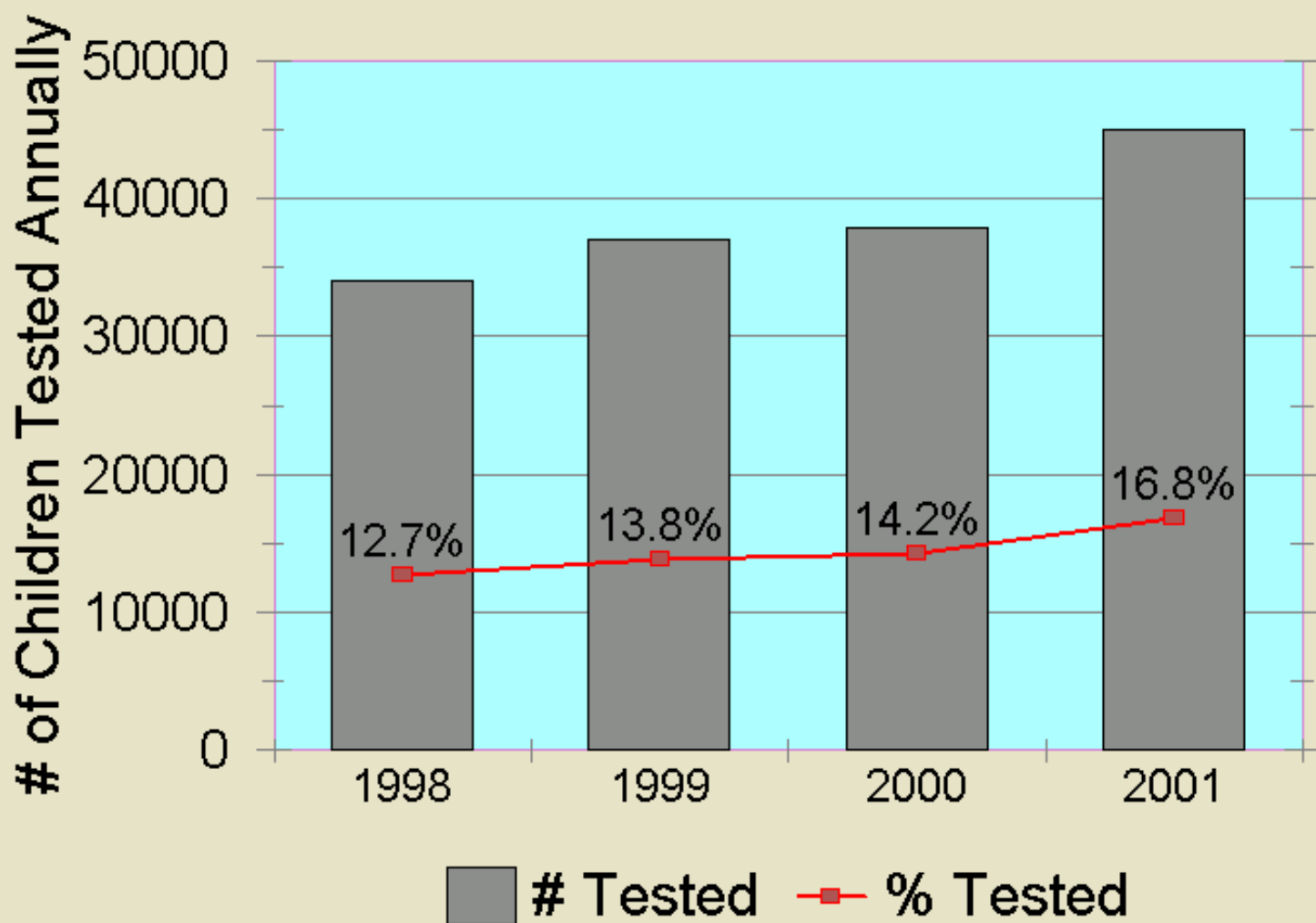
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Childhood Lead Poisoning High-Risk ZIP Code Areas in Michigan

Livingston	Mecosta	Montcalm	Ogemaw	Sanilac	St Joseph	Wayne
48137	48850	48811	48624	48097	49030	48120
48418	48886	48818	48635	48401	49032	48122
48836	49307	48829	48661	48416	49040	48124
48872	49310	48834	48739	48419	49042	48125
48892	49336	48838		48422	49066	48126
49285	49631	48850	Ontonagon	48426	49067	48128
		48884	49912	48427	49072	48141
Luce	Menominee	48885	49925	48450	49091	48146
49853	49807	48886	49948	48453	49093	48174
49868	49812	48888	49953	48454	49099	48179
	49821	48891	49967	48456		48184
Mackinac	49847	49322		48465	Tuscola	48191
49719	49848	49329	Osceola	48466	48435	48192
49757	49858	49347	49631	48469	48453	48201
49760	49873		49677	48471	48464	48202
49774	49874	Muskegon	49679	48472	48701	48203
49781	49886	49303	49688	48475	48723	48204
49827	49887	49318	48728	48741	48726	48205
49853	49892	49403			48727	48206
	49893	49404	Ottawa	Schoolcraft	48729	48207
Macomb	49896	49415	49330	49836	48733	48208
48005		49437	49403	49840	48735	48209
48015	Midland	49440	49404	49854	48741	48210
48021	48618	49441	49417	49883	48744	48211
48041	48880	49442	49423		48757	48212
48062	48883	49444	49435	Shiawassee	48759	48213
48089		49451	49464	48414	48760	48214
48091	Missaukee	49457	49504	48418	48767	48215
48236	49632	49461		48429	48768	48216
	49651		Presque Isle	48460		48217
Manistee	49657	Newaygo	49707	48616	Van Buren	48218
49613		49307	49743	48649	49013	48219
49614	Monroe	49327	49765	48817	49026	48221
49625	48131	49337	49776	48831	49038	48223
49645	48133	49349	49779	48841	49043	48224
49660	48145	49412		48848	49045	48225
49675	48157	49421	Roscommon	48857	49055	48226
	48159		48624	48866	49056	48227
Marquette	48160	Oakland		48867	49057	48228
49814	48161	48009	Saginaw	48872	49064	48229
49822	48166	48030	48460		49065	48230
49833	48179	48067	48601	St Clair	49079	48234
49849	49229	48069	48602	48001	49090	48235
49855	49267	48070	48604	48002		48236
49861	49270	48072	48607	48003	Washtenaw	48238
49866	49276	48220	48614	48006	48104	48240
49879		48320	48616	48014	48118	48242
49880		48340	48637	48022	48130	
		48341	48649	48023	48137	Wexford
Mason		48342	48655	48027	48158	49601
49405		48362	48722	48028	48160	49618
49410			48757	48032	48197	49620
49411		Oceana	48807	48039	48198	49663
49431		49420		48041	49236	
49449		49421		48060	49240	
49454		49446		48062	49285	
49660		49449		48074		
		49455		48079		
				48097		
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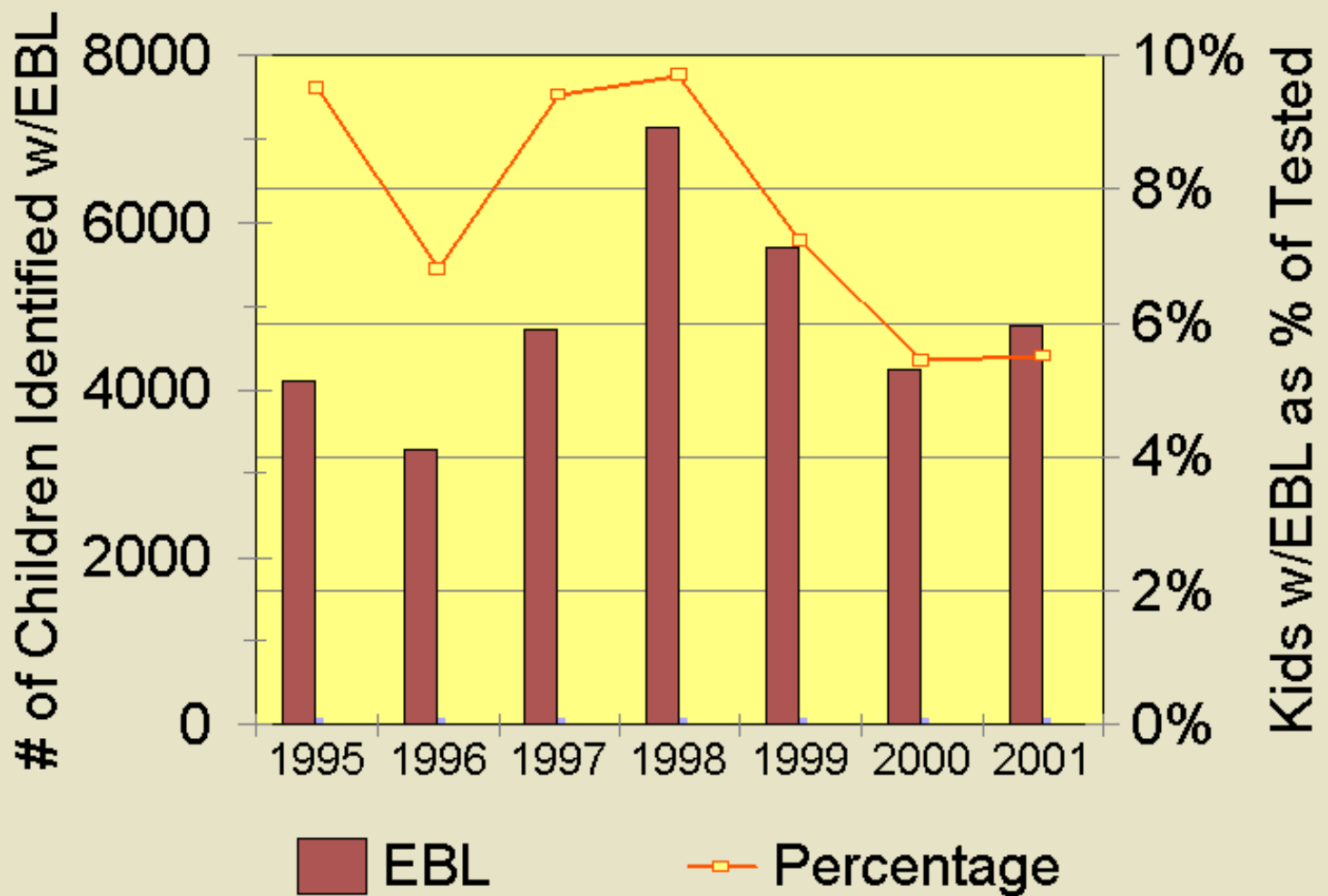
Testing for Blood Lead

Michigan Children Ages 1 & 2



Childhood Lead Poisoning in Michigan

Kids <6yrs w/Blood Lead $\geq 10\mu\text{g/dL}$ (EBL)



CHILDHOOD LEAD POISONING DATA FACTS -- ALL MICHIGAN COUNTIES

March 2002

Children Younger than Age Six - Calendar Year 2001

			Children < Age 6, Tested for Lead		Children w/elevated blood lead (EBL)					Children w/elevated capillary tests, not confirmed by venous
County	%Pre-1950 Housing*	Children Under Age 6**	Number of Children Tested	% of Total Children	Number of Children w/EBL***	% EBL****	10-14 ug/dL	15-19 ug/dL	20+ ug/dL	
Alcona	24%	630	79	13%	0	0.0%	0	0	0	0
Alger	36%	562	100	18%	0	0.0%	0	0	0	0
Allegan	33%	9,272	450	5%	3	0.7%	2	0	1	1
Alpena	34%	2,118	176	8%	4	2.3%	1	1	2	3
Antrim	28%	1,625	67	4%	1	1.5%	1	0	0	0
Arenac	24%	1,124	128	11%	0	0.0%	0	0	0	0
Baraga	43%	590	132	22%	1	0.8%	1	0	0	1
Barry	37%	4,606	367	8%	5	1.4%	2	1	2	1
Bay	40%	8,126	521	6%	12	2.3%	7	4	1	2
Benzie	33%	1,135	27	2%	1	3.7%	1	0	0	0
Berrien	35%	12,820	2,092	16%	121	5.8%	81	20	20	17
Branch	39%	3,484	98	3%	1	1.1%	1	0	0	3
Calhoun	41%	10,945	1,209	11%	51	4.3%	34	10	7	15
Cass	35%	3,818	235	6%	5	2.1%	4	0	1	2
Charlevoix	32%	2,052	72	4%	1	1.4%	1	0	0	0
Cheboygan	29%	1,893	77	4%	0	0.0%	0	0	0	0
Chippewa	32%	2,500	397	16%	1	0.3%	1	0	0	4
Clare	16%	2,236	140	6%	0	0.0%	0	0	0	0
Clinton	34%	5,436	173	3%	2	1.2%	1	1	0	1
Crawford	17%	949	15	2%	0	0.0%	0	0	0	0
Delta	43%	2,530	440	17%	3	0.7%	3	0	0	2
Dickinson	46%	1,871	83	4%	1	1.2%	0	1	0	0
Eaton	26%	7,980	446	6%	4	0.9%	2	0	2	3
Emmet	33%	2,366	96	4%	0	0.0%	0	0	0	0
Genesee	27%	38,236	3,002	8%	79	2.6%	59	10	10	1
Gladwin	18%	1,733	106	6%	1	0.9%	0	1	0	0
Gogebic	60%	973	86	9%	2	2.3%	2	0	0	0
Grand Trav	23%	5,733	163	3%	1	0.6%	1	0	0	0
Gratiot	44%	3,012	264	9%	3	1.1%	3	0	0	0
Hillsdale	42%	3,628	272	7%	3	1.1%	1	1	1	1
Houghton	62%	2,348	375	16%	5	1.3%	4	1	0	0
Huron	38%	2,447	160	7%	1	0.6%	0	1	0	0
Ingham	30%	21,259	2,634	12%	39	1.5%	25	4	10	18
Ionia	44%	5,111	400	8%	13	3.3%	11	0	2	2
Iosco	22%	1,577	156	10%	0	0.0%	0	0	0	0
Iron	51%	677	28	4%	0	0.0%	0	0	0	0
Isabella	25%	3,945	265	7%	0	0.0%	0	0	0	0
Jackson	39%	12,586	280	2%	30	10.7%	22	6	2	0
Kalamazoo	30%	18,597	1,285	7%	43	3.4%	29	6	8	6
Kalkaska	16%	1,306	49	4%	1	2.0%	1	0	0	0
Kent	32%	53,436	10,371	19%	515	5.4%	305	117	93	791
Keweenaw	61%	127	20	16%	0	0.0%	0	0	0	0

			Children < Age 6, Tested for Lead		Children w/elevated blood lead (EBL)					Children w/elevated capillary tests, not confirmed by venous
County	%Pre-1950 Housing*	Children Under Age 6**	Number of Children Tested	% of Total Children	Number of Children w/EBL***	% EBL****	10-14 ug/dL	15-19 ug/dL	20+ ug/dL	
Lake	19%	718	70	10%	2	2.9%	2	0	0	0
Lapeer	27%	7,217	188	3%	1	0.5%	1	0	0	0
Leelanau	28%	1,328	23	2%	1	4.3%	1	0	0	0
Lenawee	44%	7,564	352	5%	11	3.1%	6	3	2	0
Livingston	19%	13,800	204	1%	1	0.5%	1	0	0	1
Luce	38%	438	106	24%	1	1.0%	1	0	0	2
Mackinac	30%	708	146	21%	0	0.0%	0	0	0	1
Macomb	13%	61,805	2,980	5%	24	0.8%	19	3	2	1
Manistee	39%	1,616	64	4%	3	4.7%	3	0	0	0
Marquette	37%	3,985	322	8%	2	0.6%	1	1	0	0
Mason	39%	1,902	38	2%	1	2.6%	0	0	1	0
Mecosta	26%	2,892	319	11%	5	1.6%	5	0	0	0
Menominee	44%	1,783	223	13%	3	1.4%	3	0	0	1
Midland	20%	6,572	216	3%	2	0.9%	2	0	0	0
Missaukee	25%	1,143	34	3%	0	0.0%	0	0	0	0
Monroe	33%	11,757	1,169	10%	13	1.1%	9	2	2	1
Montcalm	34%	4,888	593	12%	6	1.0%	2	2	2	1
Montmorency	19%	544	23	4%	0	0.0%	0	0	0	1
Muskegon	36%	14,215	1,803	13%	86	4.8%	61	18	7	7
Newaygo	26%	4,014	326	8%	3	0.9%	3	0	0	0
Oakland	19%	97,281	5,747	6%	63	1.1%	43	7	13	4
Oceana	34%	2,092	87	4%	1	1.1%	1	0	0	0
Ogemaw	22%	1,384	93	7%	0	0.0%	0	0	0	0
Ontonagon	43%	419	29	7%	0	0.0%	0	0	0	0
Osceola	27%	1,754	143	8%	3	2.1%	2	1	0	0
Oscoda	18%	608	38	6%	0	0.0%	0	0	0	0
Otsego	16%	1,759	39	2%	1	2.6%	1	0	0	0
Ottawa	25%	21,940	1,140	5%	13	1.1%	8	3	2	8
Presque Isle	31%	832	65	8%	0	0.0%	0	0	0	2
Roscommon	18%	1,368	74	5%	0	0.0%	0	0	0	0
Saginaw	34%	17,275	1,581	9%	74	4.7%	45	15	14	11
St Clair	37%	13,360	391	3%	9	2.3%	8	0	1	3
St Joseph	39%	5,389	433	8%	13	3.0%	7	2	4	2
Sanilac	41%	3,506	207	6%	1	0.5%	1	0	0	1
Schoolcraft	39%	615	136	22%	1	0.7%	1	0	0	0
Shiawassee	41%	5,914	498	8%	3	0.6%	3	0	0	1
Tuscola	36%	4,310	304	7%	3	1.0%	3	0	0	1
Van Buren	35%	6,243	577	9%	5	0.9%	4	0	1	4
Washtenaw	24%	24,173	785	3%	6	0.8%	5	1	0	0
Wayne ex Det	28%	92,253	7,773	8%	225	2.9%	153	41	31	26
Wexford	32%	2,377	114	5%	4	3.5%	2	0	2	0
Detroit, City of	63%	93,365	30,886	33%	3,228	10.7%	2,111	644	473	744
MICHIGAN	32%	814,505	87,875	11%	4,771	5.5%	3,124	928	719	1,697

* 1990 Census Data, U. S. Department of Commerce, Bureau of the Census.

** U.S. Census Bureau, Census 2000 Population and Housing Summary File 1, compiled by Michigan Information Center.

*** EBL= Elevated blood level, defined as >=10 ug/dL.

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

Note: Counts of children tested and blood lead levels are reported from Michigan Department of Community Health, Childhood Lead Poisoning Prevention Project statewide database.

Note: Column for "Children Tested" reflects capillary and venous blood tests. Columns for "Children w/elevated blood lead" reflect venous tests only.

CHILDHOOD LEAD POISONING DATA FACTS -- ALL MICHIGAN COUNTIES

March 2002

Children Ages One & Two - Calendar Year 2001

			Children Ages 1 & 2, Tested for Lead		Children w/elevated blood lead (EBL)					Children w/elevated capillary tests, not confirmed by venous
County	%Pre-1950 Housing*	Children Ages 1 & 2**	Number of Children Tested	% of Total Children	Number of Children w/EBL***	% EBL****	10-14 ug/dL	15-19 ug/dL	20+ ug/dL	
Alcona	24%	224	35	16%	0	0.0%	0	0	0	0
Alger	36%	166	71	43%	0	0.0%	0	0	0	0
Allegan	33%	2,978	198	7%	2	1.0%	1	0	1	1
Alpena	34%	687	112	16%	3	2.7%	0	1	2	2
Antrim	28%	533	22	4%	1	4.5%	1	0	0	0
Arenac	24%	348	61	18%	0	0.0%	0	0	0	0
Baraga	43%	210	39	19%	0	0.0%	0	0	0	1
Barry	37%	1,475	184	12%	2	1.1%	0	1	1	1
Bay	40%	2,690	346	13%	6	1.7%	3	2	1	1
Benzie	33%	408	10	2%	1	10.0%	1	0	0	0
Berrien	35%	4,169	1,003	24%	61	6.1%	33	12	16	5
Branch	39%	1,158	67	6%	1	1.5%	1	0	0	1
Calhoun	41%	3,534	541	15%	19	3.5%	10	3	6	3
Cass	35%	1,212	122	10%	2	1.7%	2	0	0	1
Charlevoix	32%	676	21	3%	1	4.8%	1	0	0	0
Cheboygan	29%	638	14	2%	0	0.0%	0	0	0	0
Chippewa	32%	819	210	26%	1	0.5%	1	0	0	4
Clare	16%	742	79	11%	0	0.0%	0	0	0	0
Clinton	34%	1,755	67	4%	0	0.0%	0	0	0	1
Crawford	17%	295	3	1%	0	0.0%	0	0	0	0
Delta	43%	841	335	40%	3	0.9%	3	0	0	2
Dickinson	46%	598	32	5%	0	0.0%	0	0	0	0
Eaton	26%	2,558	228	9%	3	1.3%	1	0	2	2
Emmet	33%	756	26	3%	0	0.0%	0	0	0	0
Genesee	27%	12,624	1,564	12%	38	2.4%	28	2	8	1
Gladwin	18%	555	56	10%	1	1.8%	0	1	0	0
Gogebic	60%	294	37	13%	0	0.0%	0	0	0	0
Grand Trav	23%	1,908	45	2%	1	2.2%	1	0	0	0
Gratiot	44%	1,000	100	10%	3	3.0%	3	0	0	0
Hillsdale	42%	1,209	159	13%	2	1.3%	1	1	0	1
Houghton	62%	776	163	21%	4	2.5%	3	1	0	0
Huron	38%	793	67	8%	1	1.5%	0	1	0	0
Ingham	30%	7,137	1,406	20%	24	1.7%	13	3	8	14
Ionia	44%	1,714	194	11%	11	5.7%	10	0	1	2
Iosco	22%	535	59	11%	0	0.0%	0	0	0	0
Iron	51%	225	14	6%	0	0.0%	0	0	0	0
Isabella	25%	1,321	110	8%	0	0.0%	0	0	0	0
Jackson	39%	4,112	148	4%	13	8.8%	9	3	1	0
Kalamazoo	30%	6,175	779	13%	21	2.7%	15	3	3	4
Kalkaska	16%	408	6	1%	1	16.7%	1	0	0	0
Kent	32%	17,768	6,988	39%	355	5.5%	204	83	68	560
Keweenaw	61%	39	8	21%	0	0.0%	0	0	0	0

			Children Ages 1 & 2, Tested for Lead		Children w/elevated blood lead (EBL)					Children w/elevated capillary tests, not confirmed by venous
County	%Pre-1950 Housing*	Children Ages 1 & 2**	Number of Children Tested	% of Total Children	Number of Children w/EBL***	% EBL****	10-14 ug/dL	15-19 ug/dL	20+ ug/dL	
Lake	19%	250	40	16%	1	2.6%	1	0	0	1
Lapeer	27%	2,356	99	4%	1	1.0%	1	0	0	0
Leelanau	28%	430	5	1%	1	20.0%	1	0	0	0
Lenawee	44%	2,420	274	11%	8	2.9%	4	2	2	0
Livingston	19%	2,482	69	3%	1	1.5%	1	0	0	1
Luce	38%	135	63	47%	1	1.6%	1	0	0	1
Mackinac	30%	205	97	47%	0	0.0%	0	0	0	1
Macomb	13%	20,271	1,990	10%	12	0.6%	9	3	0	1
Manistee	39%	532	12	2%	2	16.7%	2	0	0	0
Marquette	37%	1,307	183	14%	0	0.0%	0	0	0	0
Mason	39%	619	20	3%	0	0.0%	0	0	0	0
Mecosta	26%	981	197	20%	1	0.5%	1	0	0	0
Menominee	44%	603	156	26%	2	1.3%	2	0	0	1
Midland	20%	2,167	138	6%	1	0.7%	1	0	0	0
Missaukee	25%	380	6	2%	0	0.0%	0	0	0	0
Monroe	33%	3,898	658	17%	7	1.1%	5	1	1	1
Montcalm	34%	1,601	315	20%	4	1.3%	1	1	2	1
Montmorency	19%	192	15	8%	0	0.0%	0	0	0	1
Muskegon	36%	4,670	1,108	24%	40	3.6%	22	12	6	3
Newaygo	26%	1,336	206	15%	0	0.0%	0	0	0	0
Oakland	19%	31,861	2,923	9%	31	1.1%	21	4	6	1
Oceana	34%	697	58	8%	1	1.7%	1	0	0	0
Ogemaw	22%	432	48	11%	0	0.0%	0	0	0	0
Ontonagon	43%	125	19	15%	0	0.0%	0	0	0	0
Osceola	27%	604	85	14%	3	3.5%	2	1	0	0
Oscoda	18%	190	12	6%	0	0.0%	0	0	0	0
Otsego	16%	586	9	2%	1	11.1%	1	0	0	0
Ottawa	25%	7,321	758	10%	8	1.1%	4	2	2	6
Presque Isle	31%	277	36	13%	0	0.0%	0	0	0	2
Roscommon	18%	447	26	6%	0	0.0%	0	0	0	0
Saginaw	34%	5,709	751	13%	37	4.9%	22	7	8	3
St Clair	37%	4,355	246	6%	6	2.5%	5	0	1	2
St Joseph	39%	1,727	191	11%	7	3.7%	3	1	3	2
Sanilac	41%	1,165	74	6%	1	1.4%	1	0	0	1
Schoolcraft	39%	215	112	52%	1	0.9%	1	0	0	0
Shiawassee	41%	1,939	194	10%	1	0.5%	1	0	0	0
Tuscola	36%	1,410	141	10%	2	1.4%	2	0	0	0
Van Buren	35%	2,047	256	13%	3	1.2%	2	0	1	2
Washtenaw	24%	8,086	429	5%	4	0.9%	4	0	0	0
Wayne ex Det	28%	30,284	3,719	12%	94	2.5%	66	14	13	11
Wexford	32%	640	20	3%	2	10.0%	0	0	2	0
Detroit, City of	63%	30,307	13,474	44%	1,496	11.5%	934	329	233	410
MICHIGAN	32%	267,412	44,961	17%	2,361	5.4%	1,468	494	398	1,059

* 1990 Census Data, U. S. Department of Commerce, Bureau of the Census.

** U.S. Census Bureau, Census 2000 Population and Housing Summary File 1, compiled by Michigan Information Center.

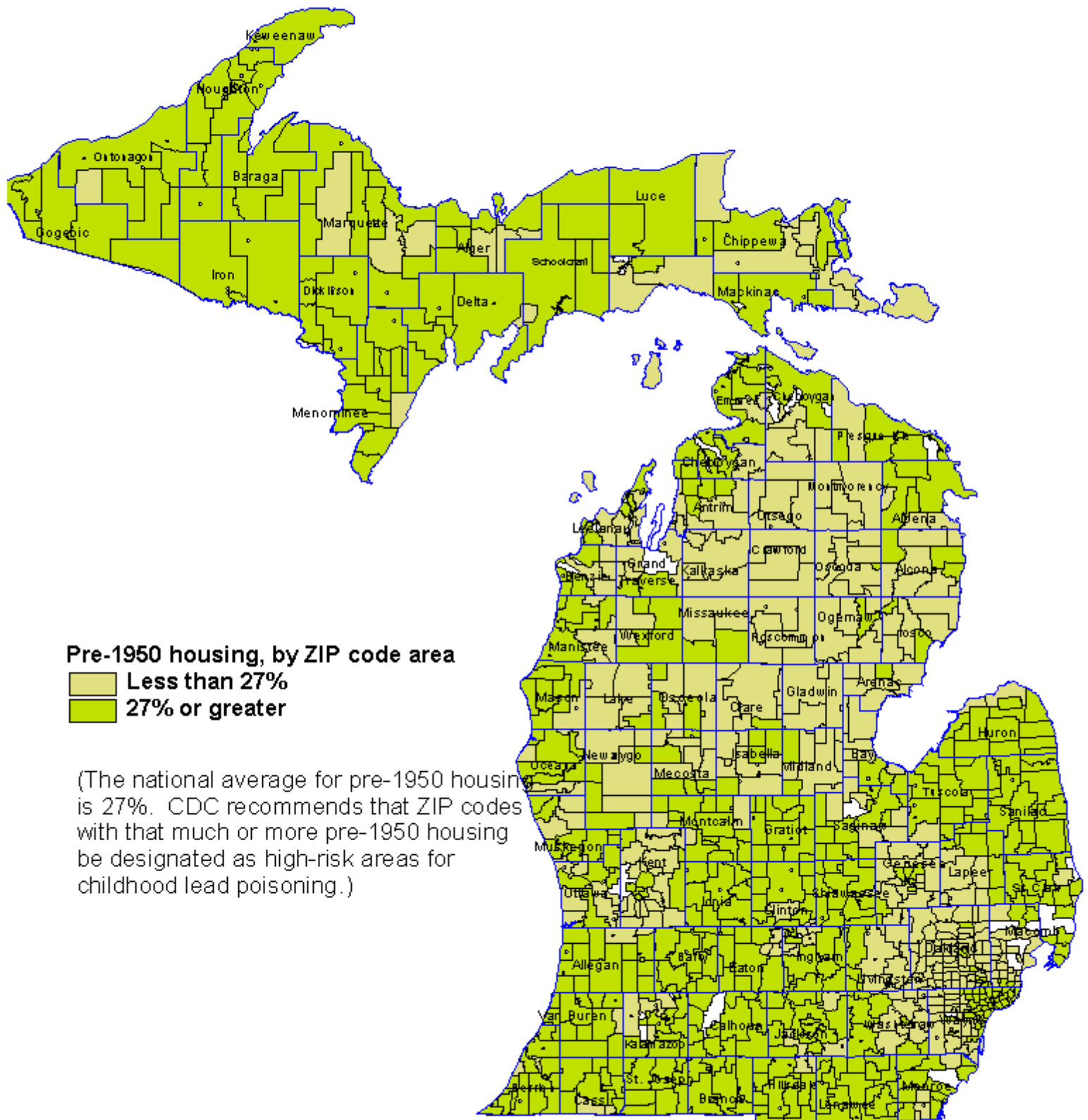
*** EBL= Elevated blood level, defined as ≥ 10 ug/dL.

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

Note: Counts of children tested and blood lead levels are reported from Michigan Department of Community Health, Childhood Lead Poisoning Prevention Project statewide database.

Note: Column for "Children Tested" reflects capillary and venous blood tests. Columns for "Children w/elevated blood lead" reflect venous tests only.

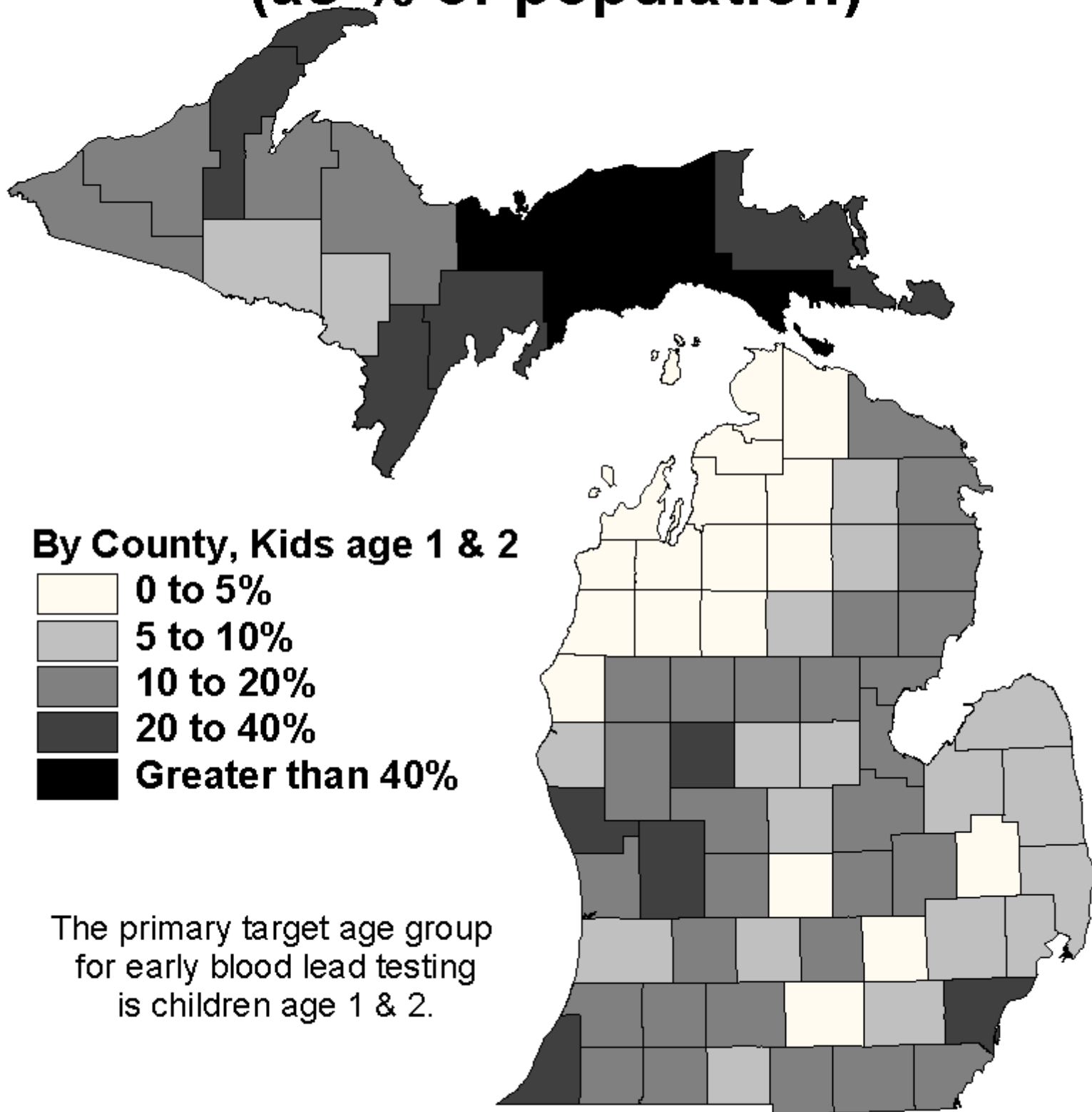
Pre-1950 Housing in Michigan shown by ZIP code area



Source: 1990 Census data

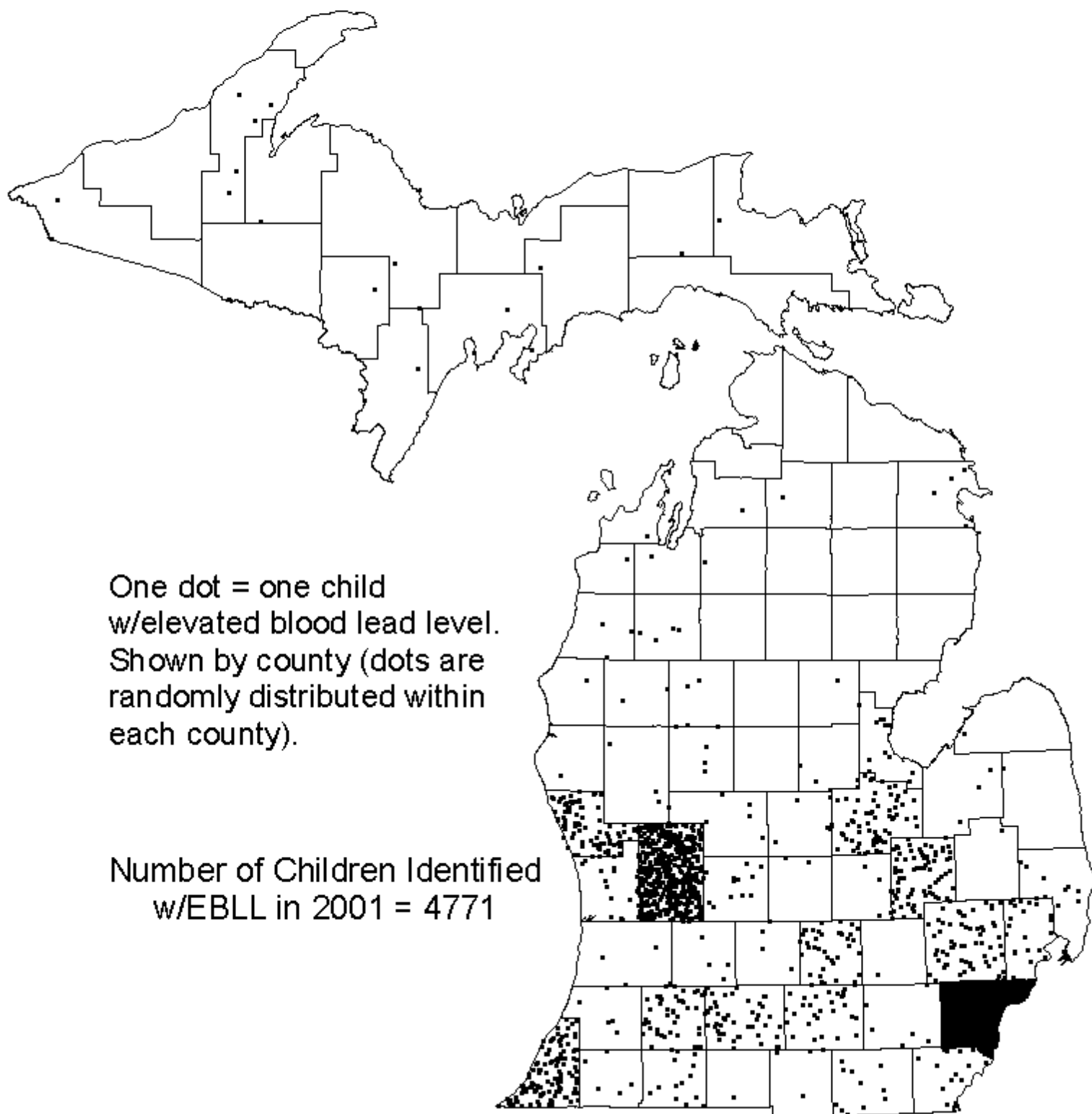
(Areas showing white indicate new ZIP designations since 1990 census.)

2001 Children Tested for Blood Lead (as % of population)



Sources: 2000 Census & MDCH CLPPP statewide database

2001 Children with Elevated Blood Lead Levels age < six years



Source: MDCH CLPPP statewide database

APPENDIX I

Lead Hazards At Indoor Firing Ranges

LEAD HAZARDS AT THE RANGE

Anybody spending time at an indoor firing range may be exposed to lead. One potential lead hazard is from the lead fumes in the "gun smoke" generated from the use of ammunition with lead primers or lead bullets.

Exposure to lead can also result from the disturbance of lead dust that has settled on surfaces in a firing range.

Individuals are exposed to lead when they clean the range, clean guns, or empty the bullet trap. Dry sweeping of the range causes settled lead dust to become airborne. Individuals who clean bullet traps by pouring or shoveling bullet debris into waste buckets may also be exposed to very high levels of airborne lead dust.

Individuals who eat, drink or smoke without washing up before meals and breaks can swallow lead dust that has settled on their hands, lunchroom surfaces, or food and drink.

THE HEALTH EFFECTS OF LEAD EXPOSURE

Lead harms the brain, nerves, red blood cells, kidneys, gastrointestinal and reproductive systems of both men and women. Adults who are lead poisoned may feel tired, irritable or get aches and pains. They can also develop serious health problems without knowing it. Lead can build up in the body and stay there for years.

STRATEGIES FOR PREVENTING LEAD POISONING WHILE AT THE RANGE

♦ Reduce the use of lead-containing ammunition.

Require the use of jacketed ammunition, preferably with non-lead primer, to reduce airborne lead in the range. Some ranges require in-house use of such ammunition and sell it at the retail counter.



♦ Control exposure through ventilation.

Good ventilation can significantly reduce airborne lead levels at the firing line. Supplied air should move steadily across all shooting booths, carrying the gun smoke away from the shooter's face and directly down the range where it is exhausted, filtered, and discharged. General building ventilation is not adequate. Contract with a ventilation consultant who has a proven track record of designing effective firing range ventilation systems. Perform regular maintenance to keep the system running well.

♦ Use good housekeeping practices.

Keep all work areas free from lead by regular cleaning. Cleaning should be done using either a special toxic dust vacuum ("HEPA" vacuum) or by wet mopping using water mixed with a surfactant (trisodium phosphate (TSP) or dish detergent, etc.). **Never dry sweep the range.** This increases exposure and spreads contamination by kicking up lead dust.

(Continued on other side)

Lead Hazards At Indoor Firing Ranges

STRATEGIES FOR PREVENTING LEAD POISONING WHILE AT THE RANGE

(continued)

- ♦ **Minimize airborne lead dust while cleaning the bullet trap.**

When possible, debris trays should be first HEPA vacuumed to remove as much lead dust as possible, wetted, and then emptied *inside* closed plastic bags. Debris should be repeatedly misted with water/surfactant mixture during all cleaning operations. New bullet trap designs that do not require cleaning are best and also save time.

- ♦ **Train individuals about lead safety.**

All individuals should receive training on how to work safely in lead exposure areas. Training increases individual awareness of health and safety conditions and provides them with information and skills to protect themselves while at the range.



- ♦ **Provide individuals with respirators.**

Fit-tested respirators should be worn during all cleaning operations. Individuals should use at least a half-mask respirator with HEPA filters while cleaning the range. At least a full-face respirator with HEPA filters should be worn while cleaning the bullet trap.

- ♦ **Provide individuals with protective clothing.**

Individuals should wear disposable coveralls, head covering, and shoe coverings when cleaning the range and the bullet trap. ***Individuals should not wear shooting clothing or shoes home.*** Lead dust is carried on clothes and shoes from the range to individuals' homes and vehicles, putting their children and other household members at risk of lead poisoning.

- ♦ **Prohibit eating, drinking and smoking in the work areas.**

Require individuals to wash their hands, forearms, and face before breaks, lunch, and at the end of their session.

- ♦ **Recommend an on-going lead medical program.**

Find a licensed doctor who is familiar with lead who you can recommend to club members. Members should have at least one annual lead specific medical exam, which includes a blood lead level, and tests for blood count and kidney function.

For more information on how to prevent lead poisoning at indoor firing ranges, contact the Michigan Department of Consumer and Industry Services at 517-322-1608.

For more information on the health effects of lead, contact Michigan State University, Division of Occupational and Environmental Medicine at 517-353-1846.

APPENDIX II

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) Birthdate.
- (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).

(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.

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

I.

Last Name

First Name

Initial

Address

City

State

ZIP Code

County

() -

Area Code and Phone Number

Date of Birth

Patient's Social Security Number

Does this child have Medicaid?

☐ yes☐ no

☐ Male
☐ Female

☐ Native American (1)
☐ Asian/Pacific Islander (2)
☐ Black (3)
☐ White (5)
☐ Multiracial (7)

☐ Hispanic (1)

Parent/Guardian Name (please print)

Parent/Guardian Social Security Number

If Patient is an adult, list Employer

II.

Physician or Clinic Name

Mailing Address

City

State

Zip Code

Area Code and Phone Number

IIa.

Specimen Collection Date

Type of Specimen: ☐ Capillary ☐ Venous

III.

BLOOD LEAD LEVEL	MICROGRAMS PER DECILITER
0.00	0.00
0.01	0.01
0.02	0.02
0.03	0.03
0.04	0.04
0.05	0.05
0.06	0.06
0.07	0.07
0.08	0.08
0.09	0.09
0.10	0.10
0.11	0.11
0.12	0.12
0.13	0.13
0.14	0.14
0.15	0.15
0.16	0.16
0.17	0.17
0.18	0.18
0.19	0.19
0.20	0.20
0.21	0.21
0.22	0.22
0.23	0.23
0.24	0.24
0.25	0.25
0.26	0.26
0.27	0.27
0.28	0.28
0.29	0.29
0.30	0.30
0.31	0.31
0.32	0.32
0.33	0.33
0.34	0.34
0.35	0.35
0.36	0.36
0.37	0.37
0.38	0.38
0.39	0.39
0.40	0.40
0.41	0.41
0.42	0.42
0.43	0.43
0.44	0.44
0.45	0.45
0.46	0.46
0.47	0.47
0.48	0.48
0.49	0.49
0.50	0.50
0.51	0.51
0.52	0.52
0.53	0.53
0.54	0.54
0.55	0.55
0.56	0.56
0.57	0.57
0.58	0.58
0.59	0.59
0.60	0.60
0.61	0.61
0.62	0.62
0.63	0.63
0.64	0.64
0.65	0.65
0.66	0.66
0.67	0.67
0.68	0.68
0.69	0.69
0.70	0.70
0.71	0.71
0.72	0.72
0.73	0.73
0.74	0.74
0.75	0.75
0.76	0.76
0.77	0.77
0.78	0.78
0.79	0.79
0.80	0.80
0.81	0.81
0.82	0.82
0.83	0.83
0.84	0.84
0.85	0.85
0.86	0.86
0.87	0.87
0.88	0.88
0.89	0.89
0.90	0.90
0.91	0.91
0.92	0.92
0.93	0.93
0.94	0.94
0.95	0.95
0.96	0.96
0.97	0.97
0.98	0.98
0.99	0.99
1.00	1.00
1.01	1.01
1.02	1.02
1.03	1.03
1.04	1.04
1.05	1.05
1.06	1.06
1.07	1.07
1.08	1.08
1.09	1.09
1.10	1.10
1.11	1.11
1.12	1.12
1.13	1.13
1.14	1.14
1.15	1.15
1.16	1.16
1.17	1.17
1.18	1.18
1.19	1.19
1.20	1.20
1.21	1.21
1.22	1.22
1.23	1.23
1.24	1.24
1.25	1.25
1.26	1.26
1.27	1.27
1.28	1.28
1.29	1.29
1.30	1.30
1.31	1.31
1.32	1.32
1.33	1.33
1.34	1.34
1.35	1.35
1.36	1.36
1.37	1.37
1.38	1.38
1.39	1.39
1.40	1.40
1.41	1.41
1.42	1.42
1.43	1.43
1.44	1.44
1.45	1.45
1.46	1.46
1.47	1.47
1.48	1.48
1.49	1.49

Specimen Number

Date of Analysis

Laboratory Name

Area Code and Phone Number

APPENDIX III

OSHA BLOOD LEAD LABORATORIES*: MICHIGAN

Laboratory Name	City	County
Blodgett Toxicology Lab	Grand Rapids	Kent
Comprehensive Health Services Inc	Detroit	Wayne
Detroit Health Department	Detroit	Wayne
DMC University Laboratories	Detroit	Wayne
Hackley Hospital Laboratory	Muskegon	Muskegon
Michigan Department of Community Health	Lansing	Ingham
Mount Clemens General Hospital	Mount Clemens	Macomb
Quest Diagnostics	Auburn Hills	Oakland
Regional Medical Laboratories	Battle Creek	Calhoun
Sparrow Regional Laboratories	Lansing	Ingham
Warde Medical Laboratory	Ann Arbor	Washtenaw

*OSHA approved blood lead laboratories as of June 25, 2002. For a complete listing of OSHA approved blood lead laboratories, visit the OSHA web site at www.osha.gov/SLTC/bloodlead/index.html

APPENDIX IV

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., R325.51971 - 325.51958). That standard was most recently amended in February, 1998. 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), employees 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 3 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.

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 ug/dL, then two consecutive blood tests must have the BLL at or below 50 ug/dL.
- If the employee's BLL was at or above 60 ug/dL or due to an average BLL at or above 50 ug/dL, then two consecutive BLL must be at or below 40 ug/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 ug/dL, then two consecutive blood tests must have the employee's BLL at or below 40 ug/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).

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 ug/dL or when an average of the last three blood lead levels 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 ug/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 ug/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 ug/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), 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.