Wisconsin Childhood Lead Poisoning Prevention Program
Blood Lead Testing and Lead Exposure Data

The burden of childhood lead exposure in Wisconsin changed dramatically in 2012 when the Centers for Disease Control and Prevention (CDC) lowered the intervention blood lead level (BLL) from 10 micrograms per deciliter (mcg/dL) to 5 mcg/dL. **In 2013, 4,865 Wisconsin children were found to have BLLs of 5 mcg/dL or more, which is more than four times the number (1031) of Wisconsin children with BLLs of 10 mcg/dl or more (CDC's definition of lead poisoning from 1991 – 2012).** Without public health intervention, the 4,865 children found with BLL of 5 mcg/dl or more in 2013 will likely cost Wisconsin billions of dollars in reduced intelligence quotient (IQ), lifetime earnings losses and the associated societal costs for health care, education and correctional services.

Blood Lead Testing Data Report

This report presents data from the Wisconsin Childhood Lead Poisoning Prevention Program. Shown here are statewide time trends and numbers of children by local health department jurisdiction. The data show that the new intervention BLL means that many more Wisconsin children are now exposed to levels of lead sufficiently high that CDC recommends comprehensive public health interventions including environmental investigation of the home for lead hazards. Finally, the report includes CDC's 2012 recommendations for confirmatory testing (Table 1), follow-up blood lead testing (Table 2) and interventions (Table 3).

Change in the Intervention Blood Lead Level

In May 2012, CDC[1] lowered the intervention BLL from 10 mcg/dL to 5 mcg/dL and referred to this BLL as a "reference value." While no level of lead in the blood is safe, this reference value was selected to identify those children whose BLLs were in the top 2.5 percent of U.S. children. CDC intends to update this reference value every four years as the population distribution of BLLs change.

CDC's decision to lower the intervention BLL was based on a large body of research that shows that BLLs less than 10 mcg/dL in young children damage the brain and impair the cardiovascular, endocrine and immune systems, causing lifelong health, learning and behavior problems. Lead exposure interferes with the normal development of a child's brain and can contribute to failure in school and juvenile delinquency. Lead exposures have also been associated with negative outcomes later in life such as hypertension, heart and kidney disease, memory loss and Alzheimer's disease, panic attacks and depression, decreased sperm counts and other fertility problems, miscarriage, increased risk of adult criminality, and overall mortality.

One study[2] demonstrated that as blood lead rises from 5 to 10 mcg/dL, children lose approximately 5 IQ points compared to peers whose lead exposure is below 5 mcg/dL. The research has also shown that the initial increase of a BLL from 0 to 10 mcg/dl has a more

[1] Advisory Committee for Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention (2012), *Low level lead exposure harms children: A renewed call for primary prevention.*
[2] Jusko TA, et. al. (2008), Environmental Health Perspectives, *Blood lead concentrations less than 5 mcg/dl and child intelligence at 6 years of age.*

This data report has been reviewed and is approved by the Wisconsin Department of Health Services, Division of Public Health (P-00665; 09/2014).

damaging impact on IQ than subsequent increases in BLLs above 10 mcg/dL. Two studies[3, 4] showed that as the BLL rises from less than 1 mcg/dL to 30 mcg/dL, the increase in IQ points lost is steepest below 10 mcg/dL. The IQ loss continues as the BLL rises from 10 to 30 mcg/dL, but at a slower rate (see Figure 1). This research supports the need for intervention at lower BLLs in order to prevent IQ loss.

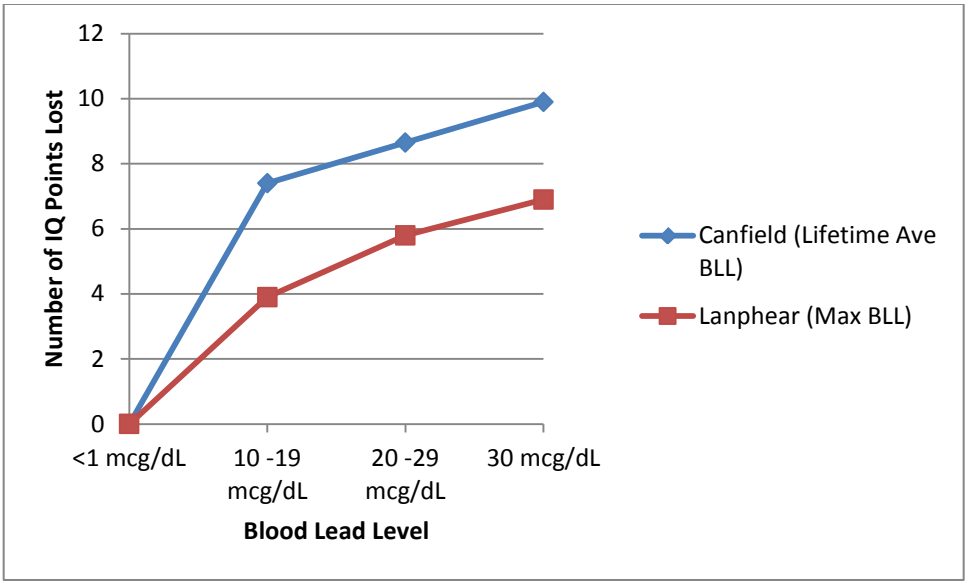

Figure 1. Number of IQ points lost by blood lead level

How Does This Change Affect Wisconsin Children and Families?

This change increased the number of Wisconsin children under age 6 who are at risk for cognitive deficits and other lifelong health problems due to lead exposure by a factor of more than four (see Figure 2). Note that the number of children *tested* for lead peaked in 2010 at approximately 106,000 and decreased to about 94,000 in 2013 (see Figure 3).

In Wisconsin in the last three years alone, laboratories and health care providers reported nearly 17,000 children with BLLs of 5 mcg/dL or more. Of the 17,000 children, approximately 14,000 had BLLs of 5 to 9 mcg/dL (see Table 4 for 2011 - 2013 data). For these children, CDC recommends comprehensive public health interventions (see Table 3). However, local health departments have not received any additional resources to implement CDC's current recommendations.

The challenge for the future is to assure that Wisconsin children who are exposed to lead get the comprehensive public health services they need to reduce their lead exposures.

[3] Lanphear BP, et. al. (2005), Environmental Health Perspectives, *Low-level environmental lead exposure and children's intellectual function: an international pooled analysis.*
[4] Canfield RL, et. al. (2003) New England Journal of Medicine, *Intellectual impairment in children with blood lead concentrations below 10 µgrams per deciliter.*

Figure 2. Statewide time trend (2001 – 2013) of the number of children with BLLs of 10 mcg/dL and the number of children with BLLs of 5 mcg/dL or more from 2011 to 2013.

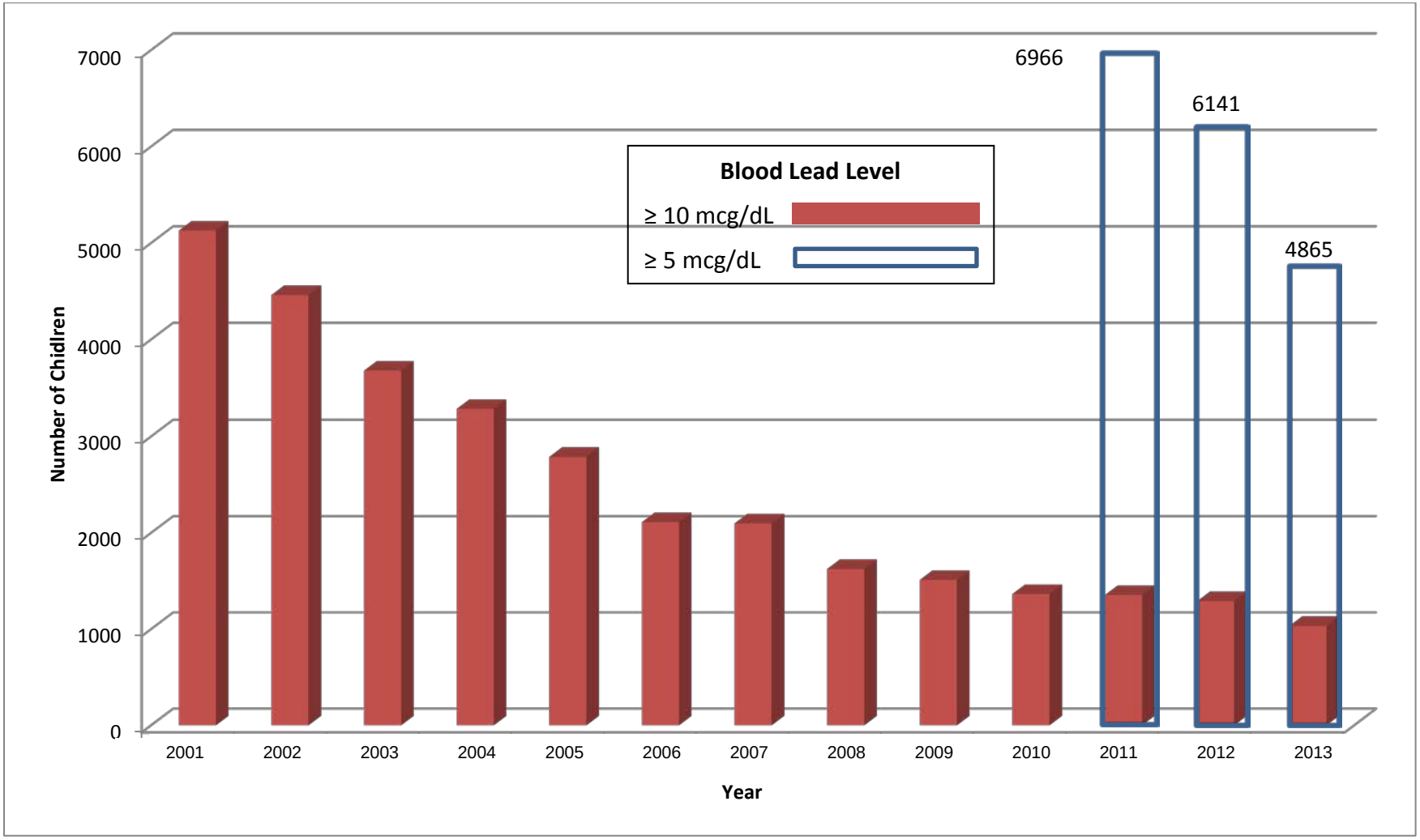

Figure 3. Statewide time trend (2001 – 2013) of the number of children in Wisconsin tested for lead exposure.

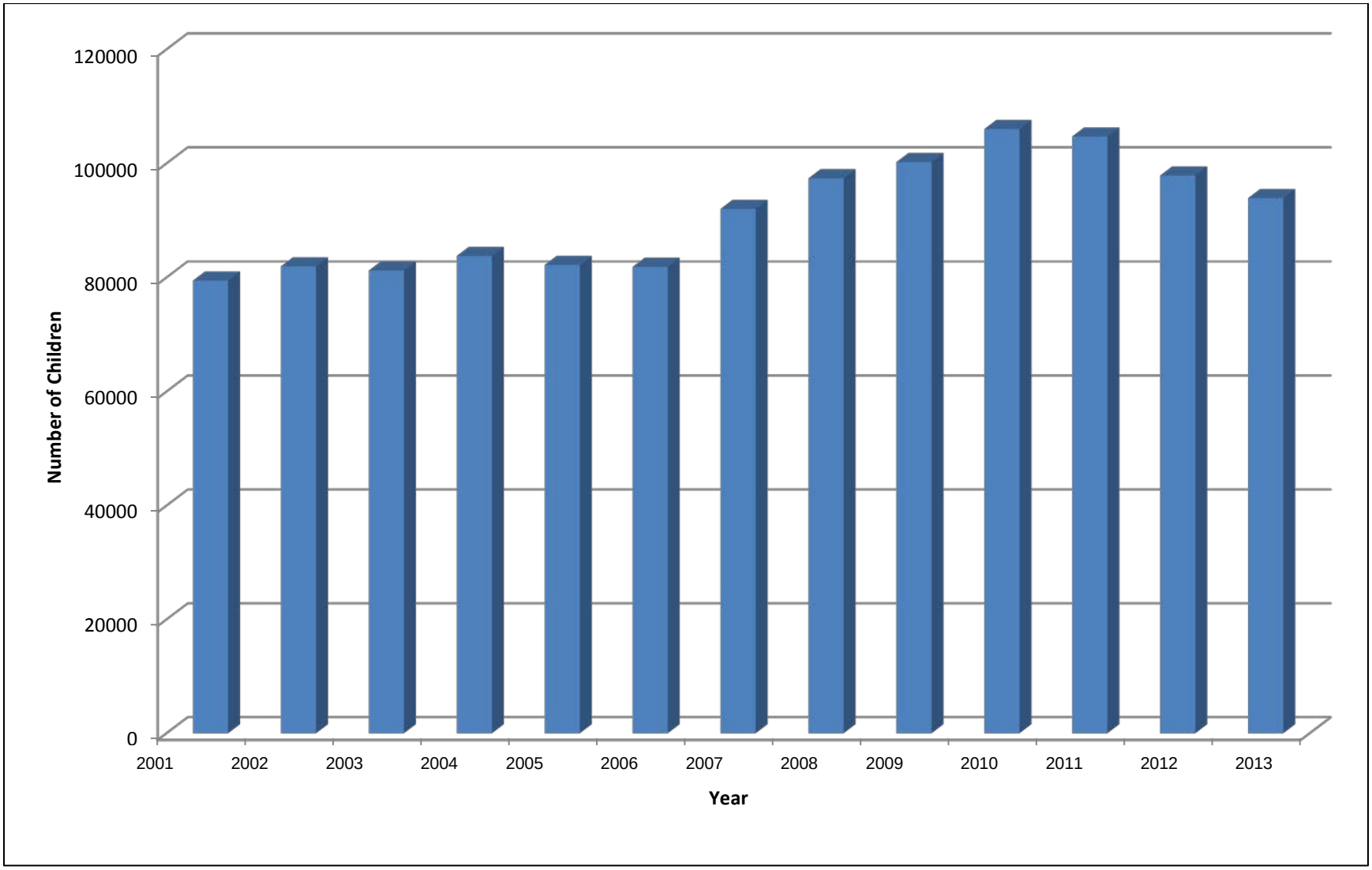

Table 1. Recommended schedule for obtaining a confirmatory venous sample

Blood Lead Level (mcg/dL)	Time to Confirmation Testing
5* - 9	1 – 3 months
10 – 44	1 week – 1 month**
45 – 59	48 hours
60 – 69	24 hours
≥ 70	Urgently as emergency test

*CDC's 2012 reference value

**The higher the BLL on the screening test, the more urgent the need for confirmatory testing. (Adapted from: Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officers. Atlanta: CDC; 1997.)

Table 2. Schedule for follow-up blood lead testing[a]

Venous Blood Lead Level (mcg/dL)	Early Follow-up Testing (2 - 4 tests after identification)	Later Follow-up Testing After Blood Lead Level Declining
5* - 9	3 months **	6 – 9 months
10 – 19	1 – 3 months **	3 – 6 months
20 – 24	1 – 3 months **	1 – 3 months
25 – 44	2 weeks – 1 month	1 month
≥ 45	As soon as possible	As soon as possible

[a]Seasonal variation of BLLs exists and may be more apparent in colder climate areas. Greater exposure in the summer months may necessitate more frequent follow-up tests.

*CDC's 2012 reference value

**Some case managers or clinicians may choose to repeat blood lead tests on all new patients within a month to ensure that their BLL is not rising more quickly than anticipated.

Table 3. CDC recommended actions based on blood lead level.

Venous Blood Lead Level (mcg/dL)	Interventions
< 5*	• Lead education – dietary & environmental • Environmental assessment** for pre-1978 housing • Follow-up BLL monitoring
≥ 5* – 44	Actions for previous level plus: • Environmental investigation and lead hazard reduction • Complete health history and physical exam • Lab work – iron status and consider hemoglobin or hematocrit • Neurodevelopmental monitoring • Abdominal x-ray (if particulate lead ingestion is suspected) with bowel decontamination if indicated
45 – 69	• Actions for previous level plus: • Free erythrocyte protoporphyrin laboratory test • Oral Chelation therapy (consider hospitalization if lead-safe environment cannot be assured)
≥ 70	• Hospitalize and commence chelation therapy (following confirmatory venous blood lead test) in conjunction with consultation from a medical toxicologist or a pediatric environmental health specialty unit • Proceed according to actions for 45-69mcg/dL

*CDC's 2012 reference value

**The scope of an "environmental assessment" will vary based on local resources and site conditions. However, this would include at a minimum a visual assessment of paint and housing conditions, but may also include testing of paint, soil, dust, and water and other lead sources. This may include looking for exposure from imported cosmetics, traditional remedies, medicinal powders, pottery, food, toys, etc., which may be more important with low level exposure.

Table 4. WISCONSIN 2011-2013 BLOOD LEAD TESTING DATA FOR CHILDREN LESS THAN 6 YEARS OF AGE BY LHD

Source: Wisconsin Blood Lead Testing Data (all data current as of April, 2014)

Tested: Number of unduplicated children with a capillary or venous blood lead test. If a child has a venous test within three months after a capillary test, the data from the venous test are included in this report.

Rate: Number of children with an elevated blood lead level (5 mcg/dL or above and 10 mcg/dL or above) divided by the number of children tested.

	2011 Data					2012 Data					2013 Data				
Local Health Department	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above
ADAMS CO	203	5	2.5	0	0	184	11	6	0	0	166	8	4.8	1	0.6
APPLETON CITY	1251	41	3.3	4	0.3	1127	28	2.5	4	0.4	1071	25	2.3	1	0.1
ASHLAND CO	420	20	4.8	3	0.7	357	22	6.2	3	0.8	350	17	4.8	4	1.1
BARRON CO	503	13	2.6	3	0.6	487	8	1.6	0	0	516	11	2.1	3	0.6
BAYFIELD CO	186	7	3.8	0	0	178	10	5.6	1	0.6	190	2	1.1	1	0.5
BROWN CO	4366	94	2.2	17	0.4	4283	107	2.5	11	0.3	4507	100	2.2	8	0.2
BUFFALO CO	199	24	12.1	4	2	189	13	6.9	2	1.1	186	18	9.7	4	2.2
BURNETT CO	233	13	5.6	0	0	232	11	4.7	0	0	181	8	4.4	1	0.6
CALUMET CO	177	7	4	1	0.6	192	5	2.6	2	1	169	5	3	0	0
CENTRAL RACINE CO	1112	27	2.4	6	0.5	673	19	2.8	4	0.6	1070	21	2	3	0.3
CHIPPEWA CO	806	29	3.6	5	0.6	796	11	1.4	2	0.3	741	9	1.2	3	0.4
CLARK CO	435	14	3.2	1	0.2	420	13	3.1	2	0.5	407	14	3.4	2	0.5
COLUMBIA CO	778	33	4.2	8	1	720	30	4.2	7	1	684	25	3.6	4	0.6
CRAWFORD CO	205	10	4.9	0	0	181	8	4.4	0	0	170	4	2.4	0	0
CUDAHY CITY	485	18	3.7	5	1	431	17	3.9	3	0.7	381	20	5.2	4	1
DE PERE CITY	622	5	0.8	0	0	560	5	0.9	0	0	578	2	0.3	0	0
DODGE CO	908	59	6.5	11	1.2	932	45	4.8	7	0.8	859	34	4	7	0.8
DOOR CO	396	15	3.8	1	0.3	431	12	2.8	1	0.2	368	5	1.4	0	0
DOUGLAS CO	803	21	2.6	3	0.4	826	24	2.9	4	0.5	743	11	1.5	1	0.1
DUNN CO	393	13	3.3	3	0.8	432	12	2.8	1	0.2	332	9	2.7	0	0
EAU CLAIRE CITY/CO	1615	40	2.5	5	0.3	1516	28	1.8	4	0.3	1566	25	1.6	3	0.2

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Source: Wisconsin Blood Lead Testing Data (all data current as of April, 2014)

Tested: Number of unduplicated children with a capillary or venous blood lead test. If a child has a venous test within three months after a capillary test, the data from the venous test are included in this report.

Rate: Number of children with an elevated blood lead level (5 mcg/dL or above and 10 mcg/dL or above) divided by the number of children tested.

	2011 Data					2012 Data					2013 Data				
Local Health Department	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above
FLORENCE CO	42	3	7.1	0	0	26	1	3.8	0	0	34	0	0	0	0
FOND DU LAC CO	1385	68	4.9	9	0.6	1217	70	5.8	10	0.8	1208	54	4.5	13	1.1
FOREST CO	120	6	5	0	0	122	2	1.6	1	0.8	133	3	2.3	0	0
FRANKLIN CITY	548	16	2.9	3	0.5	545	13	2.4	0	0	483	6	1.2	3	0.6
GRANT CO	668	49	7.3	13	1.9	591	62	10.5	10	1.7	582	23	4	4	0.7
GREEN CO	489	18	3.7	2	0.4	453	21	4.6	4	0.9	445	28	6.3	2	0.4
GREEN LAKE CO	254	16	6.3	1	0.4	225	18	8	0	0	260	10	3.8	2	0.8
GREENDALE CITY	210	5	2.4	1	0.5	207	8	3.9	0	0	198	3	1.5	0	0
GREENFIELD CITY	856	34	4	2	0.2	797	16	2	0	0	769	15	2	2	0.3
HALES CORNERS CITY	109	0	0	0	0	128	3	2.3	0	0	105	1	1	1	1
IOWA CO	213	12	5.6	3	1.4	195	11	5.6	1	0.5	193	3	1.6	1	0.5
IRON CO	90	5	5.5	0	0	91	2	2.2	1	1.1	71	5	7	0	0
JACKSON CO	283	7	2.5	1	0.4	270	8	3	1	0.4	256	4	1.6	1	0.4
JEFFERSON CO	734	48	6.5	9	1.2	778	50	6.4	8	1	840	23	2.7	5	0.6
JUNEAU CO	496	18	3.6	2	0.4	444	19	4.3	2	0.5	438	12	2.7	3	0.7
KENOSHA CO	2921	145	5	21	0.7	3000	185	6.2	36	1.2	2672	130	4.9	32	1.2
KEWAUNEE CO	255	4	1.6	0	0	233	7	3	0	0	229	3	1.3	0	0
LA CROSSE CO	1763	97	5.5	13	0.7	1452	44	3	8	0.6	1460	28	1.9	4	0.3
LAFAYETTE CO	162	15	9.3	2	1.2	132	11	8.3	2	1.5	167	6	3.6	1	0.6
LANGLADE CO	257	11	4.3	1	0.4	246	7	2.8	0	0	234	5	2.1	1	0.4
LINCOLN CO	445	18	4	2	0.4	424	15	3.5	3	0.7	361	7	1.9	1	0.3

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	2011 Data					2012 Data					2013 Data				
Local Health Department	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above	Tested	Tested 5 mcg/dL or above	Rate of 5mcg/dL or above	Tested 10 mcg/dL or above	Rate 10 mcg/dL or above
MADISON/DANE CO	5382	130	2.4	17	0.3	4634	96	2.1	12	0.3	4945	62	1.3	9	0.2
MANITOWOC CO	1082	71	6.6	14	1.3	1062	68	6.4	14	1.3	1129	43	3.8	11	1
MARATHON CO	1773	51	2.9	9	0.5	1657	47	2.8	11	0.7	1512	45	3	9	0.6
MARINETTE CO	603	21	3.5	1	0.2	547	16	2.9	2	0.4	588	19	3.2	1	0.2
MARQUETTE CO	219	10	4.6	3	1.4	191	12	6.3	1	0.5	201	10	5	1	0.5
MENASHA CITY	336	10	3	0	0	278	12	4.3	0	0	280	6	2.1	0	0
MILWAUKEE CITY	31650	3888	12.3	876	2.8	29642	3450	11.6	862	2.9	27657	2838	10.3	706	2.6
MONROE CO	937	59	6.3	4	0.4	850	43	5.1	3	0.4	801	37	4.6	5	0.6
NORTH SHORE CITY	1139	39	3.4	5	0.4	1157	29	2.5	3	0.3	927	22	2.4	3	0.3
OAK CREEK CITY	686	25	3.6	5	0.7	630	10	1.6	1	0.2	604	11	1.8	2	0.3
OCONTO CO	372	6	1.6	1	0.3	393	7	1.8	2	0.5	499	11	2.2	2	0.4
ONEIDA CO	433	8	1.9	1	0.2	390	6	1.5	0	0	333	1	0.3	0	0
OUTAGAMIE CO	805	21	2.6	4	0.5	682	27	4	4	0.6	673	15	2.2	2	0.3
OZAUKEE CO	763	22	2.9	3	0.4	883	8	0.9	1	0.1	815	20	2.5	3	0.4
PEPIN CO	104	7	6.7	0	0	103	2	1.9	1	1	101	3	3	0	0
PIERCE CO	466	17	3.6	0	0	484	9	1.9	2	0.4	445	6	1.3	0	0
POLK CO	580	12	2.1	2	0.3	457	13	2.9	0	0	489	11	2.2	2	0.4
PORTAGE CO	1311	36	2.7	4	0.3	1067	23	2.2	5	0.5	901	9	1	1	0.1
PRICE CO	201	22	10.9	1	0.5	167	6	3.6	1	0.6	147	1	0.7	0	0
RACINE CITY	3172	306	9.6	50	1.6	2786	290	10.4	44	1.6	3041	262	8.6	25	0.8
RICHLAND CO	217	27	12.4	3	1.4	199	14	7	1	0.5	192	5	2.6	1	0.5

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ROCK CO	2482	200	8.1	38	1.5	2347	190	8.1	34	1.4	2290	137	6	26	1.1
RUSK CO	207	16	7.7	1	0.5	185	10	5.4	0	0	148	2	1.4	1	0.7
SAUK CO	946	27	2.9	9	1	861	34	3.9	2	0.2	777	14	1.8	1	0.1
SAWYER CO	296	9	3	0	0	228	1	0.4	0	0	222	0	0	0	0
SHAWANO-MENOMINEE CO	762	38	5	4	0.5	720	18	2.5	3	0.4	635	19	3	2	0.3
SHEBOYGAN CO	1529	114	7.5	24	1.6	1424	133	9.3	36	2.5	1281	102	8	23	1.8
SO MILWAUKEE CITY	476	22	4.6	5	1.1	422	18	4.3	3	0.7	354	7	2	1	0.3
ST CROIX CO	851	11	1.3	1	0.1	775	9	1.2	1	0.1	593	2	0.3	0	0
ST FRANCIS CITY	149	9	6	2	1.3	139	3	2.2	0	0	147	2	1.4	0	0
TAYLOR CO	207	8	3.9	2	1	196	10	5.1	0	0	158	2	1.3	0	0
TREMPEALEAU CO	500	22	4.4	5	1	406	15	3.7	2	0.5	463	14	3	2	0.4
VERNON CO	546	34	6.3	9	1.6	471	27	5.7	3	0.6	423	24	5.7	2	0.5
VILAS CO	363	3	0.8	0	0	345	7	2	2	0.6	300	5	1.7	2	0.7
WALWORTH CO	1455	81	5.6	16	1.1	1231	40	3.2	6	0.5	1244	33	2.7	2	0.2
WASHBURN CO	281	6	2.1	1	0.4	267	7	2.6	2	0.7	147	0	0	0	0
WASHINGTON CO	1142	14	1.2	2	0.2	1012	28	2.8	10	1	994	18	1.8	2	0.2
WATERTOWN CITY	442	35	7.9	5	1.1	585	44	7.5	12	2.1	599	34	5.7	7	1.2
WAUKESHA CO	4911	118	2.4	18	0.4	4746	116	2.4	17	0.4	4627	101	2.2	11	0.2
WAUPACA CO	553	33	6	4	0.7	529	27	5.1	3	0.6	424	18	4.3	4	0.9
WAUSHARA CO	303	14	4.6	0	0	296	13	4.4	1	0.3	303	3	1	2	0.7
WAUWATOSA CITY	945	28	3	5	0.5	908	21	2.3	4	0.4	878	16	1.8	3	0.3

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WEST ALLIS CITY	1715	94	5.5	19	1.1	1646	71	4.3	15	0.9	1521	67	4.4	14	0.9
WESTERN RACINE CO	471	20	4.2	0	0	407	11	2.7	2	0.5	315	5	1.6	1	0.3
WINNEBAGO CO	1343	73	5.4	12	0.9	1486	67	4.5	14	0.9	1293	47	3.6	13	1
WOOD CO	1292	46	3.6	5	0.4	1253	21	1.7	4	0.3	1106	14	1.3	3	0.3
STATEWIDE	**104798**	**6966**	**6.6**	**1355**	**1.3**	**97868**	**6141**	**6.3**	**1291**	**1.3**	**93898**	**4865**	**5.2**	**1031**	**1.1**