

ADULT BLOOD LEAD EPIDEMIOLOGY AND SURVEILLANCE (ABLES) REPORT

Washington State, 2019-2023

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This report describes the prevalence of adult blood-lead levels (BLLs), industries those with elevated results work, and industries where lead exposure samples were collected. An overview of the duties of health care providers, laboratories, and employers is included.

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Definitions

ABLES	Adult Blood Lead Epidemiology and Surveillance
BLL	blood-lead level
BLT	blood-lead test
DOH	Washington State Department of Health
DOSH	Washington State Division of Occupational Safety and Health
L&I	Washington State Department of Labor and Industries
NAICS	North American Industrial Classification System
NHANES	National Health and Nutrition Examination Survey
PEL	permissible exposure limit
TWA	time-weighted average
µg/dl	micrograms (of lead) per deciliter (of blood)
µg/m ³	micrograms (of lead) per cubic meter (of air)
WA	Washington State
WAC	Washington Administrative Code

About the ABLES Program

The Adult Blood Lead Epidemiology and Surveillance (ABLES) program within the Department of Labor & Industries (L&I) is a designated public health authority that receives all adult blood-lead level (BLL) test results from the Washington State Department of Health (DOH).

ABLES program activities:

- Identify adults (persons greater than or equal to 16 years old) with elevated blood-lead levels.
- Mail lead exposure prevention resources and conducts confidential telephone consultation with adults to prevent lead exposure and health effects.
- Consult with employers about how to prevent lead exposure and health effects among workers.

ABLES Blood-Lead Test Results

Hundreds of adults in Washington State (WA) experience elevated BLLs each year. Lead in blood can cause anemia, nervous system and kidney problems, hypertension, decreased fertility, and increased miscarriages. The U.S. Centers for Disease Control and Prevention definition of elevated blood-lead level in an adult as being greater than or equal to 5 micrograms per deciliter ($\geq 5 \mu\text{g}/\text{dl}$) of whole blood.

The majority of all and elevated BLL reports received for adults were for males. Among elevated reports received, the average BLL for males was 12.0 $\mu\text{g}/\text{dl}$ while the average BLL for females 9.2 $\mu\text{g}/\text{dl}$. Table 1 includes distributions of test results by gender, ethnicity, state of residence, and age.

Table 1. Characteristics of Patients for All and Elevated Blood-Lead Test Results

Characteristic	% of all results	% of elevated results
Sex		
Male	61%	82%
Female	37%	14%
Unreported	2%	4%
Ethnicity		
Hispanic	2%	2%
Non-Hispanic	23%	18%
Unreported	75%	80%
State Residence		
WA	99.5%	99%
Other	0.5%	1%
Age		
≤ 24	11%	10%
25 to 34	21%	21%
35 to 44	18%	18%
45 to 54	14%	16%
55 to 64	16%	16%
65 to 74	15%	14%
≥ 75	5%	5%

According to the National Health and Nutrition Examination Survey (NHANES), the median BLL was 0.85 µg/dl for U.S. adults age 20 years and older in 2017-2018. Table 2 includes results for all adult BLL tests (47,334) conducted in WA between 2019 and 2023. All results ≥80 µg/dl (12) were from the same patient; their source of lead exposure was not identified. Ninety-two percent of test results (43,525) were below the definition of elevated. Among the 8% of results considered elevated, nearly half (1,866, 49%) were between five and nine µg/dl. Despite the majority of results being less than elevated, health professionals agree that there is no safe level of lead in blood.

Table 2. Number of Adult Blood-Lead Test Results, WA State 2019-2023

Blood Lead Level, µg/dl	2019	2020	2021	2022	2023	Total
<5	2695	8223	9065	10879	12663	43525
5 to 9	164	393	427	404	478	1866
10 to 14	203	171	213	156	198	941
15-19	104	74	117	75	100	470
20-24	64	37	59	29	56	245
25-29	20	25	48	13	24	130
30-34	9	7	24	11	8	59
35-39	7	4	12	9	9	41
40-44	3	3	5	2		13
45-49	4	1	2	1	1	9
50-54			3		2	5
55-59	2		1		2	5
60-64	2		1		1	4
65-69	3				1	4
70-74			1	1		2
75-79	1		1		1	3
80-84	1	1	1			3
85-89						0
90-94		2				2
100-104				1		1
105-109		1		1		2
110+	4					4
Total	3286	8942	9980	11582	13544	47334

Industries in which Workers were Exposure to Lead

The majority of adults with elevated BLLs are exposed to lead at their workplace. Workers can bring lead home and expose their families. Children exposed to lead may experience neurologic damage, including learning disabilities and short attention spans. Table 3 includes industries from which three or more elevated results were received as reported by workers on BLT forms.

Table 3. Industries with ≥ 3 Elevated Blood-Lead Test Results, WA State 2019-2023

Industry ¹	Blood-Lead Test	
	Results $\geq 5\mu\text{g/dl}$ (n)	Employers (n)
Storage Battery Manufacturing, NAICS 335911	111	2
Painting and Wall Covering Contractors, NAICS 238320	83	14
Aluminum Die-Casting Foundries, NAICS 331521	69	3
Ship Building and Repairing, NAICS 336611	43	3
All Other Amusement and Recreation Industries (shooting ranges), NAICS 713990	35	6
Prefabricated Metal Building and Component Manufacturing, NAICS 332311	26	2
Iron And Steel Mills And Ferroalloy Manufacturing, NAICS 331110	23	2
Finish Carpentry Contractors, NAICS 238350	20	1
Highway, Street, and Bridge Construction, NAICS 237310	18	3
Rail Transportation, NAICS 482100	10	1
Electric Power Distribution, NAICS 221122	8	3
Recyclable Material Merchant Wholesalers, NAICS 423930	8	2
Police Protection, NAICS 922120	7	2
Rolled Steel Shape Manufacturing, NAICS 331221	6	1
Mining (except Oil and Gas), NAICS 212000	5	2
Waste Management and Remediation Services, NAICS 562000	4	2
Glass and Glass Product Manufacturing, NAICS 327210	3	2
All Other Automotive Repair and Maintenance, NAICS 811198	3	1
Total	482	52

1. Industry descriptions and codes from North American Industrial Classification System (NAICS), v.2007.

L&I's Division of Occupational Health and Safety (DOSH) inspects workplaces for hazardous conditions including airborne exposure to lead. DOSH collected a total of 88 personal exposure samples for lead between 2019 and 2023. Six samples exceeded the permissible exposure limit (PEL) of 50 µg/m³ and four samples were between the action level of 30 µg/m³ and the PEL. The total number of inspections from 2019 through 2023 with at least one worker lead exposure sample was 67. Table 4 includes industries in which DOSH collected ≥3 worker exposure samples.

Table 4. Industries with ≥3 Worker Personal Lead Exposure Samples Collected, WA State 2019-2023

Industry ¹	Samples (n)	Inspections (n)
All Other Amusement and Recreation Industries (shooting ranges), NAICS 713990	8	2
Ornamental and Architectural Metal Work Manufacturing, NAICS 332323	8	2
Aluminum Die-Casting Foundries, NAICS 331521	8	2
Aircraft Manufacturing, NAICS 336411	6	2
Storage Battery Manufacturing, NAICS 335911	6	1
All Other Miscellaneous Electrical Equipment and Component Manufacturing, NAICS 335999	4	1
Nonferrous (except aluminum) die-casting foundries, NAICS 331522	4	1
Secondary Smelting and Alloying of Aluminum, NAICS 331314	4	1
Electronic Shopping and Mail-Order Houses, NAICS 454110	4	1
Machine Shops, NAICS 332710	3	1
Executive and Legislative Offices, Combined, NAICS 921140	3	1
Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing, NAICS 333112	3	1
Total	61	16

1. Industry descriptions and codes from North American Industrial Classification System (NAICS), v.2007.

Duties of Health Care Providers, Health Care Facilities, and Laboratories

All blood-lead test results are required to be reported to Washington state public health laboratories according to the [notifiable conditions rule, WAC 246-101](#). Health care providers and health care facilities and laboratories have responsibilities to report test results and information as described in Table 5.

Table 5. Duties Health care Providers, Health Care Facilities, and Laboratory Directors

<p>Health care providers and health care facilities shall:</p> <p>Provide the laboratory with the following information for each test ordered for a notifiable condition:</p> <ul style="list-style-type: none">• Patient's first and last name;• Patient's physical address including zip code;• Patient's date of birth;• Patient's sex;• Patient's ethnicity;• Patient's race;• Patient's preferred language;• Patient's best contact telephone number;• Requesting health care provider's name;• Requesting health care provider's phone number;• Address where patient received care;• Specimen type;• Specimen collection date; <p>Cooperate with public health authorities during investigation of:</p> <ul style="list-style-type: none">• A case of a notifiable condition; and• An outbreak or suspected outbreak.
<p>In addition to the information above, laboratory directors shall:</p> <p>Provide the following information with each specimen submitted to the Washington state public health laboratories</p> <ul style="list-style-type: none">• Name of submitting laboratory;• Telephone number of submitting laboratory;• Date laboratory received specimen;• Test method used; and• Test result.

ABLES uses Blood-Lead Test (BLT) Forms (see Appendix A) to collect information about patients including employer name and industry and hobbies or other activities that caused their lead exposures. Historically, workers in battery and metals manufacturing, construction painting and coatings, shipbuilding and repair, and indoor shooting ranges have been exposed to lead that caused elevated BLLs. Health care providers and health care facilities are the exclusive source of this information and are required to cooperate with ABLES during lead exposure investigations. Therefore, BLT forms should be completed for each blood-lead test patient and submitted to ABLE by:

Fax (preferred)

360-902-5672

Or mail:

**Adult Blood Lead Epidemiology and Surveillance (ABLES)
PO Box 44330
Olympia WA 98504-4330**

Duties of Employers

Employers play a major role in preventing lead exposures and protecting workers. Approximately 80% of adults with elevated BLLs are exposed to lead at their workplace or in the course of their work. The federal and Washington State Lead Standard requires employers to conduct exposure monitoring and medical surveillance to protect workers.

See full details and requirements specific to industry sectors:

- agriculture, forestry, fishing, and hunting at [WAC 296-307-624](#)
- construction at [WAC 296-155-176](#)
- general industry sectors at [WAC 296-62-07521](#)

Exposure monitoring

Employers must collect full shift (for at least seven continuous hours) personal exposure samples including at least one sample for each shift for each job classification in each work area. Employee exposure is that exposure which would occur if the employee were not using a respirator. Full shift personal samples must be representative of the monitored employee's regular, daily exposure to lead. Table 6 provides an overview of current permissible exposure limit (PEL) and action level for lead.

Table 6. Permissible Exposure Limit (PEL) and Action Level

Limit/Level	Airborne concentration, $\mu\text{g}/\text{m}^3$	Time weighted average (TWA)	Employer responsibility
Permissible exposure limit (PEL)	50	8 hours	Employer must ensure that no employee is exposed to lead at concentrations greater than the PEL.
Action level	30	8 hours	Employers must determine if any employee may be exposed to lead at or above the action level.

Medical surveillance and removal from exposure

The only safe method to reduce workers' BLLs is to remove them from the source of exposure. Employer's obligation to offer medical surveillance is triggered by the results of the air exposure monitoring. Medical surveillance must be made available to all employees who are exposed in excess of the action level for more than thirty days a year in general industry or on any day at or above the action level in the construction industry. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.

Employers must provide employees up to eighteen months of medical removal protection benefits on each occasion they are removed from exposure to lead. Medical removal protection benefits means that the employer must maintain the earnings, seniority and other employment rights and benefits of an employee as though the employee had not been removed. Table 7 provides an overview of current BLLs and testing that trigger removal and return to work.

Table 7. Work Exposure Removal and Return Blood-Lead Levels

BLL result, $\mu\text{g}/\text{dl}$	Number of tests	Action
≥ 50 , general industry	Average of the last three tests	Remove employee from work exposure
≥ 60 , general industry	A periodic and a follow-up test	
≥ 50 , construction industry	A periodic and a follow-up test	
< 40	Two consecutive tests	Return to work

PARA SER COMPLETADO POR EL PACIENTE
INFORME DE EXAMEN DE PLOMO EN LA SANGRE

El programa de Vigilancia y Epidemiología del Plomo en la Sangre de Adultos del Estado de Washington se mantiene para prevenir la exposición al plomo y sus efectos sobre la salud entre los adultos.

*** **Toda la información en el registro es estrictamente confidencial** ***

Al paciente: Por favor complete este formulario y devuélvalo a su doctor. Si usted tiene dificultad para leer o escribir, pídale ayuda a alguien. La información que usted proporcione nos ayudará a prevenir el envenenamiento por plomo en lugares de trabajo del estado de Washington. **No entregaremos esta información a nadie sin su permiso.**

SU NOMBRE			TELÉFONO DE LA CASA		
Primer	Inicial del 2do. nombre	Apellido	()	-	
DOMICILIO					
Calle	Ciudad	Estado	Código postal	Condado	
FECHA DE NACIMIENTO (MES/DÍA/AÑO) / /		GÉNERO <input type="checkbox"/> Masculino <input type="checkbox"/> Femenino		¿Le gustaría que enviáramos información a su empleador sobre cómo disminuir la exposición al plomo en el lugar de trabajo? (No daremos su nombre a su empleador) <input type="checkbox"/> Sí <input type="checkbox"/> No	
¿CUÁL ES SU OCUPACIÓN?		¿EN QUÉ TIPO DE NEGOCIO O INDUSTRIA TRABAJA?		POR FAVOR MARQUE LA ACTIVIDAD/PASATIEMPO EN QUE HA PARTICIPADO LOS ÚLTIMOS SEIS MESES	
<input type="checkbox"/> Reparador de radiadores <input type="checkbox"/> Trabajador de limpieza con chorro de arena <input type="checkbox"/> Soldador <input type="checkbox"/> Pintor <input type="checkbox"/> Vidrio <input type="checkbox"/> Vidriero <input type="checkbox"/> Pulidor		<input type="checkbox"/> Reparación de autos y servicios <input type="checkbox"/> Construcción general/pesada <input type="checkbox"/> Fabricación de baterías <input type="checkbox"/> Fabricación de productos de vidrio <input type="checkbox"/> Fabricación de químicos <input type="checkbox"/> Otro (indique abajo)		<input type="checkbox"/> Campo de tiro/fabricación de balas <input type="checkbox"/> Fabricación de pesas para pesca <input type="checkbox"/> Remodelación de casas <input type="checkbox"/> Cerámica <input type="checkbox"/> Vitrales	
NOMBRE DE LA COMPAÑÍA / TELÉFONO			UBICACIÓN DE LA COMPAÑÍA (Ciudad)		
Nombre			Teléfono () -		
POR FAVOR DESCRIBA LAS TAREAS PRINCIPALES QUE HACE EN SU TRABAJO					
1. ¿Es usted un supervisor?	Sí <input type="checkbox"/>	No <input type="checkbox"/>	¿Es usted de origen hispano?	<input type="checkbox"/> Sí <input type="checkbox"/> No	
2. ¿Le pidió su empleador que se hiciera este examen de sangre?	Sí <input type="checkbox"/>	No <input type="checkbox"/>	¿Cuál es su raza?	<input type="checkbox"/> Indígena americano o nativo de Alaska <input type="checkbox"/> Asiático <input type="checkbox"/> Negro <input type="checkbox"/> Blanco <input type="checkbox"/> Nativo de Hawai u otra isla del Pacífico <input type="checkbox"/> Otro	
3. ¿Hay niños menores de 6 años viviendo en su casa?	Sí <input type="checkbox"/>	No <input type="checkbox"/>			
4. ¿Está alguien en su casa embarazada o lactando?	Sí <input type="checkbox"/>	No <input type="checkbox"/>			

Gracias por su ayuda. Si tiene preguntas o comentarios o si desea recibir más información sobre la exposición ocupacional al plomo, por favor llame a nuestro número de teléfono gratuito al (888) 667-4277.

Envíe este formulario por fax a: **360-902-5672**

o enviar por correo a: **Adult Blood Lead Epidemiology and Surveillance (ABLES)**
P O Box 44330
Olympia WA 98504-4330

PARA SER COMPLETADO POR EL PROVEEDOR DE CUIDADO DE LA SALUD

*** **Toda la información en el registro es estrictamente confidencial** ***

Al proveedor de la salud: Por favor complete la parte siguiente y pídala a su paciente que complete la parte de arriba. Enviar este formulario prontamente contribuirá con nuestros esfuerzos para prevenir la sobreexposición ocupacional. También evitará llamadas telefónicas de seguimiento en un futuro, evitando interrupciones para usted y su personal.

FECHA (MES/DÍA/AÑO) / /		NOMBRE DEL MÉDICO		TELÉFONO	
		Primer	Apellido	()	-
CLÍNICA/OFICINA DEL DOCTOR					
DIRECCIÓN					
Calle	Ciudad	Estado	Código postal		