Oregon Environmental Public Health Tracking (EPHT)

Childhood Lead Poisoning (2001-2004 Birth Years) Nationally Consistent Data and Measures

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Introduction to EPHT

Environmental Public Health Tracking (EPHT) is the ongoing collection, integration, analysis, interpretation and dissemination of data from environmental hazard monitoring, human exposure and health effects surveillance.

The Centers for Disease Control and Prevention (CDC) funded the National Environmental Public Health Tracking (EPHT) Program with the following goals:

- Build a sustainable national environmental public health tracking network.
- Enhance environmental public health tracking work force and infrastructure.
- Disseminate information to guide policy and improve public health.
- Foster collaboration among health and environmental programs.

EPHT is a Web-based network of standardized electronic health and environmental data. Oregon is one of 17 grantees funded by the CDC in 2006 to participate in a collaborative development process and implement state/city networks that are components of the national network.

EPHT nationally consistent data and measures (NCMDs)

As part of the implementation process, content work groups (CWG) were established to identify and recommend core measures to include in the network, examine availability of existing data, identify approaches to obtaining needed data, and develop standards and guidelines to facilitate nationally consistent data collection.

The network content is conceptually divided into hazard, exposure and health outcome areas. The CWG structure included a steering group made up of the principal investigators for grantee health departments and academic partners. The steering group was, in turn, advised by content-specific teams.

Teams included content experts from the following: grantee states, cities and academic partners; CDC; other government agencies including the U.S. Environmental Protection Agency, the U.S. Geological Survey and the National Institutes of Health; and non-governmental organizations including the American Association of Poison Control Centers, the National Birth Defects Prevention Network, the National Association of Health Data Organizations, the National Association for Public Health Statistics and Information Systems and the North American Association of Central Cancer Registries.

Each content team provided recommendations for indicators and measures as well as for the data sets and methods to create the recommended measures. Content groups focused on developing measures specific to one area; however, in doing so, they considered potential linkages to other areas.

Rationale for tracking childhood blood lead testing

The adverse health effects of childhood lead poisoning are well documented and can range from death and seizures at very high blood lead levels (BLLs) to cognitive impairment at very low BLLs. There is no safe blood lead level for young children. The sources of lead poisoning are also well established.

The most common high-dose source of lead exposure for young children is lead from residential paint in homes built before 1950. Residential lead paint was banned in 1978, but paint companies began reducing the amount of lead added to residential paint before the ban. Because residential properties in deteriorating condition that contain lead paint are the most common source, they are the focus of primary prevention strategies to protect young children.

Children with elevated BLLs do not have any specific symptoms. The CDC, therefore, recommends a blood lead test for young children who are at risk for lead poisoning. While some states have universal testing policies, many have adopted targeted testing strategies aimed at identifying and testing at-risk children. In Oregon, testing is recommended for children who are more likely to be exposed to lead or that show symptoms of potential lead poisoning, such as developmental abnormalities.

State and local childhood lead poisoning prevention programs screen infants and children for elevated BLLs and educate the public and health care providers about lead poisoning. Programs use data to identify important risk factors and understand patterns of the identified risk factors within their jurisdictions. This information is disseminated to parents and health care providers via targeted education campaigns as well as through public health Web sites.

Childhood blood lead testing tracking goals

- Identify communities where children are at high risk for lead poisoning in order to guide and evaluate testing within those communities.
- Understand spatial and temporal patterns of risk for lead poisoning at national, state and local levels.
- Evaluate testing of high-risk children.

Overview: Childhood blood lead indicator and measures

Indicator: Blood lead testing coverage, housing age and poverty.

Measures: The birth year cohort is used to calculate the percentage of children with at least one blood lead test prior to age 36 months, by state, county and zip code. The 2000 census is used to calculate the percentage of children under 5 years old living in poverty and the percentage of pre-1950 housing units by state, county and ZIP code.

Time period: Calculation of these measures began with the 2001 birth cohort and is repeated for each succeeding birth cohort once those children reach 3 years of age. The time scale is annual with a three-year lag.

Data sources:

Oregon Lead Poisoning Prevention Program, Oregon Department of Human Services, 800 N.E. Oregon Street, Suite 640, Portland, OR 97232;

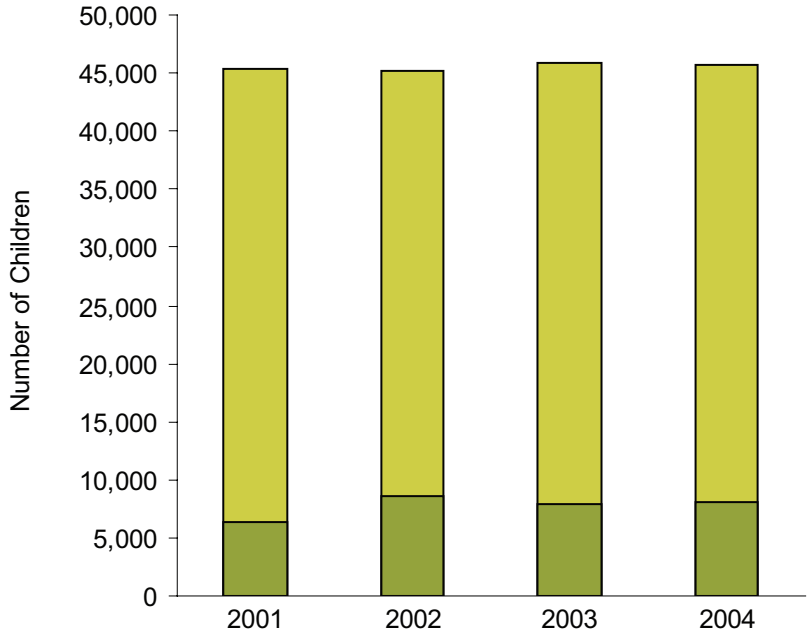
Center for Health Statistics (Vital Records), Oregon Department of Human Services, 800 N.E. Oregon Street, Suite 205, Portland, OR 97232;

U.S. Census Bureau, American FactFinder: *http://factfinder.census.gov/home/saff/main.html?_lang=en.*

Childhood blood lead measures and risk factors

A. Percentage and count of children tested for lead poisoning prior to 36 months of age (by birth year cohort) by state, county and zip code

In Oregon, approximately 17 percent of children born between 2001 and 2004 received a blood lead level test before the age of 3. This number is slightly higher than the national average of 13 percent (in 2004). Graph 1 shows that the percentage of tested children varied between 14.2 percent and 18.9 percent, but there was no systematic increase or decrease in testing over the four birth year cohorts.



	2001	2002	2003	2004
Total births	45,317	45,190	45,935	45,660
Tested before age 3	6,440	8,545	7,857	8,046
Percent tested	14.2%	18.9%	17.1%	17.6%

Graph 1. Percentage and count of children tested for blood lead before age 3, in Oregon, by birth year cohort

The proportion of tested children varied widely among counties, as shown in Table 1. For example, Multnomah County appears to test the highest proportion of children with more than 30 percent for the 2004 birth year cohort, while the proportion of tested children is below 1 percent in several other counties.

Note that the address, including county, for 37 percent of tested children was not reported. A low count and percentage of tested children in a given county might, therefore, be due to truly infrequent testing or to the omission of address information in the reports from these counties. As it is unknown how frequently address information is reported in the different counties, the data in Table 1 cannot be considered conclusive.

Table 1. Percentage and count of children tested before age 3, by county and birth year cohort

Birth year	2001		2002		2003		2004	
	%	*(count)*	%	*(count)*	%	*(count)*	%	*(count)*
Baker	0.6	*(1)*	0.6	*(1)*	0.7	(1)	2.6	(4)
Benton	1.8	*(15)*	2.2	*(17)*	1.3	(10)	1.5	(11)
Clackamas	6.4	*(262)*	9.9	*(401)*	8.8	(354)	9.4	(384)
Clatsop	1.3	*(5)*	2.3	*(10)*	7.6	(28)	4.3	(17)
Columbia	9.0	*(47)*	10.1	*(52)*	5.6	(30)	11.3	(54)
Coos	1.0	*(6)*	1.3	*(8)*	2.1	(13)	4.7	(30)
Crook	2.5	*(6)*	2.8	*(6)*	1.7	(4)	4.0	(10)
Curry	0.0	*(0)*	1.3	*(2)*	1.3	(2)	5.8	(9)
Deschutes	0.7	*(10)*	1.1	*(17)*	1.1	(18)	0.7	(12)
Douglas	1.8	*(20)*	3.8	*(39)*	4.7	(52)	3.5	(39)
Gilliam	0.0	*(0)*	0.0	*(0)*	4.8	(1)	0.0	(0)
Grant	0.0	*(0)*	0.0	*(0)*	0.0	(0)	2.9	(2)
Harney	4.8	*(4)*	5.2	*(4)*	1.5	(1)	5.3	(4)
Hood River	14.7	*(44)*	11.7	*(38)*	7.9	(23)	4.8	(15)
Jackson	3.5	*(75)*	5.7	*(121)*	5.5	(118)	3.5	(75)
Jefferson	4.3	*(13)*	6.5	*(20)*	3.5	(11)	3.5	(11)
Josephine	2.8	*(21)*	4.3	*(32)*	6.4	(51)	6.3	(50)
Klamath	4.2	*(35)*	5.4	*(41)*	5.4	(45)	6.5	(48)
Lake	1.4	*(1)*	0.0	*(0)*	1.4	(1)	5.3	(3)
Lane	4.6	*(164)*	6.8	*(237)*	5.7	(213)	12.0	(419)
Lincoln	0.5	*(2)*	0.9	*(4)*	2.8	(12)	0.9	(4)
Linn	0.7	*(10)*	1.0	*(14)*	1.1	(15)	1.1	(15)
Malheur	18.0	*(85)*	21.2	*(102)*	10.1	(46)	10.0	(46)
Marion	7.7	*(353)*	10.4	*(460)*	10.3	(477)	13.7	(638)
Morrow	7.2	*(13)*	9.7	*(15)*	12.4	(23)	10.1	(18)
Multnomah	21.2	*(1958)*	25.9	*(2420)*	28.6	(2670)	31.3	(2909)
Polk	6.8	*(51)*	9.7	*(75)*	8.8	(68)	10.3	(85)
Sherman	0.0	*(0)*	26.7	*(4)*	13.6	(3)	20.0	(3)
Tillamook	8.9	*(21)*	19.4	*(47)*	15.7	(40)	4.7	(13)
Umatilla	8.8	*(93)*	12.9	*(138)*	17.5	(196)	15.0	(161)
Union	1.0	*(3)*	0.7	*(2)*	0.9	(3)	0.4	(1)
Wallowa	0.0	*(0)*	1.8	*(1)*	0.0	(0)	0.0	(0)
Wasco	15.9	*(46)*	20.0	*(58)*	23.7	(62)	22.3	(59)
Washington	4.7	*(354)*	5.2	*(391)*	5.3	(407)	5.7	(436)
Wheeler	0.0	*(0)*	0.0	*(0)*	0.0	(0)	12.5	(1)
Yamhill	4.1	*(48)*	4.8	*(57)*	7.0	(82)	8.7	(100)

B. Relationship between childhood blood lead testing and risk factors of pre-1950 housing and children under age 5 living in poverty (as measured in the 2000 census) by state, county, ZIP code and census tract

Research has shown that lead poisoning and elevated blood lead levels are more frequent in children who grow up in poverty or live in houses built before 1950. Table 2 presents, by state and county, the proportion of children under 5 years of age who live in poverty and the percentage of housing units that were built before 1950. There is significant variation in the distribution of these risk factors across the state.

In order to test whether the distribution of child poverty is related to the distribution of pre-1950 housing, we broke the data into census tracts, which are smaller geographical units embedded within counties. An analysis at this level of resolution revealed a reliable but weak association between the two risk factors outside the five most populous counties (Multnomah, Washington, Clackamas, Lane and Marion). In more rural areas of the state, poverty in children under 5 years of age was slightly more frequent in census tracts with a higher percentage of older housing (r=0.32).

From a public health perspective, blood lead testing should target children at a high risk of lead poisoning. One would expect to find higher rates of blood lead testing in areas with a higher prevalence of risk factors such as poverty and older housing. However, the data do not show such a relationship. Counties with higher rates of testing did not necessarily have higher rates of poverty and old housing; however, some counties with high risk factors had relatively lower rates of testing (see Graph 2).

At the ZIP code level, too, there is no clear relationship between testing frequency and risk factor distribution; for instance, ZIP code areas in Eastern Oregon have high proportions of pre-1950 housing (see Map 3), but mostly low proportions of tested children (see Map 1). Likewise, many areas with higher poverty rates (see Map 2) do not show high testing rates.

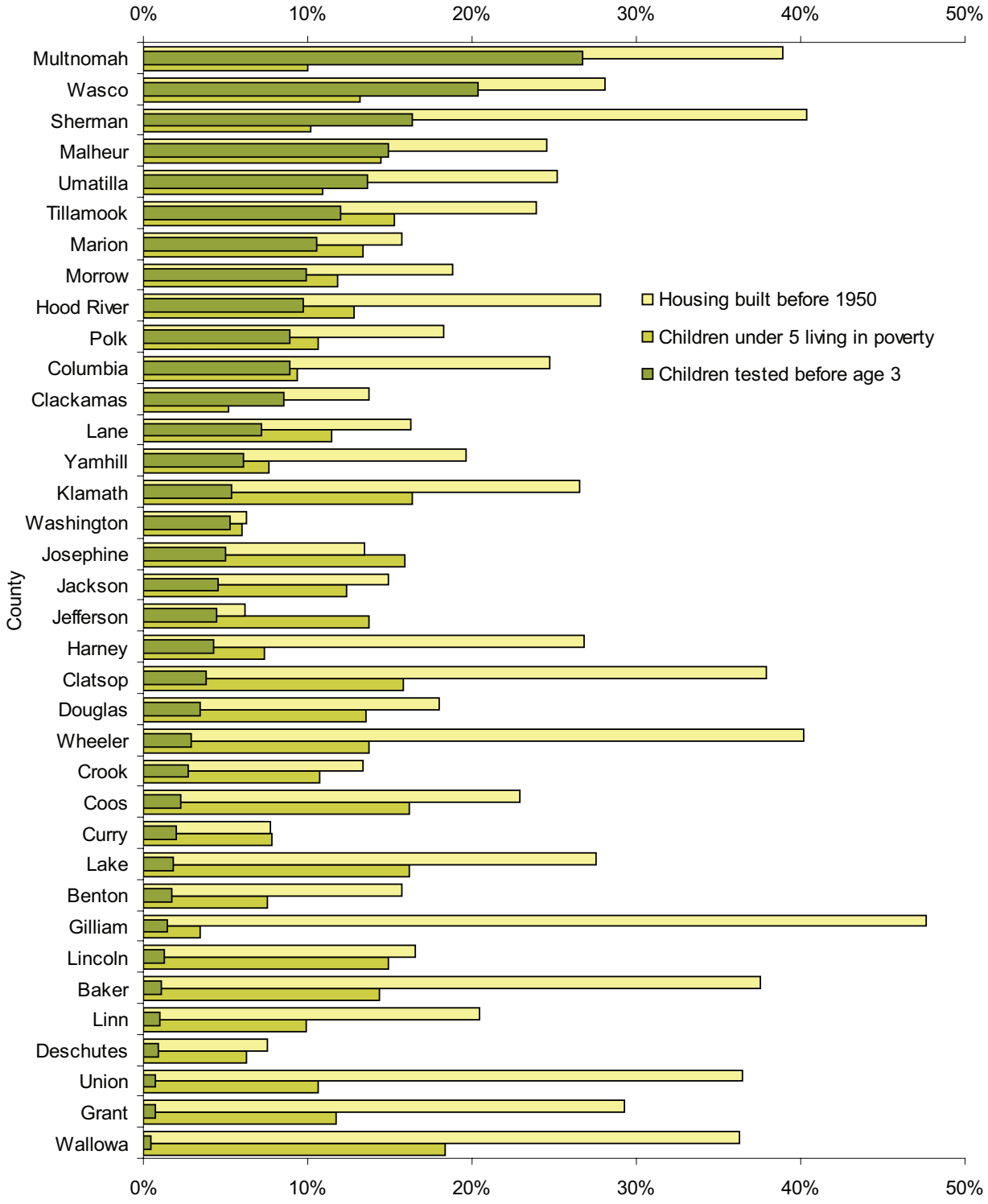
As previously mentioned, the proportion of children tested in each county or ZIP code could not be measured reliably because the residence address was unknown for many children. The fact that we could not find a correlation might, therefore, be due to incomplete geographical information.

Furthermore, analyses based on relatively large geographical aggregates, such as counties and ZIP codes, may be misleading because they allow for coincidental associations between factors. For instance, Multnomah County has a relatively high proportion of old housing and a high percentage of children receiving blood lead level tests. The rate of testing, however, is probably not motivated primarily by the age of housing, but more likely due to differences in the local perception of risk and the resources available for outreach and testing by the county health department, the city of Portland and community-based organizations.

In order to draw reliable conclusions about the relationship between risk factors and the likelihood of blood lead testing in children, data will need to be analyzed at a finer level of resolution, such as census tracts or block groups. The testing data, however, are currently not available at these geographical levels. For future years, we hope to receive more complete address information for all tested children, which will allow us to analyze the data at finer and more appropriate levels of geography.

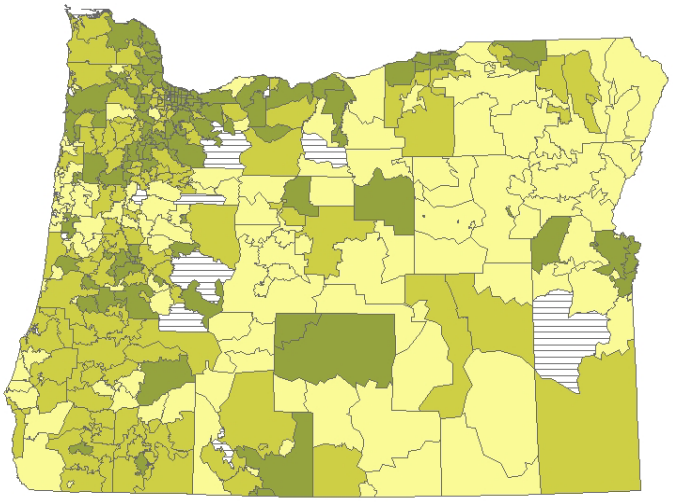
Table 2 Percentage and count of children under age 5 living in poverty and percentage of housing units built before 1950, by state and county

	Children under age 5 living in poverty		Housing units built before 1950	
	%	*(count)*	%	*(count)*
Oregon	9.95	*(22181)*	20.61	*(299403)*
Baker	14.37	*(127)*	37.56	*(3156)*
Benton	7.53	*(302)*	15.74	*(5033)*
Clackamas	5.23	*(1144)*	13.75	*(18830)*
Clatsop	15.79	*(317)*	37.91	*(7463)*
Columbia	9.34	*(260)*	24.69	*(4339)*
Coos	16.22	*(495)*	22.87	*(6689)*
Crook	10.77	*(135)*	13.41	*(1108)*
Curry	7.84	*(68)*	7.76	*(885)*
Deschutes	6.26	*(443)*	7.52	*(4102)*
Douglas	13.54	*(762)*	18.02	*(7800)*
Gilliam	3.45	*(3)*	47.65	*(497)*
Grant	11.75	*(53)*	29.25	*(1171)*
Harney	7.37	*(32)*	26.83	*(948)*
Hood River	12.79	*(192)*	27.83	*(2176)*
Jackson	12.33	*(1341)*	14.93	*(11306)*
Jefferson	13.70	*(201)*	6.21	*(517)*
Josephine	15.89	*(641)*	13.47	*(4478)*
Klamath	16.32	*(668)*	26.52	*(7659)*
Lake	16.22	*(60)*	27.58	*(1103)*
Lane	11.42	*(2122)*	16.26	*(22595)*
Lincoln	14.86	*(323)*	16.58	*(4457)*
Linn	9.87	*(695)*	20.44	*(8691)*
Malheur	14.49	*(346)*	24.54	*(2757)*
Marion	13.40	*(2932)*	15.74	*(17026)*
Morrow	11.81	*(111)*	18.85	*(806)*
Multnomah	10.04	*(4247)*	38.95	*(112407)*
Polk	10.61	*(416)*	18.26	*(4467)*
Sherman	10.20	*(10)*	40.32	*(377)*
Tillamook	15.29	*(178)*	23.90	*(3801)*
Umatilla	10.90	*(577)*	25.21	*(6978)*
Union	10.65	*(155)*	36.44	*(3864)*
Wallowa	18.36	*(65)*	36.23	*(1413)*
Wasco	13.20	*(205)*	28.07	*(2990)*
Washington	5.96	*(2094)*	6.28	*(11239)*
Wheeler	13.70	*(10)*	40.14	*(338)*
Yamhill	7.63	*(451)*	19.61	*(5937)*



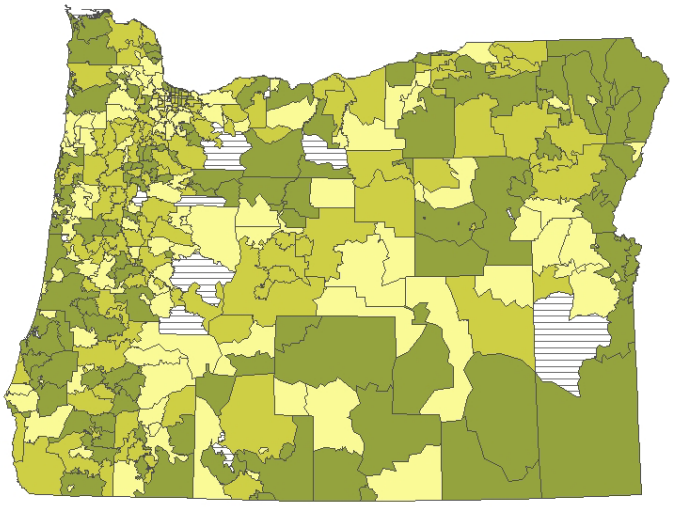
Graph 2. Percentage of children in 2001-2004 birth year cohorts tested before age 3; percentage of children under age 5 living in poverty; and percentage of housing units built before 1950

The three shades on each map represent one-third of all ZIP codes, with darker shades indicating higher proportions.Areas with dark horizontal lines are ZIP codes for which no data were available. Note that large geographical areas are not equivalent to large populations; ZIP code areas vary with population density.



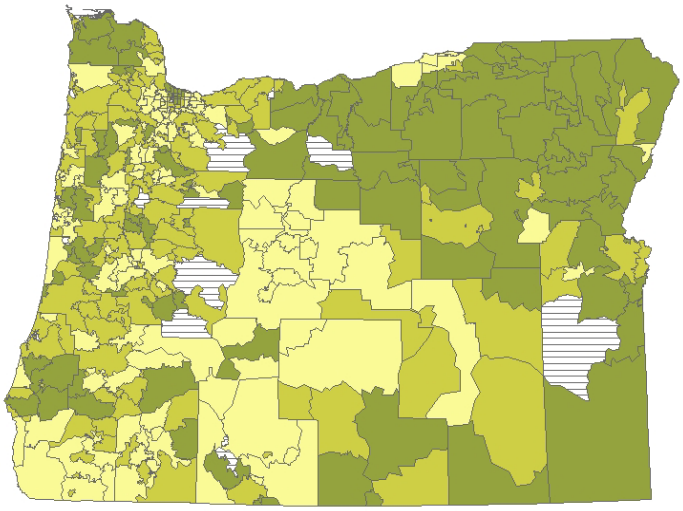
Map 1.
Percentage of children born in 2001-2004 tested before age 3, by ZIP code

- 0.0 - 1.7%
- 1.8 - 7.3%
- 7.4 - 48.0%
- no data available



Map 2.
Percentage of children under age 5 living in poverty, by ZIP code

- 0.0 - 4.3%
- 4.4 - 11.7%
- 11.8 -100%
- no data available



Map 3.
Percentage of housing units built before 1950, by ZIP code

- 0.0 - 16.2%
- 16.3 - 28.9%
- 29.0 - 81.9%
- no data available

Maps 1 – 3 Distribution of testing and risk factors by ZIP code

Major limitations

These measures estimate testing rates in children living in communities that may be at greater risk of exposure due to older housing. Testing rates do not directly reflect the number of children with elevated blood lead levels. It is a surrogate for a child's risk of lead poisoning due to lead paint in the home and other sources of lead. A more direct measure would be based on a study of individual children and the actual age and condition of their homes.

Address and demographic information on children tested for lead poisoning is incomplete. Some children tested do not have an address in the Oregon DHS Childhood Lead Poisoning Prevention Program data system. This can result in some tested children being counted in the wrong ZIP code or not counted at all. Children may also be exposed to lead paint in neighboring ZIP codes while visiting family, attending child care, etc. In rural areas there may be so few children tested that the estimates are not reliable.

There are limitations when using ZIP codes as a geographic scale. Housing data from the U.S. Census must be converted to ZIP codes. This conversion is not exact. A ZIP code area is not homogenous and ZIP codes change over time. Changes in ZIP codes can prevent accurate comparison of testing levels between years.

The condition of the paint within the home is an important factor in possible exposure to lead. Using the number of pre-1950s housing from the U.S. Census does not account for houses that have been renovated or have had lead removed. Remodeling or demolition of an older home can significantly increase the risk for lead exposure. Children from low-income families are at greater risk for lead poisoning; nevertheless, the major source of the risk for all children is the presence of lead paint in the home.

Childhood blood lead surveillance data are not randomly sampled or representative of the population. Census data are only available every 10 years and do not contain information on the condition of pre-1950 housing or provide address-level information on the year the housing was built. Vital Statistics birth data are not adjusted for children who move to another state, county or ZIP code after birth. This measure also does not account for other sources of lead in the community.

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Glossary

Assessment	One of the three core functions of public health (assessment, policy development, assurance). It comprises monitoring health status to identify community health problems; diagnosing and investigating health problems an d health hazards in the community; and evaluating the effectiveness, accessibility and quality of population-based health services.
CDC	Centers for Disease Control and Prevention, DHHS.
Census tract	A small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users in order to present data. Census tract boundaries normally follow visible features, but may follow governmental unit boundaries and other non-visible features in some instances; they always nest within counties. Census tracts are designed to be relatively homogeneous units with respect to population characteristics, economic status and living conditions at the time of establishment. They average approximately 4,000 inhabitants and may be split by any sub-county geographic entity.
Cohort	A group of individuals with a characteristic in common, such as being born in the same year.
Correlation	The degree to which variables change together. A normal coincidence of one phenomenon with another may occur when the variables are unrelated but have a trend in common over time or space. Hence, correlation does not imply causation.
DHHS	United States Department of Health and Human Services.
DHS	Oregon Department of Human Services.
Environmental Public Health Tracking	The national initiative to establish a network for ongoing collection, integration, analysis and interpretation of data about environmental hazards, exposure to environmental hazards and health effects.
Exposure	Proximity to and/or contact with a substance having the potential to cause disease in such a manner that effective transmission of the agent or harmful effects of the agent may occur.

Reference links

Oregon Department of Human Services (DHS), Oregon Center for Health Statistics (Vital Records): *www.oregon.gov/DHS/ph/chs/.*

Oregon Department of Human Services (DHS), Oregon Environmental Public Health Tracking (EPHT): *www.oregon.gov/DHS/ph/ephtl/.*

Oregon Department of Human Services (DHS), Oregon Lead Poisoning Prevention Program (LPPP): *www.oregon.gov/DHS/ph/lead/index.shtml.*

U.S. Department of Commerce, U.S. Census Bureau. American FactFinder: *http://factfinder.census.gov/home/saff/main.html?_lang=en.*

U.S. Department of Health and Human Services (DHHS), Agency for Toxic Substances and Disease Registry (ATSDR): *www.atsdr.cdc.gov/tfacts13.html.*

U.S. Department of Health and Human Services (DHHS), Centers for Disease Control and Prevention (CDC), National Environmental Public Health Tracking (NEPHT) Program: *www.cdc.gov/nceh/tracking.*

U.S. Department of Health and Human Services (DHHS), Centers for Disease Control and Prevention (CDC), National Lead Poisoning Prevention Program: *www.cdc.gov/nceh/lead/.*

U.S. Department of Health and Human Services (DHHS), National Institutes of Health (NIH), National Institute of Environmental Health Sciences (NIEHS): *www.niehs.nih.gov/health/topics/agents/lead/index.cfm*.

U.S. Department of Housing and Urban Development (HUD), Office of Healthy Homes and Lead Hazard Control: *www.hud.gov/offices/lead/.*

U.S. Environmental Protection Agency (EPA). Lead in paint, dust and soil: *www.epa.gov/lead/index.html*.

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