

Diesel Pollution Awareness

A Community-Led Project In Salem, OR

2017 - 2018

Latinos Unidos Siempre

COMMUNITY AIR SAMPLING

Information is power. Only when we know about pollution in our neighborhoods can we can work together on solutions.

We designed this community air sampling project to build awareness of diesel pollution in our lives. Community members identified locations of concern and then conducted observations and air quality sampling at those locations.

The result is a series of air quality “snapshots” of personal exposures to diesel pollution.

National models predict that we have a reason to be concerned about diesel pollution in our neighborhoods. They don’t provide a picture of our experience of local pollution: what we breathe as we wait for the bus, play in the park—or what pollution might end up inside our homes and in community spaces.

To better understand diesel pollution in our lives, community members conducted an air sampling project. Our team worked to LOCATE, OBSERVE and MEASURE the fine black carbon particles found in diesel pollution.

LOCATE

First, we identified places where heavy duty diesel engines are likely to be used and where community members spend time outdoors. We focused on places where there may be children, the elderly and people with health challenges who are most vulnerable to air pollution.

OBSERVE

Second, we spent time in those spaces making observations about what we see, smell, hear and feel. We also took notes on how people are spending time in the space, whether they are passing through or lingering. Just using our senses can give us a better idea of air pollution sources and exposures.

MEASURE

Third, we used a micro-aethalometer to measure fine black carbon particles in the air. When these measurements are matched to our observations, we get a better idea of how a passing diesel truck or other source of particle pollution might affect the air we breathe. We hope that by gathering and sharing this information, our neighbors will have a better idea of how diesel engines affect our air quality.



MICRO-AETHALOMETER (“micro-eth-el-ah-meh-ter” AKA “micro-eth”) This air sampling device is about the size of a bulky cell-phone with a small tube attached.

The machine runs air across a tiny white filter. Then, it shines a light on the filter and measures how much light is absorbed by the miniscule dark particles of black carbon. Measuring black carbon helps us see particles from burning fossil fuel as separate from dust, pollen or other particles.



TERMS TO KNOW

$\mu\text{g}/\text{m}^3$

This is a measurement unit using micro-grams per cubic meter of air to describe the amount of black carbon that is concentrated in the air. Our sampling device uses this unit.

0.1 $\mu\text{g}/\text{m}^3$ of PM 2.5

This measurement is the Oregon state health benchmark for air that is safe to breathe over a lifetime without adding to the risk of cancer.

Black carbon

This substance is one part of the material that makes up particulate matter (PM) from burning fossil fuels such as gas, coal, wood and diesel.

Breathing in black carbon can damage the heart and lungs and raise the risk of cancer. Black carbon also causes local climate effects, causing snow and ice to melt faster. In this project, we measure black carbon.

Health Benchmark

The state of Oregon creates a “health benchmark” for 52 toxic air pollutants. A panel of scientists helps set the level that we need to protect health for the most sensitive people. These benchmarks set a goal for the state, but are not required by law.

Some benchmarks, including the diesel pollution level, are set to make sure that there is less than a one-in-a-million chance of cancer from a lifetime of exposure. Other benchmarks are set at the level needed to avoid non-cancer health effects.

Latinx

Latinx is a general term used to refer to Latino and or Latina without referring to a specific gender.

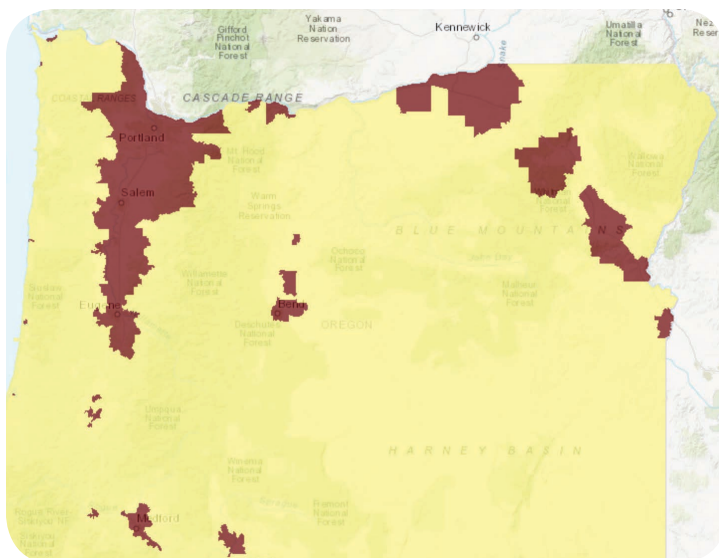
Particulate matter, PM and PM 2.5

Particulate matter (PM) is the tiny solid particles in air pollution. It can come from dust, pollen, or smoke from burning wood, gasoline or other fuels.

The very tiniest particulate matter is called PM 2.5 for its maximum size, in microns. PM 2.5 (or less) is important to track because it can easily get deep into the lungs, and even the bloodstream, causing serious health problems.

Diesel exhaust is made up of about 80-95% PM 2.5. Toxic gases in diesel exhaust can attach to diesel particles and be carried deep into the body.

DIESEL POLLUTION IN OREGON



The dark areas in this map show where the estimated concentrations of diesel pollution are higher than the state's health benchmark.

These estimates take into account the times and places that people are exposed to diesel particulate matter, including the indoor environment.

Statewide, the estimated exposure concentration is four times higher than the state's health benchmark.

Diesel emissions are above Oregon's 0.1 µg/m³ health benchmark in 19 counties:

Multnomah	0.78
Clackamas	0.45
Washington	0.44
Marion	0.39
Lane	0.30
Linn	0.24
Jackson	0.19
Yamhill	0.19
Benton	0.17
Deschutes	0.17
Polk	0.17
Umatilla	0.16
Josephine	0.16
Baker	0.16
Columbia	0.16
Wasco	0.15
Malheur	0.14
Hood River	0.13
Douglas	0.10

Total concentration of ambient diesel particulate matter in µg/m³ estimates from 2014 data modeled by the 2018 National Air Toxics Assessment

Estimated annual health impacts from diesel in Oregon:

176 premature deaths
 145 heart attacks
 25,910 lost work days
 5,376 worsened asthma in children
 119 asthma hospital visits for children
 5,652 respiratory symptoms in children

Estimates of health effects are based on an EPA analysis using 2005 National Air Toxics Assessment data.

Other health effects linked to diesel:

Cognitive impairment
 Male infertility
 Stroke
 Lung cancer
 Birth anomalies
 Pre-term birth or low birth rate
 Impaired lung growth in children
 Maternal exposure and autism risk



DIESEL POLLUTION AND HEAVY DUTY ENGINES

Diesel pollution harms our health in Oregon

Exposure to diesel fumes can harm the heart, lungs and brain. Diesel is also a carcinogen. National models suggest that many counties in Oregon experience diesel exhaust at levels that raise the risk of cancer over a lifetime. Diesel exhaust in Oregon today is estimated to cause more than 100 premature deaths each year and cost billions of dollars a year for treatment of health issues and lost productivity.

Many states are dealing with the health crisis by replacing old dirty engines with cleaner alternatives. But Oregon lags behind neighboring states when it comes to financial incentives to replace engines, regulations to phase out old engines, and enforcement of existing federal regulations. Old engines in trucks, buses and construction equipment continue to operate for longer than expected.

You can't see the worst diesel pollution

Diesel exhaust looks black and sooty, but the particles that are most dangerous to health are too small to see. Fine particles are smaller than red blood cells, and ultrafine particles are about the size of a virus. Their small size allows them to be inhaled deep into our lungs and transfer to the bloodstream, where they can travel through the body and cause damage.

Heavy duty engines are the biggest polluters

Trains, ships, big trucks, buses and construction equipment run on diesel fuel. The biggest contribution to diesel pollution in Oregon comes from vehicles on the road and construction equipment. In our neighborhoods, we see heavy duty trucks on the highways, but also on garbage routes, delivery routes and bus routes. Heavy duty diesel engines made before 2007 are the dirtiest; newer engines meet strong Federal standards. But Oregon has tens of thousands of older school buses, transit buses, trucks and construction engines running today. The oldest vehicles are less likely to be on the highway, and more likely to run local routes through our neighborhoods.

The worst diesel pollution affects low-income and people-of-color households

People are regularly exposed to diesel exhaust at work on railroads, loading docks, and construction sites. People who drive trucks or buses or work as diesel mechanics have a greater risk of lung cancer. Communities located at the margins of urban areas near busy roads and highways, rail lines and ports, business and industrial facilities are also likely to experience more air pollution.

ABOUT THE SALEM COMMUNITY

Salem is growing in racial and ethnic diversity. Today, about 30 percent of the population is registered as non-white. Within that population, more than 20 percent identify as Latinx. The average age in Salem is 35, which is 12 percent younger than Oregon's average.

About 17.2% of Salem's population fall below the poverty line. Most people of color live in low income neighborhoods such as Hayesville, Badger Corner, and Northgate. Nearly 10 percent of Oregon adults and children have asthma, according to Oregon public health officials.

Salem is the third largest city in the state after Portland and Eugene. Major roadways including Interstate 5, Oregon Route 99E, and Oregon Route 22 serve as major truck routes.

Major construction sites and road work in Salem is underway on streets like Portland Road NE, Liberty Street SE/NE, and Church St. These construction sites can bring debris and lots of heavy duty engines that can be harmful to the individuals that work and are exposed to these emissions.

Furthermore, lots of the trucks cut through or make Salem their destination.

The Salem-Keizer Recycling and Transfer Station, the Republic Services Capitol Recycling & Disposal Transfer Station and other such facilities handle large volumes of truck traffic.

Transit-dependent and avid bus riders are exposed to diesel regularly. Cherriots, the public transit operator based in Salem, has a diesel fleet with 5% of the buses running on biodiesel. The Salem-Keizer School district has 88 school buses that are still operating with dirty diesel engines.

Air quality is only one environmental issue that our community cares about.

The people of Salem are concerned about other environmental hazards, such as soil contaminated with legacy toxic pesticides.

Many of our community members are farm workers and are concerned about exposure to pesticides. Other issues that discussed in our interviews were crop burning, dairy farming (cows), traffic, contaminated water and climate change.



This map displays the estimated total concentration of diesel particulate matter in outdoor air. These are modeled estimates, meaning that they are not directly measured by air monitoring equipment.

Total concentration
($\mu\text{g}/\text{m}^3$)

- 0.00 - 0.38
- 0.39 - 0.87
- 0.88 - 1.38
- 1.39 - 2.20
- 2.21 - 3.81

This map was created by Multnomah County Health Department using US EPA data, last updated May 2016.

OUR STUDY METHODS IN SALEM

Using a Micro-Aetholometer provided by Oregon Environmental Council, Latinos Unidos Siempre interns, staff and community volunteers collected air quality samples at ten fixed locations around Salem neighborhoods between November 2017 and April 2018. The team also interviewed people in the neighborhood about their experiences and concerns about air pollution.

How we chose our study locations and interview subjects

On January 18, 2018, we held a community gathering at the Latinos Unidos Siempre office where we introduced the Diesel Pollution Awareness Project. Community members including high school and college students, parents, activists, educators and other locals, guided us to choose our sampling sites by looking at a large map of Salem and sharing their locations of concern.

Throughout our meeting, community members pinpointed areas of concern on a map of Salem. Individuals suggested that we collect data near the Salem Hospital, “busy” bus stops, railroad crossings, train stations and the former KMART parking lot near the airport. Most of these locations are industrialised, have exposure to high amounts of traffic, and have construction taking place. After this meeting, we chose ten sites to sample that both matched community concerns and were in areas where we could interview community members about their experiences.



WHAT WE LEARNED FROM INTERVIEWS

We decided to focus our interviews on community members who had respiratory issues and that work and/or live close to construction or major roadways. Interviews included:

- A high school tennis player who practices outside for long hours and has asthma.
- A teacher and former construction worker with respiratory issues.
- The supervisor of a children's club at an apartment complex.
- An elder from our community who compares the air in Mexico to the air in Salem.
- A university student working on a diesel research project concerned about her family
- A woman whose kids were having respiratory issues due to nearby construction



Our community was our biggest asset to this project, helping us understand how air quality affects our lives.

People interviewed for this project and attending our meetings raised concerns about air quality related to growing industry in Salem, the proximity of facilities such as a mine near residential areas, and ongoing construction in residential areas. People highlighted their concerns not only for themselves, but for infants and health-affected family and neighbors.

Most of the people we met or interviewed did not know what diesel pollution is. However, they did know that construction has an effect on their health.

Community members pointed out places of concern because of their proximity to construction or industrial areas. One family described how their children experienced respiratory problems, but when they moved away from a home near a construction site, the respiratory issues decreased.

People know what diesel pollution looks like, but not exactly what it is, the health effects that it causes, or its connection to asthma symptoms. None of our interviewees were aware that Oregon is behind neighboring states when it comes to cleaning up old diesel engines.

WHAT WE LEARNED FROM SAMPLING AND OBSERVATION

From our observations, we noticed that the places where we would see trucks were mostly in places where construction was being done, or near industrial areas.

In most of the locations that we observed, we saw people walking on the street. In some locations, such as the Colonia Libertad apartment complex for farm workers, we witnessed construction sites near their homes.

Our study shows that even when we could not see pollution, it was something we could measure in the air. Also, the air that someone breathes when standing on a street corner or playing tennis outdoors is not at a level that stays the same the whole time. A change in wind, or a passing truck, can make the amount of pollution in the air change a lot from minute to minute.

Our samples were taken with a tool designed for monitoring personal exposure—very close to what an individual might breathe. However, our samples were taken in brief moments of time, usually about an hour. Our samples are simply snapshots, not a full picture of what one person might breathe over an entire day, or more than one day.

We found that the air we were breathing was most often between one and ten times above the state's benchmark: the level that we would need over a lifetime to avoid cancer risk from PM 2.5. We saw spikes in pollution that reached 600 times the safe benchmark, but those levels did not last for more than about 30 seconds.



Using a Micro-Aetholometer provided by Oregon Environmental Council, Latinos Unidos Siempre interns collected air quality samples at ten fixed locations around Salem in March 2018

DATE AND TIME	30-SECOND AVERAGE $\mu\text{g}/\text{m}^3$ of black carbon PM 2.5	30-SECOND RANGE $\mu\text{g}/\text{m}^3$ of black carbon PM 2.5
3/09/18 12:23 PM - 12:52 PM	0.12	0.34 - 1.26
3/13/18 5:54 PM - 7:43 PM	0.73	0.37 - 2.92
3/13/18 8:01 PM - 10:30 PM	0.91	0.58 - 3.96
3/22/18 10:50 PM - 11:37 PM	0.98	0.06 - 6.14
3/22/18 12:10 PM - 12:37 PM	0.26	0.08 - 0.62
3/23/18 9:01 PM - 10:08 PM	0.12	0.02 - 0.56
3/23/18 11:07 PM - 12:12 PM	0.29	0.00 - 0.93
3/25/18 3:02 PM - 3:29 PM	0.41	0.22 - 0.56
3/27/18 6:03 PM - 9:18 PM	0.16	0.00 - 2.59
3/28/18 11:18 PM - 12:42 PM	0.41	0.00 - 2.69
3/28/18 1:26 PM - 2:22 PM	0.24	0.00 - 1.04

- “Average” is the sample average after cleaning data of any erroneous values.
- “Range” is the 5th Percentile - 98th Percentile of black carbon measured.

Throughout the process, we learned lessons from our experience collecting data.

The micro-aethalometer is a very sensitive tool. Small movements, wind, temperature shifts and rain would change the way it measures black carbon.

Gathering data takes time. We dedicated two hours of equipment set-up for each session. When something goes wrong – a change in weather or forgetting to take the cap off of the air intake – those hours of work are not reflected in our final results.

Gathering data can be uncomfortable. When weather conditions were bad, we took the monitor into the car and let the intake tube hang outside. The temperature difference between the inside of the car and outside made the data invalid.

It is important to record our own observations and match them to the data promptly. The micro-aetholometer records time and date, but not location.

OUR STUDY CONCLUSIONS

Our study helped us understand more about how people experience air pollution as individuals. We found that:

Individual experiences matter:

National and regional air quality studies do not describe how one person's experience is different from another. We saw a lot of differences between the way people breathe in the locations we studied.

In some places, such as the tennis court, people spent an hour or more exercising and breathing heavily -- in other locations, people were only passing by. In some locations, like bus stops, there were spikes in pollution from passing vehicles; in other locations, the air quality stayed relatively steady.

Stories matter:

For all the health effects related to diesel pollution exposure, it is difficult to find scientists who agree on how much is too much for our daily lives. People experience pollution differently depending on their age, health, and the activities they do each day.

When we listen to people's stories about how they experience air pollution, we can better understand how much an old dirty diesel engine might affect them. Or when someone describes how their breathing changes when the air changes, we can understand the effects of air pollution.

Single air pollutants don't exist by themselves:

Our study measured just one kind of small particulate matter: black carbon. but there are many other particles and gases in our air from smoke stacks, tailpipes, and forest fires.

During our interviews, people talked about pollution from cars, dust from construction, pesticides in the air and other sources. When we think of health issues caused by diesel pollution, we must account for how it affects communities that may experience other issues, and how they are linked to health disparities.

And when we consider how much diesel is too much, we must account for other stress on people's health.

We need a change for our health:

Our study shows that there is air pollution at some level in every location we studied, and that people experience air pollution as a change in their health. We also know that diesel pollution is especially toxic, it is present in our neighborhoods, and we can advocate for healthier and cleaner alternatives that could be used.

The best precaution we can take is to replace old, dirty engines with cleaner ones. Instead of waiting for science to tell us just exactly how much diesel pollution is too much, or just what variety of other air pollutants we experience, it's time to take action to reduce pollution where solutions already exist.



“We fight hard and go for every point. So my teammates are affected by the construction going on.”

Ben Ho is tennis captain for varsity boys tennis at McKay High School in Salem. He has had asthma since he was two years old. He notices that his players struggle more when diesel construction equipment operates nearby.

“I wish that there were more regulations on diesel pollution so we don’t have to worry about health.”



Giselle Lopez Ixta, a student at Portland State University. Her family lives near a grocery distribution center, where her father works on the loading dock. She worries about the long-term effects of his exposure to truck exhaust.



Residents of Colonia Libertad apartment complex in SE Salem live near major roadways and industry. The complex is home to many farm workers. One resident worries that construction, including a new distribution center, will increase pollution.

“We don’t know what the construction will do to traffic. We don’t know how it will turn out.”

“My biggest concern is that legislators aren’t listening to people personally affected by pollution.”



Casandra Sanchez Sorianov is one of the interns who conducted this awareness project. She was motivated to study diesel in Salem because of her own experience of respiratory health, and her worries about kids who grow up with asthma.



Latinos Unidos Siempre is a local youth led organization based in Salem, Oregon, since 1996. The mission of LUS is to empower youth to become leaders in their community through political, educational and cultural development, while combating systemic racism through grassroots organizing and civic engagement.

LUS is made up of youth of color, ages 11 to 25, who reside in Salem or in surrounding communities. Every year, youth learn how to become civically engaged and lead projects that educate and engage their community, such as the “Diesel Pollution Awareness Project,” while connecting with local and state elected officials.

LUS is a place where youth are given the voice and the power to make positive changes in their community.

www.facebook.com/LUSSalem/



Oregon
Environmental
Council

Founded in 1968 by concerned Oregonians from across the state, Oregon Environmental Council is a membership-based, nonpartisan nonprofit. We bring Oregonians together to protect our water, air and land with healthy solutions that work for today and for future generations. www.oconline.org

THE DIESEL POLLUTION AWARENESS PROJECT was a collaboration between Latinos Unidos Siempre and Oregon Environmental Council in 2017 and 2018. The purpose of this project is to bring more awareness around diesel pollution and its health impacts on the residents of Salem, while engaging the community and local youth leadership. The project, video and report were designed and led by [Casandra Sanchez Soriano](#) and [Antonio Munos](#).

For more information, contact Oregon Environmental Council's Healthy Environments program:

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