Oregon Environmental Public Health Tracking Program

Carbon Monoxide Poisoning Report 2000 – 2011

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Introduction to Oregon Tracking

Environmental Public Health Tracking 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 Oregon Environmental Public Health Tracking Program (Oregon Tracking) 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.

Oregon Tracking provides a public portal to standardized electronic health and environmental data. Oregon is one of 24 grantees funded by the CDC to participate in a collaborative network development process and implement state/city networks that are components of the National Environmental Public Health Tracking Network (Tracking Network).

Rationale for tracking carbon monoxide poisoning

Carbon monoxide (CO) is a tasteless, odorless and colorless gas. It occurs naturally in the atmosphere as a result of photochemical reactions, volcanic eruptions and wildfires. People produce CO when burning fuel in engines, furnaces and open fires. Tobacco smoke also contains CO and smokers generally have higher concentrations of CO in their bloodstream than non-smokers.

The concentration of CO in ambient air does not usually exceed 5 parts per million (ppm). At that level, CO is harmless. Higher concentrations have acute health effects. When CO is inhaled, it binds to hemoglobin in red blood cells, preventing the bloodstream from absorbing sufficient levels of oxygen.

Initially, exposure to concentrations above 100 ppm can cause severe headaches, dizziness, confusion and nausea, eventually leading to unconsciousness. If exposure at high levels is prolonged over several hours, death can result.

The primary risk for CO poisoning comes from home and garage operation of gas generators and malfunctioning fuel-burning appliances such as stoves, water heaters and furnaces. Operating such engines and appliances in a confined space can cause CO to quickly accumulate to toxic concentrations.

Because CO poisoning often happens slowly and produces symptoms similar to other illnesses, it can be very hard to detect and symptoms are often overlooked. Confirmed cases are generally acute poisoning.

Survivors of severe CO poisoning may suffer long-term neurological problems. The effects of long-term low level environmental exposures are not well understood, although such exposures have been linked to increased risk for cardiovascular disease.

According to the CDC, in 2007, there were 2,302 hospitalizations (12 in Oregon) for confirmed cases of unintentional, non-fire related CO poisoning in the United States out of approximately 22,000 suspected cases. In addition, the CDC estimates an average of 439 deaths per year due to CO poisoning. In Oregon, there were an average of 17 deaths per year between 2007 and 2011.

Besides the Public Health Division, both the Oregon State Fire Marshall and the Oregon State Marine Board publish educational materials on preventing carbon monoxide poisoning. Effective April 1, 2011, state law requires carbon monoxide detectors be installed by landlords in all rental units. In addition, before homes are sold at least one functioning detector must be installed. Other regulations require detectors be installed in new constructions.

For purposes of the law, CO sources include:

- A heater, fireplace, furnace, appliance or cooking source that uses coal, wood, petroleum products and other fuels that emit carbon monoxide as a by-product of combustion.

  Petroleum products include, but are not limited to, kerosene, natural gas or propane.
- An attached garage with a door, ductwork or ventilation shaft that communicates directly with a living space.

Carbon monoxide poisoning indicators and measures

The following carbon monoxide poisoning indicators and measures are discussed in this report:

Indicator	*Measures*
A. Carbon monoxide hospitalizations	A1. Number of hospitalizations
	A2. Crude rate
	A3. Age-adjusted rate
B. Carbon monoxide deaths	B1. Number of deaths
	B2. Crude rate
	B3. Age-adjusted rate

Unintentional CO poisonings are tracked using both hospitalizations and deaths. The measures include the annual number of poisonings, age-adjusted rate and crude rate by cause (all cause, fire-related, not fire-related and unknown) for hospitalizations and deaths. Hospitalized patients with any discharge diagnosis related to CO poisoning (ICD-9 code 986) and deceased individuals whose primary or underlying cause of death is listed as CO poisoning (ICD-10 code T58) are included in these measures.

The rates are calculated using U.S. Census Bureau annual population estimates, except when population counts are available from the decennial census; age adjustments are based on the age distribution of the U.S. standard population. Hospitalization rates are calculated based on the number of hospital admissions.

Transfers from one hospital to another that occurred on the same day or the day following the admission have been excluded from these data, as have duplicate records. The use and quality of hospitalization diagnostic codes and cause of death codes to describe how a poisoning occurred vary widely. This decreases our ability to distinguish between cases of CO poisoning that are intentional or unintentional and cases that are fire-related or non-fire related.

When comparing Oregon CO poisoning rates to those for other Tracking States, it is important to be aware that variations in death investigation laws may also cause differences in the number of deaths recorded. Furthermore, CO poisoning may often go unrecognized by medical providers, medical examiners or coroners and be attributed to other causes.

Hospital admissions that occurred during the most recent year for which we have data and were discharged in the subsequent year are not captured in this report. Thus, the number of hospitalizations in the most recent year may be understated. Oregon residents that were hospitalized out of state may not be included in the hospital measures.

Records for persons receiving care at home, in emergency rooms and in outpatient settings are not included in the hospitalization data. Veterans Affairs, Indian Health Services and institutionalized (e.g. prison) population records are also not included in the hospitalization data. All Oregon resident deaths are captured by the Oregon Center for Health Statistics death certificates.

Hospitalizations and deaths due to carbon monoxide poisoning are relatively rare in Oregon. Because the numbers are small almost all calculated rates are unreliable. Instead of using unreliable numbers to

draw conclusions about trends, this report focuses on the number and type of carbon monoxide poisoning cases in Oregon.

Measures A1& B1. Carbon monoxide poisoning hospitalizations and deaths, 2000-2011

Figure 1.Measure A1: Number of carbon monoxide poisoning hospitalizations, Oregon 2000-2011

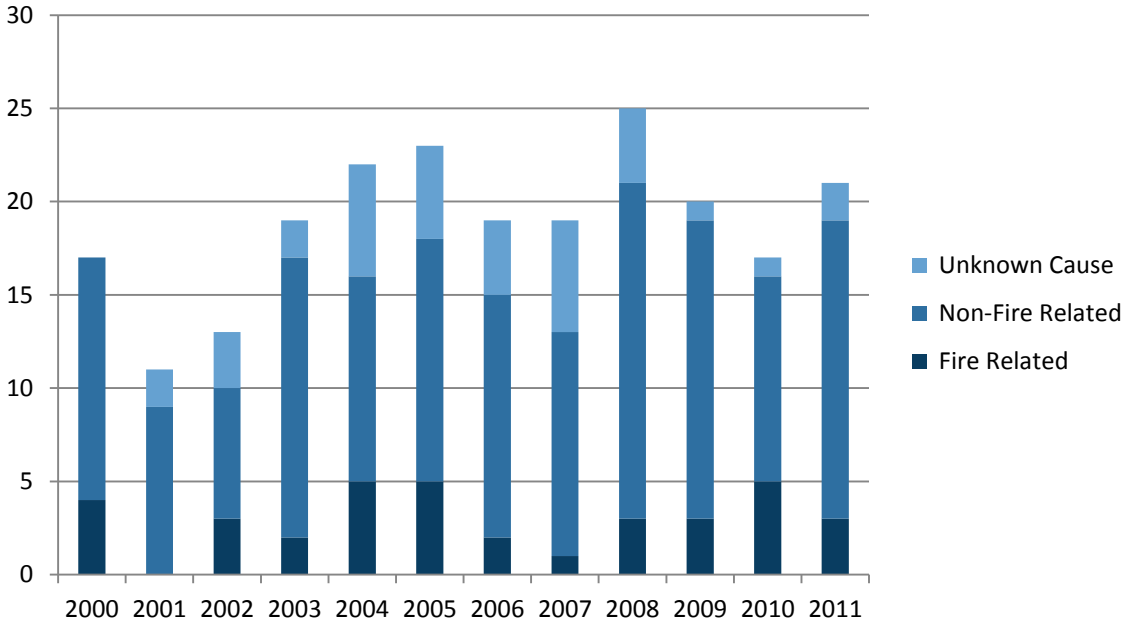
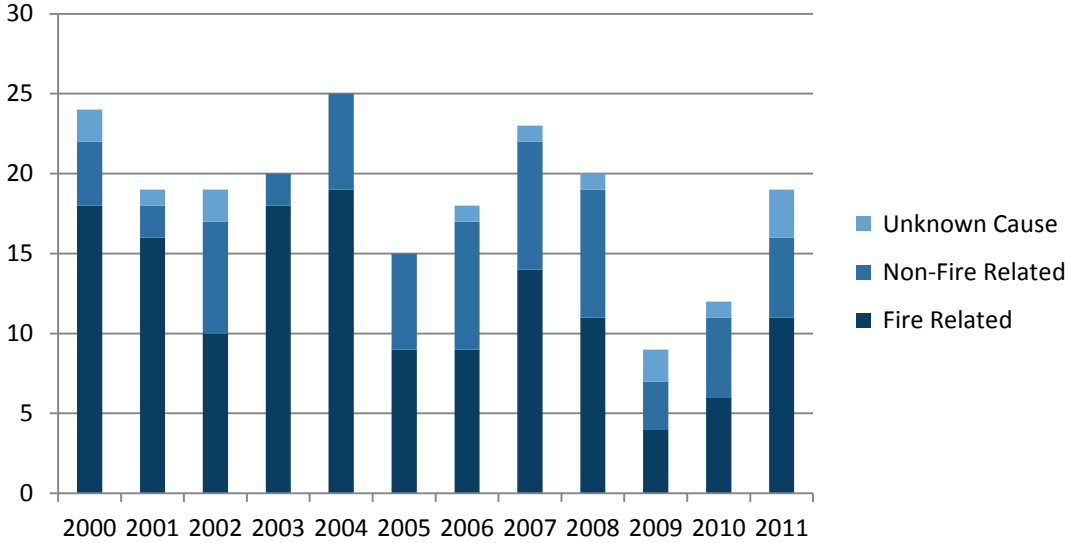


Figure 2.Measure B1: Number of carbon monoxide poisoning deaths, Oregon 2000-2011



Most CO deaths are fire related, but the majority of CO hospitalizations are not due to fire.These data suggest fires are the deadliest cause of carbon monoxide poisoning. Because hospitalization and mortality data come from different sources, it is not possible to identify people who died from carbon monoxide poisoning after being hospitalized.

Measures A2, A3, B2 & B3. Carbon monoxide poisoning hospitalization and death rates, 2000-2011

Table 1 lists crude and age-adjusted rates for carbon monoxide poisoning hospitalizations and deaths from 2000 to 2011. Unreliable rates, those based on 10 or fewer cases, are shown in gray italic text.

Table 1. Carbon monoxide poisoning rates per 100,000 population, 2000-2011

	Hospitalizations		Deaths	
	Crude rate	Age-adjusted rate	Crude rate	Age-adjusted rate
All causes	0.5	0.5	0.5	0.5
Fire-related	0.1	0.1	0.4	0.3
Non fire-related	0.4	0.3	0.1	0.1
Unknown cause	0.1	0.1	*0.0*	*0.0*

Major limitations

Oregon Tracking does not publish county-level numbers for carbon monoxide poisonings because there are too few cases to have reliable estimates. Moreover, Oregon does not have access to outpatient or emergency department (ED) data and therefore cannot report on patients treated in those settings who were not admitted to the hospital.

Regulations requiring carbon monoxide detectors may reduce numbers of poisoning cases in Oregon. However, since the numbers of hospitalizations and deaths are low, more years of data are needed before making a determination as to the effectiveness of the new law. There is some variation in carbon monoxide poisoning among Oregon counties, but due to small numbers most of the county rates are unreliable. This precludes drawing conclusions about regional variation in carbon monoxide poisoning.

Summary

Though few Oregonians get sick or die from carbon monoxide poisoning, many of these cases are preventable. Regulations requiring carbon monoxide detectors may reduce death and hospitalization rates, as will declines in cigarette smoking and related house fires. However, more data are needed before drawing conclusions about carbon monoxide poisoning trends.

Recommendations

As most carbon monoxide poisoning deaths are due to fires, fire prevention efforts will have the biggest impact on reducing fatalities. Regulations require carbon monoxide detectors be installed in houses prior to sale, but many houses that have not been sold recently may lack functioning carbon monoxide detectors.

Continued education about risks of poisoning will encourage homeowners to install detectors, which can help avert hospitalizations and deaths.Operational smoke alarms also save lives; The Oregon State Fire Marshall reports that of the 1,018 civilian injuries from residential fires from 2007-2011, 18% were caused by cigarettes, matches and lighters. Therefore, tobacco prevention efforts will likely also result in fewer carbon monoxide poisonings.

Reference links

Agency for Toxic Substances & Disease Registry – Carbon Monoxide ToxFAQs™:
http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=1163&tid=253

Centers for Disease Control & Prevention – Carbon Monoxide Poisoning:
http://www.cdc.gov/co/

Environmental Protection Agency – Carbon Monoxide:
http://www.epa.gov/iaq/co.html

Oregon State Fire Marshall – Carbon Monoxide:
http://www.oregon.gov/OSP/SFM/Pages/CommEd_CO_Program.aspx

Oregon State Marine Board Carbon Monoxide Inspection Guide:
http://www.oregon.gov/osmb/pages/safety/carbon1.aspx

Oregon Health Authority
Public Health Division
Center for Health Protection
Oregon Tracking Program
Portland State Office Building
800 N.E. Oregon Street, Suite 640
Portland, OR 97232
Phone: 971-673-0977
Fax: 971-673-0979

Web site: *www.healthoregon.org/epht*

E-mail: epht.ohd@state.or.us