Alaska Village Air Toxics Fact Sheet

Useful numbers from different studies to know

Introduction: Toxic air pollutants, also known as hazardous air pollutants (HAPs), are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects

General category names to know: Air toxics include the following general categories of compounds: volatile and semi- volatile organic compounds (VOC's), polycyclic aromatic hydrocarbons (PAH's), heavy metals (e.g. lead, cadmium, mercury) and aldehydes (e.g. formaldehyde).

Specific toxics: At the link: http://www.epa.gov/ttn/atw/hlthef/hapindex.html -, EPA formally lists 189 HAPS which have, or will have health standards associated with them. Specific examples of common toxic air pollutants include benzene, which is found in gasoline; and methylene chloride, which is used as a solvent and paint stripper by a number of industries, and can be found in household products.

Examples of other listed air toxics include:

- **Dioxin:** comes from burning wastes, wood, and other combustion processes
- **Asbestos:** In old insulation, floors, ceilings, etc (not hazardous if covered), gravel pits in some areas (breathing dust could be hazardous)
- **Toluene:** gasoline, other petroleum products, other industrial products.
- **Heavy Metals** such as cadmium, mercury, chromium, and lead compounds – waste burning, vehicle emissions.

Additional EPA regulated potential hazardous air compounds are:

EPA Air Quality Standards (States and counties and cities must meet these or go into non-compliance. EPA Air quality standards are based on these compounds in the air):
Carbon Monoxide (CO): 35 ppm (1-hour average), 9 ppm (8-hour average)
Nitrogen Dioxide(N02, including NOx): 0.053 ppm (annual mean)
Ozone ("smog") 03): 0.12 ppm (1-hour average), 0.08 ppm (8-hour average)
Sulfur Dioxide (So2, including Sox): 0.14 ppm (24-hour average), 0.030 ppm (annual mean)
PM10 (diameter < 2.5 micrometers): 65 µg/m3 (24-hour average), 15.0 µg/m3 (annual mean)
PM2.5 (diameter < 10 micrometers): 150 µg/m3 (24-hour average), 50 µg/m3 (annual mean)
Lead 1.5 µg/m3 (quarterly mean)

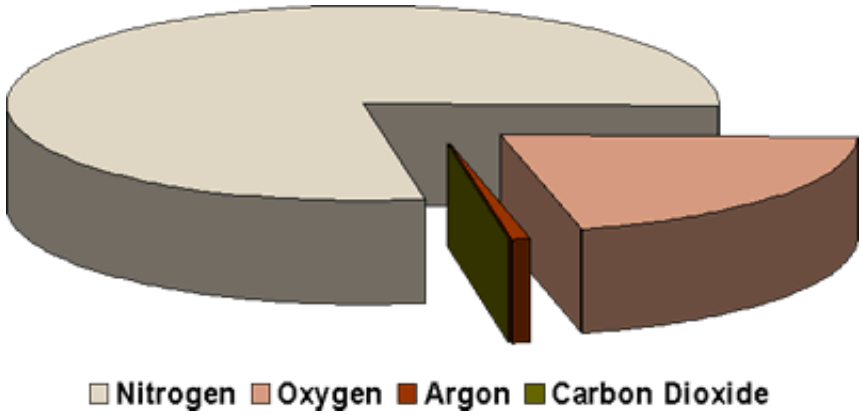
The U.S. EPA lists about 3,000 chemicals targeted for evaluation for pollution prevention action

There may be more than 10,000 chemicals that require evaluation from a pollution prevention viewpoint.

Do you want to estimate all the HAPs in your village? Go to: http://www.dec.state.ak.us/air/anpms/as/toxics/village/villageAK.htm . DEC developed an excel spreadsheet to fill in for villages, based on a Fairbanks study. Most of the categories will not apply to your village. For those, you just leave blank. For the categories that do fit your village, fill in the blue highlighted cells. It will take a long time to do accurately, but might provide you with some good information for education and for grantwriting. You can call DEC for assistance.

Many other compounds are regulated by EPA in various industries (e.g. power plants are limited by the amount of SO_2). Many other hazardous compounds are not regulated but can present health effects. These include ETS (environmental tobacco smoke) as well as perhaps thousands of chemicals that have not been evaluated yet as to their health effects and what a safe level of exposure to humans is. CO_2 emissions will likely be increasingly regulated versus voluntary efforts, due to it being a greenhouse gas that is associated with climate change. Even though it is part of clean air, at high levels of exposure (i.e. a sealed off room with a person inside) it can also be toxic.

A Reminder – What is in Clean Air?:



Dust:

1. **Lowering speed of vehicles** from 45 miles to 35 miles per hours on unpaved roads reduced Particulate Matter (PM – i.e. dust) by 22%

2. 1 mile of unpaved road with a vehicle going over 1 time per day for a year creates 1 ton of dust **500 ft out from the road**. (USFS study). Note - **How far out does the dust go from your roads?** Can you tell by looking at the roadside plants?

3. To estimate the **concentration in the air of a contaminant from an unpaved road**, use a dust loading factor of 8×10^{-6} kg/m^3 to obtain the concentration in air in g/m^3.

4. The current **dust emission factor for unpaved roads** is 2.0 lbs PM_{10}/VMT (vehicle mile traveled).

5. **Dust emissions can be prevented or reduced** in just four basic ways:
   - ✓ Limiting the creation or presence of dust-sized particles. (e.g. reducing speeds, reducing PM sources or frequency of use)
   - ✓ Reducing wind speed at ground level. (e.g. barrier from 3 -5 ft along roads, or reducing vehicle speeds)
   - ✓ Binding dust particles together (dust adhesives for roads)
   - ✓ Capturing and removing dust from its sources. (E.g., better stoves, 4 stroke instead of 2-stroke)

6. **Asthma and Dust:** Exposure to motor traffic emissions can have a significant effect on respiratory function in children and adults. One study showed that children living within 100 meters of heavily traveled roadways have significantly higher rates of wheezing and diagnosed asthma. Among adults, a study of street cleaners in Copenhagen who were exposed to traffic-related air pollution found an odds ratio of 2.3 for asthma when the street cleaners were compared to a control group of cemetery workers in the same city.

7. **Global Dust effects:** Global dust is increasing all around the world. Circulation patterns are changing and getting stronger. As a result, dust from Asia is increasingly being swept up and deposited in Alaska in the Springtime. The air quality from this dust may not be noticeable then. But when the snow melts, that dust is added to what is already in the village. This dust has contaminants as well.

8. **Snowmelt Effects**: Not enough is known as to the amount of global dust to local village dust. But the global dust alone is enough to move up Breakup by 2 to 4 weeks. The dirtier the snow – meaning the more PM that is spread out on the snow, the faster the snow melts.

9. **Where do airborne contaminants settle?** You can visually assess where PM and its associated contaminants settle by using traditional knowledge and observation. Airborne particles flow with the air. When the airflow lessens, the larger particles begin to settle. At low or no wind speeds, the settleable particles will drift down. PM tends to get entrained in precipitation, including snowdrifts. A PM/Snowdrift study showed where the snowdrifts were highest, the highest total amount of PM and its associated contaminants was found – although the concentration in the snow was lower (more snow/water to dilute). Where in the village does dust settle the most? Those are the areas to have children avoid, move drying racks from, etc. OR determine what about that area is making the dust settle (are there tarps, connexes, old buildings that can be moved, or traffic redirected?).

Snowmachines and ATV's

1. **Snowmachine CO exposure** A study of snowmachine rider CO exposure conducted at Grand Teton National Park showed that a rider at distances of 25 to 125 feet behind another rider and traveling at speeds from 10 to 40 mph can be exposed to average CO levels ranging from 0.5 to 23 ppm, depending on speed and distance. **The highest CO level measured in this study was 45 ppm, as compared to the current 1-hour NAAQS for CO of 35 ppm.** Exposure levels can be less if a snowmobile drives 15 feet off the centerline of the lead snowmobile, although the exposure levels are still of concern.

2. **Smowmachine Benzene Exposure:** A 1996 national assessment found that about 50% of the US population had benzene inhalation cancer risks exceeding 10 in one million. The nationwide annual average benzene exposures was 1.4 g/m3. In comparison, snowmachine **riders and those directly exposed to exhaust had benzene exposure levels two to three orders of magnitude greater than the national average**.

3. In addition to snowmobilers themselves, **people who are active near where a number of snowmobilers are may also be exposed to high CO levels**. An OSHA survey reported a peak CO exposure of 268 ppm for a Yellowstone Park employee working at the entrance where snowmachines enter the park. This level exceeds the recommended exposure limit of 200 ppm. Employee's exposures to several other air toxics were measured. Benzene exposures ranged from 67-600 _g/m3, with the same individual experiencing highest CO and benzene exposures. The highest benzene exposure concentrations exceeded the NIOSH Recommended Exposure Limit of 0.1 ppm for 8-hour average exposures.

4. **Driving behind more snowmachines increases exposure**: State of Montana's emission study, benzene exposures for riders driving behind a single snowmobile were predicted to range from 1.2E+02 to 1.4E+03 g/m3. Using the same model to predict exposures when riding at the end of a line of six snowmobiles spaced 25 feet apart yielded exposure predictions of 3.5E+03, 1.9E+03, 1.3E+03, and 1.2E+03 g/m3 benzene at 10, 20, 30, and 40 mph, respectively.

5. **ATV's:** You can see how much more the emissions are from ATVs than cars based on the regulation levels they must meet:

6. **Engine Category ATV Emission Rates (grams per mile)***

	HC	CO	NOx	PM
Baseline two-stroke	53.9	54.1	0.2	2.1
Baseline four-stroke	2.4	48.5	0.4	0.1
ATV's meeting EPA standards	1.6	42.9	0.3	0.1
Cars:	0.41	3.4	0.4	0.08

7. **Carbon monoxide emissions increase dramatically in cold weather.** This is because engines need more fuel to start at cold temperatures and because some emission

control devices (such as oxygen sensors and catalytic converters) operate less efficiently when they are cold. Also, nighttime inversion conditions are more frequent in the colder months of the year.

8. **Toxics in Vehicle emissions:** Besides NOx, HC, PM, and CO, emissions contain several other substances that are known or suspected human or animal carcinogens, or have serious noncancer health effects. These include benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein.

9. **Boats, Snowmachines and ATV's emit a lot more Hydrocarbons (HC) and Carbon monoxide (CO) than cars.**
   Here are the Miles a Current Passenger Car Would Need to Drive to Emit the Same Amount of Pollution as the Equipment Category Emits in One Hour of Operation.

Recreational Marine	CI HC+NOx	2,400
Snowmachines	HC	24,300
Snowmachines	CO	1,520
2-Stroke ATVs	HC	14,850
4-Stroke ATVs	HC	590

10. This is important because ATVs, snowmachines, and boats are open, **riders are near the exhaust, and for snowmachines and ATV's riding in town, they are next to houses and walkers**.

Stoves, Heaters, Fireplaces, and Chimneys

In addition to environmental tobacco smoke and engines, other sources of combustion products are unvented kerosene and gas space heaters, woodstoves, fireplaces, and gas stoves, and the power plant in town. For home and office combustion sources, the major pollutants released are carbon monoxide, nitrogen dioxide, and PM (that can be associated with toxic pollutants).

Unvented kerosene heaters may also generate acid aerosols. Combustion gases and particles also come from chimneys and flues that are improperly installed or maintained and cracked furnace heat exchangers. Pollutants from fireplaces and woodstoves with no dedicated outdoor air supply can be "back-drafted" from the chimney into the living space, particularly in weatherized homes.

Health Effects of Combustion Products

1. **Carbon monoxide** (CO) is a colorless, odorless gas that interferes with the delivery of oxygen throughout the body. At high concentrations it can cause unconsciousness and death. Lower concentrations can cause a range of symptoms from headaches, dizziness, weakness, nauseaconfusion, and disorientation, to fatigue in healthy people and episodes of increased chest pain in people with chronic heart disease. The symptoms of carbon monoxide poisoning are sometimes confused with the flu or food poisoning. Fetuses, infants, elderly people, and people

with anemia or with a history of heart or respiratory disease can be especially sensitive to carbon monoxide exposures.

2. **Nitrogen dioxide** (NO_2) is a colorless, odorless gas that irritates the mucous membranes in the eye, nose, and throat and causes shortness of breath after exposure to high concentrations. There is evidence that high concentrations or continued exposure to low levels of nitrogen dioxide increases the risk of respiratory infection; there is also evidence from animal studies that repeated exposures to elevated nitrogen dioxide levels may lead, or contribute, to the development of lung disease such as emphysema. People at particular risk from exposure to nitrogen dioxide include children and individuals with asthma and other respiratory diseases.
3. **PM**, released when fuels are incompletely burned, can lodge in the lungs and irritate or damage lung tissue.
4. **A number of pollutants, including radon and benzo(a)pyrene, both of which can cause cancer, attach to small particles** that are inhaled and then carried deep into the lung.

Note - Take special precautions when operating fuel-burning unvented space heaters. A persistent yellow-tipped flame is generally an indicator of maladjustment and increased pollutant emissions. While a fuel-burning space heater is in use, open a door from the room where the heater is located to the rest of the house and open a window slightly.

Open Waste Burning

1. Dioxin effects after 15 min of barrel burning*

Toxicological studies on dioxin showed the potential for health risks within 26 feet of the source of open burning from just 15 minutes of burning. **As the burning continues, the significant impact area widens.** If people in your community insist on home burning, **move the barrels** so that they are 50 ft (or more) from houses. Locate burnboxes far away, and keep people from the dump during a burn.

2. Barrel burning health risks from CCTHITA health study.****

Just 2 to 40 household burn barrels emit many of the most dangerous toxins at the same level as emitted from a 200-ton per day incinerator facility that serves 20,000 households. A healthy person may suffer non-specific reactions from burnboxes or barrels including burning eyes, headaches, nausea, fatigue, dizziness and other symptoms. Some may develop an allergic hypersensitivity if the dose is high enough. **People in four Alaska Native Villages who burned their trash near home were twice as likely to have a cough, from 5 to 17 times more likely to suffer faintness, and 5 to 10 times more likely to experience numbness, than people who didn't burn. The more often people burned the more likely they were to get the symptoms.**

Household Products and Health Effects via Air Exposure Pathways (inhalation and dermal absorption)

(Modified and expanded from Tennessee Valley Authority, Univ. of Tennessee Regional Waste Management Department)

In the Kitchen:		
Sample sources	**Contaminants**	**Possible health effects**
Chlorine bleach	Sodium hypochlorite, and if mixed with ammonia, releases toxic chloramine gas	Short-term exposure may cause mild asthmatic symptoms or more serious respiratory problems
Metal polishes	Petroleum distillates	Short-term exposure can cause temporary eye clouding; longer exposure can damage the nervous system, skin, kidneys, and eyes
Glass cleaner, all purpose cleaners	Ammonia	Eye irritant, can cause headaches and lung irritation
Disinfectants	Phenol and cresol	Corrosive; can cause diarrhea, fainting, dizziness, and kidney and liver damage
Furniture and floor polishes	Nitrobenzene	Skin discoloration, shallow breathing, vomiting, and death; associated with cancer and birth defects
Preservative in many products	Formaldehyde	Human carcinogen; strong irritant to eyes, throat, skin, and lungs
Under the Sink or in the Entryway:		
Sample sources	**Contaminants**	**Possible health effects**
Spot removers and carpet cleaners	Perchloroethylene or 1-1-1 trichloroethane solvents	Can cause liver and kidney damage if ingested; perchloroethylene is an animal carcinogen and suspected human carcinogen;
In mothballs	Naphthalene or paradichlorobenzene	Naphthalene is a suspected human carcinogen that may damage eyes, blood, liver, kidneys, skin, and the central nervous system; paradichlorobenzene can harm the central nervous system, liver, and kidneys;
Toilet bowl cleaner	Hydrochloric acid or sodium acid sulfate	Irritant, can burn lungs
Fabric softeners	Fragrances commonly used in them	Irritating to susceptible people
Spray starch	Formaldehyde, phenol, and pentachlorophenol; in addition, any aerosolized particle	Irritate the lungs
In the Living Room and Bedroom:		
Sample sources	**Contaminants**	**Possible health effects at elevated levels**
"Wrinkle-resistant" T-shirts, pants, clothes, iron sheets, bedding, curtrains, sleepwear – any woven fabric, especially polyester/cotton blends that are "easy care"	Formaldehyde	Eye, nose, and throat irritation; wheezing and coughing; fatigue; skin rash; severe allergic reactions. May cause cancer.
Pressed wood furniture (most modern furniture)	Formaldehyde and other chemicals	See above
Synthetic Carpets	Fungicides and pesticides	Tributyl tin oxide, a fungicide in carpets has been linked to asthma.

In the Bath.		
Sample sources	**Contaminants**	**Possible health effects**
Shampoos	Cresol, formaldehyde, nitrates/nitrosamines and sulfur compounds	Cresols: Acute inhalation exposure can result in respiratory tract irritation, with symptoms such as dryness, nasal constriction, and throat irritation. Mixed cresols are also strong dermal irritants. Possible carcinogen, cause reproductive effects in animals at high levels. Some people are allergic to Sulfur, mostly found in dandruff shampoos, causing respiratory distress.
Hair spray	Butane propellants, as well as formaldehyde resins	Exposure in confined areas, may result in light-headedness and irritation to respiratory tract
Soaps, dishwashing soaps	Triclosan	Virginia Polytechnic Institute found that triclosan reacts with chlorine molecules in tap water to form **dioxins** (which enter the air). Researchers believe that these chlorinated dioxins are forming in kitchen sinks across the country. The same study also found that the combination of tap water and triclosan produces significant quantities of **chloroform** (also entering the air), which is a probable human carcinogen
Antiperspirants and deodorants, soaps	Ammonia, formaldehyde, triclosan	Ammonia **-** Exposure to high levels of ammonia in air may be irritating to your skin, eyes, throat, and lungs and cause coughing and burns. Lung damage and death may occur after exposure to very high concentrations of ammonia. Some people with asthma may be more sensitive to breathing ammonia than others**.**
Creams, and moisturizers	Phenols, fragrance	Phenol: highly irritating to the skin, eyes, and mucous membranes, unknown as to whether it is a carcinogen.
In the Arctic Entryway or under the house A number of dangerous substances are frequently present, including kerosene, lubricating/motor oils, and gasoline.		
Sample sources	**Contaminants**	**Possible health effects**
Paint thinner	Chlorinated aliphatic and aromatic hydrocarbons	Cause liver and kidney damage
Gasoline, motor oils (petroleum hydrocarbon)	Benzene, toluene, ethylene, xylene, other contaminants	Skin and lung cancer
Oil-based paint	Mineral spirits	Skin, eye, nose throat, and lung irritant. High air concentrations can cause nervous system damage, unconsciousness and death
Paint thinner	Ketones	May cause respiratory ailments; vary according to specific form of the chemical
Wood putty	Ketones and toluene	Kidney, liver, central nervous system damage; may damage reproductive system

1. **Formaldehyde** Formaldehyde deserves a special mention for air pollutants because it is in many home products and it forms from secondary reactions from products and combustion sources. It has a very low threshold for health effects. Luckily, industry is creating products with lower concentrations of formaldehyde than before.

Formaldehyde is a colorless, pungent-smelling gas, can cause watery eyes, burning sensations in the eyes and throat, nausea, and difficulty in breathing in some humans exposed at elevated levels (above **0.1 parts per million**). High concentrations may trigger attacks in people with asthma. There is evidence that some people can develop a sensitivity to formaldehyde. It has also been shown to cause cancer in animals and may cause cancer in humans. Health effects include eye, nose, and throat irritation; wheezing and coughing; fatigue; skin rash; severe allergic reactions. Due to differences in modeling and data used, it is a *probable* carcinogen under EPA and a *known* carcinogen according to the International Institute for Research on Cancer.

The greatest source of formaldehyde in homes is thought to be from pressed wood products. Some studies suggest that **coating pressed wood products with polyurethane may reduce formaldehyde emissions for some period of time**. To be effective, any such coating must cover all surfaces and edges *and* remain intact. Be sure to ventilate well when applying the coatings. Increase the ventilation and carefully follow the manufacturer instructions while applying these coatings.

Washing permanent press (or "wrinkle-resistant") fabrics like clothes, sheets, etc. before using them reduces formaldehyde emissions by 60%.

2. **Attached Garage Studies – Arctic Entryway Similarities?** Arctic entryways have not been studied, but in many ways they are similar to garages – what is stored there (besides vehicles), and how they result in air flow into the house. A number of studies indicate **houses with attached garages result in higher levels of pollutants inside the home.** This is because there are pressure imbalances that make the pollutants seep into the house, and the garage is where people store petroleum products and machinery/engines with petroleum products, vehicle care products, etc. In 1996, Anchorage conducted a study of indoor air quality in 137 homes. Concentrations of benzene and other volatile organic products (VOCs) in Anchorage homes were 2 to 50 times higher than those out of doors and significantly higher than concentrations measured in similar studies conducted in US, Canada, and Europe. **Anchorage observed a strong association between indoor VOC concentrations and whether the home had an attached garage**.

3. **Citrus oil cleaners (UC Berkeley study):** Pollutants were measured during and after simulated cleaning activities, including mopping, general cleaning, and use of a plug-in air freshener. The investigators found that chemicals ***directly*** emitted from the products generally were not a problem, <u>but</u> indoor chemical **reactions did produce** a health concern. Using products that contained terpenes – the fragrance components of **pine and citrus oils** resulted in the **production of formaldehyde and ultrafine particles** (PM).

Again, Formaldehyde is a known human carcinogen and a respiratory irritant with a <u>very</u> low threshold for health effects. While health effects associated with the ultrafine particles generated during cleaning are not well understood, **exposure to PM from the outdoor environment is associated with a variety of health effects, including serious heart and lung disease and even premature death.**

So exposure to these citrus oil cleaners indoors could be a concern for individuals *cleaning in small enclosed areas, and individuals with pre-existing lung or heart disease*

The study found also that in high exposure situations, such as **cleaning multiple interior windows with limited ventilation, or cleaning a large surface area such as a shower stall in a small bathroom**, could lead to exposure to **2-butoxyethanol above health values**. *In winter-time, how many people open their windows?*

4. **VOC's indoors:** EPA found levels of about a dozen common organic pollutants (VOC's) to be **2 to 5 times higher inside homes than outside**, *regardless* of whether the homes were located in rural or highly industrial areas. Additional studies indicate that while people are using products containing organic chemicals, they can expose themselves and others to *very high pollutant levels, and elevated concentrations can persist in the air long after the activity is completed*. . Some organics can cause cancer in animals; some are suspected or known to cause cancer in humans. Common health effects at elevated levels can include Eye, nose, and throat irritation; headaches, loss of coordination, nausea; damage to liver, kidney, and central nervous system

   VOC's can release organic compounds while you are using them, and, to some degree**, even when they are stored.**

   Know the symptoms: Key signs associated with too much exposure to VOCs include eye irritation, nose and throat discomfort, respiratory irritation, headache, allergic skin reaction, nausea, fatigue, dizziness, visual disorders, and memory impairment.

   Health effect? The ability of VOCs to cause health effects varies greatly-- some are highly toxic, others have no known health effect. For most VOC's, not much is known about what health effects occur from the levels commonly found in homes.

5. **Indoor dust exposure study – how much does outdoor dust contribute?** (Clarkson and Stanford Universities): Nearly all the indoor exposure to PM was from dust re-suspended by human activities. Only 1-2% of the exposure was from the ambient outdoor PM levels. During days of low human activity in the home, still about 55% of the PM exposure was due to indoor human activity.

   Why does this matter? A "personal cloud" develops – meaning there is a much higher pm level near a person than what is measured in the room. Dusting showed very high personal exposure, and vacuuming was equivalent to 2 people walking in the room. So people who are more susceptible to respiratory illnesses should be extra careful when conducting or being near these activities.

6. **Carpets, chemicals, and vacuuming**. Studies conducted to look at the fraction of pesticides, PAHs, PCBs and dust in carpet versus recoverable dust in aged carpets (i.e. not new).
   - Pesticide residue increases markedly as the particle size of the dust decreases.
   - Highest dust loadings in the area sampled nearest the primary entrance into the home.
   - With few exceptions, the bulk of the pesticide residue, PAHs, PCBs were distributed primarily in the carpet fibers, binder, and padding (not the dust). So that these contaminants are not removable by vacuum.
   - 76% to 85% of the contaminants vacuumed were trapped in the paper fibers of the vacuum bags (i.e. associated with very fine particle sizes.

7. **Environmental tobacco smoke (ETS)** (or "second-hand smoke") Tobacco smoke contains , carbon monoxide, Carcinogens like polynuclear aromatic hydrocarbons, aromatic amines, nitrosamines, tar benzo(a)pyrene, vinyl chloride, formaldehyde, Co-carcinogens: catechol, phenol, cresol. ETS contains about 4,000 different constituents.

   The largest impact of exposure to ETS can be seen in children and their respiratory system. The risk for asthma is 2.5 times greater in young children with mothers who smoke more than 10 cigarettes a day indoors as compared to mothers who smoke less or not at all. Children of all ages who live in a home with smokers are 63% more likely to have asthma. Overall, exposure to ETS places children at increased risk for the development and exacerbation of asthma as well as sinusitis, otitis media, bronchiolitis, and diminished pulmonary function. In studies of maternal smoking during pregnancy, as little as 10 cigarettes per day have been associated with an increased risk of the child developing asthma later in life. In addition, the children of teenage mothers have a three-fold to five-fold increased risk of developing childhood asthma.

Store-bought Food – what are some additives that it contains?

The following list is from http://ific.org/publications/brochures/foodingredandcolorsbroch.cfm and **does not** include the pesticides, fungicides, fertilizers, hormones, etc. used to grow the food (residuals which can be in or on the food), nor the emissions created in producing and transporting it.

Types of Food Ingredients The following summary lists the types of common food ingredients, why they are used, and some examples of the names that can be found on product labels. Some additives are used for more than one purpose.			
Types of Ingredients	**What They Do**	**Examples of Uses**	**Names Found, on Product, Labels**
Preservatives	Prevent food spoilage from bacteria, molds, fungi, or yeast (antimicrobials); slow or prevent changes in color, flavor, or texture and delay rancidity (antioxidants); maintain freshness	Fruit sauces and jellies, beverages, baked goods, cured meats, oils and margarines, cereals, dressings, snack foods, fruits and vegetables	Ascorbic acid, citric acid, sodium benzoate, calcium propionate, sodium erythorbate, sodium nitrite, calcium sorbate, potassium sorbate, BHA, BHT, EDTA, tocopherols (Vitamin E)
Sweeteners	Add sweetness with or without the extra calories	Beverages, baked goods, confections, table-top sugar, substitutes, many processed foods	Sucrose (sugar), glucose, fructose, sorbitol, mannitol, corn syrup, high fructose, corn syrup, saccharin, aspartame, sucralose, acesulfame, potassium, (acesulfame-K), neotame
Color Additives	Offset color loss due to exposure to light, air, temperature extremes, moisture and storage conditions; correct natural variations in color; enhance colors that occur naturally; provide color to colorless and "fun" foods	Many processed foods, (candies, snack foods margarine, cheese, soft drinks, jams/jellies, gelatins, pudding and pie fillings)	FD&C Blue, Nos. 1 and 2, FD&C, Green No. 3, FD&C Red, Nos. 3 and 40, FD&C, Yellow, No. 5 (tartrazine), and No. 6, Orange B, Citrus Red, No. 2, annatto extract, beta-carotene, grape skin, extract, cochineal, extract or, carmine, paprika, oleoresin, caramel color, fruit and, vegetable juices, saffron (Note:, Exempt color, additives are not, required to be, declared by, name on labels, but may be declared, simply as colorings, or color added)
Flavors and Spices	Add specific flavors (natural and synthetic)	Pudding and pie fillings, gelatin dessert mixes, cake mixes, salad dressings, candies, soft drinks, ice cream, BBQ sauce	Natural, flavoring, artificial flavor, and spices
Flavor Enhancers	Enhance flavors already present in foods (without providing their own separate flavor)	Many processed foods	Monosodium glutamate (MSG), hydrolyzed soy protein, autolyzed yeast extract, disodium guanylate or inosinate
Fat Replacers (and components of formulations used to replace fats)	Provide expected texture and a creamy "mouth-feel" in reduced-fat foods	Baked goods, dressings, frozen desserts, confections, cake and dessert mixes, dairy products	Olestra, cellulose gel, carrageenan, polydextrose, modified food starch, micro-, particulated, egg white protein, guar gum, xanthan gum, whey protein, concentrate
Nutrients	Replace vitamins and minerals lost in processing (enrichment), add nutrients that may be lacking in the diet	Flour, breads, cereals, rice, macaroni, margarine, salt, milk, fruit beverages, energy bars,	Thiamine, hydrochloride, riboflavin, (Vitamin B2), niacin, niacinamide, folate or folic acid, beta carotene, potassium, iodide,

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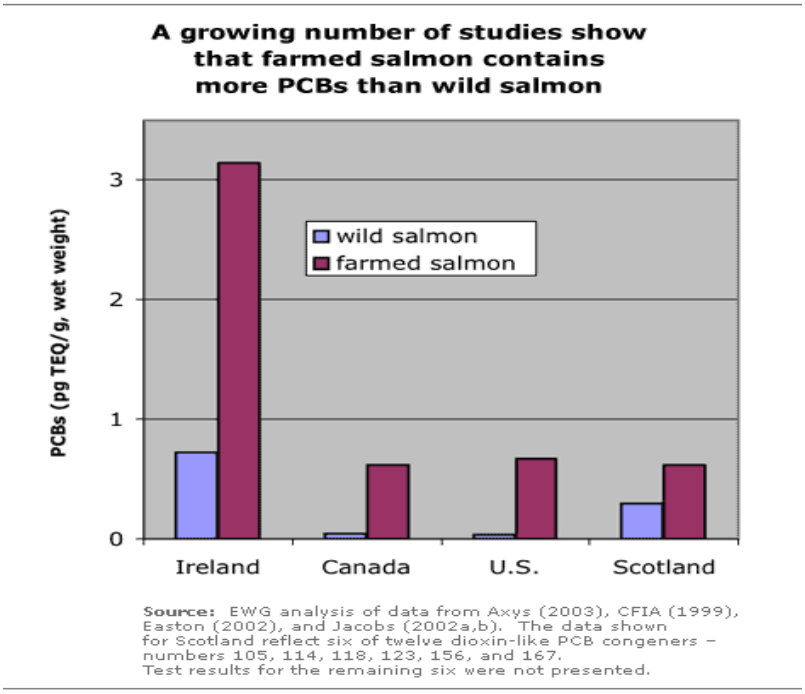
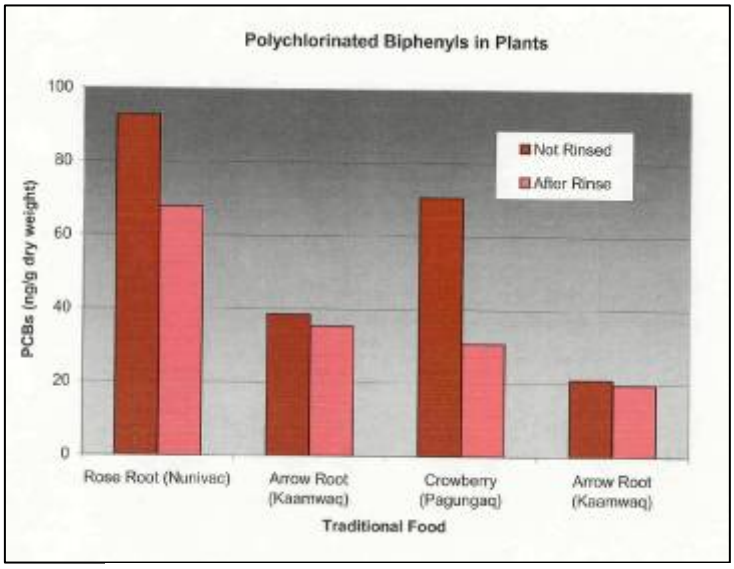
	(fortification)	instant breakfast drinks	iron or, ferrous sulfate, alpha tocopherols, ascorbic acid, Vitamin D, amino acids, (L-tryptophan, L-lysine, L-leucine, L-methionine)
Emulsifiers	Allow smooth mixing of ingredients, prevent separation, keep emulsified products stable, reduce stickiness, control crystallization, keep ingredients dispersed, and to help products, dissolve more easily	Salad dressings, peanut butter, chocolate, margarine, frozen desserts	Soy lecithin, mono- and, diglycerides, egg yolks, polysorbates, sorbitan monostearate
Stabilizers and Thickeners, Binders, Texturizers	Produce uniform texture, improve "mouth-feel"	Frozen desserts, dairy products, cakes, pudding and gelatin mixes, dressings, jams and jellies, sauces	Gelatin, pectin, guar gum, carrageenan, xanthan gum, whey
Leavening Agents	Promote rising of baked goods	Breads and other baked goods	Baking soda, monocalcium, phosphate, calcium, carbonate
Anti-caking agents	Keep powdered foods free-flowing, prevent moisture absorption	Salt, baking powder, confectioner's sugar	Calcium silicate, iron ammonium citrate, silicon dioxide
Humectants	Retain moisture	Shredded coconut, marshmallows, soft candies, confections	Glycerin, sorbitol
Yeast Nutrients	Promote growth of yeast	Breads and other baked goods	Calcium sulfate, ammonium phosphate
Dough Strengtheners and Conditioners	Produce more stable dough	Breads and other baked goods	Ammonium sulfate, azodi-, carbonamide, L-cysteine
Firming Agents	Maintain crispness and firmness	Processed fruits and vegetables	Calcium chloride, calcium lactate
Enzyme Preparations	Modify proteins, polysaccharides and fats	Cheese, dairy products, meat	Enzymes, lactase, papain, rennet, chymosin
Gases	Serve as propellant, aerate, or create carbonation	Oil cooking spray, whipped cream, carbonated beverages	Carbon dioxide, nitrous oxide

1. **Should air pollution concerns reduce subsistence activities to avoid contaminant health effects?** **NO.** Western science studies say the same thing as Alaska Native knowledge. Studies too numerous to mention show that eating subsistence foods is much more beneficial for physical health as well other types of health than eating store-bought foods.

2. Store food compared with subsistence foods: **Farmed salmon contains five to 10 times the PCBs** of wild salmon.



3. ***ACAT study of contaminated subsistence plants by a former defense site:*** Rinsing them first reduced PCB levels on crowberries by about 50%. It reduced PCB's in root plants not as much, but some. Since rinsing helped, this indicates **rinsing subsistence foods will reduce air-borne contaminants – (if there are any contaminants in the first place)**.



Provided by Alaska Community Action on Toxics (ACAT)

Data, data, where is the data for Villages?

Toxics Release Inventory data are reported by individual facilities, who send yearly reports to federal EPA on a form called "Form R". EPA converts these forms into an electronic database. A facility must only report to TRI if the facility:

- Has 10 or more full-time employees, and
- Manufactures or processes over 25,000 pounds of the approximately 600 designated chemicals or 28 chemical categories specified in the regulations, or uses more than 10,000 pounds of any designated chemical or category, and
- Engages in certain manufacturing operations in the industry groups specified in the U.S. Government Standard Industrial Classification Codes (SIC) 20 through 39, or
- Is a federal facility which are all now required to report per the August, 1995 Executive Order signed by President Clinton.

This reported information is available from the Toxics Release Inventory on the EPA website. So if you look up your city or borough, you are unlikely to see anything there.

If you go to:
http://yosemite.epa.gov/r10/extaff.nsf/0/e795f4fb1651910a8825657c006f8805?OpenDocument
you will see the data for Alaska for a large number of environmental media. Click on Air Quality. You can see how little data is available for Alaska Villages. Only Alaska's 3 largest cities were required to start an air monitoring program (Anchorage, Fairbanks, Juneau now have air quality indexes daily). Go to Air Quality. You won't find much for your village or region, but it is interesting to see the lack of data and what data is kept. The State DEC will be including estimates of Alaska Village emissions in its next emissions inventory.

2. Significance factor: Toss a coin ten times and see if it is heads or tails. You know the chance is 50% for heads. But you are just as likely to get 7 heads – which would mean your result would be 70%. Or you could easily get 3 heads, meaning your result from this study would be 30%. If you toss the coin 1,000 times or 10,000 times you will get closer and closer to 50% - the real result.

This is a basic explanation of why "scientists" don't want to conduct exposure studies in villages, and why there is not enough information about whether cancer rates are higher in villages. Western science relies on statistics. Just like the number of coin tosses, they need a very high number of people to make sure their results are not just by chance. They use the term significance. If a scientist says the results are not significant, it just means to them there were not enough "coin tosses" to tell. A village can say they have 70% cancer rates, but a scientist will think they did not have enough people ("coin tosses") to tell whether the village risk may actually be much less (i.e. 50%).

3. Money factor: Where Science gets done is politics and policy too. Politics means that lobbying and information by and from powerful, influential, or large groups of people will tend to draw research money to that topic because politicians will perceive it as a priority for the people they represent. Alaska Native Villages are a small population, but as federally-recognized Tribes,

populations with unique lifestyles, indigenous peoples, and in areas where climate change is having the most profound effect, their potential to influence research is may not be fully used. Also – agencies often want to channel their funds to where it will do the most good overall. In one type of thinking, this means conducting studies for the most common types of living situations to cover the most people.

4. Villages are just like cities factor: Here is a quote from the Alaska Rural Communities Emission Inventory (WRAP, ADEC 2007). This project looked at 10 AK rural cities and then made many assumptions based on the surveys received to calculate projected emissions:

> "In the **absence of information on the vehicle fleet characteristics in the rural communities, the vehicle age distribution and mileage accumulation were based on those found for Anchorage** in the Anchorage CO Maintenance Plan"

5. **Mass Does Not Equal Concentration** – The data that is available or can be developed by villages themselves is generally in mass – for example, pounds of PM. But what is of health effect concern is concentration and exposure (how/does it gets into humans). Concentration is the mass of pollutant for a given volume of air, like milligrams per cubic meter. Chemical characteristics, sunlight, weather, and other forces affect pollutant concentration in air.

Additional Good Resources:

Description	Website address
NAU has a great list of resources that includes many Alaska specific resources.	http://www4.nau.edu/eeop/iaq_resources.html
Air Quality in Alaska. You won't find much for your village or region at this site, but it is interesting to see the lack of data and what data is kept.	http://yosemite.epa.gov/r10/extaff.nsf/0/e795f4fb1651910a8825657c006f8805?OpenDocument
Comprehensive site for lots of air toxics information.	http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB
With the household products database, you can look up specific product types and it will give you the health effects and the compounds (doesn't have all products, but several of them).	http://hpd.nlm.nih.gov/products.htm
Inventory checklist at American Lung Association	http://iaq.aklung.org/
Region 10 Trial Air Quality site:	http://yosemite.epa.gov/R10/AIRPAGE.NSF/webpage/Tribal+Air+Program+Main+Page