

Center for Environmental Oncology University of Pittsburgh Cancer Institute

Frequently Asked Questions about Cancer and the Environment

The Center for Environmental Oncology of UPCI is serious about supporting you with the information you need—when you need it. The following links include answers to some of your most commonly asked questions about the links between cancer and the environment.

- [Cancer Myths and Facts](#)
 - [Cell Phone Use](#)
 - [Exercise and Your Health](#)
 - [Flame Retardants](#)
 - [Food and Diet](#)
 - [Gasoline Toxicity](#)
 - [Green Building](#)
 - [Hazardous Toxins](#)
 - [Household Products](#)
 - [Lowered Life Expectancy for Women, Obesity & the Environment](#)
 - [Occupational Exposures](#)
 - [Organic Foods](#)
 - [Pesticides](#)
 - [Plastics](#)
 - [Radiation](#)
 - [Smoking Toxicity](#)
 - [Water Pollution](#)
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Cancer Myths and Facts

By Devra Lee Davis, PhD, MPH, Director, Center for Environmental Oncology of UPCI and Ronald B. Herberman, MD, Director, UPCI & UPMC Cancer Centers

Recently, the media heralded good news with banner headlines & televised lead-in stories: Cancer death rates are going down! This is certainly true for all types of cancer combined. But, this is not true for a number of specific types of the disease, nor do African Americans share in the same declines as do whites. These FAQs explore some of the many myths vs. facts about cancer, the environment, & sound public policy.

- [Myth: Rates of Cancer Deaths, of all types and in all populations, are going down.](#)
- [Myth: Most cancers are genetic in nature so there's little we can do to protect ourselves.](#)
- [Myth: A small amount of a chemical carcinogen in a children's product isn't dangerous because the level is so low. Low doses of cancer-causing chemicals are safe because there is a threshold for cancer induction.](#)
- [Myth: We are protected, thanks to the FDA, which has established a recommended level of no more than 10 parts per million in consumer products.](#)
- [References](#)

Myth: Rates of cancer deaths, of all types and in all populations, are going down.

Total deaths from cancers indeed are declining in the United States. This is largely because fewer people are smoking and more are getting screened for polyps and curable stages of colo-rectal cancer. However, incidence, or new cases of cancer, is increasing for a number of specific types of cancer, including non-Hodgkin's lymphoma and childhood cancer. Childhood cancer is the second largest cause of death in children ages 0--15 in the United States (second only to accidents), and more than 8,000 new cases are diagnosed each year. While improvements in treatment have reduced deaths from childhood cancer, incidence rates increased nearly 21% between 1975 and 1998--approximately 1% each year and have continued to increase until at least 2003. This is not due to improved detection (or smoking or an aging population) but to unexplained environmental influences.

Race also plays an important role in cancer. The American Cancer Society reports that African-American men and women have 40% and 20% higher death rates respectively from all cancers combined when compared with whites. The use of hormone-containing personal care products is one possible explanation why young African American women get more breast cancer than do their white counterparts. Also, African Americans tend to live and work in more polluted areas than do other people. While one in eight Americans is African American, one in two African Americans works in a lower paying field and in jobs, such as sanitation, which put them at increased exposure to toxins.

Myth: Most cancers are genetic in nature so there's little we can do to protect ourselves.

In fact, the National Cancer Institute reports that only about one in ten cases of breast cancer occur in a woman born with a genetic risk of the disease. An expert panel convened by Mt. Sinai Hospital recently

concluded that genetic predisposition accounts for no more than 20% of all childhood cancers and that between 5% and 90% of childhood cancer, depending on its type, could be attributed to environmental exposures.

This means that a potentially large percentage of childhood cancers are preventable. One study of pesticide exposures testifies to the detrimental effects of toxic chemicals on children's health, specifically in relation to cancers. In this study, children with leukemia were 4 to 7 times as likely to have been exposed to pesticides used in the yard or garden compared to children without the disease. Another study found that children with leukemia were 11 times as likely to have mothers who were exposed to pesticide sprays or foggers during pregnancy compared to healthy children.

A report released by the Lowell Center for Sustainable Production concluded that instituting measures to reduce parental and childhood exposures to these and other substances suspected of causing cancer, including development of safer substitutes, should play an important role in a cancer prevention strategy.

Myth: A small amount of a chemical carcinogen in a children's product isn't dangerous because the level is so low. Low doses of cancer-causing chemicals are safe because there is a threshold for cancer induction.

When experimental animals are tested at the lowest parts per billion level-over the animal's lifetime-they develop cancer. The levels found in some children's bathing products are one thousand times greater and measured in parts *per million*. The gold standard for cancer protection widely used by federal agencies is that an isolated chemical should not be estimated to cause more than one excess cancer per one million persons. This is called a one-in-one-million risk.

However, cancer risks from exposure to cancer-causing chemicals in several products substantially exceed this gold standard. Results from an independent chemical testing laboratory, released a month ago, found a probable human carcinogen, 1,-4 dioxane (also known as para-dioxane) in some common children's shampoos at levels higher than those recommended by the US Food and Drug Administration. The Environmental Working Group, www.ewg.org, a research and advocacy organization that ran the study, estimates that more than a quarter of all personal-care-products sold in the United States may contain this cancer-causing agent.

In a February 2007 *Newsweek* article, Center for Environmental Oncology director Devra Lee Davis wrote, "The presence of a cancerous agent at levels above those suggested by the FDA is disturbing enough. The idea that such a compound exists at any amount in any products that can be in regular contact with babies' skin is even more disconcerting. Scientists have long known that certain chemicals like para-dioxane can cause cancer...Now we're beginning to realize that the sum total of a person's exposure to all the little amounts of cancerous agents in the environment may be just as harmful as big doses of a few well-known carcinogens."

The combined effects of our lifetime exposure to a mixture of cancer-causing chemicals can create synergistic effects so what may look like low exposure levels for any one compound adds up and even multiplies.

Myth: We are protected, thanks to the FDA, which has established a recommended level of no more than 10 parts per million in consumer products.

David Steinman's research, discussed in his book *Safe Trip to Eden* and additional studies after the book was published, shows that at least 15 percent of cosmetic products with 1,4-dioxane exceed the FDA recommended upper limit. But since these so-called limits are only voluntary, companies not meeting them face no consequences from the federal government.

Within a day of the Newsweek article appearing, ATSDR withdrew from its website the toxicological profile of 1, 4-dioxane. The revised posting as of April, 2007 says, "In February, 2007, ATSDR, [an agency charged with evaluating toxic hazards,] was informed by the Director of the Food and Drug Administration's (FDA) Office of Cosmetics and Colors, that an error was present in the Public Health Statement of the toxicological profile. The FDA pointed out to ATSDR that the FDA had not recommended a limit for 1, 4-dioxane in cosmetic products." In fact, the only FDA recommendation about 1, 4-dioxane pertains to levels in adhesives and food additives.

The ATSDR revised notice advises consumers to read labels:

1, 4-dioxane may be a contaminant in cosmetics, detergents, and shampoos that contain the following ingredients (which may be listed on the product label): "PEG," "polyethylene," "polyethylene glycol," "polyoxyethylene," "-eth-" or "-oxynol-."

*Most manufacturers remove 1, 4-dioxane from these ingredients to concentrations recommended by the FDA as safe. Thus, most products on the market today contain 1,4-dioxane in very small amounts or not at all. However, some cosmetics, detergents, and shampoos may contain 1, 4-dioxane at levels higher than recommended by the FDA. Because products contaminated at concentrations higher than the FDA-recommended levels are not possible to determine without testing, families should avoid using products containing the ingredients listed above unless the manufacturer can guarantee that 1, 4-dioxane is below the FDA-recommended level.

In 1992, 1, 4-dioxane was listed as a banned ingredient in cosmetics. But, in 2001, FDA scientists reported finding increased levels in a number of consumer products. Within the past few years, the European Union has banned the use of para-dioxane in all personal care products and recently initiated a recall of any contaminated products, including a number of children's bath products.

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Questions and Answers: Electromagnetic Fields and Our Health

*Reviewed by Dr. Om P. Gandhi, Professor and Chairman, Department of Electrical Engineering, University of Utah, Salt Lake City**

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1. [Do cell phones cause brain cancer?](#)
2. [How can cell phones cause cancer, since they don't directly damage DNA or break chemical bonds?](#)
3. [Why should I be concerned about how I use my cell phone?](#)
4. [Do all phones emit the same amount of electromagnetic radiation?](#)
5. [I have to carry my cell phone with me at all times, what should I do to limit my exposure?](#)
6. [Is there anything I can do to help reduce the risk of electromagnetic fields when I'm talking on the phone?](#)
7. [How far from the body should I hold the phone?](#)
8. [Is text messaging a safer alternative to talking on the phone?](#)
9. [Is it safe for my child to use a cell phone?](#)
10. [If some of the research suggests that long term cell phone use may have health effects are countries urging caution?](#)
11. [Why don't we have proof that cell phones are dangerous?](#)
12. [Why do so many studies on cell phones and cancer not show a link between cancer and cell phone use?](#)
13. [Why is the concern over cell phones only now being raised?](#)
14. [What are other sources of electromagnetic radiation that may be of concern?](#)
15. [What about the dangers from cell tower antennas?](#)
16. [Can studies be important if they do not achieve statistical significance?](#)
17. [Why is statistical significance not the only criteria to interpret the study results?](#)

[References](#)

1. Do cell phones cause brain cancer?

We don't know. But, we're concerned. Cell phone industry studies show that cell phone radio frequency signals are absorbed into the brain—and that they reach deeply into the brains of children.

Studies in some countries that have used cell phones for a decade or longer have found that regular users of cell phones and cordless phones have doubled the risk of brain cancer. One preliminary study even found that those who started using cell phones as teenagers have five times more brain cancer by age 29.

2. How can cell phones cause cancer, since they don't directly damage DNA or break chemical bonds?

You can get cancer without DNA damage.

Cancer is a complex disease that occurs when cells lose their ability to stay in order. Scientists know that cancer results from many different types of damage to our bodies that take place over a long period in a multi-step process. The disease can begin with damage to the basic building blocks underlying all living cells--our DNA. When DNA is damaged, cells can get signals to grow without controls, which can lead to more than 200 forms of cancer. But sometimes the disease occurs without direct genetic damage to our DNA, as for instance when asbestos is inhaled deeply into the lung causing inflammation that triggers cancer several decades after exposure started.

For many types of cancer direct DNA damage can start the cancer process by causing our healthy genes to lose their ability to repair the sorts of damage that happen everyday through sunlight and other normal parts of modern life. Genes that usually suppress abnormal cell growth can get switched off, while those that boost dangerous growth can get turned on.

In addition to direct genetic damage, studies have shown that cancer genes can be affected by factors that have nothing to do with DNA. There is growing evidence that chemicals and physical agents such as electromagnetic fields can also affect the chances that cancer will occur either by damaging the capacity of the immune system to fend off damage or through some other path that damages the proteins that usually keep our bodies in balance.

The data on cell phone use and cancer is incomplete and inconsistent at this moment, but some studies do show that cell phone radiation has the capacity to disturb normal cells and the cell phone industries own studies show that the cell signal is absorbed deeply into the brains of children, and up to 2 inches into an adult skull. Some studies of populations that have used cell phones for longer periods of time have found some increased risk of serious brain tumors, while others have not. More research is needed to determine if cell phones cause cancer and, if it does, exactly how this happens. But, because brain tumors can take several decades to arise, the absence of conclusive evidence at this time should not be misconstrued as proof that there is no problem.

3. Why should I be concerned about how I use my cell phone?

Manufacturers report that cell phones emit electromagnetic radiation that can penetrate the brain. It can take a decade or more for brain cancer and other serious diseases to develop. Ten years ago about

one in four people used cell phones; today nearly nine out of every ten do. At this time, we can not say definitively whether cell phones are safe or not. However, a growing body of evidence, from countries where phones have been used for a long time, suggests that decade-long use of cell phones may increase the risk of developing serious health problems like cancer.

4. Do all phones emit the same amount of electromagnetic radiation?

No, not all phones are the same. You should choose a device with the lowest SAR possible (SAR = Specific Absorption Rate, which measures the strength of the magnetic field absorbed by the body) compatible with your type of usage (lower SAR phones emit fewer electromagnetic radiations but will not work as well in remote areas). SAR ratings of contemporary phones manufactured by different manufacturers are available by searching for "SAR ratings cell phones" on the internet.

5. I have to carry my cell phone with me at all times, what should I do to limit my exposure?

If you must carry your cell phone on you, it is preferable that the keypad is positioned toward your body and the back is positioned toward the outside of your body. Depending on the thickness of the phone this may provide a minimal reduction of exposure. You can also put the phone on "off-line" mode which stops the electromagnetic field and turn it on when you need to use it. In addition, avoid keeping your phone near your body at night (like under a pillow or on a bedside table). Be especially cautious if you are pregnant or trying to become pregnant.

6. Is there anything I can do to help reduce the risk of electromagnetic fields when I'm talking on the phone?

Yes. Try to keep the phone away from your body. You should switch sides regularly while communicating on your cell phone to spread out your exposure. Before putting your cell phone to the ear, wait until your correspondent has picked up. This limits the power of the electromagnetic field emitted near your ear and the duration of your exposure.

Whenever possible, use the speaker phone mode, or a hands-free kit equipped with an air tube inserted in last few inches nearest your ear piece. A wireless Bluetooth earpiece, using an infra-red signal, produces only 1/100th of the electromagnetic field of a normal cell phone.

7. How far from the body should I hold the phone?

The farther the phone is from the head, the weaker the signal that reaches the brain. If you hold it one millimeter away the signal has 1/4 the strength. At four millimeters, about a quarter of an inch - the signal is 1/16 as strong - this is because the strength of the signal drops off as the square of the distance.

8. Is text messaging a safer alternative to talking on the phone?

Yes. Texting will limit the duration of your exposure as well as increase the distance between your head and the phone. Both of these actions reduce the strength of electromagnetic radiation you receive. However, only choose text messaging when it is safe to do so. *Never text message while driving.*

9. Is it safe for my child to use a cell phone?

You should not allow children to use a cell phone except in emergencies. The developing organs of a fetus or a child are the most sensitive to any possible effects of exposure to electromagnetic fields. A

child's brain doubles in the first years of life. Studies by expert engineers should that the electromagnetic field reaches much more deeply into a child's brain than an adult's.

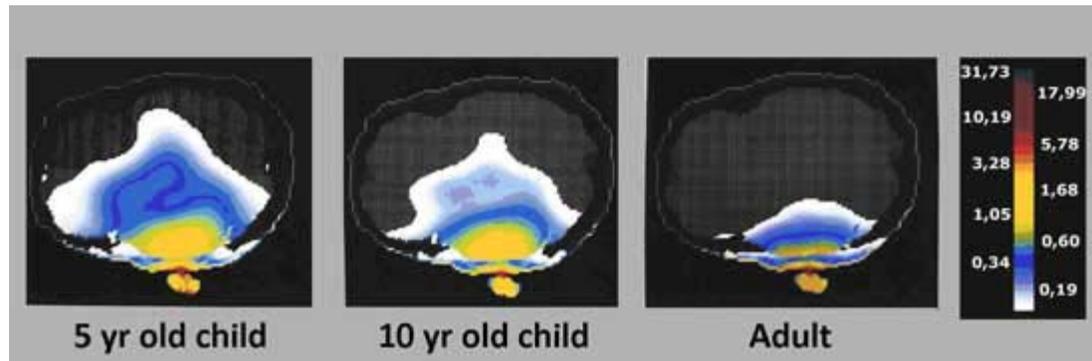


Figure 1. Model estimate of the absorption of electromagnetic radiation from a cell phone based on age (Frequency GSM 900 Mhz) (On the right, color scale showing the Specific Absorption Rate in W/kg) used with permission of Om P. Gandhi, University of Utah and the Institute of Electrical and Electronics Engineers, Inc., NY [1]

Because of the brain's smaller size and thinner skull the model predicts that significantly more electromagnetic radiation will be absorbed by the brain of a five year old compared with a fully developed adult sized brain.

10. If some of the research suggests that long term cell phone use may have health effects are countries urging caution?

In the U.S., the Federal Drug Administration (FDA) has recommended placing more distance between your body and your phone or using a headset to reduce your expose to electromagnetic radiation. [2]

In fact, the governments of other nations, including France, India, Canada, and Israel have all issued warnings about the dangers of electromagnetic fields emitted from cell phones.

11. Why don't we have proof that cell phones are dangerous?

Human studies on cell phone use are not definitive—yet. Because increased use by large groups of people is a relatively new phenomenon, and because many of the health problems we are concerned about can take decades or longer to develop, we are not yet able to evaluate their long term impact on health. More studies are needed to clarify the magnitude of the risk. With expert scientists at M D Anderson, the National Institute of Environmental Health Sciences and elsewhere, we are requesting that the cell phone companies provide scientists independent access to cell phone use records so that appropriate studies to evaluate cell phone use and health effects can be carried out.

12. Why do so many studies on cell phones and cancer not show a link between cancer and cell phone use?

Many of the negative studies on this topic have design flaws that underestimate the risk. For example, an often cited Danish study started out with 700,000 cell phone users and excluded more than 200,000 who used cell phones for business purposes. Business persons are much more likely to be heavy users of

cell phones. This same study defined someone as a "regular cell phone user" when he or she only uses the phone one time a week for six months. It is important to include all users, especially long-term and heavy users of cell phones, to obtain the best possible data. Moreover, most of the negative studies did not adjust for the use of cordless phones, which emit radiofrequency signals, and are commonly used.

In general, most of the studies do not have a sufficient study period to evaluate the risk for long-term cell phone uses. In addition, few studies have asked about cordless phone use and cordless phones also emit radiofrequency signals.

13. Why is the concern over cell phones only now being raised?

Cell phone use has exploded over the past decade. Today, more than 9 out of 10 Americans and Western Europeans use a cell phone. More children and teenagers are using cell phones on a regular basis. It would be unwise to take a "watch and wait" attitude. We waited for too long to act on the dangers of tobacco and asbestos.

14. What are other sources of electromagnetic radiation that may be of concern?

Wi-Fi and cell towers are so prevalent in urban, suburban, and rural areas it is nearly impossible for someone to avoid exposure to electromagnetic radiation. Additional research on our exposures from these sources is also needed.

15. What about the dangers from cell tower antennas?

We need to continue our research on the potential dangers associated with cell antenna electromagnetic emissions. The US standard for cell towers is currently set at (580 $\mu\text{W}/\text{cm}^2$)—which is more than a 50 times higher than that of many other nations.

One point to keep in mind is several countries, including Russia (10 $\mu\text{W}/\text{cm}^2$), Italy (10 $\mu\text{W}/\text{cm}^2$), China (6 $\mu\text{W}/\text{cm}^2$), and Switzerland (4 $\mu\text{W}/\text{cm}^2$), have significantly lower permissible levels of exposure.

16. Can studies be important if they do not achieve statistical significance?

When we look at patterns in human populations of any age-group, we rely on two basic principles to see whether what we observed is important. First, where the differences between any two groups are big, they are less likely to be random. Big differences delight epidemiologists, precisely because they are so unusual in public health. When they occur, they tend to signal something important is going on. Second, your chances of finding a difference are greater the more times or things you observe. This is called the law of large numbers. The two principles are related: the larger the sample that you get to look at, the smaller a real observed difference can be found. Roughly speaking, statistical testing asks whether the differences that are seen are not just some fluke. If it is pretty unlikely that the difference would have arisen by chance alone, then the difference is called "statistically significant."

For large populations, like those of industrial countries with hundreds of millions of citizens with common exposures, what is significant in statistics may be a small number but a very big deal. For instance, a 10 percent increase in deaths from current patterns of air pollution for persons living in the most polluted areas of industrial nations today translates in the United States into about 60,000 extra deaths a year. An extra death is one that we would expect not to happen if people had lived under other

conditions. All the statistical modeling in the world does not change the loss entailed in personal tragedies. Yet it does allow us to grasp that deaths and births are part of larger patterns.

Adapted from Devra Davis, The Secret History of the War of Cancer, Chapter 7, Page 187.

17. Why is statistical significance not the only criteria to interpret the study results?

How do we know whether the differences in lung cancer or heart disease between smokers and nonsmokers are incidental? We calculate the odds that you would see a difference between groups at least as big as the one you actually obtain. This probability is called the p-value. P can range from 0 to 1. A value of 1 means there is a 100 percent chance that the findings are inadvertent; 0.5 indicates there is a fifty-fifty chance the findings are accidental; and 0.05 signifies that there is only a 5 percent chance, or one in twenty, that the findings are just random. According to scientific convention in public health research, a value of 0.05 is usually accepted as statistically significant. But this is merely a convention. In physics the upper limit for statistical significance is $p = 0.1$, meaning there is a 10 percent chance the results could have happened randomly. Public health scientists accept a p of 0.05, not because this is a magic number but because this is the one expert have agreed to. What if the p is 0.06 or 0.09? That's where judgment becomes important.

Public health importance should not be confused with statistical significance. You can have one without the other. Where small numbers of persons or very rare events are involved, using the p-value alone may be plain wrong. In these situations, epidemiologists sometimes rely on "confidence intervals" that are calculated to show the values that are likely to have occurred. Basically a confidence interval lets us know the range within which a given result is likely to fall about 95 percent of the time. In other words, there's just a 0.05, or one in twenty, chance the result falls outside that range. Another thing public health scientists look for when deciding whether they have found a true connection between the environment and health is any evidence that with more exposure you get a stronger effect. This is referred to as a relationship between dose, or the amount of exposure, and the risk of the response, or the health endpoint under study. For instance, we know that those who smoke two packs of cigarettes a day tend to get sicker sooner and die younger than those who smoke one pack a day. But the real world throws us lots of curve balls. It turns out, for instance, that those who smoked four packs a day in the 1950s actually lived longer than those who smoked a bit less. The reasons are pretty clear. Anyone with lungs and a heart capable of sustaining the continual bombardment of so much smoking probably had some resistance to these toxins. Even smoking, one of the nastiest and most important environmental hazards we know of, doesn't kill everyone.

Adapted from Devra Davis, The Secret History of the War of Cancer, Chapter 7, Page 188-189.

*These Frequently Asked Questions have been reviewed by Dr. Om Gandhi, University of Utah.

Dr. Om P. Gandhi is Professor and Chairman, Department of Electrical Engineering at the University of Utah, Salt Lake City. He is the author or co-author of several book chapters, and journal articles on electromagnetic dosimetry, microwave tubes, and solid-state devices. He also edited the book,

Biological Effects and Medical Applications of Electromagnetic Energy (Prentice-Hall, 1990) and co-edited the book *Electromagnetic Biointeraction* (Plenum Press, 1989).

Dr. Gandhi was elected a Fellow of the IEEE in 1979 and received the Distinguished Research Award from the University of Utah for 1979-1980. He has been President of the Bioelectromagnetics Society (1992-93), Cochairman of the IEEE SCC 28.IV Subcommittee on the RF Safety Standards (1988-), and Chairman of the IEEE Committee on Man and Radiation (COMAR) for 1980-1982. In 1995, he received the d'Arsonval Medal of the Bioelectromagnetics.

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 2. <http://www.fda.gov/cellphones/qa.html#3>
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FAQs: Exercise and Your Health

- [Why should I be active?](#)
- [Can a lack of physical activity hurt your health?](#)
- [Why is America less active today as compared to 40 years ago?](#)
- [What does it mean to be physically fit?](#)
- [Why is physical activity so important for children?](#)
- [What and how much physical activity is recommended for a healthy individual?](#)
- [What are different examples of physical activity?](#)
- [Are there any risks to being more physically active?](#)
- [How does physical activity relate to mental health and mental ability?](#)
- [Does regular physical activity lower the risk of cancer?](#)
- [What level of physical activity is needed to be truly beneficial?](#)
- [How are obesity and cancer related?](#)
- [How can you prevent the risk of cancer and obesity?](#)
- [What are the statistics of being obese and getting cancer? What is the mortality rate?](#)

Why should I be active?

As quoted by Dr. Ken Copper, the father of aerobics, "It's easier to maintain your health than regain it." Physical activity has many health benefits. Some examples include:

- reduces the risk of developing coronary heart disease
- reduces the risk of stroke
- lowers the risk of developing high blood pressure
- reduces the risk of developing colon cancer
- reduces feelings of depression and anxiety
- promotes psychological well-being and reduces feelings of stress
- helps build and maintain healthy bones, muscles, and joints
- active people have lower premature death rates than people who are the least active.

Can a lack of physical activity hurt your health?

There is supporting evidence that shows those who are not physically active are not improving their health, but may actually be hurting it. Regular physical activity has been shown to reduce the morbidity and mortality from many chronic diseases.

Unknown, (2007, May 22). [Why should I be active?](#) Retrieved October 31, 2007, from Centers for Disease Control and Prevention Web site.

Why is America less active today as compared to 40 years ago?

With changes in technology, physical labor is not needed like it was. In the past, people engaged in regular, moderate to vigorous, physical activity when it came to performing their jobs, household chores, and even traveling. Today, machines do most of the work that used to be done by hand and buses and cars have replaced walking and cycling. While some still remain active through recreational activities, many spend much time in sedentary recreations, such as watching television or using home computers.

World Cancer Research Fund/American Institute for Cancer Research. Food, nutrition, physical activity, and the prevention of cancer: a Global perspective. Washington DC: AICR, 2007.

What does it mean to be physically fit?

It is more than being able to run long distances or lift a lot of weight at the gym. Being fit is not defined just by what kind of activity you do, how long you do it, or at what level of intensity. While these are important measures of fitness, they only address single areas. Overall fitness is made up of five main components:

- [Cardio-respiratory endurance](#)
- [Muscular strength](#)
- [Muscular endurance](#)
- [Body composition](#)
- [Flexibility](#)

Unknown, (2007, May 22). [Components of physical fitness](#). Retrieved November 5, 2007, from Centers for Disease Control and Prevention Web site.

Why is physical activity so important for children?

Increased physical activity has been associated with an increased life expectancy and decreased risk of cardiovascular disease. Physical activity produces overall physical, psychological and social benefits. Inactive children are likely to become inactive adults.

Unknown, (2007). [Exercise \(physical activity\) and children](#). Retrieved November 5, 2007, from American Heart Association Web site.

What and how much physical activity is recommended for a healthy individual?

For health benefits to the heart, lungs and circulation, it is suggested to participate in any moderate-to-vigorous-intensity aerobic activity for at least 30 minutes on most days of the week at 50-85 percent of your maximum heart rate. What's important is to include physical activity as part of a regular routine. Activities that are particularly beneficial when done on a regular basis include brisk walking, hiking, stair-climbing, aerobic exercise, jogging, running, bicycling, swimming and activities such as soccer and basketball that include continuous running.

Unknown, (2007). [Physical activity](#). Retrieved November 5, 2007, from American Heart Association Web site.

What are different examples of physical activity?

Performing manual labor, household work by hand, walking, and cycling are forms of vigorous to moderate physical activity. Exercise and other forms of physical training, such as sports which increase oxygen uptake and improve cardiovascular function; or anaerobic activity, such as lifting weights which increases muscle strength and mass, are types of recreational physical activity. Sitting, standing, and other light physical activity intrinsic to normal waking life, such as stretching, fidgeting, and maintaining postures, are also forms of physical activity.

World Cancer Research Fund/American Institute for Cancer Research. Food, nutrition, physical activity, and the prevention of cancer: a Global perspective. Washington DC: AICR, 2007.

Are there any risks to being more physically active?

Persons with known cardiovascular disease or who have already experienced a major cardiovascular event, such as a heart attack, stroke, or heart surgery, should have a physical evaluation by their physician before beginning even a moderate physical activity program. However, other than in those cases, most adults do not need to consult their physicians before engaging in moderate-intensity physical activity. The most common risk associated with physical activity is injury to the musculoskeletal system-the bones, joints, tendons, and muscles. These injuries are usually not serious, often require no treatment other than a few days of rest, and can be minimized by taking sensible precautions such as gradually working up to the desired level of activity and by avoiding excessive amounts of exercise at one time.

Unknown, (2007, May 22). [Risks to being active](#). Retrieved November 5, 2007, from Centers for Disease Control and Prevention Web site.

How does physical activity relate to mental health and mental ability?

Physically active people tend to have better mental health, according to the 1996 U.S. Surgeon General's Report on Physical Activity and Public Health. Compared with inactive people, the physically active had higher scores for positive self-concept, more self-esteem and more positive "moods" and "affects." More-active people also seem to score higher on perceived ability to perform activities of daily living, physical well-being and other measures related to quality of life. A few studies even suggest that more-active lifestyles may be linked with higher levels of alertness and mental ability, including the ability to learn.

Unknown, (2007). [Exercise \(physical activity\), mental health and mental ability](#). Retrieved November 5, 2007, from American Heart Association Web site.

Does regular physical activity lower the risk of cancer?

Observational studies have examined the possible association between physical activity and the risk of developing colon cancer. In 2002, a major review of observational trials found that physical activity reduced colon cancer risk by 50 percent. This risk reduction occurred even with moderate levels of physical activity. For example, one study showed that even moderate exercise, such as brisk walking for 3 to 4 hours per week, can lower colon cancer risk.

What level of physical activity is needed to be truly beneficial?

According to the 2007 report, *Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective*, regular, sustained physical activity protects, or may protect, against cancers of the colon, breast (postmenopausal), and endometrium. There is limited evidence to what specific type or degree of physical activity is sufficient. Nevertheless, to prevent these cancers, overall evidence supports the idea that the more physically active people are, the better. This does, however, exclude extreme levels of activity.

World Cancer Research Fund/American Institute for Cancer Research. Food, nutrition, physical activity, and the prevention of cancer: a Global perspective. Washington DC: AICR, 2007.

How are obesity and cancer related?

Obesity is associated with an increased risk for some types of cancer including gall bladder and prostate. In addition, obesity and physical inactivity may account for 25 to 30 percent of several major cancers including colon, breast (postmenopausal), [endometrial](#), kidney, and cancer of the esophagus.

How can you prevent the risk of cancer and obesity?

Preventing weight gain can reduce the risk of many cancers. Experts recommend that people establish and maintain habits of healthy eating and physical activity early in life to prevent becoming overweight and obesity. It is recommended that for those who are already overweight or obese to avoid additional weight gain, and to lose weight through a low-calorie diet and exercise. A weight loss of only 5 to 10 percent of total weight can provide health benefits.

What are the statistics of being obese and getting cancer? What is the mortality rate?

It was reported in *Cancer Detection and Prevention* that about 41,000 new cases of cancer in the United States were estimated to be due to obesity in 2002. This means that about 3.2 percent of all new cancers are linked to obesity. A recent report from the *New England Journal of Medicine* estimated that, in the United States, 14 percent of deaths from cancer in men and 20 percent of deaths in women were due to overweight and obesity.

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The Problem: Toxic flame retardants in furniture threaten the health of humans, the environment, and wildlife

Exposure to brominated and chlorinated flame retardants pose a risk to children's health

In 1977, brominated Tris, which had been used to make children's sleepwear fire resistant, was banned after it was found to be carcinogenic in animal tests and to leach into children's bodies. Its replacement, chlorinated Tris, was also later banned after it was found to be a mutagen, meaning it changed DNA. Today, chlorinated Tris is the second most-used fire retardant in furniture, and was recently deemed by the Consumer Product Safety Commission to be "a probable human carcinogen based on sufficient evidence in animals."

Watch the recent CBS Evening News segment about [fire retardant chemicals in consumer products](#) and a segment that discusses a [possible ban on fire retardants in some states](#).

Brominated fire retardants bioaccumulate in people and animals

PBDEs have increased 40-fold in human breast milk since the 1970s. Women in North America on average have ten times the levels of women in Europe or Asia. PBDEs have the potential to disrupt thyroid hormone balance and contribute to a variety of neurological and developmental deficits, including low intelligence and learning disabilities. Recent studies found that pet cats in the U.S. have very high levels of PBDEs in their blood. Researchers identified an association between the PBDEs in cats and hyperthyroidism. This is a new disease in cats that emerged around 1980 soon after PBDEs began to be used in significant quantities, and is now the second most common disease in cats.

Firefighters have higher risk for some cancers

When toxic fire retardants burn cancer-causing dioxins are formed. In November 2006, the Journal of Occupational and Environmental Medicine published an analysis of 32 studies that found that fire fighters have significantly elevated rates of four types of cancer: multiple myeloma, non-Hodgkin's lymphoma, prostate, and testicular cancer, likely resulting from chemicals exposures at burn sites. [Read more >](#)

Alternatives: Fire-safety without toxics

Equally fire-safe alternatives are available

Affordable, less toxic flame retardants are available. Alternatives include inherently flame resistant metals and woods, naturally flame resistant barriers, and additives including silicon, boric acid, and phosphates.

More fire-retardant chemicals doesn't mean fewer fire deaths

An analysis of fire data from 1980 to 2002 shows that, among the eight most populated states in the U.S., the rate of reduction of fire deaths in California, the only such state that has regulations leading to the use of fire retardant chemicals, is nonetheless similar to seven other states that do not regulate the flammability of furniture.

Fire fighters

Due to elevated levels of cancer among fire fighters, the California Professional Fire Fighters supports AB 706. In addition, the International Association of Fire Fighters as well as many state fire associations support new laws in Washington, Maine, Minnesota, Illinois and other states that would ban the use of certain brominated or chlorinated fire retardants.

THE SOLUTION: Smarter Regulation = More Safety

AB 706 - The California Furniture Safety and Fire Prevention Act will:

1. Provide the furniture industry more options for creating affordable and even safer products;
2. Create opportunities for green chemistry innovation;
3. Reduce workplace exposure to toxic chemicals for furniture industry workers and fire fighters;
4. Protect the health of future generations by banning toxic brominated and chlorinated chemicals from products that come in direct contact with our families.

Supporters

- Bluewater Network/Friends of the Earth (co-sponsor)
- MOMS - Making Our Milk Safe (co-sponsor)
- Breast Cancer Fund
- Breast Cancer Action
- California Labor Federation
- California Professional Firefighters
- California State Firefighters' Association
- Center for Environmental Health
- Coalition For A Safe Environment
- Consumer Attorneys of California
- Commonweal
- Consumer Federation of California
- Environmental Working Group
- Episcopal Diocese of California
- Firefighters Burn Institute
- Healthy Children Organizing Project
- MomsRising.org

- Natural Resources Defense Council
- The Ocean Conservancy
- Oceana
- Physicians for Social Responsibility
- Planning and Conservation League
- Sacramento Area Fire Fighters Local 522
- San Francisco Fire Fighters Local 798
- Sierra Club
- Silicon Valley Toxics Coalition
- The Trauma Foundation

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Dr. Arlene Blum's Publications on Flame Retardants

1. [The fire retardant dilemma](#) - Science 318(5848):194b-195.
2. November 2006 Op-ed in the New York Times - [Fire Retardant Chemicals](#)
3. 2005 study on [Body Burden of Toxic Chemicals](#) - as reported in the Oakland Tribune
4. Flame-retardant Additives as Possible Cancer Hazard [\(PDF\)](#)
5. Another Flame Retardant, Tris-(1,3-dichloro-2-propyl)-phosphate and it's Expected Metabolites are Mutagens [\(PDF\)](#)
6. Children Absorb Tri s-BP Flame Retardant from Sleepwear [\(PDF\)](#)

Related Publications

1. Toxic Dilemma [\(PDF\)](#) Editorial by Donald Kennedy - Science 318 - 2007

Hh

FAQs - Food and Diet

1. [General dietary advice for reducing the risk of cancer.](#)
2. [What are the links between obesity and cancer?](#)
3. [Are there certain foods that will help reduce the likelihood of developing cancer?](#)
4. [How might I best increase my fruit and vegetable intake?](#)
5. [What should I know about fish consumption and cancer risk?](#)
6. [Can garlic help prevent cancer?](#)
7. [Does alcohol increase cancer risk?](#)
8. [Can red wine help prevent cancer?](#)
9. [How does cooking meat affect cancer risk?](#)
10. [What are the chronic health effects of drinking contaminated water?](#)
11. [Does drinking coffee cause cancer?](#)
12. [References](#)

General dietary advice for reducing the risk of cancer:

Eat a diet that is as plant-based as possible (more fruits, vegetables and legumes).

When at all possible, eat organic and antibiotic-free food. This will reduce the level of pesticides and added hormones in your food.

Avoid diets high in fat because they have shown evidence of an increased likelihood of developing cancer of the colon, breast, prostate, and the lining of the uterus (the endometrium).

What are the links between obesity and cancer?

Some studies have reported links between obesity and cancers of the gallbladder, ovaries, and pancreas. Obesity and physical inactivity may account for 25 to 30% of several major cancers - colon, breast (postmenopausal), endometrial, kidney, and cancer of the esophagus.

Are there certain foods that will help reduce the likelihood of developing cancer?

Yes, there are. Some of the best cancer-fighting foods are known as [The Baker's Dozen](#)

How might I best increase my fruit and vegetable intake?

[There are a lot of good ways to increase the amount of fruits and vegetables in your diet.](#)

What should I know about fish consumption and cancer risk?

Fish can pose considerable health risks when contaminated with substances such as metals (e.g., mercury and lead), industrial chemicals (e.g., PCBs) and pesticides (e.g., DDT and dieldrin). Some of those contaminants have been linked to cancer. People should vary the types of fish they eat to reduce the likelihood of exposure to toxins.

The health benefits / drawbacks of eating fish vary according to the species:

Best (high in Omega-3 fatty acids & low in environmental contaminants):

- [Anchovies](#)
- [Herring, Atlantic \(U.S., Canada\)](#)
- [Mackerel, Atlantic](#)
- [Oysters \(farmed\)](#)
- [Sablefish/black cod \(Alaska\)](#)
- [Salmon, wild \(chinook, chum, coho, pink, sockeye\)](#)
- [Sardines](#)

Worst (high in mercury, PCBs, or environmental impacts):

- [Chilean seabass/toothfish](#)
- [Grouper](#)
- [Marlin](#)
- [Orange roughy](#)
- [Rockfish/rock cod \(Pacific\)](#)
- [Salmon, Atlantic \(farmed\)](#)
- [Shark](#)
- [Sturgeon \(wild\)](#)
- [Swordfish \(imported\)](#)
- [Tilefish](#)
- [Tuna, bluefin](#)

Details can be found at [Oceans Alive](#).

Can garlic help prevent cancer?

A host of studies provide compelling evidence that garlic and its organic allyl sulfur components are effective inhibitors of the cancer process. 28 of 37 observational studies in humans using garlic and related allyl sulfur components showed some cancer preventive effect. The evidence is particularly strong for a link between garlic and prevention of prostate and stomach cancers. Since all of these studies have been observational, these findings have not yet been verified in clinical trials.

Does alcohol increase cancer risk?

Yes.

Alcohol consumption is an established cause of cancers of the mouth, pharynx, larynx, esophagus, liver, and breast. Risk increases substantially with intake of more than 2 drinks per day. Regular consumption of even a few drinks per week has been associated with an increased risk (30-50%) of breast cancer in women.

Alcohol consumption combined with tobacco use increases the risk of cancers of the mouth, larynx, and esophagus far more than either drinking or smoking alone.

In some studies, the role of alcohol abuse in the formation of tumors in the colon has been evaluated and found that it promotes the development of DMH-induced colon cancer.

Women who are undergoing hormone replacement therapy (HRT) and who drink just one drink a day double their chances of developing breast cancer, according to a study published in the Annals of Internal Medicine.

Can red wine help prevent cancer?

Possibly.

Although consumption of large amounts of alcoholic beverages may increase the risk of some cancers, there is growing evidence that the health benefits of red wine are related to its nonalcoholic components.

Polyphenols found in red wine have been found to have antioxidant properties. Research on these has shown that they may help inhibit the development of certain cancers.

Recent evidence from animal studies on resveratrol, a type of polyphenol, suggests this anti-inflammatory compound may be an effective chemopreventive agent in three stages of the cancer process: initiation, promotion and progression.

Research studies published in the International Journal of Cancer show that drinking a glass of red wine a day may cut a man's risk of prostate cancer in half and that the protective effect appears to be strongest against the most aggressive forms of the disease.

How does cooking meat affect cancer risk?

Cooking certain meats at high temperatures creates chemicals that are not present in uncooked meats. Experimental studies have shown that meats cooked at high temperatures contain heterocyclic amines (HCAs) and polycyclic aromatic hydrocarbons (PAHs), which are mutagenic and carcinogenic in animals.

You can reduce your exposure to these chemicals by varying methods of cooking meats; microwaving meats more often, especially before frying, broiling, or barbecuing; and refraining from making gravy from meat drippings. You should also refrain from eating any charred pieces of meat, as these too contain chemicals suspected of being carcinogenic to humans.

What are the chronic health effects of drinking contaminated water?

The drinking water contaminants that can have chronic effects are chemicals (such as disinfection by-products, solvents, and pesticides), radionuclides (such as radium), and minerals (such as arsenic). Examples of the chronic effects of drinking water contaminants are cancer, liver or kidney problems, or reproductive difficulties.

Does drinking coffee cause cancer?

Many studies are currently underway examining the relationship between coffee and cancer development. Some data show that consumption of caffeinated coffee, tea with caffeine, or caffeine was not associated with incidence of colon or rectal cancer, whereas regular consumption of decaffeinated coffee was associated with a reduced incidence of rectal cancer. Other studies have also found that coffee consumption was not associated with breast cancer incidence.

One peer-reviewed publication demonstrated a higher prevalence of coffee drinking among bladder cancer cases than controls. Further investigation is needed on this topic.

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Frequently Asked Questions about Gasoline Toxicity

- [Why is gasoline considered to be toxic?](#)
 - [Is there any way to reduce benzene exposure from gasoline?](#)
 - [How can I minimize my family's exposure to benzene?](#)
 - [What are Leaking Underground Storage Tanks \(LUSTs\)?](#)
 - [References](#)
-

Why is gasoline considered to be toxic?

For more than a century, gasoline fueled engines have been used in cars, trucks, locomotives, and other motorized machinery. Engine exhausts contain thousands of gases and particles, some of which are considered by the International Agency for Research on Cancer (IARC) to cause cancer.

Exposure to automotive gasoline most likely occurs from breathing its vapor at a service station while filling a car's fuel tank. At high levels, automotive gasoline is irritating to the lungs when breathed in and may also cause harmful effects to the nervous system.

A number of key chemicals in gasoline are known to cause cancer or other serious health effects in humans or in experimental animals. Some of these ingredients include benzene, toluene, xylene, and methyl tert-butyl ether (MTBE).

- **Benzene:** is a naturally occurring hydrocarbon found in crude oil and natural gas. It is also released in cigarette smoke and known to cause cancer in humans. Long-term exposure to benzene in the workplace can cause leukemia. Regularly breathing low levels can damage the nervous system and cause anemia and other problems of the blood. Benzene is a recognized carcinogen and it is the Environmental Protection Agency's (EPA) policy that no level of human exposure to a Group A carcinogen can be assumed safe.
- **Toluene and Xylene:** Although the link to cancer has not been established, regular breathing of toluene causes birth defects and brain damage, and xylene can cause loss of consciousness and even death at high levels. Importantly, in addition to the amount of benzene already present in gasoline, the EPA has determined that incomplete combustion of xylene and toluene in gasoline also significantly contributes to the amount of benzene in auto exhaust.
- **MTBE:** Many states, including Pennsylvania, Delaware and Washington D.C. have banned MTBE, a gasoline additive, because of its capacity to cause cancer and damage to the nervous system. Unfortunately, MTBE can be found in groundwater in many regions due to leaking underground storage tanks. The EPA is required to control 188 hazardous air pollutants based on a list initially defined by the Clean Air Act Amendments of 1990.

Is there any way to reduce benzene exposure from gasoline?

Yes.

Use of cleaner burning gasoline reduces pollution, specifically ozone and carbon monoxide. It also reduces other carcinogenic air pollutants by over 15% percent, including benzene and 1, 3-butadiene. Cleaner burning gasoline contains the same ingredients as regular gasoline, but it has been oxygenated (to add an oxygenate, such as ethanol to the gasoline) and reformulated in order to greatly improve air quality on a year-round basis.

How can I minimize my family's exposure to benzene, a volatile compound?

Indoor concentrations of "volatile organic compounds" (VOCs) and resulting exposures may vary significantly, depending on the level of ventilation in your home and the activities in your home, such as smoking. You can reduce your family's exposures by following these steps:

- If you smoke, smoke outdoors and in areas away from children. Avoid taking your children to places where they may be exposed to secondhand smoke. Better yet, try to stop smoking!
- Keep your child away from stored gasoline, especially in enclosed areas.
- Do not allow your child to pump gas into your car. Because they stand at the same levels as the pump, they would inhale a large amount of the hazardous vapors.
- Do not allow your car to idle in the garage even if the garage door is open, and turn your car off immediately upon entering the garage.
- Avoid storing VOCs-containing products, such as paints, paint strippers, kerosene for space heaters, or gasoline for lawn mowers. Buy only as much as you will use right away.

There are some individuals whose risk of developing cancer is higher due to their occupation - often as a result of being exposed to high levels of benzene, such as gas station attendants. [Read more about jobs that are carcinogenic to humans and individuals with increased cancer risk due to their occupation.](#)

What are Leaking Underground Storage Tanks (LUSTs)?

After World War II, thousands of gasoline stations were built across the United States (2.2 million tanks!) Bare steel tanks, with an average tank life expectancy of 15- 30 years, were installed underground to store gasoline. Since the 1980's, corrosion and faulty installation and operation have resulted in widespread groundwater contamination by gasoline and methyl tertiary butyl ether (MTBE). Because 50% of all Americans rely on groundwater for their drinking water, these leaking underground storage tanks pose a significant public health hazard.

You can read more about LUSTs in [an article from our Winter 2007 newsletter](#), written by Evelyn Talbott, DrPH, Professor of Epidemiology, GSPH and Jeanne Zborowski, PhD, Senior Research Specialist, Department of Epidemiology, GSPH, University of Pittsburgh.

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Green Building

Green and sustainable design is not a waning trend. As advances in science and research are made, the need for green design is becoming increasingly apparent. According to the [Natural Resources Defense Council](#), green design conforms “to environmentally sound principles of building, material and energy use to ensure resource conservation while promoting healthier living and working spaces.”

Indoor air quality plays a major role in human health. The selection of materials and methods of construction affect the indoor environment of a building. Operation and maintenance of the building plays an equally important role in health and well-being of its occupants.

Chemicals evaporate from materials used in the structural components of a building and its furnishings. These chemicals, called [Volatile Organic Compounds](#) (VOCs), contribute greatly to indoor air pollution. Substances that play a role include:

- treated wood
- vinyl flooring
- plastics
- carpeting
- painted surfaces
- adhesives
- finishes on furniture

Sustainable Design and Construction

Sustainable design refers to the construction of efficient and environmentally responsible buildings that are, at the same time, aesthetically satisfying. These structures use less water and energy. They also use renewable products and cost less to operate and maintain than non-green buildings.

Making Your Home “Green”

If you are building a new home or remodeling your existing home, consider using durable, efficient products such as those listed below.

- Structural materials, such as, cork or bamboo flooring and engineered stone countertops
- Insulate walls with recycled blue jean (cotton) insulation and finish with wall board made from waste wheat straw fiber
- Design options include the use of natural lighting and ventilation
- Finishes that are non-toxic, such as low or no-VOC paints, or that do not require toxic chemicals to maintain
- Heating, ventilation and air conditioning (HVAC) systems that are energy efficient

- Recycled roofing products, like recycled rubber slate
- Furnishings made with natural fabrics
- Carpeting that is low in volatile chemicals and has backing that contains no plastics

Many companies, including some well-known home improvement stores, now offer [low-VOC and no-VOC paints](#). If you want to learn more about similar products and their availability, visit Pittsburgh's [Green Building Alliance](#) website for a list of vendors and the alternative materials they offer.

All building types—homes, health care facilities, offices, and commercial buildings—can be sustainable or "green." Contrary to popular belief, recent studies and sustainable business models show that the cost of building green is comparable to constructing traditional buildings while the economic and health benefits are greatly enhanced.

Operation and Maintenance

The operation and maintenance of a building impacts health as much as design and construction. Often, toxic chemicals (including paints, polishes, waxes, strippers, varnishes, air fresheners, cleaners, and disinfectants) are used to maintain and clean building components and furnishings. Green options are available and decrease the environmental impact of building maintenance and operations while allowing for a healthier indoor environment. For example, flooring made from chlorine-free polymers can be cleaned with plain water rather than harsh chemical cleaners. The [US Green Building Council](#) has developed guidelines for Leadership in Energy and Environmental Design (LEED) that apply to all aspects of building design and operation.

You can extend sustainable living outside your home by greening your yard with hardy, sustainable vegetation that can flourish without the use of pesticides and will conserve water resources. The Environmental Protection Agency provides a helpful brochure, [GreenScaping](#), offering plant choices and other easy recommendations for growing and maintaining a healthy yard.

For More Information:

- [Mascaro Sustainability Initiative](#)
 - Penn State University's Sustainable Design Initiative, "[Lean and Green](#)" and [Indoor Environment Center](#)
-

FAQs - Hazardous Toxins

What are the top 12 hazardous toxins in our environment?

1. [Arsenic](#)
2. [Lead](#)
3. [Mercury](#)
4. [Vinyl chloride](#)
5. [PolyChlorinated Biphenyls \(PCBs\)](#)
6. [Benzene](#)
7. [Polycyclic aromatic hydrocarbons \(PAHs\)](#)
8. [Cadmium](#)
9. [Benzo\[a\]pyrene](#)
10. [Benzo\[b\]fluoranthene](#)
11. [Chloroform](#)
12. [DDT](#)

Sources

Origin of the [CERCLA Priority List of Hazardous Substances](#):

Federal law requires the [Agency for Toxic Substances and Disease Registry \(ATSDR\)](#) and the [U.S. Environmental Protection Agency \(EPA\)](#) to prepare a list, in order of priority, of substances that are most commonly found at facilities on the National Priorities List (NPL) and which are determined to pose the most significant potential threat to human health due to their known or suspected toxicity and potential for human exposure at these NPL sites. The CERCLA list is not a list of "most toxic" substances, but rather a prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at NPL sites. Thus, it is possible for substances with low toxicity but high NPL frequency of occurrence and exposure to be on this priority list.

Arsenic

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds. Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenic (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The [U.S. Department of Health and Human Services](#) (HHS), the [International Agency for Research on Cancer](#) (IARC), and the [U.S. Environmental Protection Agency](#) (EPA) have all declared inorganic arsenic to be carcinogenic to humans.

[ATSDR: Arsenic](#)

Benzene

Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness. Exposure to benzene, especially in the workplace, may cause cancer in animals and humans, including leukemia. In addition, benzene can pass from the mother's blood to a fetus. Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

You can reduce your exposure by limiting contact with gasoline and cigarette smoke. We encourage families not to smoke in their house, in enclosed environments, or near their children. Or better yet, quit smoking altogether!

[ATSDR: Benzene](#)

Benzo[a]pyrene and Benzo[b]fluoranthene

Benzo[a]pyrene and Benzo[b]fluoranthene are two of the over 100 [polycyclic aromatic hydrocarbons](#) formed during the incomplete burning of organic matter.

Benzo[a]pyrene occurs ubiquitously in products of incomplete combustion of fossil fuels and has been identified in ambient air, surface water, drinking water, waste water, and char-broiled foods.

Benzo[b]fluoranthene is found in fossil fuels and occurs ubiquitously in products of incomplete combustion; it has been detected in mainstream cigarette smoke; urban air; gasoline engine exhaust; emissions from burning coal and from oil-fired heating; broiled and smoked food; oils and margarine; and in soils, groundwater, and surface waters at hazardous waste sites.

Mixtures of PAHs containing benzo[a]pyrene have long been known to cause cancer---a 1775 report described scrotal cancer in chimney sweeps, and twentieth-century studies found skin cancer in workers exposed to shale oil and creosote. While the contribution of benzo[a]pyrene to the carcinogenicity of these PAH mixtures is uncertain, benzo[a]pyrene is known to be among the most potent and best documented skin carcinogens among non-human animals, and is commonly used as a positive control in skin application assays of other chemicals. Benzo[a]pyrene has been shown to cause skin tumors in mice, rats, rabbits, and guinea pigs. Based on the animal evidence, EPA has classed benzo[a]pyrene as a 'probable human carcinogen'.

Similarly, although there are no human data that specifically link exposure to benzo[b]fluoranthene to human cancers, benzo[b]fluoranthene is a component of mixtures that have been associated with human cancer, including coal tar, soots, coke oven emissions, and cigarette smoke, and

benzo[b]fluoranthene itself produced tumors in mice in studies using a variety of methods of exposure. Based on the animal evidence, EPA has classed benzo[b]fluoranthene as a 'probable human carcinogen'.

Oak Ridge National Laboratory, Risk Assessment Information System. Toxicity Summaries for [BENZO\[A\]PYRENE](#) and [BENZO\[B\]FLUORANTHENE](#).

Cadmium

Cadmium is used in batteries and plastics and is released in cigarette smoke and in the burning of fossil fuels. Long-term exposure to cadmium can result in kidney diseases, lung damage, and fragile bones.

In the home, store substances that contain cadmium safely, and keep nickel-cadmium batteries out of reach of young children. If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools. A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

[ATSDR: Cadmium](#)

Chloroform

This substance can be found in contaminated air and water. Chloroform is considered by several agencies, including the [U.S. Department of Health and Human Services](#) (HHS), the [U.S. Environmental Protection Agency](#) (EPA), and the [International Agency for Research on Cancer](#) (IARC), as a probable carcinogen in humans. This is largely based on evidence that exposure to chloroform has caused liver and kidney cancer in laboratory animals.

[ATSDR: Chloroform](#)

DDT

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

You can be exposed to DDT by eating contaminated foods imported from countries that still allow the use of DDT to control pests, or by breathing contaminated air, drinking contaminated water, or swallowing contaminated soil particles near waste sites and landfills that contain these chemicals. Children of mothers who have been exposed can also be exposed through their mother's breast milk.

Studies in DDT-exposed workers did not show increases in cancer, but animals given DDT with their food did show an increased rate of liver cancer.

[ATSDR: DDT and related chemicals](#)

Lead

Lead can leak into drinking water through old pipes and can be found also in the air near areas with deteriorating lead based paints.

Exposure to lead can damage the nervous system and can cause an increase in blood pressure in middle-aged adults. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production. According to several health agencies, lead may have the potential to cause cancer in humans, although a conclusive link has not been established.

Do not allow children to chew or mouth painted surfaces that may have been painted with lead-based paint. If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it. Some types of paints and pigments that are used as make-up or hair coloring contain lead. Read the labels carefully to avoid using those products.

[ATSDR: Lead](#)

Mercury

Contact with mercury can occur during dental and medical treatments and from contaminated water, air, and seafood. Inorganic mercury compounds are sometimes used in skin lightening creams and as antiseptic creams and ointments.

The different forms of mercury have distinct patterns of adverse health effects. Exposure to high levels of mercury may cause brain or kidney damage and harm a developing fetus. The [U.S. Environmental Protection Agency](#) (EPA) has determined that two types of mercury, mercuric chloride and methylmercury, are possible human carcinogens.

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase your exposure.

[ATSDR: Mercury](#)

Polychlorinated Biphenyls (PCBs)

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds; there are no known natural sources. PCBs have been used as coolants and lubricants in electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects.

You can be exposed to PCBs by using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago (these items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure), but the most likely way is by eating contaminated food, including fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products. It's also possible to be exposed by breathing air near hazardous waste sites and drinking contaminated well water, or through work-related exposures (such as during PCB disposal operations, maintenance on PCB-containing equipment, or due to accidents involving such equipment).

Known PCB-related health effects include acne-like skin conditions in adults, neurobehavioral and immunological changes in children, and a variety of injuries and disorders in animals, including anemia;

acne-like skin conditions; liver, stomach, and thyroid gland injuries; immune system changes; behavioral alterations; impaired reproduction; and cancer. The [U.S. Department of Health and Human Services](#) (HHS), the [International Agency for Research on Cancer](#) (IARC), and the [U.S. Environmental Protection Agency](#) (EPA) have all determined that PCBs are likely to cause cancer in humans.

[ATSDR: Polychlorinated Biphenyls \(PCBs\)](#)

Polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons are formed by the incomplete combustion of coal, oil, petrol, wood, tobacco, charbroiled meats, garbage, or other organic materials. There are more than 100 different compounds which fall into the PAH family; most have no known use, though a few are used in medicines, and to make dyes, plastics, and pesticides. Naphthalene, also known as mothballs, is used in making dyes, explosives, plastics, lubricants, and moth repellent. Anthracene is used in dyes, insecticides and wood preservatives.

In the home, polycyclic aromatic hydrocarbons are present in tobacco smoke, smoke from home heating (burning wood or oil), char-grilled food and creosote treated wood products. Some workplaces can give exposures to polycyclic aromatic hydrocarbons. High concentrations of polycyclic aromatic hydrocarbons have been found in coal-tar production plants, coking plants, bitumen and asphalt production plants, smoke houses, aluminium production plants, and trash incinerators. They are found in facilities that manufacture or use petroleum, petroleum products or coal, or where wood, or other plant materials are burned. People may also be exposed to polycyclic aromatic hydrocarbons in the soil where coal, wood, petrol or other products have been burned. Food produced from these soils may also contain polycyclic aromatic hydrocarbons.

Exposure can irritate the eyes, nose, throat and bronchial tubes. Skin contact can cause irritation or a skin allergy. Very high levels may cause headaches, nausea, damage the red blood cells, damage the liver and kidneys, and may even cause death. The International Agency for Research on Cancer has cited a number of polycyclic aromatic hydrocarbons as 'probably carcinogenic to humans', a number of others are cited as being 'possibly carcinogenic to humans'.

[ATSDR: PAHs](#)

Australia [National Pollutant Inventory Substance Profile: PAHs](#)

Vinyl chloride

Vinyl chloride is used in plastic industries and also can be found in hazardous waste sites and landfills.

Exposure to vinyl chloride can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Exposure over a long period of time (factory workers) can cause nerve damage, permanent liver damage, immune reactions, and liver cancer. The [U.S. Department of Health and Human Services](#) (HHS), the [International Agency for Research on Cancer](#) (IARC), and the [U.S. Environmental Protection Agency](#) (EPA) have all declared vinyl chloride to be carcinogenic.

Aside from reducing occupational exposures, one way to limit your family's contact with vinyl chloride is to limit their exposure to cigarette and cigar smoke.

[ATSDR ToxFAQs™: Vinyl chloride](#)

Sources:

[Agency for Toxic Substances and Disease Registry \(ATSDR\) Toxic Substances Portal.](#)

See also links under each section.

Frequently Asked Questions about Hazardous Household Products

These FAQs describe types of potentially hazardous household products and how to interpret the labeling on such products. They also provide ways to avoid exposures to these chemicals and list non-toxic alternatives for certain classes of household products.

- [What are some types of hazardous household products?](#)
- [What makes a household product hazardous?](#)
- [How do you know if a product is hazardous?](#)
- [What don't the labels tell?](#)
- [What are inert ingredients?](#)
- [How can I reduce my exposure to hazardous products?](#)
- [What are some alternatives to hazardous products?](#)

[References](#)

What are some types of hazardous household products?

Most hazardous household products can be grouped into four major categories:

- **Automotive products** include motor oil, brake and transmission fluid, antifreeze, car batteries, gasoline, kerosene, diesel fuel, and car wax with solvent.
- **Household cleaners** include drain cleaners, oven cleaners, toilet cleaners, spot removers, silver polishes, furniture polishes, cleansers and powdered cleaners, window cleaners, bleach, liquid cleaners, and dyes.
- **Paints and solvents** include latex, oil-based, auto and model paint, paint stripper, primer, rust remover, turpentine, varnish, wood preservative, mineral spirits, and glues.
- **Pesticides and Lawn Care Products** are potentially hazardous, especially to children. Pesticide exposure can occur through dermal contact, inhalation, or ingestion. Approximately 4 billion pounds of pesticides are used worldwide in agriculture and in most household gardens.
- **Other hazardous products** include aerosol products, dry cell and disc or button batteries, hearing aid batteries, moth balls and flakes, shoe polish, photographic chemicals, smoke detectors and air fresheners and deodorizers.

What makes a household product hazardous?

A 1987 EPA study found approximately 12 common organic pollutants in concentrations 2 to 5 times higher from air tested inside homes versus the outdoor air. This increase was due to the use of common household products. Product warning labels are often inadequate and pertain only to acute exposures.

Long-term or repeated use of some household chemicals, such as chlorinated hydrocarbons, can result in cancer. Commonly used compounds that can have serious adverse effects are methylene chloride (found in adhesive removers and paint strippers and thinners), [tetrachloroethylene](#) (used in dry cleaning

of clothes and considered potentially carcinogenic by the EPA), and paradichlorobenzene (found in room air fresheners, toilet bowl deodorizers, and moth crystals).

How do you know if a product is hazardous?

The Federal Hazardous Substances Act of 1960 established labeling requirements for consumer products containing hazardous substances. If a product has a hazardous substance, the front label must include a warning and a description of the hazard.

Levels of hazards are identified this way:

- **DANGER** - substances which are extremely flammable, corrosive or highly toxic.
- **POISON** - substances which are highly toxic.
- **WARNING** or **CAUTION** - substances which are moderately or slightly toxic.
- A statement telling you how to avoid the hazard must appear with safe use instructions. Examples might be **KEEP OUT OF REACH OF CHILDREN** or **USE IN A WELL-VENTILATED AREA**.

What don't the labels tell?

Label information is directed at "acute" or immediate effects only. You are not given information about "chronic" or long-term hazards of chemical products, such as cancer or birth defects.

There are other concerns about labels as well. Some products contain ingredients that have not been officially recognized by the federal government as hazardous but still are cause for concern.

What are inert ingredients?

"Inert" ingredients are chemicals added as "carriers" for the active ingredients in cleaners and pesticides. Only the percentage of inert ingredients is required on the label, not their identity. Even the inert ingredients can have biological effects, such as alkylphenolic surfactants and phthalate esters, which are sometimes used in cosmetics.

How can I reduce my exposure to hazardous products?

- Avoid using the product altogether. There are safer alternatives to many commonly-used household cleaning products which you can find in your local grocery store. ([See below for examples](#) or [view our alternatives to pesticides table](#) (PDF).)
- Always read the label before using a product that may be poisonous.
- Turn on the fan and open windows when using chemical products such as household cleaners.
- Wear protective clothing (gloves, long sleeves, long pants, socks, shoes) if you spray pesticides or other chemicals.
- Never mix household products together. You can make a poisonous gas by mixing chemicals such as ammonia and bleach.

- Keep chemical products in their original bottles or containers. Do not use food containers such as cups, bottles, or jars to store chemical products such as cleaning solutions or beauty products.

What are some alternatives to hazardous products?

Some of the basic ingredients in homemade household cleaners are very effective on their own:

- **Baking soda** is a good scouring powder that can be used for cleaning, deodorizing, removing stains, softening fabrics and clearing drains.
- **Cornstarch** deodorizes carpets and removes greasy stains because it is very absorbent. Lemon juice cuts through grease and stains on mirrors, dishes and pots.
- **Table salt** can be used as a mild disinfectant or a gentle scouring powder.
- **Washing soda** (a baking soda detergent) cuts through grease, removes stains, disinfects and softens water.
- **White vinegar** is a mild disinfectant that cuts through grease, prevents mould and cleans glass. Certain plants such as the spider plant are natural air filters.

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Frequently Asked Questions about Lowered Life Expectancy for Women, Obesity and the Environment

A recent study in the journal *PLoS Medicine* ([Ezzati et al. 2008](#)) concluded that in nearly 1,000 counties in America, which are home to about 12 percent of the nation's women, life expectancy became shorter by 1999 than it was in the early 1980s. Although life span has generally increased since 1961, the authors reported it began to level off or even decline in the 1980s for 4 percent of men and 19 percent of women.

- [To what do the researchers attribute this drop in life expectancy in women up to 1999?](#)
- [Why was this study conducted?](#)
- [Did data reveal differences between disadvantaged and advantaged populations in gains in life expectancy?](#)
- [What were some of the geographic disparities found?](#)
- [What did researchers notice about overweight or obesity trends in men and women?](#)
- [How could the environment play a role in obesity?](#)
- [Diabetes trends](#)
- [What recent scientific literature has been published on 'obesogens'?](#)
- [What is now known about aspartame and obesity?](#)
- [What is the evidence for the link between endocrine-disrupting chemicals and obesity?](#)
- [In regards to bisphenol A, what is prudent public policy?](#)

[References](#)

To what do the researchers attribute this drop in life expectancy in women up to 1999?

Findings indicate that women have been dying increasingly from diabetes, lung cancer, emphysema, and kidney failure, reflecting the long-term consequences of smoking. Unfortunately, women took up this habit in large numbers decades after men did. The authors also found that this may represent the leading edge of the obesity epidemic. If so, women's life expectancy could decline broadly across the United States in coming years.

Why was this study conducted?

The researchers examined mortality and cause-of-death data for the United States from 1961 through 1999 to see whether there were different life expectancies across different U.S. counties over the last four decades. The researchers chose to look at counties—the smallest geographic units for which data on death rates are collected in the US—because it allowed them to make comparisons between small subgroups of people.

Did data reveal differences between disadvantaged and advantaged populations in gains in life expectancy?

Yes. The findings suggest that beginning in the early 1980s and continuing through 1999, disadvantaged populations did not experience the same gains in life expectancy experienced by advantaged populations, and some became even worse off. In those counties, life expectancy increased by only one year (from 74.5 to 75.5 years) between 1983 and 1999, while in the advantaged counties, life expectancy of women reached 83 years. Unfortunately, this growing disparity in women's mortality is tied in with race, income and geography. For instance, in counties where there were more African-Americans lived, life expectancy declined the most.

What were some of the geographic disparities found?

Counties with significant declines in women's life expectancies were concentrated in Appalachia, the Southeast, Texas, the southern Midwest and along the Mississippi River. Life expectancy increases were seen mainly in the Northeast and on the Pacific Coast. The study found that after 1983, life span rose with wealth.

What did researchers notice about overweight or obesity trends in men and women?

Obesity has risen markedly in the past two decades, with women more affected than men. About 33 percent of women are now obese, compared with 31 percent of men, and extreme obesity is twice as common in women (7 percent) as in men (3 percent). High blood pressure, which can be partly attributed to weight gain, has been increasing in women and declining in men. In 1990, 2 out of every 5 women over 60 had hypertension and by 2000, it was one out of every two. Being overweight also greatly increases the risk of developing Type 2, or "adult onset" diabetes.

How could the environment play a role in obesity?

This relationship is currently being examined within the scientific community. Research on the obesity epidemic in the United States over the last few decades is being conducted around such environmental factors as: 1.) aspartame and other artificial sweeteners that can stimulate appetite and obesity; and 2.) endocrine disrupting chemicals (such as those found in plasticizers and personal care products) and obesogens (chemicals that have been shown to cause obesity in animals). In cancer research, every chemical that we can prove causes cancer in humans also causes cancer in animals, when adequately studied. Therefore, we have reason to suspect that chemicals which cause obesity in animals may also cause obesity in humans.

Recently, researchers showed that when Agouti mice (mice that are all genetically-related) were fed prenatal diets high in BPA (a hormone-disrupting chemical found, for instance, in some plastics and the linings of some canned goods), those mice became obese—twice the weight of a normal mouse—and had increased risk of breast and prostate cancers ([Dolinoy et al. 2007a](#)). This finding has led scientists to develop the Environmental Obesogens / Diabetes Hypothesis: Pre-natal, early life and young life exposures to bisphenol A (BPA) activate fat receptors and stimulate fat cells, which predispose individuals to obesity and/or related metabolic disorders (diabetes).

Diabetes trends:

- More than 20% of adults are clinically obese.
- An additional 30% are defined as overweight.
- In 1999, 13% of children aged 6–11 years and 14% of adolescents aged 12–19 years in the United States.
- The rate of obesity has doubled in past decade, now 30% of all adults.



Genetically identical agouti mice, one fed a diet of bisphenol A (BPA) ([Dolinoy et al. 2007b](#)).

What recent scientific literature has been published on ‘obesogens’?

([Arsenescu, et al. 2008](#)) A widely used flame retardant, PCB 77, causes increased body weight and ‘bad’ cholesterol when exposed at low levels, but reduces body weight at much higher levels. Some cancers are associated with obesity. Additional research should consider whether different PCB exposures are associated with obesity are also associated with cancer. That would assist national cancer organizations currently concerned with obesity and cancer in recognizing that more than lifestyle and the built environment are associated with obesity and its known cancer risks.

-- Michael Lerner, PhD, President, [Commonweal](#) and Founding CHE ([The Collaborative on Health and the Environment](#)) Partner

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To learn more about this project, please refer to the following sources:

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- To learn more about the Superfund Basic Research Program, visit the [SBRP web site](#).
- All Research Briefs are available on the [NIEHS Research Briefs web page](#).

What is now known about aspartame and obesity?

Aspartame is consumed by about 200 million Americans every day. In America today, more than ten million children regularly consume diet sodas and other foods containing aspartame. The greater vulnerability of the young to carcinogens has consistently been demonstrated experimentally in aspartame and a number of other compounds. Experiments conducted in 2008 by an Italian research group, found that animals exposed prenatally to aspartame have double the risk of developing multiple tumors compared with animals exposed postnatally ([Soffritti et al. 2008](#)). In light of these findings, when evaluating public health impacts of widely-used materials, it is important to consider the effect of exposures over a lifetime, especially those that may begin prenatally.

What is the evidence for the link between endocrine-disrupting chemicals and obesity?

A recent study found that prenatal exposure to organotins (a diverse group of widely distributed chemical pollutants) demonstrated that these chemicals disrupt the delicate signaling path of hormones and therefore could lie behind the growing obesity epidemic ([Grün et al. 2006](#)). In utero exposure to these persistent, widespread pollutants can elevate fat found in the liver and testis. The animals, once born, also were fatter. These organotins pollutants may be contributing to, in part, the obesity epidemic. Research is ongoing on these important new findings.

In regards to bisphenol A, what is prudent public policy?

Michael Thun, of the American Cancer Society, stated that limiting exposure to BPA is "prudent." ([American Cancer Society 2008](#))

The U.S. National Institute of Environmental Health Sciences suggests following these steps to reduce BPA exposure (National Institute of Environmental Health Sciences 2008)::

- Don't microwave polycarbonate plastic food containers. Polycarbonate is strong and durable, but over time it may break down from over use at high temperatures.
- Polycarbonate containers that contain BPA usually have a [#7 on the bottom](#)
- Reduce your use of canned foods.

- When possible, opt for glass, porcelain or stainless steel containers, particularly for hot food or liquids.
- Use baby bottles that are BPA free.

See The National Toxicology Program (NTP) Draft Brief On Bisphenol A (BPA) for detailed information and recommendations ([National Toxicology Program 2008](#)).

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Frequently Asked Questions: Occupational Health Hazards

These FAQs describe the reasons that work exposures can have distinct health effects, especially exposures to carcinogenic chemicals. The highest risk jobs and the most common types of work-related cancers are given, as well as jobs associated with other types of health effects, such as breathing and skin problems.

- [How can you be sure that worker's health problems come from exposure to substances at work?](#)
- [What types of things are we exposed to at work that can affect our health?](#)
- [How big of a problem are these work exposures in regards to cancer?](#)
- [What kinds of jobs put you at the greatest risk of developing cancer?](#)
- [Are there other types of medical problems caused by work exposures?](#)

[References](#)

How can you be sure that workers' health problems come from exposure to substances at work?

To quote Paracelsus, the dose makes up the poison. In many cases, workers are exposed to much higher amounts of a hazardous substance and for a much longer time than occurs in their everyday lives.

Examples of this may include a spray painter exposed to the chemicals in paints, a sewage worker exposed to a biological agent that causes diarrhea, a carpenter exposed to wood dust, a housekeeper exposed to toxic cleaning agents, and a nurse exposed to infectious micro organisms. In addition, these workers are often subjected to multiple exposures in their environment (e.g. the housekeeper may be exposed to biological agents and dust, as well as cleaning fluids).

[\(European Agency for Safety and Health at Work\)](#)

What types of things are we exposed to at work that can affect our health?

- Physical
 - Non-ionizing radiation e.g. microwaves, infra-red, visible and ultra-violet light
 - Ionizing radiation e.g. X-rays, gamma rays, beta particles, alpha particles from [radon](#)
 - [Noise](#) (usually measured in decibels dB) and vibration
 - Temperature, humidity etc.
 - Ergonomic: Posture, movement (e.g. keyboard operation), load bearing (e.g. patient handling)
- Chemical
 - Inorganic - e.g. lead, arsenic, silica

- Organic - e.g. solvents, resins, glues, fluxes (vapors and gases are usually expressed in concentrations of parts per million or per billion: ppm or ppb)
- Biological
 - Allergens of biological origin:- laboratory animals, insects, mites, wood and other plant material, fungal spores
 - Infections: Bacteria: Tuberculosis, Bruce, Leptons etc.
 - Viruses: e.g. Hepatitis B from needle stick injuries

[\(Agius 2007\)](#)

How big of a problem are these work exposures in regards to cancer?

Based on well-documented associations between occupational exposures and cancer, it is estimated that approximately 20,000 cancer deaths and 40,000 new cases of cancer each year in the U.S. are attributable to a person's occupation.

Less than 2% of chemicals in commerce have been tested for carcinogenicity.

10% of lung cancer, 21% to 27% of bladder cancers, and nearly 100% of mesotheliomas in the U.S. population are caused by occupational exposures to carcinogens.

[\(Intercultural Cancer Council 2004; National Institute for Occupational Safety and Health\)](#)

What kinds of jobs put you at the greatest risk of developing cancer?

Every year, millions of U.S. workers are exposed to substances known to cause cancer in animals, and even some that are carcinogenic to humans. For example, individuals whose work exposes them to asbestos, a known human carcinogen, in industries such as insulation work, are three to four times more likely to develop lung cancer than workers who are not exposed to it. Numerous industries in which occupational exposure to carcinogens is higher than in other workplaces, as well as the people whose workplace exposes them to carcinogenic materials everyday are listed [here](#).

[\(Blair; Brown 2007; National Institute for Occupational Safety and Health\)](#)

Are there other types of medical problems caused by work exposures?

Individuals involved in occupations such as bakers, farmers, carpenters and construction workers, where workers operate in dusty environments, have a higher chance of getting asthma.

Those who work with the following substances can suffer occupational asthma or allergic respiratory diseases such as trinitities:

- Disincarnate used in paints
- Flour or grain dust
- Wood dust

- Natural rubber latex
- Enzymes
- Agricultural moulds and viruses
- Crystalline silica

Many chemicals can cause skin problems. Workers that are at higher risk for skin problems include:

- Hairdressers (mainly from the combined effect of water and chemicals, such as those used in perms)
- Construction workers (particularly if using wet cement containing Chromium VI)
- Cooks
- Cleaners v Dental nurses
- Mechanics
- Printers

([European Agency for Safety and Health at Work](#))

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FAQs: Organic Foods

These FAQs define and describe the difference between organic, certified organic, and 'natural' foods; lists the USDA standards for the organic foods industry; and explains how organic production benefits farmers, the environment, and consumers.

- [What does organic mean?](#)
- [What is the difference between 'organic' & 'natural'?](#)
- [What are the standards that define 'certified organic'?](#)
- [How is organic processing better for the environment?](#)
- [What types of food are available as organic?](#)
- [What conventionally grown fruits and vegetables contain the Highest and Lowest levels of pesticides?](#)
- [What are the organic standards for raising meat, poultry, & dairy?](#)
- [Are organic foods healthier?](#)
- [Do organic farmers ever use pesticides?](#)
- [How large is the organic foods industry?](#)
- [Does organic production benefit farmers?](#)

[View Sources](#)

What does organic mean?

Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations.

Organic meat, poultry, eggs, and dairy products come from animals that are given no antibiotics or growth hormones. Organic food is produced without using most conventional pesticides; fertilizers made with synthetic ingredients or sewage sludge; bioengineering; or ionizing radiation.

Before a product can be labeled "organic," a Government-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet USDA organic standards. Companies that handle or process organic food before it gets to your local supermarket or restaurant must be certified, too.

What is the difference between 'organic' and 'natural'?

"Natural" often is misrepresented in product labeling to imply "healthful," but "natural" only means that the product has undergone minimal processing. Unlike products that are certified organic, natural products have no certification or inspection system and do not necessarily relate to the products' growing methods or use of preservatives.

What are the standards that define 'certified organic'?

When a grower or processor is "certified organic," a USDA accredited public or private organization has verified that the business meets or exceeds the standards set forth in the USDA Organic Rule.

Farmers must grow produce for three years without the application of synthetic pesticides or chemicals. The farm, its equipment, and any processing facilities are inspected by an independent agency unaffiliated with the grower, the processor or the vendor, and are then issued a certificate from that agency certifying the farm's produce as "organic."

The USDA has identified three categories for labeling organic products:

100% Organic: Made with 100% organic ingredients

Organic: Made with at least 95% organic ingredients

Made With Organic Ingredients: Made with a minimum of 70% organic ingredients with strict restrictions on the remaining 30% including no GMOs (genetically modified organisms)

Products with less than 70% organic ingredients may list organically produced ingredients on the side panel of the package, but may not make any organic claims on the front of the package.

How is organic processing better for the environment?

Organic farming, by definition, does not use environmentally harmful chemicals that may contaminate rain and groundwater. Organic farming also replenishes and maintains healthy, fertile topsoil with rich biological matter, which does not erode into waterways. Additionally, unusual varieties of crops and livestock are more likely to be raised organically, which helps to keep the gene pool for food products diversified.

What types of food are available as organic?

Most consumers think of fruits and vegetables when they think of organic products, but there are many other organic foods, including pastas, sauces, frozen juices, frozen meals, cereals, soups, chocolate, cookies, meat, poultry, dairy and even wine.

Which conventionally grown fruits and vegetables contain the Highest and Lowest levels of pesticides?

Highest - Limit your exposure to pesticides by especially buying these produce organic:

- Apples
- Bell Peppers
- Celery
- Cherries
- Grapes (imported)
- Nectarines
- Peaches
- Pears
- Potatoes
- Red Raspberries
- Spinach
- Strawberries

Lowest - These conventionally grown fruits and vegetables contain the lowest levels of pesticides:

- Asparagus
- Avocados
- Bananas
- Broccoli
- Cauliflower
- Corn (sweet)
- Kiwi
- Mangos
- Onions
- Papaya
- Pineapples
- Peas (sweet)

What are the organic standards for raising meat, poultry, and dairy?

Organic livestock standards prohibit the use of synthetic growth hormones such as rBGH and the routine use of antibiotics. Additionally, all animals must be raised in natural living conditions appropriate for their species. The animals are fed only organic feed, and the processing for all meat, poultry and dairy products must meet organic standards, as well.

Are organic foods healthier?

Some studies say 'yes,' others say 'not necessarily'. So far there is little conclusive scientific evidence.

One good example is that research has shown that organic milk contains almost two-thirds more omega 3 fatty acids, which are good for unborn children and may combat heart disease and the effects of arthritis.

Some recently published studies in peer-reviewed journals have shown organic foods to have higher nutritional value. For example, researchers at the University of California, Davis, recently found that organic tomatoes had higher levels of phytochemicals and vitamin C than conventional tomatoes.

Organic foods, simply, are spared the application of potentially harmful long-lasting insecticides, herbicides, fungicides and fertilizers. Many EPA-approved pesticides were registered long before extensive research linked these chemicals to cancer and other diseases. Now, the EPA considers 60% of all herbicides, 90% of all fungicides, and 30% of all insecticides as potentially cancer-causing.

Do organic farmers ever use pesticides?

Organic farmers' primary strategy is "prevention." By building healthy soils, healthy plants are better able to resist disease and insects. When pest populations get out of balance, growers will try various options like insect predators, mating disruption, traps and barriers. If these fail, the certifier may grant permission to apply botanical or other non-persistent pesticides from the USDA National List of Approved Substances under restricted conditions. Botanicals are derived from plants and are broken down quickly by oxygen and sunlight.

Note: Organic food is not necessarily pesticide free, though it will have much lower levels of pesticides. Pesticides can travel in the air (or "drift") from a treated field to an untreated field. Pesticides can also persist in soil and be taken up by some foods even though no new pesticides were used to grow the food.

How large is the organic foods industry?

According to the Organic Trade Association, one to two percent of the U.S. food supply is grown using organic methods and is produced by approximately 7,800 certified organic farmers. Organic food sales have rapidly increased by more than 20 percent annually during the past decade, which has resulted in an estimated \$9.3 billion industry in 2001.

Does organic production benefit farmers?

Lots of farmers say they feel empowered by organic systems, which make them use their brains (not chemicals) to solve problems.

Because there are only very limited pesticides allowed in organics, farm workers should be at less risk from exposure to chemicals. Several scientific studies have found that exposure to certain agricultural pesticides may be associated with an increased risk of cancer among pesticide applicators.

Growing organic produce can also open up new markets for farmers.

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Pesticides FAQs

These FAQs describe the potential harmful effects of pesticides and how you can be exposed to them. Reduce your pesticide exposure by buying organically grown produce, properly washing fruits and vegetables before you consume them, and by properly disposing pesticide containers. Alternative methods to control mosquitoes and other pests are provided, as well as the procedure to take to have your drinking or well water tested for pesticides.

In general, The Center for Environmental Oncology recommends not using chemical pesticides and trying alternatives first.

1. [Are pesticides harmful to humans and the environment?](#)
2. [Can natural biological methods be used to control pests in agriculture?](#)
3. [How much pesticide residue is allowed on fruits and vegetables?](#)
4. [What steps can I take to reduce my exposure to pesticide residues?](#)
5. [What does "organically grown" mean?](#)
6. [Where can I have my drinking water tested for pesticides?](#)
7. [What is DEET?](#)
8. [What is DDT and how can we prevent mosquito bites without using DDT?](#)
9. [Are there other alternatives to pesticides?](#)
10. [What is pesticide spray drift?](#)
11. [What are the impacts of spray drift?](#)
12. [How can I get rid of the pesticides that I don't want anymore?](#)
13. [What are herbicides?](#)
14. [What are some safer alternatives to prevent and kill weeds?](#)

[Sources](#)

[Are pesticides harmful to humans and the environment?](#)

Yes. The "-cide" in pesticide means "to kill." Pesticides, as a class of chemicals, are specifically designed to kill pests such as bacteria, insects and rodents. A considerable number of pesticides registered by the United States Environmental Protection Agency (EPA) contain suspected carcinogens. In addition, many pesticides are nerve poisons, which means they can impact the development of a child's brain. Recent research is beginning to reveal that some pesticides could be [endocrine disruptors](#), which when absorbed into the body, either mimic or block hormones and disrupt the body's normal functions. Atrazine, for example.

One example of an endocrine-disrupting pesticide is atrazine, a heavily used herbicide in the United States. It was first approved for use as an herbicide in the U.S. in 1958. Because of concerns about toxicity, atrazine is banned in Europe. In the U.S., by contrast, the [U.S. Environmental Protection Agency](#)

[\(EPA\) estimates](#) that 76 to 85 million pounds of atrazine are applied annually, mostly to corn, sorghum, and sugarcane fields.

Atrazine has been detected in many water systems throughout the world. People exposed to unsafe levels of the compound may develop diarrhea, eye or skin irritation, and stomach pain.

While the EPA has expressed concern about atrazine's potential hormonal effects, they have stated that atrazine is "not likely to be carcinogenic to humans." Dr. Tyrone Hayes, professor at the University of California, Berkeley has seen indications that doses of atrazine - in concentrations as low as one part per billion - inhibit the growth of the larynxes of male frogs and cause the formation of eggs in their testes. As hormone disruptors have been linked to cancer development in several studies, Dr. Hayes's work provides support to the idea that atrazine may cause cancer in humans.

[Can natural biological methods be used to control pests in agriculture?](#)

Yes. Organic food production limits the use of pesticides to those that are produced from natural sources, as opposed to synthetic chemicals.

You can employ Integrated Pest Management (IPM), which is a more environmentally responsible method of controlling pests. Effective, less risky pest controls are chosen first, including highly targeted pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. [Click here](#) for more information!

[How much pesticide residue is allowed on fruits and vegetables?](#)

The United States Department of Agriculture (USDA) and United States Food and Drug Administration (FDA) both monitor foods for pesticide residues and publish annual reports. Copies of the [USDA Pesticide Data Program](#) annual reports are available from the USDA. EPA sets limits on how much of a pesticide residue can remain on food. You can search a [database of pesticide residue limits](#) to learn what the residue limits are for your favorite foods.

The following conventionally grown fruits and vegetables contain the **HIGHEST** levels of pesticides. In general, it is best to buy thin-skinned fruits and vegetables organic. Limit your exposure to pesticides by buying these organic, especially:

- Apples
- Bell Peppers
- Winter Squash
- Green Beans
- Cantaloupe
- Cherries
- Grapes (imported)
- Nectarines
- Peaches
- Pears
- Potatoes
- Tomatoes
- Raspberries
- Spinach
- Strawberries

These conventionally grown fruits and vegetables contain the **LOWEST** levels of pesticides.

- Asparagus
- Avocados
- Bananas
- Broccoli
- Cauliflower
- Corn (sweet)
- Kiwi
- Mangos
- Onions
- Papaya
- Oranges
- Pineapples
- Peas (sweet)

What steps can I take to reduce my exposure to pesticide residues?

Washing, peeling, and trimming fruits and vegetables often will help reduce or remove any pesticide residues. For more information, read the fact sheet "[Healthy, Sensible Food Practices](#)."

What does "organically grown" mean?

"Organically grown" refers to food grown and processed using no synthetic fertilizers or pesticides. Pesticides derived from natural sources (e.g., biological pesticides) may be used to produce organically grown food. For more information, read the fact sheet, [What "Organically Grown" Means](#). The United States Department of Agriculture (USDA) has issued [standards for labeling of organically-grown crops](#).

[Recent studies](#) have shown that eating more organic food will reduce your exposures to pesticides, and the harm they can cause.

Where can I have my drinking water tested for pesticides?

If your water is from a public water supply, contact your water supplier or the state drinking water office located in your state environmental agency. They can tell you whether your water is regularly tested for a specific type of pesticide and how much, if any, has ever been found.

If you have a private well or if your water has not been tested for that type of pesticide, contact your [state pesticide program](#). They can assist you in determining whether testing is warranted, choosing the type of analysis to be performed, identifying laboratories capable of performing the analysis, and determining the significance of testing results.

The publication [Pesticides in Drinking-Water Wells \(PDF\)](#) provides a step-by-step explanation of how pesticides can enter drinking-water wells, a list of the types of health concerns that pesticides can pose, and advise on testing your water supplies.

What is DEET?

DEET (chemical name, N,N-diethyl-meta-toluamide) is the active ingredient in many insect repellent products. It is used to repel biting pests such as mosquitoes and ticks, including ticks that may carry Lyme disease. The [Reregistration of the Insect Repellent DEET](#) fact sheet includes information for consumers on using this product safely. Information about using insect repellents safely is available in a [general fact sheet](#) by the EPA.

The [U.S. Centers for Disease Control and Prevention](#) recommends using repellents containing oil of lemon eucalyptus [p-menthane 3,8-diol (PMD)], a plant-derived active ingredient, as an alternative to commercial insect repellants. Note: Product labels containing this ingredient do not recommend using such repellants on children under the age of three.

What is DDT and how can we prevent mosquito bites without using DDT?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans.

Methods include using netting on beds, screens on windows, and double lock chambers on doors to stop bites.

Mosquitoes will develop in any puddle that lasts more than four days. You should cover standing water near pumps and install septic tank systems and simple drains to decrease the amount of standing water.

Replace outdoor lights with yellow "bug" lights. Wear headnets, long sleeve shirts, and long pants if venturing into areas with high mosquito populations, such as salt marshes or wooded areas. Use mosquito repellents when necessary, according to their label instructions.

Are there other alternatives to pesticides?

[Click here](#) for our "Alternatives to Pesticides" table

What is pesticide spray drift?

The EPA defines pesticide spray drift as the physical movement of a pesticide through air at the time of application or soon thereafter to any site other than that intended for application (often referred to as "off target"). The EPA does not include in its definition the movement of pesticides to off-target sites caused by erosion, migration, volatility, or contaminated soil particles that are windblown after application, unless specifically addressed on a pesticide product label with respect to drift-control requirements.

What are the impacts of spray drift?

Off-target spray can affect human health and the environment. For example, spray drift can result in pesticide exposures to farm workers, children playing outside, and wildlife and its habitat. Drift can also contaminate a home garden or another farmer's crops, causing unhealthy pesticide residues and/or plant damage. The proximity of individuals and sensitive sites to the pesticide application, the amounts of pesticide drift, and toxicity of the pesticide are important factors in determining the potential impacts from drift.

If there is drift, or you suspect drift, of a pesticide onto you or your property, call your [state agency](#) to file a pesticide misuse complaint. Ask them to send an investigator.

How can I get rid of the pesticides that I don't want anymore?

Follow any specific disposal instructions on the label of the pesticide or bring it to a local hazardous waste collection center. In Pittsburgh, you can contact the Pennsylvania Resource Center (PRC) at www.prc.org, who conduct 4 hazardous waste collections a year, The EPA and local governments sometimes hold special [pesticide collection days](#) (click on your home state on the map in this link) when you may drop-off unwanted pesticides free of charge for proper disposal. For more information, see [Safe Disposal of Pesticides](#).

What are herbicides?

Herbicides are synthetic chemicals that control weeds. Some naturally-occurring chemicals, such as copper sulfate, also have the potential to control weeds, but the term herbicide is reserved for chemically synthesized compounds.

What are some safer alternatives to prevent and kill weeds?

As some commercial herbicides can pose significant health risks, the following options are safer alternatives you can use to prevent and kill weeds:

Mulch:

Covering garden soil with mulch blocks weeds. Use two or three inches of shredded bark, wood chips, straw, cocoa bean hulls, gravel or rocks. The mulches will also keep moisture in the soil, so you will have to water less frequently.

Boiling Water:

Douse weeds with boiling water. Weeds, like humans, will burn if exposed to boiling water. This method also kills weed seeds.

Soap:

Mixed 5 tablespoons of nontoxic liquid soap in one quart (4 cups) of water in a spray bottle. Coat the weeds with the soapy water. Works best on hot days.

Vinegar:

Pour household vinegar into a spray bottle and evenly coat weeds with it. U.S. Department of Agriculture scientists recently [confirmed this in tests](#). Vinegar is really five percent acetic acid in water, and it burns the plant, especially on sunny days. For extra strength weed killer, look for pickling vinegar, which is nine percent acetic acid. Don't get the vinegar on your garden plants, as it can kill them too.

Alcohol:

Mix one to five tablespoons of alcohol--depending on how stubborn the weeds are to kill--with one quart (4 cups) of water in a spray bottle. Shower weeds with the spray. Don't let the alcohol get on garden plants as it may damage their leaves.

Corn meal gluten:

Use it as a pre-emergent herbicide and fertilizer. Corn meal gluten prevents weeds from growing, and then breaks down to provide nitrogen to your plants or lawn. Use it on lawns or established perennial beds, as it won't kill already growing plants. That does mean, of course, that it will not work on already existing weeds.

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Frequently Asked Questions about Plastics

These FAQs describe the potential hazards associated with plastic containers, mostly through microwaving or reuse. You will also learn about the recycling process and how to identify the different types of plastics.

- [What do the numbers and triangles mean on the bottom of plastic containers?](#)
- [Are all plastics safe?](#)
- [Should I be concerned about using plastic in the microwave?](#)
- [Will a plastic bottle leach harmful substances into my water if I reuse it?](#)
- [What can I do to reduce my exposure to the chemicals in plastic?](#)
- [What happens to the products that I take to my local recycling center or place on the curb for pickup?](#)

What do the numbers and triangles mean on the bottom of plastic containers?

The numbers with the triangles surrounding them describe the type of plastic material, or resin, used to make the container. If you are asked to sort your plastic materials, use these numbers to determine if products are made out of plastics that your recycling center or curbside pick-up will collect. Generally, #1 (PETE) and #2 (HDPE) plastics are most often collected and recycled.

1. PETE or PET (polyethylene terephthalate): used for most clear beverage bottles.
2. HDPE (high density polyethylene): used for "cloudy" milk and water jugs, opaque food bottles.
3. PVC or V (polyvinyl chloride): used in some [cling wraps](#) (especially commercial brands), some "soft" bottles.
4. LDPE (low density polyethylene): used in food storage bags and some "soft" bottles.
5. PP (polypropylene): used in rigid containers, including some baby bottles, and some cups and bowls.
6. PS (polystyrene): used in foam "clam-shell"-type containers, meat and bakery trays, and in its rigid form, clear take-out containers, some plastic cutlery and cups.
7. Other (usually polycarbonate): used in 5-gallon water bottles, some baby bottles, some metal can linings.

Are all plastics safe?

No.

You should avoid buying and using #3, #6, and #7.

[#3 PVC \(polyvinyl chloride, or vinyl\):](#)

PVC is hazardous in all of its phases: manufacturing, the products themselves in the home, and in the disposal of it.

One of the most toxic plastics, PVC is often used to make food packaging and in the production of plumbing and construction materials. PVC is commonly used in teething rings and soft squeeze toys for young children, beach balls, bath toys (some rubber duckies), and dolls. Check the product or label to see what number plastic has been used.

To soften PVC into these flexible forms, various toxic chemicals are added as "plasticizers." Traces of these chemicals, known as adipates and phthalates, can leak out of PVC into your food. Some phthalates have been linked to cancer, kidney and liver damage, harm to developing reproductive organs, and premature breast development in baby girls. Inhaling these chemicals can also worsen asthma in children.

Because it contains a variety of additives and lacks a uniform composition, PVC is far less recyclable than other plastics.

Learn more about what makes up PVC: [vinyl chloride](#).

[Click here](#) to learn about the alternatives to PVC that are available.

#6 PS (polystyrene):

#6 plastic may leach styrene into the food it touches. A recent study in [Environmental Health Perspectives](#) concluded that some styrene compounds leaching from food containers are estrogenic (meaning they can disrupt normal hormonal functioning).

Styrene is also considered a possible human carcinogen by the World Health Organization's [International Agency for Research on Cancer](#).

#7 Other, most commonly PC (polycarbonate):

#7 polycarbonate may be able to release its primary building block, bisphenol A, another suspected hormone disruptor, into liquids and foods. Although several governments in Europe and North America currently hold polycarbonate tableware and food storage containers to be safe, this is a highly active area of research. Additionally, while category 7 most often refers to polycarbonate, it is actually a catchall "other" category, and it may not be possible to be sure just what it is. The Center for Environmental Oncology recommends avoiding these containers wherever possible.

[Click here](#) to view and print the Center for Environmental Oncology of UPCI's plastics card, a pocket guide for remembering which types of plastic to avoid buying or using.

Should I be concerned about using plastic in the microwave?

Whether substances found in plastic can leach out into food or into the air of our homes is an active area of research. The Center for Environmental Oncology of UPCI contends that no plastics (including Styrofoam, wraps or containers) should be used in the microwave. Studies are looking at chemicals called "plasticizers." Plasticizers are used in some plastics and other products. They help make the plastic more flexible, but they do not become part of the plastic. Under the right conditions, plasticizers may leach out of the plastic.

Plasticizers can be environmental estrogens, called [endocrine disruptors](#)

The plasticizers called nonylphenol and [bisphenol A](#) are both weak environmental estrogens.

- Bisphenol A is used in:
 - the lining of some tin cans
 - dental sealants
 - baby bottles and pacifiers
- Nonylphenol is used in many applications, including:
 - some laundry detergents
 - some paints
 - cosmetics
 - as a non-pesticide ingredient in many commercial pesticide formulations.

Some organizations, such as the [USDA](#), state that you should only use cookware that is specially manufactured for use in the microwave oven. Glass, ceramic containers, and all plastics should be labeled for microwave oven use. Never let plastic wrap touch your food during microwaving, however. The Center for Environmental Oncology still suggests that no plastics be used in the microwave, especially plastic storage containers such as margarine tubs, take-out containers, whipped topping bowls, and other one-time use containers. These containers can warp or melt, possibly causing harmful chemicals to migrate into the food. [Click here](#) for more information.

Will a plastic bottle leach harmful substances into my water if I reuse it?

Most convenience-size beverage bottles sold in the U.S. are made from polyethylene terephthalate (#1 PET). The FDA has determined that PET meets standards for food-contact materials established by federal regulations and therefore permits the use of PET in food and beverage packaging for both single use and repeated use. The FDA has evaluated test data that simulate long-term storage and that support repeated use.

The toxicological properties of PET and any compounds that might migrate under test conditions have also been well studied. The results of these tests demonstrate that PET is safe for its intended uses.

The Center for Environmental Oncology of UPCI, however, still recommends that beverage bottles not be reused more than a few times because of the risk that toxic materials might leach into your food.

What can I do to reduce my exposure to the chemicals in plastic?

- Choose packaging that's made from truly recyclable materials: paper, glass, metal cans.
- Bring your own container to salad bars, yogurt shops, etc. - any place you'll be served in plastic.
- Buy in bulk, whenever possible. It's the least-packaged option.
- For wrapped foods, choose butcher paper, waxed paper or cellulose bags.
- Bring cloth bags to your supermarket to carry groceries home.
- Choose #1 (PETE) or #2 (HDPE) whenever plastic cannot be avoided! These are the most commonly recycled plastics.

- Some plastics are not readily recyclable, such as #3 (PVC), #6 (PS), #7 (often polycarbonate). Check to see which ones are recycled by your community.
- For more ways to reduce your plastic usage and exposure to chemicals in plastic, [click here](#).

What happens to the products that I take to my local recycling center or place on the curb for pickup?

Recyclables are sent to a materials recovery facility to be sorted and prepared into marketable commodities for manufacturing. Processors purchase the materials and will then bale or shred them. After this process is complete, the pieces are sold to manufacturers who turn the raw materials into new products.

Glass and aluminum are often remanufactured into "new" glass bottles and aluminum cans, but plastic bottles typically cannot be remanufactured into plastic beverage bottles. Currently, the U.S. Food and Drug Administration (FDA) does not allow plastic beverage bottles to be recycled into "new" ones because of the possibility that the material will retain harmful chemicals, such as bleach and soap, contacted during processing. Instead, these recyclables are made into items such as laundry detergent bottles, carpets, clothes, sleeping bags, and other items that do not come in direct contact with food.

Frequently Asked Questions: Radiation

1. [What is ionizing and non-ionizing radiation?](#)
2. [How does radiation cause health effects?](#)
3. [How do we know radiation causes cancer?](#)
4. [Is diagnostic radiation a major issue?](#)
5. [Is it true that using mammography before age 40 can cause more harm than good?](#)
6. [What does CT stand for and how does it work?](#)
7. [What is the purpose of the CT scan?](#)
8. [What risks are associated with whole body CT scans?](#)
9. [What is being done to reduce radiation exposure?](#)
10. [How concerned should we be about radiation in medicine?](#)
11. [What is the future outlook of harm to the population due to radiation?](#)
12. [How harmful are CT scans for children?](#)
13. [Is the amount of radiation needed to produce a clear image in CT scans the same for children and adults?](#)
14. [Is it true that with the increased use of medical radiation, the incidence of some cancers has actually decreased?](#)
15. [If radiation exposure is so harmful, why do physicians order imaging examinations so frequently?](#)
16. [What efforts have professional societies taken to publicize the risks of inappropriate use of diagnostic radiation?](#)

What is ionizing and non-ionizing radiation?

Radiation that has enough energy to move atoms in a molecule or cause them to vibrate, but not enough to remove electrons, is referred to as non-ionizing radiation. Examples of this kind of radiation are sound waves, visible light, and microwaves. Radiation that can remove electrons is called ionizing radiation, because it has enough energy to remove tightly bound electrons from atoms, thus creating ions and damaging DNA. This is the type of energy that most people think of as radiation. Ionizing or x-ray radiation can be used to ease bone pain for cancer patients, to cause cancerous tumors to die or shrink, to detect fractures, broken bones and to find tumors. Ionizing radiation is also used to produce what is called nuclear energy and in many manufacturing processes.

Adapted from Unknown, (2007, October 3). [Ionizing and non-ionizing radiation](#). Retrieved October 24, 2007, from U.S. Environmental Protection Agency Web site.

How does radiation cause health effects?

Radioactive materials that decay spontaneously produce ionizing radiation, which can strip electrons from atoms or break some chemical bonds, including those involved in the basic building block of all living material—our DNA. Any living tissue in the human body can be damaged by ionizing radiation. We all have the capacity to repair DNA damage, although sometimes that repair capacity cannot work well. Mistakes made in the natural repair process can lead to cancerous cells. The most common forms of ionizing radiation are alpha and beta particles, or gamma and X-rays. Other long-term health effects associated with ionizing or x-ray radiation include birth defects or teratogenic (an agent affecting the embryo or fetus) that include smaller head or brain size, poorly formed eyes, abnormally slow growth, and mental retardation, and genetic mutations passed from parent to child.

How do we know radiation causes cancer?

We have learned through observation of people who have been highly exposed. As the use of radioactive materials and reports of illnesses became more frequent, scientists began to notice patterns in the illnesses. People working with radioactive materials and x-rays developed particular types of uncommon medical conditions. Scientists began to keep track of the health effects, and soon set up careful scientific studies of groups of people who had been exposed. The best known long-term studies are those of Japanese atomic bomb blast survivors, other populations exposed to nuclear testing fallout, and uranium miners.

Is diagnostic radiation a major issue?

According to the [American College of Radiology white paper](#), in the United States, we receive as much radiation from diagnostic procedures every year as was released through the Chernobyl accident, which spewed hundred of Hiroshimas into the environment. The American College of Radiology is calling for a summit meeting with emergency room physicians to come up with ways to reduce unnecessary diagnostic radiation.

E. Stephen Amis, Priscilla F. Butler, Kimberly E. Applegate, et al., "American College of Radiology White Paper on Radiation Dose in Medicine," *Journal of the American College of Radiology* 4 (2007): 272-284.

Is it true that using mammography before age 40 can cause more harm than good?

Along with public health experts in Canada, England, and Scandinavia, and famed surgeon Dr. Susan Love, many believe that mammography screening of women who have no symptoms helps to save lives of women who are age 50 and older who are close to menopause. Lately, mammographic screening has been done on younger women and can carry two risks. One is the risk of unnecessary surgery and the fear that goes along with it. The other risk is the radiation itself. Radiation to the young breast is a risk, as we know from the girls who were preteens at the time of the Hiroshima bombing that now have a much higher risk of breast cancer when they get to be in their 40s and 50s.

Halicks, Richard, *Fighting the wrong war: We know what causes cancer, so why don't we attack it there?* (2007, September 30). *The Atlanta Journal-Constitution*.

What does CT stand for and how does it work?

CT stands for computer tomography. In traditional medical diagnostic x-ray equipment, low doses of x-rays are passed through tissues in the body onto a series of detailed cross-sectional images. In CT, the x-rays are targeted through the particular internal part of the body of interest at many hundreds of angles for every cross sectional slice. The information from these x-rays after they have passed through the body is analyzed by a computer, which then creates a series of detailed cross-sectional images. Thus, a typical CT scan can involve dozens to hundreds of chest x-rays.

What is the purpose of the CT scan?

CT scans look at the whole body and are used as a means of screening for early signs of illness in people who have no symptoms or disease risk factors. The benefit is that diseases such as cancer can be treated more successfully if they are detected in their early stages. They are most useful in the examination of specific target organs in the body using a narrow beam of x-rays. It is also used to measure the size and precise location of tumors; to evaluate the extent of cancer spread, and as an aid to guiding biopsies and radiation treatments.

What risks are associated with whole body CT scans?

Although CT imaging may be useful as an investigative tool for some potentially fatal disease, general whole body CT scanning in otherwise healthy individuals can also have negative consequences. For example, patients who receive a clean bill of health after a whole body scan may be left with a false sense of security about their health, discouraging them from adopting healthier lifestyles, having regular medical check ups or other more appropriate screening tests. On the other hand, people whose scans produce suspicious findings, such as those often found in the thyroid may be subjected to expensive, invasive and sometimes unnecessary follow-up medical procedures.

What is being done to reduce radiation exposure?

The National Council on Radiological Protection and Measurement is developing a set of guidelines on the management of patient dose in CT scanning. The FDA is developing a tutorial on the dangers associated with CT scanning and it will be available on their website when it is completed. The American Society of Radiologic Technologists has supported the introduction of legislation in the US House of Representatives (HR 583, the Consistency, Accuracy, Responsibility and Excellence in Medical Imaging and Radiation Therapy Act, known as the [CARE bill \[PDF\]](#)) [50] as a means of providing safer medical imaging examinations by setting federal standards for personnel who perform them. This bill specifically requires certification, licensure, testing, training, or experience for individuals who will be involved in performing medical imaging services.

E. Stephen Amis, Priscilla F. Butler, Kimberly E. Appelgate, et al., "American College of Radiology White Paper on Radiation Dose in Medicine," *Journal of the American College of Radiology* 4 (2007): 272-284.

How concerned should we be about radiation in medicine?

In a 2007 white paper on radiation in medicine, the American College of Radiology noted that in the past quarter century, the amount of radiation the U.S. population receives each year from medical imaging has increased fivefold. A single computerized scan of the stomach today can give half the dose that was shown to induce cancer in those who survived the atomic bomb blasts in Japan.

What is the future outlook of harm to the population due to radiation?

A group of Yale researchers, looking at current patterns estimates that in one year, 700 people will die from cancers associated with head CTs and 1,800 will die from radiation-induced cancer from abdominal examinations carried out when they were infants.

Davis, Devra (2007, September 30). [Tumor has it](#). Retrieved October 23, 2007, from New York Post Web site.

How harmful are CT scans for children?

A CT scan to the head of a baby can give you between 200 and 4,000 chest X-rays at once. Therefore, they should be used in a much more limited way.

Mieszkowski, Katharine (2007, October 08). [Life will kill you](#). Retrieved October 23, 2007, from Salon.Com Website.

Is the amount of radiation needed to produce a clear image in CT scans the same for children and adults?

No. The amount of radiation needed to produce a clear image is directly proportional to the subject's body size. Therefore, children require much less ionizing radiation than adults do when they get X-rays and CT scans. A child, who receives a CT scan for his or her abdominal region using a setting that is meant for adults, ends up being exposed to as much radiation as is used in about 4,000 X-rays. This translates to approximately eight times the amount of ionizing radiation that an adult would be exposed to for a similar procedure.

Adapted from Kim, Ben (2006, December 6). [Understanding the potential dangers of CT scanning](#). Retrieved October 24, 2007, from Dr. Ben Kim: Experience Your Best Health Web site.

Is it true that with the increased use of medical radiation, the incidence of some cancers has actually decreased?

No. Lung cancer is decreasing in men because of smoking cessation and breast cancer is leveling off. There is no evidence that increased screening is responsible for this decline, nor is there any reason to suppose that it could account for the decline in lung cancer. Radiation-induced cancers typically do not occur until 1 or 2 decades after exposure. Therefore, any increase in cancer occurrences due to medical exposure in the past two decades may not be evident for many years to come.

If radiation exposure is so harmful, why do physicians order imaging examinations so frequently?

Although some referring physicians are very knowledgeable regarding radiation safety and incorporate it into their imaging decisions, others have had little or no training in radiation exposure and do not routinely consider this factor when referring for these exams. In addition, non-physician health care providers may be granted the authority to order imaging studies and their ordering patterns may be reflected by the behavior of their supervising physicians.

Amis, E.S., Butler, P.F., Applegate, K.E., Birnbaum, S.B., Brateman, L.F., Hevezi, J.M., Mettler, F.A., Morin, R.L., Pentecost, M.J., Smith, G.G., Strauss, K.J., & Zeman, R.K. (2007). American college of radiology white paper on radiation dose in medication. *Journal of the American College of Radiology*. 4, 272-284.

For additional information, review [this article by Brenner and Hall](#) on CT scans.

-Brenner DJ, Hall EJ. Computed tomography—an increasing source of radiation exposure. *N Engl J Med*. 2007;357(22):2277-2284.

What efforts have professional societies taken to publicize the risks of inappropriate use of diagnostic radiation?

For more than a decade, the FDA and professional radiology groups such as the American College of Radiology have provided a number of advisories that warn of the dangers of inappropriate radiation.

Table 1: Chronology of Seminal Guidelines and Actions

Year	Organization	Document	Conclusions
1987	ATSDR, HHS	Toxicological Profile for Ionizing Radiation	Ionizing radiation has toxicologic, adverse health effects.
1987	National Commission on Radiological Protection	NCRP Report on Ionizing Radiation	Medical X-rays and nuclear medicine make up 79% of all manmade exposure, and 15% of all exposure.
1990	National Research Council, National Academy of Sciences, Committee on Biological Effects of Ionizing Radiations (BEIR)	Health Effects of Exposure to Low Levels of Ionizing Radiation: BEIR V	Large epidemiologic studies are needed to verify risk estimates largely based on A-bomb survivors and animal studies. Especially women and children, both of whom are more sensitive.
1993	International Commission on Radiological Protection	National Council on Radiation Protection and Measurements. Limitation of exposure to ionizing radiation. Bethesda, Md: National Council on Radiation Protection and Measurements; 1993. NCRP Report No. 116.	Expect 8% increase in fatal cancer risk per sievert of exposure at a given time. A linear no-threshold model should be used unless proven wrong.
1993	American College of Radiology	AJR Article	Appropriateness Criteria
1996	NRC/NAS	Radiation in Medicine (To Err is Human) NAS publication Institute of Medicine. To err is human: building a safer health system. Washington, DC: National Academy of Sciences; 1999.	Regulatory reform is needed; "only 10% of ionizing radiation used in medicine is subject to NRC and Agreement State regulatory system... Because no federal requirement exists for data collection ... realistic, accurate data on the incidence and type of problems ... remain elusive." [p120] Public and expert perception of risk diverge

1996	USDoJ	Diagnostic Imaging in Child Abuse	<p>Head</p> <p>All infants and children suspected of intracranial injury must undergo CT and/or MRI. CT is accepted method for intracranial injury and is key to Dx of shaken baby syndrome.</p> <p>Speed, availability and lower cost make CT commonly used. MRI is often preferable to CT, among other reasons because more sensitive in imaging subarachnoid hemorrhaging and no ionizing radiation.</p> <p>Thoracoabdominal trauma</p> <p>CT examination is indicated.</p>
1999	ATSDR/HHS	<p>Toxicological Profile for Ionizing Radiation</p> <p>Comprehensive 438 pp profile and guidelines</p>	<p>Updates 1987 profile with sections on pediatric exposure and new literature. Ionizing radiation is a hazardous substance.</p> <p>Medical uses account for 15% of exposure. 3m diagnostic examinations on 109,000 x-ray machines in the US in 1989. CT an emerging trend.</p>
2000	United Nations Scientific Committee on Effects of Atomic Radiation	UNSCEAR 2000 Report, Vol I and II, Sources and Effects of Ionizing Radiation	<p>Linear no threshold holds.</p> <p>Even the smallest dose has the potential to cause a small increased risk.</p>
2000	American Radium Society	<p>President's address</p> <p>Hall 2000</p>	Single micron beam experiments show bystander effects and mutations when cytoplasm irradiated. Though findings are not yet definite, such experiments will provide data on low levels not measurable in epidemiologic studies and provide missing mechanism data.
2001 Aug 18-19	Society for Pediatric Radiology (funded by GE)	<p>ALARA Conference</p> <p>**Pediatr Radiol 2002</p> <p>**Most comprehensive expert discussion of the complex issues and practical guidelines to date</p>	<p>As Low As Reasonably Achievable</p> <p>*how to determine effective dose</p> <p>*how to educate others</p> <p>On <i>individual</i> level risk is outweighed by benefit.</p> <p>Children are more sensitive by 10x.</p>

			<p>Girls more sensitive.</p> <p>Incidence is greater than mortality. Excess mortality is a public health issue.</p> <p>There is no consensus regarding single expression of dose.</p> <p>Only CT for appropriate indications. [10-30% are not]</p> <p>Adjust (weight) for children.</p> <p>Manufacturers need to provide tools to prevent excess doses.</p> <p>More research is needed for dose reduction versus image quality.</p> <p>Disseminate information to GPs, pediatricians, ER MDs. Educate medical students.</p>
2001 Sept.	Food and Drug Administration	Public Health Notification: Reducing Radiation Risks from Computed Tomography for Pediatric and Small Adult Patients	<p>Recommendations to radiologists, radiation health professionals, risk managers, hospital administrators:</p> <p>optimize CT settings</p> <p>reduce multiple scans with contrast material</p> <p>eliminate inappropriate referrals</p>
2002	National Cancer Institute/NIH & Society of Pediatric Radiology	Radiation & Pediatric Computed Tomography A Guide for Health Care Providers	<p>Children are more sensitive to radiation and have longer to live than adults.</p> <p>Minimizing radiation exposure will reduce the projected number of CT-related cancer deaths</p> <p><u>Immediate</u></p> <p>perform only when necessary</p> <p>adjust parameters for pediatric use</p> <p>minimize multi-phase scans</p> <p><u>Longer Term</u></p> <p>encourage development and adoption of pediatric protocols</p> <p>educate and disseminate re concerns</p>

			research to determine relationship between CT scans and cancer risks
2002	National Council on Radiation Protection and Measurements	2-day symposium on CT dose Linton and Mettler, 2003	70% of all medical doses are now by CT, which is 15% of examinations Children receive higher doses than they should. These can be reduced without loss of diagnostic information educate physicians and radiologic technologists develop technique charts develop automated exposure control devices create climate of demand for these when ordering equipment USE THE SAME LANGUAGE for dose accreditation is voluntary
2002	American College of Radiology	Updated Statement on Whole Body Scans	Large studies are under way to determine whether targeted organ screens save lives. There is no evidence that total body CT screening is cost efficient or effective in prolonging life.
2005	International Commission on Radiation Protection	ICRP Recommendations 2005	Cellular process evidence supports “the view that in the low dose range up to a few tens of mSv, it is scientifically reasonable to assume that in general and for practical purposes cancer risk will rise in direct proportion to absorbed dose in organs and tissues.”
2005	NIEHS	Press Release: US Department of Health and Human Services, Public Health Service, National Toxicology Program. Report on carcinogens. 11th ed.	Ionizing radiation is a known human carcinogen
2005	American Medical Association Council on Science and	Resolution 521 (A-05), introduced by the Washington Delegation	Work with the public health, radiology, and radiation oncology specialty societies and all other interested parties to study the issue of

	Public Health	and adopted at the 2005 AMA Annual Meeting	radiation exposure by the American public and develop a plan, if appropriate, to allow the ongoing monitoring and quantification of radiation exposure sustained by individual patients in medical settings.
2006	FDA and Conference of Radiation Control Program Directors (CRCPD)	Nationwide Evaluation of X-Ray Trends 2000 Computed Tomography	<p>Random sample of 265 facilities surveyed in 39 states. Estimates 124 CT procedures/week per facility, of which 93.9% (116) are performed on adults and 6.1% (8) on children.</p> <p>Estimating total facilities=7,167, that gives 57,336 procedures/week on children or ~3 million/year and 831,372 procedures/week on adults or 43,231,344/year</p> <p>Children: 65% on head, 33.3% on body</p> <p>Adults: 41% head, 56% body</p> <p>Wide variability in exposure for same type of exam.</p> <p>Recommends adjusting protocol when doses exceed “national norms”</p> <p>That is, standard is de facto defined as norm.</p>
2006	National Research Council, National Academy of Sciences, Committee on Biological Effects of Ionizing Radiations (BEIR)	BEIR VII Phase 2** **Considered the definitive source	<p>The balance of all evidence favors a linear no-threshold risk model.</p> <p>Hormesis rejected based on studies of A-bomb survivors.</p> <p>Low dose defined as ≤ 100 mSv</p> <p>Risk varies higher for females and young at time of exposure.</p> <p>a single population dose of 10 mSv is associated with a lifetime attributable risk for developing a solid cancer or leukemia of 1 in 1000.</p> <p>No epidemiologic study of populations exposed to CT was available to the committee.</p> <p>Studies of prenatal exposure to diagnostic X-rays have provided important information on the existence of a significantly increased risk of leukemia and childhood cancer following</p>

			<p>diagnostic doses of 10–20 mGy <i>in utero</i>.</p> <p>Research needs:</p> <p>Most studies of medical radiation should rely on exposure information collected prospectively, including cohort studies as well as nested case-control studies.</p> <p>Future studies should continue to include individual dose estimation for the site of interest, as well as an evaluation of the uncertainty in dose estimation.</p> <p>Epidemiologic studies of the following exposed populations would be particularly useful:</p> <p>follow-up studies of persons receiving CT scans, especially children; and</p> <p>2. studies of infants who experience diagnostic exposures related to cardiac catheterization, those who have recurrent exposures to follow their clinical status, and premature babies monitored for pulmonary development with repeated X-rays.</p>
2006	American Medical Association Council on Science and Public Health	Directives adopted by the AMA House of Delegates at the 2006 AMA Annual Meeting	<p>1. Collaborate with specialty medical societies and other interested stakeholders to convene a meeting to: (a) examine the feasibility of monitoring and quantifying cumulative radiation exposure sustained by individual patients in medical settings; and (b) discuss methods to educate physicians and the public on the appropriate use and risks of low linear energy transfer radiation in order to reduce unnecessary patient exposure in the medical setting.</p> <p>2. The AMA will continue to monitor the National Academy of Sciences’ ongoing efforts to study the impact of low levels of low linear energy transfer radiation on human health.</p> <p>In addition to the directives, AMA recommends consulting the ACR Appropriateness Criteria.</p>

2006	IARC, NCI/NIH, others	<p>Cancer consequences of Chernobyl</p> <p>Cardis et al J. Radiol. Prot. 26(2006) 127–140</p>	<p>Thyroid cancer increased dramatically among exposed in childhood and adolescence. Only 20 years have passed so too early to evaluate full impact, but no other clearly demonstrated increases in cancer risk.</p> <p>Provides summary of case-control and cohort studies.</p>
2007	American Academy of Pediatrics	<p>Guidance for the Clinician</p> <p>Brody et al.</p>	<p>“Any estimated risk of a CT scan is far less than the likely benefit to the patient for indicated examinations.”</p> <p>Those exposed at the age of 10 have about 1.0-1.8 times the estimated risk as those exposed at 30.</p> <p>No published studies have directly attributed cancer to CT scanning and it is important to recognize how difficult it would be to perform such a study. The lifetime risk of fatal cancer in the general population is approximately 1 in 5. To perform a study to detect an increase from 0.20 to 0.2002 (plus the 1-in-5000 potential risk from a CT scan) would require hundreds of thousands to millions of subjects and extremely careful matching of the subjects to ensure an accurate result.”</p> <p>Tell patients [...] “Radiologists are specialists in CT who are trained to use the least amount of radiation necessary.”</p>
2007	American College of Radiology	<p>White Paper on Radiation Dose in Medicine*</p> <p>*Major impact on dissemination to specialty associations</p> <p>Amis et al. 2007</p>	<p>Individual benefits “certainly exceed the risks” but “significant increase in the population’s cumulative exposure to ionizing radiation. Will this cause an increased incidence of cancer years down the line? Although the answer to that question is currently under debate, the presumption is that it will.”</p> <p>CT use has increased from 3 m in 1980 to 60m in 2005</p> <p>Recommends accreditation</p>

			<p>Issues specific recommendations for referring physicians, radiologists, technologists, patients, medical physicists, vendors, regulatory agencies, accrediting bodies and third-party payers.</p> <p>Should refer to “estimated exposure” not “exposure.”</p>
Jan 22 2008	Alliance for Radiation Safety in Pediatric Imaging Launched	<p>Imagegently.org (7,400,000 individual members)</p> <p>Click here for more information.</p>	<p>72,000,000 CTs in 2006—20% up from 60,000,000 in 2005—of which 4,000,000 are pediatric scans.</p> <p>Recommends promoting understanding of importance of “child-size” radiation doses.</p>

FAQs about Smoking and Related Diseases

The following FAQs describe the health effects of smoking, including tobacco smoke from cigarettes, cigars and pipes, environmental exposure to "second-hand" smoke and smoke from marijuana. It describes the many effects of smoking, especially the major life-threatening effects of chronic obstructive pulmonary disease (COPD) and cancer. It also describes the beneficial effects of quitting smoking, both to the smoker and their family.

- [How is smoking linked with cancer?](#)
- [Why should I be concerned?](#)
- [What is another major health effect of smoking?](#)
- [Why should I quit smoking?](#)
- [What differences would I see in my life if I were to quit smoking?](#)
- [Can smoking cigars and pipes lead to lung cancer?](#)
- [Can I be affected by breathing someone else's smoke?](#)
- [What are the effects of second-hand smoke on children's health?](#)
- [How can smoking tobacco affect my oral health?](#)
- [What about smoking marijuana?](#)
- [Is using smokeless tobacco safer than smoking cigarettes?](#)

[References](#)

How is smoking linked with cancer?

Tobacco smoke is a proven human carcinogen and is associated with a number of different cancers, including lung and breast cancer. It also causes chronic lung and cardiovascular diseases.

[\(National Cancer Institute 2005\)](#)

Why should I be concerned?

- Smoking tobacco remains the leading preventable cause of death in the United States, causing more than 440,000 deaths each year and resulting in an annual cost of more than \$75 billion in direct medical costs.
- In 2003, 29.8% of the U.S. population 12 and older - 70.8 million people - used tobacco at least once in the month prior to being interviewed in a national survey. This figure includes 3.6 million people age 12 to 17.
- Approximately 80% of adult smokers started smoking before the age of 18. Every day, nearly 4,000 young people under the age of 18 try their first cigarette.
- Scientists estimate that environmental tobacco smoke (ETS), also called "secondhand smoke," is responsible for approximately 3,000 lung cancer deaths per year among adult nonsmokers in the United States.

- In the United States, it has been estimated that about 7.8 million people age 12 years and older currently use smokeless tobacco.
- Lung cancer kills more women every year than breast cancer. About 90% of all lung cancer deaths among women are from smoking. Even though we know its effects are harmful, 1 out of every 5 women in the U.S. still smokes. We already know that the best way to prevent lung cancer is to quit (or never start) smoking. The sooner a person quits smoking the better; it's never too late to benefit from quitting.

([CDC Office on Smoking and Health 2007](#); [National Cancer Institute 2007a](#); [National Cancer Institute 2007b](#); [National Institute on Drug Abuse \(NIDA\) 2006a](#); [National Women's Health Information Center 2003](#); [Substance Abuse and Mental Health Services Administration 2003](#))

What is another major health effect of smoking?

Chronic obstructive pulmonary disease (COPD), a group of diseases that includes chronic bronchitis and emphysema, is now the fourth leading cause of death in the USA, accounting for over 120,000 deaths annually and costing more than 30 billion dollars per year. It is estimated that over 16 million Americans have COPD.

In this country, more than 85% of COPD is due to smoking tobacco. Smoking-related COPD tends to run in families.

([National Lung Health Education Program 2006](#))

Why should I quit smoking?

- You will live longer and feel better.
- Quitting will lower your chances of having a heart attack, stroke, or cancer.
- The people you live with, especially children, will be healthier. If you are pregnant, you will improve your chances of having a healthy baby.
- And you will have extra money to spend on things other than cigarettes.

([U.S. Public Health Service 2000](#))

What differences would I see in my life if I were to quit smoking?

Time Lapse	Effect
20 Minutes	Blood pressure and pulse drop to normal
8 Hours	Carbon monoxide level in blood drops, oxygen level increases
24 Hours	Carbon monoxide is eliminated entirely
48 Hours	Ability to smell and taste is enhanced
2-21 Weeks	Circulation improves

1 Year	Heart attack risk halved
10 Years	Lung cancer risk halved
15 Years	Heart attack risk similar to that of someone who never smoked

[\(British United Provident Association Limited\)](#)

Can smoking cigars and pipes lead to lung cancer?

Yes.

Smoking cigars and pipes also puts you at risk for lung cancer. Cigar and pipe smokers have a higher risk of lung cancer than non-smokers. Even those cigar and pipe smokers who do not inhale are at increased risk for lung, mouth, and other types of cancer.

[\(NIHSeniorHealth 2007\)](#)

Can I be affected by breathing someone else's smoke?

Yes.

The U. S. Environmental Protection Agency (EPA) has classified secondhand smoke as a Group A carcinogen - a substance known to cause cancer in humans. There is no safe level of exposure to Group A carcinogens, which also include asbestos and benzene.

Secondhand smoke is the third- leading preventable cause of death in America, killing 53,000 nonsmokers each year.

Smoke from the tip of a cigarette has 20 times the carcinogens as the smoke inhaled by a smoker.

There is clear scientific evidence of an increased risk of lung cancer in non-smokers exposed to "second-hand" smoke. This increased risk is estimated at 20% in women and 30% in men who live with a smoker.

Similarly, it has been shown that non-smokers exposed to second-hand smoke in the workplace have a 16 to 19% increased risk of developing lung cancer. The risk of developing lung cancer increases with the degree of exposure. The California Environmental Protection Agency estimates that second-hand smoke causes 3000 deaths each year due to lung cancer in non-smokers.

Non-smokers exposed to second-hand smoke have a 25 to 35% increased risk of suffering acute coronary diseases.

[\(Consumer Reports 1995; Glantz and Parmley 1991; World Health Organization Tobacco Free Initiative \(TFI\)\)](#)

What are the effects of second-hand smoke on children's health?

Small children whose parents smoke at home have an increased risk of suffering lower respiratory tract and inner ear infections. Second-hand smoke is also linked to an increase in the number and severity of asthma episodes in asthmatic children. There is also evidence that second-hand smoke increases the risk of Sudden Infant Death Syndrome (SIDS).

It is well known that exposures, such as tobacco smoke, can cause damage to DNA, the genetic material, which, if it is not repaired, becomes an irreversible "mutation." Accumulation of such mutations occurs with age and leads to diseases of aging, such as cancer. Thus, a child who experiences mutagenic exposure in the womb caused by the mother who smokes or is living in a home with a partner that

smokes might begin life with a greater lifetime risk of developing cancer or at a greater risk of developing cancer at an early age.

[\(World Health Organization Tobacco Free Initiative \(TFI\)\)](#)

How can smoking tobacco affect my oral health?

Smoking damages a smoker's mouth, gums and teeth and can lead to tooth staining, gum disease, tooth loss and in more severe cases, mouth cancer. Smoking is the most common cause of mouth cancer, and can increase your risk of developing the condition by several times.

In addition, many people who drink alcohol also smoke cigarettes. Because alcohol helps tobacco to absorb into the mouth, people who smoke and drink to excess are up to 30 times more likely to develop the condition.

[\(British Dental Health Foundation 2005\)](#)

What about smoking marijuana?

- Marijuana and cigarette smoke contain as many as 50 of the same cancer-causing substances.
- Someone who smokes marijuana regularly may have many of the same respiratory problems that tobacco smokers do, such as daily cough and phlegm production, more frequent acute chest illness, a heightened risk of lung infections, and a greater tendency to obstructed airways.
- Smoking marijuana possibly increases the likelihood of developing cancer of the head or neck.
- Marijuana abuse also has the potential to promote cancer of the lungs and other parts of the respiratory tract because it contains irritants and carcinogens. In fact, marijuana smoke contains 50 to 70 percent more carcinogenic hydrocarbons than does tobacco smoke.
- The main active chemical in marijuana is THC (delta-9-tetrahydrocannabinol). Some of marijuana's adverse health effects may occur because THC impairs the immune system's ability to fight disease. These facts suggest that, puff for puff, smoking marijuana may be more harmful to the lungs than smoking tobacco.

[\(Adams and Martin 1996; Cohen 1981; Friedman, Newton, Klein 2003; Hoffmann and others 1975; National Institute on Drug Abuse \(NIDA\) 2006b; Sridhar and others 1994; Tashkin 1990; Zhang and others 1999; Zhu and others 2000\)](#)

Is using smokeless tobacco safer than smoking cigarettes?

- Smokeless tobacco contains 28 cancer-causing agents. It is a known cause of human cancer, specifically cancers of the oral cavity.
- Oral health problems strongly associated with smokeless tobacco use are leukoplakia (a lesion of the soft tissue that consists of a white patch or plaque that cannot be scraped off) and recession of the gums.
- Smokeless tobacco use can lead to nicotine addiction and dependence. The amount of nicotine absorbed from smokeless tobacco is 3 to 4 times the amount delivered by a cigarette.

- Contrastingly: Using smokeless tobacco, instead of smoking cigarettes, does not cause harm to anyone beside the user (as opposed to the environmental tobacco smoke created by smoking cigarettes).
- The best choice is to stop using any tobacco product. Click here to view a guide designed to help you quit using smokeless tobacco provided by the National Institute for Dental and Craniofacial Research.

([National Cancer Institute 2003](#))

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Water Pollution

- [What is the most serious water pollution problem in the Southwestern PA area?](#)
- [What environmental public health threat does sewer overflows present?](#)
- [Are there Cryptosporidium or Giardia oocysts in western PA water?](#)
- [Isn't epidemic waterborne bacterial infection a thing of the past in the U.S.?](#)
- [Who is most at risk for contracting a waterborne infectious disease?](#)
- [Have there been any reports of water enthusiasts in the Pittsburgh area getting ill from water contact?](#)
- [Why does storm-water runoff from parking lots cause pollution of our receiving streams & main rivers?](#)

Nitrates in water

- [Are there water problems in the Southwestern PA region related to unsafe levels of nitrates in water?](#)
- [Are there particular problems for babies & small children associated with drinking water high in nitrates?](#)

Land Development

- [Is there any evidence that development has an effect on the level of contaminants in water or environmental public health?](#)
- [What forms of pollution increase because of unsustainable commercial or residential development?](#)

Radon in water

- [Is the gas radon 222 a problem for residents of Pennsylvania?](#)
- [Have there been any very high levels of radon in water reported in the area that could increase lung cancer risk?](#)

Arsenic

- [Is arsenic a problem in drinking water?](#)
- [What does exposure to arsenic in water cause?](#)

Fish & Water Contaminants / Eating Contaminated Fish

- [Should we be concerned about contaminants in water if they are filtered out before we drink them?](#)
- [Have there been epidemics of poisoning from eating contaminated fish?](#)

- [How many newborns are at risk from neurodevelopmental disease because their mothers ate fish contaminated with methylmercury in the U.S.?](#)
- [Are any specific sub-groups of the population more at risk for exposure to methylmercury?](#)
- [Are there subsistence fishers in Southwestern Pennsylvania who can be exposed to contaminants in fish?](#)
- [Have there been any reports of consumption of freshwater fish in the United States causing health problems?](#)
- [Does the level of methylmercury in fish vary by species?](#)
- [What are the health risks of eating contaminated fish?](#)

[View All Sources](#)

Water Pollution

What is the most serious water pollution problem in the Southwestern Pennsylvania area?

Overflow of outdated combined sewers & sanitary sewers directly into our streams & rivers is the most serious water pollution problem.

([Anderson and others 2000](#); [Committee on Water Quality Improvement for the Pittsburgh Region 2005](#); [Fulton and Buckwalter 2004](#))

What environmental public health threat does sewer overflows present?

Sewer overflows threaten public health through endemic or epidemic infection from human pathogens such as the bacteria *E. coli* or the parasites *Cryptosporidium* & *Giardia*.

([Lee and others 2002](#); [Robertson, Campbell, Smith 1992](#))

*Are there *Cryptosporidium* or *Giardia oocysts* in western PA water?*

Yes.

Alarming, studies at and downstream from sewage outfalls in main stem rivers & tributaries near Pittsburgh, PA have shown elevated levels of the human parasites *Cryptosporidium* & even higher levels of *Giardia*. This poses a risk to drinking water & to those who come in contact with the water while fishing or during other recreational activities.

([Gibson, CJ III and others 1998](#); [Hedberg and Osterholm 1993](#))

Isn't epidemic waterborne bacterial infection a thing of the past in the United States?

No.

In 1993, there was a massive epidemic of *Cryptosporidiosis* in Milwaukee that sickened over 400,000 people & killed at least 40 people who had weakened immune systems.

([Mac Kenzie, WR and others 1994](#))

Who is most at risk for contracting a waterborne infectious disease?

Anglers & other water recreationalists are at most risk due to their fish consumption & direct contact with contaminants.

([Biello 2007](#); [Volz and Christen 2007](#))

Have there been any reports of water enthusiasts in the Pittsburgh area getting ill from water contact?

Yes.

Fisherman have reported gastro-intestinal disturbances following water contact subsequent to seeing sewage gates open during wet weather events.

([Volz and Christen 2007](#))

Why does storm & water runoff from parking lots cause pollution of our receiving streams & main rivers?

It carries with it parking lot surface materials that are carcinogens, like polycyclic aromatic hydrocarbons (PAHs), naphthalene & creosote. Runoff also carries oils, grease & gasoline, volatile organic compounds (VOCs), & animal & pet feces.

([Anderson and others 2000](#); [USGS National Water-Quality Assessment \(NAWQA\) Program](#); [Volz 2007](#))

Nitrates in water***Are there water problems in the Southwestern Pennsylvania region related to unsafe levels of nitrates in water?***

Yes.

Unsafe levels of nitrates have been reported in the Connoquenessing Creek affecting the water supply of Zelienople & in rural areas & main stem rivers.

([Anderson and others 2000](#); [Borough Of Zelienople, PA 2004](#))

Are there particular problems for babies & small children associated with drinking water high in nitrates?

Yes.

Children are particularly susceptible, the development of methemoglobinemia, which affects the ability to deliver oxygen to tissue as well as developmental & neurological problems.

([Fan and Steinberg 1996](#))

Land Development***Is there any evidence that development has an effect on the level of contaminants in water or environmental public health?***

Yes.

In a modeling exercise based on actual green space & development data it was determined that there was a substantial increase in 14 water pollutants in receiving waters under both an 8 & 2 unit per acre development schemes.

([Greenberg and others 2003](#); [Greenberg and others 1994](#))

What forms of pollution increase because of unsustainable commercial or residential development?

The forms that increase are biological oxygen demand (BOD—a proxy measure for human and/or pet waste); chemical oxygen demand (COD—a proxy measure for the amount of organic chemicals in the water); total nitrogen (fertilizers), phosphates & suspended solids; & the metals- lead, copper, zinc, cadmium, chromium; nickel.

([Greenberg and others 2003](#); [Greenberg and others 1994](#))

Radon in water

Is the gas radon 222 a problem for residents of PA?

Yes.

In a study of the Allegheny-Monongahela basin, over half of the groundwater samples tested were above the EPA-proposed maximum contamination level (MCL) for radon in drinking water. And, although radon sampling is required for municipal sources, there are no requirements to test for or remediate high radon in water levels in private wells.

([Anderson and others 2000](#))

Have there been any very high levels of radon in water reported in the area that could increase lung cancer risk?

Yes.

Two area groundwater samples exceeded the 4,000 pCi/L limit requiring the local drinking water authority to initiate programs to reduce radon in indoor air & in drinking water.

([Anderson and others 2000](#))

Arsenic

Is arsenic a problem in drinking water?

Yes.

Arsenic is present in drinking water from geological deposits in many areas of the U.S. & Western PA. It also comes from confined animal feeding lots & legacy iron & steel production. Arsenic is carcinogenic.

([U.S. Environmental Protection Agency 2000](#); [U.S. Environmental Protection Agency 2001a](#); [U.S. Environmental Protection Agency 2001b](#); [U.S. Environmental Protection Agency 2001c](#))

What does exposure to arsenic in water cause?

Exposure to arsenic in drinking water has been associated with many adverse health effects, including lung, bladder, liver & skin cancers. Other adverse health effects include death, kidney/liver/gall bladder disease, nausea, developmental & reproductive effects, & skin keratosis & hyperpigmentation.

([Agency for Toxic Substances and Disease Registry \(ATSDR\) 2005](#))

Fish & Water Contaminants / Eating Contaminated Fish

Should we be concerned about contaminants in water if they are filtered out before we drink them?

Yes.

We should be concerned because fish bioaccumulate some metals like methylmercury & old industrial contaminants like PCB's in their fat & these are also bioaccumulated in humans & can increase risk for neurological disease, birth defects & cancer.

([Eto 2006](#); [Hemond and Fechner-Levy 2000](#); [U.S. Environmental Protection Agency 2007](#))

Have there been epidemics of poisoning from eating contaminated fish?

Yes.

In Minamata, Japan mothers who ate fish contaminated with methylmercury inadvertently caused their children, exposed when fetuses, to be born with birth defects & mental retardation. Other people exposed developed neurological problems.

([Eto 2006](#))

How many newborns are at risk from neurodevelopmental disease because their mothers ate fish contaminated with methylmercury in the U.S.?

More than 300,000 newborns are exposed to unacceptable levels of methylmercury during fetal development.

Large amounts of mercury harm the nervous system. Young children, developing fetuses & breast-fed babies are at most risk, because small amounts of mercury can damage a brain that is just starting to form or grow. Too much mercury may affect a child's behavior & lead to learning problems later in life.

([National Institute of Environmental Health Sciences 2004](#))

Are any specific sub-groups of the population more at risk for exposure to methylmercury?

Yes.

Asians, Native Americans, & Pacific Islanders are the most likely to be exposed to methylmercury because they eat more fish or are subsistence fishers.

([National Institute of Environmental Health Sciences 2004](#))

Are there subsistence fishers in Southwestern PA who can be exposed to contaminants in fish?

Yes.

Many African Americans, Asians & Amish people use river & lake caught fish for their main protein source.

([Volz and Christen 2007](#))

Have there been any reports of consumption of freshwater fish in the United States causing health problems?

Yes.

Quite a few studies by different research groups suggest health impacts may be profound. Problems associated with changes in the sex ratio of children, men fathering more male children than female children, & women bearing more girls than boys have been reported.

([Fields 2005](#))

Does the level of methylmercury in fish vary by species?

Yes.

The level of mercury in fish & shellfish meals varies greatly depending on the type of fish consumed & the volume of fish in proportion to the rest of the meal.

([National Institute of Environmental Health Sciences 2004](#))

What are the health risks of eating contaminated fish?

PCBs, methylmercury, PFCs & dioxins build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which are a health concern. PCB exposure has an effect on thyroid function, which is critical for development in children & also causes cancer. The consumption advice for PCBs is intended to protect children from developmental problems. PCBs also cause changes in human blood, liver, & immune functions of adults. In addition, PCBs cause cancer in laboratory animals & may cause cancer in humans. The EPA has determined that the most carcinogenic forms of PCB's accumulate in fish.

([Minnesota Dept. of Health, Fish Advisory Program 2007](#); [U.S. Environmental Protection Agency 2007](#))

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