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# Breast Cancer and the Environment

**QUESTIONS AND ANSWERS**

**INSTITUTE OF MEDICINE**  
OF THE NATIONAL ACADEMIES



In 2011, the Institute of Medicine – an independent nonprofit organization that provides evidence-based advice to policy makers and the public – published a report about breast cancer and the environment.

The report, funded by Susan G. Komen for the Cure®, offers a detailed explanation of its findings and recommendations. Download it at [www.iom.edu/BreastCancerEnvironment](http://www.iom.edu/BreastCancerEnvironment)



**In your lifetime, you probably will know several people with breast cancer;** an estimated 230,480 women in the United States found out they had the disease in 2011. Throughout their lives, women have experiences and make decisions that can influence their chances of getting breast cancer. We have little control over some of these risk factors. For example, girls who begin menstruating younger than their friends or women who are older at menopause are more likely to develop breast cancer.

But sometimes we can make choices – good or bad – that affect our risk of getting breast cancer. Avoiding unnecessary or inappropriate exposure to radiation, limiting how much alcohol you drink, avoiding certain kinds of hormone therapy, and minimizing weight gain are steps that might reduce risks for some women. In other cases, it is harder to know what to do. We don't yet know enough about many of the chemicals we encounter to figure out if they are connected to breast cancer.

Many people are concerned that environmental factors are increasing the risk of breast cancer. In a 2011 report, the Institute of Medicine (IOM) looked at the available evidence and found some answers and many more questions. Obesity, alcohol consumption, and some medical treatments raise the risk of breast cancer at least a little. For other factors, the evidence is not that easy to come by, and sometimes the answers are not as clear as we would like them to be. The IOM also looked at why it's hard to get clear answers and what women can do to reduce their risk.



**QUESTION** What does it mean to say 1 in 8 women will get breast cancer?

**ANSWER** The 1 in 8 number we often hear is the risk of getting breast cancer during a woman's lifetime. But it does not mean that 1 in every 8 women is diagnosed with breast cancer each year. A breast cancer diagnosis is never good news, and thankfully most women will never get one. In fact, the National Cancer Institute estimates that if a group of 1,000 women were followed for 10 years from their 50th to their 60th birthdays, about 20 to 30 of them would be diagnosed with breast cancer by their 60th birthday. The other 970 to 980 women in this group would not develop breast cancer during these 10 years – although some of them might develop it later in life.

Age alone is a big factor in who develops breast cancer. Until women reach their thirties, the chance of being diagnosed with breast cancer is very low, and after that the risk begins to rise. The risk of breast cancer is at its highest when women are in their sixties and seventies. Women who begin menstruating later, have a first child at a younger age, or enter menopause earlier will tend to have a relatively lower risk of breast cancer.

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Researchers have  
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**QUESTION** Researchers have been studying breast cancer for decades. Why don't we know more about how to prevent it?

**ANSWER** For years, breast cancer has been the most common type of invasive cancer among American women, and it's true that millions of dollars have been spent trying to identify its causes. But breast cancer is a complex disease, and the research to understand its causes is as complicated as the disease itself.

A woman's breast changes throughout her entire life. It begins to develop even before a girl is born, and major changes occur during puberty, pregnancy, breastfeeding, and menopause. Hormones, like estrogen, play an important role in changes to the breast, and they also can encourage growth of both normal and abnormal cells. Cancer occurs when abnormal growth of cells cannot be controlled by the body's usual protections. Because the breast changes so much over time, there are a lot of opportunities for cancer to develop in the breast.

Also, many different factors can contribute to breast cancer. A small number of women inherit genes with mutations that make developing breast cancer – and sometimes other cancers too – much more likely. For most women, though, it is what happens during their lifetimes, not the genes they inherited, that contribute most to breast cancer.

Breast cancer can be hard to study. We can't do experiments on women to see if something bad happens to those who are exposed to a chemical or some other agent of concern. That means that studies have to ask women to remember what happened to them in the past, or they have to follow women for many years to see who develops breast cancer and who doesn't, or both. In addition, studies that follow a group of women have to be relatively large (involving many thousands of women) to collect enough cases of breast cancer to do useful analysis of the data.

Researchers are also paying more attention to how experiences as a baby, a child, or an adolescent may influence the risk for breast cancer when women reach middle and older ages. But this gap of many decades between environmental exposures at younger ages and the older ages at which most breast cancers are diagnosed makes research difficult. It can be hard for older women to remember what happened to them when they were much younger or for researchers to follow a large enough group of girls until they reach the older ages at which some of them develop breast cancer.

While research is making progress in understanding breast cancer, we still have many questions.

# Should I avoid mammograms?



**QUESTION** Should I avoid mammograms?

**ANSWER** When you have common medical procedures such as mammograms, dental X-rays, and CT scans, you are exposed to X-rays. X-rays are a type of *ionizing radiation*, and exposure to ionizing radiation can increase the risk of breast and other cancers. Children may be especially vulnerable. Because mammograms use a very low dose of radiation and can be helpful in early detection of breast cancer, you should not avoid getting mammograms altogether. Follow your doctor's advice about how often you need them. Some tests – including CT scans – give higher doses of radiation, so it is a good idea to ask questions about these procedures and avoid them when they are not necessary.

*Non-ionizing radiation* is the kind of energy released by microwave ovens, cell phones, and other products with similar technology. Although ionizing radiation is a risk factor, studies have not found that non-ionizing radiation contributes to women's breast cancer.

Just two or three abdominal CT scans deliver about the same amount of radiation exposure that the survivors of the atomic bombing of Hiroshima, Japan, received.



What does it mean  
when I read that  
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for breast cancer by  
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**QUESTION** What does it mean when I read that something increases risk for breast cancer by 20 percent?

**ANSWER** Numbers like this often come from looking at two groups of women: one group exposed to the risk factor and another that is not exposed. A researcher compares the risk of breast cancer in one group relative to the other, giving a "relative risk." (Studies can use other approaches, too, but they all rely on comparing the experience of at least two groups of women.) If the study finds an increase in breast cancer risk, the relative risk will be more than 1.0.

A relative risk of 1.2, for example, means that women with the risk factor are 20 percent more likely to develop breast cancer than women without the risk factor. In the same group of 50-year-old women we considered earlier, an increase in risk of 20 percent would result in about 4 to 6 additional cases among the 1,000 women. That would make a total of 24 to 36 women who would be likely to be diagnosed with breast cancer during the next 10 years, instead of the 20 to 30 who would be diagnosed without that added risk.

**QUESTION** How can drinking alcohol be good for the heart and also cause breast cancer?

**ANSWER** It is true that just one drink a day of wine or beer makes it slightly more likely for women to develop breast cancer. But drinking this small amount of alcohol also has been shown to reduce risk of death from heart disease. Of course, drinking a lot of alcohol is unhealthy.

This is an example of how complicated it can be to decide what is good for you. Each individual woman needs to consider how the benefits and risks of alcohol may apply to her. Risks are averages for a whole group or population. Some women may have higher risks than average, for instance, because they have certain genes or started menstruating at a very young age, while others have lower risks. Talking with your doctor may be helpful.



*How can drinking alcohol be good for the heart and also cause breast cancer?*





*Is it safe to drink  
water out of a plastic bottle?*



**QUESTION** Is it safe to drink water out of a plastic bottle?

**ANSWER** Plastic water bottles have been in the news a lot recently, and you've probably heard about BPA (bisphenol A) and phthalates. Both chemicals are added to plastic products to make them more flexible. They are used in lots of products, ranging from lotion, food packaging, and toys (phthalates) to metal cans, dental appliances, plastic water bottles, and receipt paper (BPA).

Scientists can measure levels of these chemicals in blood or urine but are uncertain what effect these and many other chemicals have on women's risk for breast cancer. In studies in laboratory animals, both BPA and phthalates have been shown to mimic estrogen in the body, potentially changing hormone signals and possibly contributing to breast cancer.

Scientists don't know enough about how these chemicals affect breast cancer risk to know whether avoiding them will reduce that risk. It can be hard to understand and measure the behavior of chemicals like these in humans. Sometimes tests using animals or cells that were grown in labs are the only tools researchers can use. The results of these tests give us clues about what may happen to people, but we need better tests in animals and cells to predict effects in humans.





**QUESTION** What can I do to reduce my risk of developing breast cancer?

**ANSWER** While there are many things we don't yet know about breast cancer, some of the risks are clear. Knowing these risks points to some of the ways you can reduce your chance of developing the disease. Ionizing radiation does increase the risk for breast cancer. So do hormone replacement therapies that include both estrogen and progestin. Avoiding medical radiation and hormone therapy, unless they are medically necessary, is a good idea. Drinking alcohol and smoking tobacco appear to slightly increase the risk of developing breast cancer. Limiting these behaviors can help reduce the risk. Staying fit and avoiding weight gain can also help reduce the risk of breast cancer. Overweight women are more likely to develop breast cancer after menopause, while women who are physically active have lower risk.

*What can I do to reduce  
my risk of developing  
breast cancer?*



*Breast Cancer and the Environment: A Life Course Approach*, authored by the IOM Committee on Breast Cancer and the Environment: The Scientific Evidence, Research Methodology, and Future Directions, provides a comprehensive view of this issue.

**COMMITTEE ON BREAST CANCER AND THE ENVIRONMENT: THE SCIENTIFIC EVIDENCE, RESEARCH METHODOLOGY, AND FUTURE DIRECTIONS**

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While we have learned a lot about breast cancer and what increases risk, there are still many questions. New research needs to weave together work by many different kinds of scientists to find answers. Across the world, researchers are looking at breast cancer and trying to answer questions like these that still need attention:

What are the causes of and contributors to breast cancer across a woman's entire lifetime?

Can we learn more about what environmental chemicals do inside the human body that may make some of them increase the risk of breast cancer?

Can scientists find better ways to identify what different things people have been exposed to, and to tell when and how much they were exposed to even when they were very young?

How can breast cancer's development be interrupted or prevented?

How could the testing of chemicals be improved to provide better information about breast cancer risk?

How can we learn more about the effect of many small exposures to environmental factors over time, or the effects when these exposures occur together?

What is the best way to get accurate information about breast cancer risks to people?

Funding for this booklet was made possible through a grant from Susan G. Komen for the Cure®, which as of December 2011 has invested \$685 million in breast cancer research and more than \$1.3 billion in community programs to find cures and end suffering from breast cancer.



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