



# Breast Cancer Risk and Prevention

## Risk Factors for Breast Cancer

A risk factor is anything that affects your chance of getting a disease, such as cancer. But having a risk factor, or even many, does not mean that you are sure to get the disease. While you can't change some breast cancer risk factors—family history and aging, for example—there are some risk factors that you can control.

- [Lifestyle-related Breast Cancer Risk Factors](#)
- [Breast Cancer Risk Factors You Cannot Change](#)
- [Factors with Unclear Effects on Breast Cancer Risk](#)
- [Disproven or Controversial Breast Cancer Risk Factors](#)

## Can Breast Cancer Be Prevented in Women at Increased Risk?

There is no sure way to prevent breast cancer. But there are things you can do that might lower your risk. This can be especially helpful for women with certain risk factors for breast cancer, such as having a strong family history or certain gene changes.

- [Deciding Whether to Use Medicine to Reduce Breast Cancer Risk](#)
- [Tamoxifen and Raloxifene for Breast Cancer Prevention](#)
- [Aromatase Inhibitors for Lowering Breast Cancer Risk](#)
- [Preventive Surgery to Reduce Breast Cancer Risk](#)

## Breast Cancer Risk Factors You Cannot Change

The main risk factors for breast cancer are things you cannot change: being a woman, getting older, and having certain gene changes. These make your risk of breast cancer

higher. But having a risk factor, or even many, does not mean that you are sure to get the disease.

## Being a woman

Simply being a woman is the main risk factor for breast cancer. Men can have breast cancer, too, but this disease is about 100 times more common in women than in men. This might be because men have less of the female hormones estrogen and progesterone, which can promote breast cancer cell growth.

## Getting older

As you get older, your risk of breast cancer goes up. Most invasive breast cancers (those that have spread from where they started) are found in women age 55 and older.

## Certain inherited genes

About 5% to 10% of breast cancer cases are thought to be hereditary, meaning that they result directly from gene defects (called *mutations*) passed on from a parent.

**BRCA1 and BRCA2:** The most common cause of hereditary breast cancer is an inherited mutation in the *BRCA1* and *BRCA2* genes. In normal cells, these genes help prevent cancer by making proteins that help keep the cells from growing abnormally. Mutated versions of these genes cannot stop abnormal growth, and that can lead to cancer.

- If you have inherited a mutated copy of either gene from a parent, you have a higher risk of breast cancer.
- In some families with *BRCA1* mutations the lifetime risk of breast cancer is as high as 80%, but on average this risk seems to be in the range of 55% to 65%. For *BRCA2* mutations the risk is lower, around 45%.
- Breast cancers linked to these mutations are more often found in younger women and more often in both breasts than cancers not linked to these mutations. Women with these inherited mutations also have a higher risk of developing other cancers, mainly ovarian cancer.
- In the United States, *BRCA* mutations are more common in Jewish people of Ashkenazi (Eastern Europe) origin than in other racial and ethnic groups, but anyone can have them.

**Changes in other genes:** Other gene mutations can also lead to inherited breast cancers. These gene mutations are much less common and most of them do not increase the risk of breast cancer as much as the BRCA genes. They are seldom causes of inherited breast cancer.

- **ATM:** The *ATM* gene normally helps repair damaged DNA. Inheriting 2 abnormal copies of this gene causes the disease *ataxia-telangiectasia*. Inheriting one abnormal copy of this gene has been linked to a high rate of breast cancer in some families.
- **TP53:** The *TP53* gene gives instructions for making a protein called *p53* that helps stop the growth of abnormal cells. Inherited mutations of this gene cause *Li-Fraumeni syndrome*. People with this syndrome have an increased risk of breast cancer, as well as some other cancers such as leukemia, brain tumors, and sarcomas (cancers of bones or connective tissue). This mutation is a rare cause of breast cancer.
- **CHEK2:** Li-Fraumeni syndrome can also be caused by inherited mutations in the *CHEK2* gene. A *CHEK2* mutation, even when it doesn't cause this syndrome, can increase breast cancer risk about 2-fold.
- **PTEN:** The *PTEN* gene normally helps regulate cell growth. Inherited mutations in this gene cause *Cowden syndrome*, a rare disorder that puts people at higher risk for both non-cancer and cancer tumors in the breasts, as well as growths in the digestive tract, thyroid, uterus, and ovaries. Defects in this gene can also cause a different syndrome called *Bannayan-Riley-Ruvalcaba syndrome* that's not thought to be linked to breast cancer risk. The syndromes caused by mutations in *PTEN* can be grouped together as *PTEN Tumor Hamartoma Syndrome*.
- **CDH1:** Inherited mutations in this gene cause *hereditary diffuse gastric cancer*, a syndrome in which people develop a rare type of stomach cancer. Women with mutations in this gene also have an increased risk of invasive lobular breast cancer.
- **STK11:** Defects in this gene can lead to *Peutz-Jeghers syndrome*. People affected with this disorder have pigmented spots on their lips and in their mouths, polyps in the urinary and gastrointestinal tracts, and a higher risk of many types of cancer, including breast cancer.
- **PALB2:** The *PALB2* gene makes a protein that interacts with the protein made by the *BRCA2* gene. Mutations in this gene can lead to a higher risk of breast cancer. It isn't yet clear if *PALB2* gene mutations also increase the risk for ovarian cancer and male breast cancer.

**Genetic testing:** Genetic testing can be done to look for mutations in the *BRCA1* and *BRCA2* genes (or less commonly in other genes such as *PTEN* or *TP53*). While testing

can be helpful in some cases, the pros and cons need to be considered carefully.

If you're thinking about genetic testing, it's strongly recommended that you first talk to a genetic counselor, nurse, or doctor who can explain and interpret the results of these tests. It's very important to understand what genetic testing can and can't tell you, and to carefully weigh the benefits and risks of genetic testing before these tests are done. Testing costs a lot and might not be covered by some health insurance plans.

Our section on genetics and cancer has more information about genetic mutations and testing for them.

## **Having a family history of breast cancer**

It's important to note that most women (about 8 out of 10) who get breast cancer *do not* have a family history of the disease, but:

- Women who have close blood relatives with breast cancer have a higher risk of the disease.
- Having a first-degree relative (mother, sister, or daughter) with breast cancer almost doubles a woman's risk. Having 2 first-degree relatives increases her risk about 3-fold.
- Women with a father or brother who have had breast cancer also have a higher risk of breast cancer.

Overall, less than 15% of women with breast cancer have a family member with this disease.

## **Having a personal history of breast cancer**

A woman with cancer in one breast has a higher risk of developing a new cancer in the other breast or in another part of the same breast. (This is different from a recurrence or return of the first cancer.) This risk is even higher for younger women with breast cancer.

## **Your race and ethnicity**

Overall, white women are slightly more likely to develop breast cancer than African-American women, but African-American women are more likely to die of this cancer. In women under age 45, breast cancer is more common in African-American women.

Asian, Hispanic, and Native American women have a lower risk of developing and dying from breast cancer.

## Having dense breast tissue

Breasts are made up of fatty tissue, fibrous tissue, and glandular tissue. Someone is said to have dense breasts (on a mammogram) when they have more glandular and fibrous tissue and less fatty tissue. Women with dense breasts on mammogram have a risk of breast cancer that is 1.2 to 2 times that of women with average breast density. Unfortunately, dense breast tissue can also make mammograms less accurate.

A number of factors can affect breast density, such as age, menopausal status, the use of certain drugs (including menopausal hormone therapy), pregnancy, and genetics.

For more information, see our page on breast density and mammograms.

## Certain benign breast conditions

Women diagnosed with certain benign (non-cancer) breast conditions may have a higher risk of breast cancer. Some of these conditions are more closely linked to breast cancer risk than others. Doctors often divide benign breast conditions into 3 general groups, depending on how they affect this risk.

**Non-proliferative lesions:** These conditions don't seem to affect breast cancer risk, or if they do, it's to a very small extent. They include:

- Fibrosis and/or simple cysts (sometimes called *fibrocystic changes* or *disease*)
- Mild hyperplasia
- Adenosis (non-sclerosing)
- Phyllodes tumor (benign)
- A single papilloma
- Fat necrosis
- Duct ectasia
- Periductal fibrosis
- Squamous and apocrine metaplasia
- Epithelial-related calcifications
- Other tumors (lipoma, hamartoma, hemangioma, neurofibroma, adenomyoepithelioma)

Mastitis (infection of the breast) is not a tumor and does not increase the risk of breast cancer.

**Proliferative lesions without atypia (cell abnormalities):** In these conditions there's excessive growth of cells in the ducts or lobules of the breast. They seem to raise a woman's risk of breast cancer slightly. They include:

- Usual ductal hyperplasia (without atypia)
- Fibroadenoma
- Sclerosing adenosis
- Several papillomas (called *papillomatosis*)
- Radial scar

**Proliferative lesions with atypia:** In these conditions, the cells in the ducts or lobules of the breast tissue grow excessively, and some of them no longer look normal.. These types of lesions include:

- Atypical ductal hyperplasia (ADH)
- Atypical lobular hyperplasia (ALH)

Breast cancer risk is raised 3½ to 5 times higher than normal in women with these changes. If a woman has a family history of breast cancer and either hyperplasia or atypical hyperplasia, she has an even higher risk of breast cancer.

For more on these conditions, see the section we have on Non-cancerous Breast Conditions.

### **Lobular carcinoma in situ**

In lobular carcinoma in situ (LCIS), cells that look like cancer cells are growing in the lobules of the milk-producing glands of the breast, but they do not grow through the wall of the lobules. LCIS is also called *lobular neoplasia*. It's sometimes grouped with ductal carcinoma in situ (DCIS) as a non-invasive breast cancer, but it differs from DCIS in that it doesn't seem to become invasive cancer if it isn't treated.

Women with lobular carcinoma in situ (LCIS) have a much higher risk of developing cancer in either breast.

## **Starting menstruation (periods) before age 12**

Women who have had more menstrual cycles because they started menstruating early (before age 12) have a slightly higher risk of breast cancer. The increase in risk may be

due to a longer lifetime exposure to the hormones estrogen and progesterone.

## Going through menopause after age 55

Women who have had more menstrual cycles because they went through menopause later (after age 55) have a slightly higher risk of breast cancer. The increase in risk may be because they have a longer lifetime exposure to the hormones estrogen and progesterone.

## Having radiation to your chest

Women who as children or young adults were treated with [radiation therapy](#) to the chest for another cancer (such as Hodgkin disease or non-Hodgkin lymphoma) have a significantly higher risk for breast cancer. This varies with the patient's age when they got radiation. And if you had chemotherapy with the radiation, it might have stopped ovarian hormone production for some time, which lowers the risk. The risk of developing breast cancer from chest radiation is highest if you had radiation during adolescence, when your breasts were still developing. Radiation treatment after age 40 does not seem to increase breast cancer risk.

## Exposure to diethylstilbestrol (DES)

From the 1940s through the early 1970s some pregnant women were given an estrogen-like drug called *DES* because it was thought to lower their chances of losing the baby (miscarriage). These women have a slightly increased risk of developing breast cancer. Women whose mothers took DES during pregnancy may also have a slightly higher risk of breast cancer.

For more on DES, see our informational page about [DES exposure](#).

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# Lifestyle-related Breast Cancer Risk Factors

Certain breast cancer risk factors are related to personal behaviors, such as diet and exercise. Other lifestyle-related risk factors include decisions about having children and taking birth control.

## Drinking alcohol

[Drinking alcohol](#) is clearly linked to an increased risk of developing breast cancer. The risk increases with the amount of alcohol consumed. Compared with non-drinkers, women who have 1 alcoholic drink a day have a very small increase in risk. Those who have 2 to 5 drinks daily have about 1½ times the risk of women who don't drink alcohol. Excessive alcohol consumption is known to increase the risk of other cancers, too. The American Cancer Society recommends that women have no more than 1 alcoholic drink a day. A drink is 12 ounces of regular beer, 5 ounces of wine, or 1.5 ounces of 80-proof distilled spirits.

## Being overweight or obese

[Being overweight or obese](#) after menopause increases breast cancer risk. Before menopause your ovaries make most of your estrogen, and fat tissue makes only a small amount. After menopause (when the ovaries stop making estrogen), most of a woman's estrogen comes from fat tissue. Having more fat tissue after menopause can raise estrogen levels and increase your chance of getting breast cancer. Also, women who are overweight tend to have higher blood insulin levels. Higher insulin levels have been linked to some cancers, including breast cancer.

Still, the link between weight and breast cancer risk is complex. For instance, risk appears to be increased for women who gained weight as an adult, but may not be increased among those who have been overweight since childhood. Also, excess fat in



the waist area may affect risk more than the same amount of fat in the hips and thighs. Researchers believe that fat cells in various parts of the body have subtle differences that may explain this.

The American Cancer Society recommends you stay at a healthy weight throughout your life by balancing your food intake with physical activity and avoiding excessive weight gain.

## Physical activity

Evidence is growing that physical activity in the form of exercise; reduces breast cancer risk. The main question is how much exercise is needed. In one study from the Women's Health Initiative, as little as 1¼ to 2½ hours per week of brisk walking reduced a woman's risk by 18%. Walking 10 hours a week reduced the risk a little more.

To reduce your risk of breast cancer, [the American Cancer Society recommends](#) that adults get at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity activity each week (or a combination of these), preferably spread throughout the week.

Moderate activity is anything that makes you breathe as hard as you do during a brisk walk. During moderate activities, you'll notice a slight increase in heart rate and breathing. You should be able to talk, but not sing during the activity. Vigorous activities are performed at a higher intensity. They cause an increased heart rate, sweating, and a faster breathing rate. Activities that improve strength and flexibility, such as weight lifting, stretching, or yoga, are also beneficial.

## Having children

Women who have not had children or who had their first child after age 30 have a slightly higher breast cancer risk overall. Having many pregnancies and becoming pregnant at an early age reduces breast cancer risk overall. Still, the effect of pregnancy is different for different types of breast cancer. For a certain type of breast cancer known as triple-negative, pregnancy seems to increase risk.

## Birth control

**Oral contraceptives:** Studies have found that women using oral contraceptives (birth control pills) have a slightly higher risk of breast cancer than women who have never used them. Once the pills are stopped, this risk seems to go back to normal over time.

Women who stopped using oral contraceptives more than 10 years ago do not appear to have any increased breast cancer risk.

**Birth control shot:** Depo-Provera is an injectable form of progesterone that's given once every 3 months as birth control. A few studies have looked at the effect of birth control shots on breast cancer risk. Women currently using birth-control shots seem to have an increase in breast cancer risk, but it appears that there is no increased risk in women 5 years after they stop getting the shots.

**Birth control implant, IUD, skin patch, vaginal ring:** These forms of birth control also use hormones that could fuel breast cancer growth. Some studies have shown a link between use of hormone-releasing IUD and breast cancer risk, but few studies have looked into the use of birth control implants, patch, and ring and breast cancer risk.

When thinking about using hormonal birth control, women should discuss their other risk factors for breast cancer with their health care provider.

## Hormone therapy after menopause

[Hormone therapy](#) with estrogen (often combined with progesterone) has been used for many years to help relieve symptoms of menopause and help prevent osteoporosis (thinning of the bones). This treatment goes by many names, such as *post-menopausal hormone therapy* (PHT), *hormone replacement therapy* (HRT), and *menopausal hormone therapy* (MHT).

There are 2 main types of hormone therapy. For women who still have a uterus (womb), doctors generally prescribe estrogen and progesterone (known as *combined hormone therapy* or HT). Progesterone is needed because estrogen alone can increase the risk of [cancer of the uterus](#). For women who've had a hysterectomy (those who no longer have a uterus), estrogen alone can be used. This is known as *estrogen replacement therapy* (ERT) or just *estrogen therapy* (ET).

**Combined hormone therapy (HT):** Use of combined hormone therapy after menopause increases the risk of breast cancer. It may also increase the chances of dying from breast cancer. This increase in risk can be seen with as little as 2 years of use. Combined HT also increases the likelihood that the cancer may be found at a more advanced stage. (This means it's already spread from the place it started when it's found.)

The increased risk from combined HT appears to apply only to current and recent users. A woman's breast cancer risk seems to return to that of the general population within 5

years of stopping treatment.

**Bioidentical hormone therapy:** The word *bioidentical* is sometimes used to describe versions of estrogen and progesterone with the same chemical structure as those found naturally in people. The use of these hormones has been marketed as a safe way to treat the symptoms of menopause. It's important to realize that because there aren't many studies comparing "bioidentical" or "natural" hormones to synthetic versions of hormones, there's no proof that they're safer or more effective. More studies are needed to know for sure;. The use of these bioidentical hormones should be thought to have the same health risks as any other type of hormone therapy.

**Estrogen therapy (ET):** The use of estrogen alone after menopause does not seem to increase the risk of breast cancer much, if at all. But when used long term (for more than 10 years), ET has been found to increase the risk of ovarian and breast cancer in some studies.

At this time there are few strong reasons to use post-menopausal hormone therapy (either combined HT or ET), other than possibly for the short-term relief of menopausal symptoms. Along with the increased risk of breast cancer, combined HT also appears to increase the risk of heart disease, blood clots, and strokes. It does lower the risk of colorectal cancer and osteoporosis, but this must be weighed against the possible harms, especially since there are other ways to prevent and treat osteoporosis and [screening can](#) sometimes prevent colon cancer. ET does not seem to increase breast cancer risk, but it does increase the risk of stroke.

The decision to use HT should be made by a woman and her doctor after weighing the possible risks and benefits (including the severity of her menopausal symptoms), and considering her other risk factors for heart disease, breast cancer, and osteoporosis. If they decide she should try HT for symptoms of menopause, it's usually best to use it at the lowest dose that works for her and for as short a time as possible.

## Breastfeeding

Some studies suggest that breastfeeding may slightly lower breast cancer risk, especially if it's continued for 1½ to 2 years. But this has been hard to study, especially in countries like the United States, where breastfeeding for this long is uncommon.

The explanation for this possible effect may be that breastfeeding reduces a woman's total number of lifetime menstrual cycles (the same as starting menstrual periods at a later age or going through early menopause).

# Factors with Unclear Effects on Breast Cancer Risk

There are some things that might be risk factors for breast cancer, but the research is not yet clear about whether there really is a link. They include things like tobacco smoke and working at night. Learn more about these factors.

## Diet and vitamins

Many studies have been done looking for a link between certain diets and breast cancer risk, but so far the results have been conflicting. Results of some studies have shown that diet may play a role, while others showed no evidence that diet influences breast cancer risk.

Studies looking at vitamin levels have had inconsistent results. And some studies have found that higher levels of certain nutrients ; increased the risk for breast cancer in women. So far, no study has shown that taking vitamins reduces breast cancer risk. This is not to say that there's no point in eating a healthy diet. A diet low in fat, low in red meat and processed meat, and high in fruits and vegetables can have other health benefits.

Many studies of women in the United States have not linked breast cancer risk to fat in the diet. Still, studies have found that breast cancer is less common in countries where the typical diet is low in total fat, low in polyunsaturated fat, and low in saturated fat. Researchers are still not sure how to explain this. It may be at least partly due to the effect of diet on body weight. Also, studies comparing diet and breast cancer risk in different countries are complicated by other differences (such as activity level, intake of other nutrients, and genetic factors) that might also affect breast cancer risk.

More research is needed to better understand the effect of the types of fat eaten on breast cancer risk. It's clear that calories do count, and fat is a major source of calories. High-fat diets can lead to being overweight or obese, which is a known breast cancer risk factor. A diet high in fat is also a risk factor for some other types of cancer. And intake of certain types of fat is clearly related to higher risk of heart disease.

## Chemicals in the environment

A great deal of research has been reported and more is being done to understand possible environmental influences on breast cancer risk.

Compounds in the environment that have estrogen-like properties are of special interest. For example, substances found in some plastics, certain cosmetics and personal care products, pesticides, and PCBs (polychlorinated biphenyls) seem to have such properties. In theory, these could affect breast cancer risk.

This issue raises a great deal of public concern, but at this time research does not show a clear link between breast cancer risk and exposure to these substances. Studying such effects in humans is hard to do. More research is needed to better define the possible health effects of these substances and others like them.

## Tobacco smoke

For a long time, studies showed no link between cigarette smoking and breast cancer. But in recent years, more studies have shown that heavy smoking over a long-time is linked to a higher risk of breast cancer. In some studies, the risk was highest in certain groups, such as women who started smoking before they had their first child. The 2014 US Surgeon General's report on smoking concluded that there is "suggestive but not sufficient" evidence that smoking increases the risk of breast cancer.

Researchers are also looking at whether [secondhand smoke](#) increases the risk of breast cancer. Both mainstream and secondhand smoke contain chemicals that, in high concentrations, cause breast cancer in rodents. Studies have shown that chemicals in tobacco smoke reach breast tissue and are found in breast milk of rodents.

In human studies, the evidence on secondhand smoke and breast cancer risk is not clear, at least in part because the link between smoking and breast cancer is also not clear. One reason for this might be that tobacco smoke may have different effects on breast cancer risk in smokers compared with those who are just exposed to secondhand smoke.

A report from the California Environmental Protection Agency in 2005 concluded that the evidence about secondhand smoke and breast cancer is "consistent with a causal association" in younger, mainly pre-menopausal women. The 2014 US Surgeon General's report concluded that there is "suggestive but not sufficient" evidence of a link at this point. In any case, this possible link to breast cancer is yet another reason to

avoid secondhand smoke.

## Night work

Some studies have suggested that women who work at night, such as nurses on a night shift, might have an increased risk of breast cancer. This is a fairly recent finding, and more studies are looking at this. Some researchers think the effect may be due to changes in levels of melatonin, a hormone that's affected by the body's exposure to light, but other hormones are also being studied.

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# Disproven or Controversial Breast Cancer Risk Factors

There are many factors that research has shown are not linked to breast cancer. You may see information online or hear about these disproven or controversial risk factors, but it is important to learn the facts.

## Antiperspirants

Internet and e-mail rumors have suggested that chemicals in underarm antiperspirants are absorbed through the skin, interfere with lymph circulation, and cause toxins to build up in the breast, eventually leading to breast cancer.

Based on the available evidence (including what we know about how the body works), there is little if any reason to believe that antiperspirants increase the risk of breast cancer. For more information, see [our page about antiperspirants and breast cancer risk](#).

## Bras

Internet and e-mail rumors and at least one book have suggested that bras cause breast cancer by obstructing lymph flow. There is no good scientific or clinical basis for this claim, and a recent study of more than 1,500 women found no association between wearing a bra and breast cancer risk.

## Induced abortion

Several studies have provided very strong data that neither induced abortions nor spontaneous abortions (miscarriages) have an overall effect on the risk of breast cancer. For more detailed information, see [Abortion and Breast Cancer Risk](#).

## Breast implants

Several studies have found that breast implants do not increase the risk of breast cancer, although silicone breast implants can cause scar tissue to form in the breast.

Implants make breast tissue harder to see on standard mammograms, but additional x-ray pictures called implant displacement views can be used to examine the breast tissue more completely.

Certain types of breast implants can be linked to a rare type of cancer called *anaplastic large cell lymphoma (ALCL)*. It is sometimes referred to as breast implant-associated anaplastic large cell lymphoma (BIA-ALCL). This lymphoma appears to happen more often in implants with textured (rough) surfaces rather than smooth surfaces. If ALCL does show up after an implant, it can show as a lump, a collection of fluid near the implant, pain, swelling or asymmetry (uneven breasts). It usually responds well to treatment.

- [References](#)

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## Deciding Whether to Use Medicine to Reduce Breast Cancer Risk

If you are a woman who has a higher than average risk of breast cancer, you should know that drugs like [tamoxifen and raloxifene](#) have been shown to help reduce the risk. Talk to a health care provider to find out if taking one of these drugs is an option for you.

### Should I take a drug to help reduce my breast cancer risk?

Using drugs to help lower the risk of getting a disease is called chemoprevention. The first step in deciding if you should take a drug to help lower your chances of having breast cancer is to have a health care provider assess your breast cancer risk. (See below for names of tools that can be used to do this.) All drugs have benefits and risks. For women with an increased risk of breast cancer, the benefits of chemoprevention may outweigh the risks.



For now, most experts say that your breast cancer risk should be higher than average for you to consider taking tamoxifen or raloxifene. If you do have a higher than average breast cancer risk, you need to compare the benefit of possibly reducing your chance of getting breast cancer with the risk of side effects and other problems from taking one of these drugs.

Your risk factors need to be identified to find out if you are at higher than average risk for breast cancer. A risk factor is anything that affects your risk of getting a disease. But keep in mind that having risk factors that are linked to a higher risk does not mean that you will develop breast cancer. In fact, most women who have one or more risk factors will never develop breast cancer.

Risk factors for breast cancer include:

- Being a woman
- Getting older
- Having blood relatives who had breast cancer
- Your menstrual history
- Your pregnancy history
- Having had invasive breast cancer or [ductal carcinoma in situ \(DCIS\)](#) in the past
- Being diagnosed with lobular carcinoma in situ (LCIS)
- Being diagnosed with atypical ductal hyperplasia (ADH) or atypical lobular hyperplasia (ALH)
- Having a gene mutation linked to [family cancer syndrome](#) (such as a *BRCA* mutation)

## How is breast cancer risk assessed?

Researchers have built some statistical models to help predict a woman's risk of getting breast cancer.

The Breast Cancer Risk Assessment Tool (also called the Gail Model) is one of these. It can estimate your risk of getting breast cancer in the next 5 years and over your lifetime, based on many of the factors listed above.

The tool does have some limits, though. For instance, it only looks at family history in close relatives (like siblings, parents, and children). And it doesn't estimate risk if you have a history of ductal carcinoma in situ (DCIS), lobular carcinoma in situ (LCIS), or have had breast cancer. It's also not helpful if you have a family cancer syndrome.

Also, the data that this tool was based on didn't include Hispanic/Latina, American Indian, or Alaskan Native women, so estimates for these women may not be accurate.

Other risk assessment tools are based largely on family history, such as the Tyrer-Cuzick model and the Claus model.

These tools can give you a rough estimate of your risk, but no tool or test can tell you whether you'll develop breast cancer.

## **How high does my risk need to be?**

Different studies have different definitions of a higher than average risk of breast cancer. Two big studies of tamoxifen and raloxifene, the Breast Cancer Prevention Trial (BCPT) and the Study of Tamoxifen and Raloxifene (STAR), used a 1.7% risk of developing breast cancer over the next 5 years as their cut-off point. (1.7% is the risk of a healthy woman aged 60.)

Some organizations recommend that doctors discuss the use of medicines to lower breast cancer risk in women at least 35 years old who have a 5-year risk of 1.7% or higher. Others only recommend chemoprevention for women 35 years and older with a 5-year risk of 3% or higher.

Most organizations recommend doctors and patients consider the use of either tamoxifen or raloxifene to lower risk. But at least one also recommends that doctors and their patients consider another type of drug called an aromatase inhibitor.

The American Cancer Society does not have recommendations for the use of medicines to help lower the risk of breast cancer.

## **Are there reasons not to take one of these drugs to help reduce breast cancer risk?**

All drugs have risks and side effects that must be discussed when making the decision about chemoprevention. Most experts agree that only women who are at a higher risk of breast cancer should take a drug to help lower their risk.

Neither tamoxifen nor raloxifene should be used to reduce breast cancer risk in women who:

- Have a higher risk of serious blood clots\*
- Are pregnant or planning to become pregnant
- Are breastfeeding
- Are taking estrogen (including birth control pills and shots or menopausal hormone therapy)
- Are taking an aromatase inhibitor
- Are younger than 35 years old

\*Women who have a higher risk of serious blood clots include those who have **ever** had serious blood clots (deep venous thrombosis [DVT] or pulmonary embolism [PE]). Many doctors also feel that if you've had a stroke or heart attack you also have a higher risk of blood clots if you take these drugs. If you smoke, are obese, or have (or are being treated for) high blood pressure or diabetes you also have a higher risk of serious blood clots. Women with these conditions should talk to their doctors to see if the benefits of chemoprevention outweigh the risks.

A woman who has been diagnosed with any type of uterine cancer or atypical hyperplasia of the uterus (a kind of pre-cancer) should not take tamoxifen to help lower breast cancer risk.

Raloxifene has not been tested in pre-menopausal women, and should only be used in women who have gone through menopause.

You should talk with your doctor about your total health picture to make the best possible choice.

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# Tamoxifen and Raloxifene for Breast Cancer Prevention

Tamoxifen and raloxifene have been shown to reduce the risk breast cancer, but they can have their own risks and side effects. Tamoxifen and raloxifene are the only drugs that are approved in the US to help lower the risk of breast cancer.

## What kind of drugs are tamoxifen and raloxifene?

Both of these drugs are *selective estrogen receptor modulators* (or SERMs). This means that they act against (or block) estrogen (a female hormone) in some tissues of the body, but act like estrogen in others. Estrogen can fuel the growth of breast cancer cells. Both of these drugs block estrogen in breast cells, which is why they can be useful in lowering breast cancer risk.

These drugs are used more often for other things.

- Tamoxifen mainly is used to treat [hormone receptor-positive breast cancer](#) (breast cancer with cells that have estrogen and/or progesterone receptors on them).
- Raloxifene is used mostly to prevent and treat osteoporosis (very weak bones) in post-menopausal women.

Both drugs are pills taken once a day. Tamoxifen also comes in a liquid form. Tamoxifen can be used by women whether or not they have gone through menopause, but raloxifene is only approved to be used by post-menopausal women. To lower the risk of breast cancer, these drugs are taken for 5 years.

## How much do these drugs lower the risk of breast cancer?

The effect of these drugs on breast cancer risk has varied in different studies. Tamoxifen has been shown to lower risk by 13% to 48%, while raloxifene has lowered risk by 18% to 58%. When the results of all the studies are taken together, the overall reduction in risk for these drugs was about 38% (more than a third). These drugs lower the risk of both invasive breast cancer and ductal carcinoma in situ.

## What would this mean for me?

Although a medicine that cuts your risk by more than a third (or 38%) sounds like it must be a good thing, what it would really mean for you depends on how high your risk is in the first place (your baseline risk).

For example, if you had an 8% risk of getting breast cancer in the next 5 years, you would be considered to be at increased risk. An 8% risk would mean that over the next 5 years, 8 of 100 people with your risk would be expected to get breast cancer. A 38% relative risk reduction means that the risk would go from 8% to 5%. So now only 5 of the 100 people would get breast cancer over the next 5 years. So for you, a change in the relative risk of 38% actually means a 3% change in your absolute risk (from 8% to 5%).

Since the change in absolute risk depends on your baseline risk, you would benefit less if you had a lower baseline risk, and you would benefit more if your risk was higher. If you had a baseline risk of only 1.7% (which is what was needed to be in some of the studies of these drugs), the 38% change in relative risk would mean that your risk would go down to 1.05%. This means a 0.65% change in absolute risk.

Your doctor can estimate your breast cancer risk based on factors like your age, medical history, and family history. This can help you see how much benefit you might get from taking one of these drugs.

## Are there other benefits to taking these drugs?

Both tamoxifen and raloxifene can help prevent osteoporosis, a severe weakening of the bones that is more common after menopause.

## What are the risks and side effects of taking these drugs?

The most common side effects of these drugs are **symptoms of menopause**. These include hot flashes and night sweats. Tamoxifen can also cause vaginal dryness and

**vaginal discharge.** Pre-menopausal women taking tamoxifen can experience menstrual changes. Menstrual periods can become irregular or even stop. Although periods often start again after the drug is stopped, they don't always, and some women go into menopause. This is more likely in women who were close to menopause when they started taking the drug.

Other more serious side effects are rare. These include serious blood clots and cancer of the uterus.

## **Blood clots**

Both tamoxifen and raloxifene increase your risk of developing blood clots in a vein in your leg (deep venous thrombosis) or in your lungs (pulmonary embolism). These clots can sometimes cause serious problems, and even death. In the breast cancer prevention studies, the overall risk of these blood clots over 5 years of treatment was less than 1%. This risk could be higher if you had a serious blood clot in the past, so these drugs are not recommended to lower breast cancer risk in anyone with a history of blood clots.

If you are taking tamoxifen or raloxifene, tell your doctor if you develop leg swelling, chest pain, or shortness of breath, as these can be symptoms of blood clots.

Because these drugs increase your risk of developing serious blood clots, there is also concern that they also increase your risk of heart attack or stroke. So far, though, this hasn't been seen in studies.

## **Cancer of the uterus**

Because tamoxifen acts like estrogen in the uterus, it can increase your risk of [endometrial cancer](#) and [uterine sarcoma](#) (cancers of the uterus). It also is linked to a higher risk of endometrial pre-cancers. Raloxifene does not act like estrogen in the uterus and is not linked to an increased risk of uterine cancer.

Although tamoxifen does increase the risk of uterine cancer, the overall increase in risk is low. In one large study of women taking the drug for up to 5 years to lower breast cancer risk, less than 1% of women taking the drug were diagnosed with uterine cancer. Most of these cancers were found at a very early stage. Some women were diagnosed with endometrial pre-cancer. Risk of uterine cancer goes back to normal within a few years of stopping the drug.

The increased risk seems to affect the women over 50 and not the younger women.

If you are taking tamoxifen, tell your doctor if you have any abnormal vaginal bleeding or spotting, especially after menopause, as these are possible symptoms of uterine cancer. If you have been diagnosed with uterine cancer or pre-cancer you should not take tamoxifen.

If you have had a hysterectomy (surgery to remove the uterus), you are not at risk for endometrial cancer or uterine sarcoma and do not have to worry about these cancers.

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USPSTF summary

<http://www.uspreventiveservicestaskforce.org/uspstf13/breastcanmeds/breastcanmedsrs.htm>

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## Aromatase Inhibitors for Lowering Breast Cancer Risk

Aromatase inhibitors (drugs that lower estrogen levels) may someday prove to be as good as or even better than tamoxifen or raloxifene in reducing breast cancer risk, but they haven't been well studied for this use. More study is needed to see who would most benefit and how long treatment should be continued.

### What are aromatase inhibitors?

Aromatase inhibitors lower estrogen levels by stopping an enzyme in fat tissue (called *aromatase*) from changing other hormones into estrogen. These drugs don't stop

the ovaries from making estrogen. They only lower estrogen levels in women whose ovaries aren't making estrogen (such as women who have already gone through menopause). The drugs in this class include:

- Anastrozole (Arimidex<sup>®</sup>)
- Exemestane (Aromasin<sup>®</sup>)
- Letrozole (Femara<sup>®</sup>)

Aromatase inhibitors are pills taken once a day.

## Can aromatase inhibitors lower the risk of breast cancer?

Aromatase inhibitors are used mainly to treat hormone receptor-positive breast cancer, but are being studied to see if they can lower breast cancer risk. Early findings are promising, but they are not yet approved for this use in the US.

## What are the risks and side effects of aromatase inhibitors?

The most common side effects of aromatase inhibitors are **symptoms of menopause**, such as hot flashes, night sweats, and vaginal dryness. These drugs can also cause **muscle and joint pain**. This side effect can be serious enough to cause some women to stop taking the drugs.

Unlike [tamoxifen and raloxifene](#), aromatase inhibitors tend to speed up bone thinning, which can lead to osteoporosis. It is easy for people with osteoporosis to have broken bones.

Aromatase inhibitors may raise cholesterol. Women with pre-existing coronary heart disease who take an aromatase inhibitor may be at risk of having a heart problem.

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# Preventive Surgery to Reduce Breast Cancer Risk

For the few women who have a very high risk for breast cancer, surgery to remove the breasts or ovaries may be an option.

**Preventive (prophylactic) mastectomies:** Removing both breasts before cancer is diagnosed can greatly reduce the risk of breast cancer (by up to 97%). Some women diagnosed with cancer in one breast choose to have the other, healthy breast removed as well to help prevent a second breast cancer. Breast removal does not completely prevent breast cancer because even a very careful surgeon will leave behind at least some breast cells, which might go on to become cancer.

Some of the reasons for considering this type of surgery may include:

- Mutated *BRCA* genes found by [genetic testing](#)
- Strong family history (such as breast cancer in several close relatives)
- Lobular carcinoma in situ (LCIS) seen on biopsy
- Previous cancer in one breast (especially in someone with a strong family history)

This type of [surgery](#) has been shown to be helpful in studies of large groups of women with certain conditions, but there's no way to know ahead of time if this surgery will benefit any one woman. Some women with *BRCA* mutations will develop breast cancer early in life, and have a very high risk of getting a second breast cancer. A prophylactic mastectomy before the cancer occurs might add many years to their lives. But while most women with *BRCA* mutations develop breast cancer, some don't. These women would not benefit from the surgery, but they would still have to deal with its aftereffects. Second opinions are strongly recommended before any woman decides to have this surgery.

**Prophylactic oophorectomy (removal of the ovaries):** Women with a *BRCA* mutation may reduce their risk of breast cancer by 50% or more by having their ovaries surgically removed before menopause. This is probably because the ovaries are the main sources of estrogen in the body.

It's important that women with a *BRCA* mutation recognize they also have a high risk of developing [ovarian cancer](#). Most doctors recommend that women with *BRCA* mutations have their ovaries surgically removed once they finish having children to lower this risk.

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