



Breast Cancer Facts & Figures 2011-2012

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Breast Cancer Basic Facts

What is breast cancer?

Cancer is a group of diseases that cause cells in the body to change and grow out of control. Most types of cancer cells eventually form a lump or mass called a tumor, and are named after the part of the body where the tumor originates.

Breast cancer begins in breast tissue, which is made up of glands for milk production, called lobules, and the ducts that connect the lobules to the nipple. The remainder of the breast is made up of fatty, connective, and lymphatic tissue.

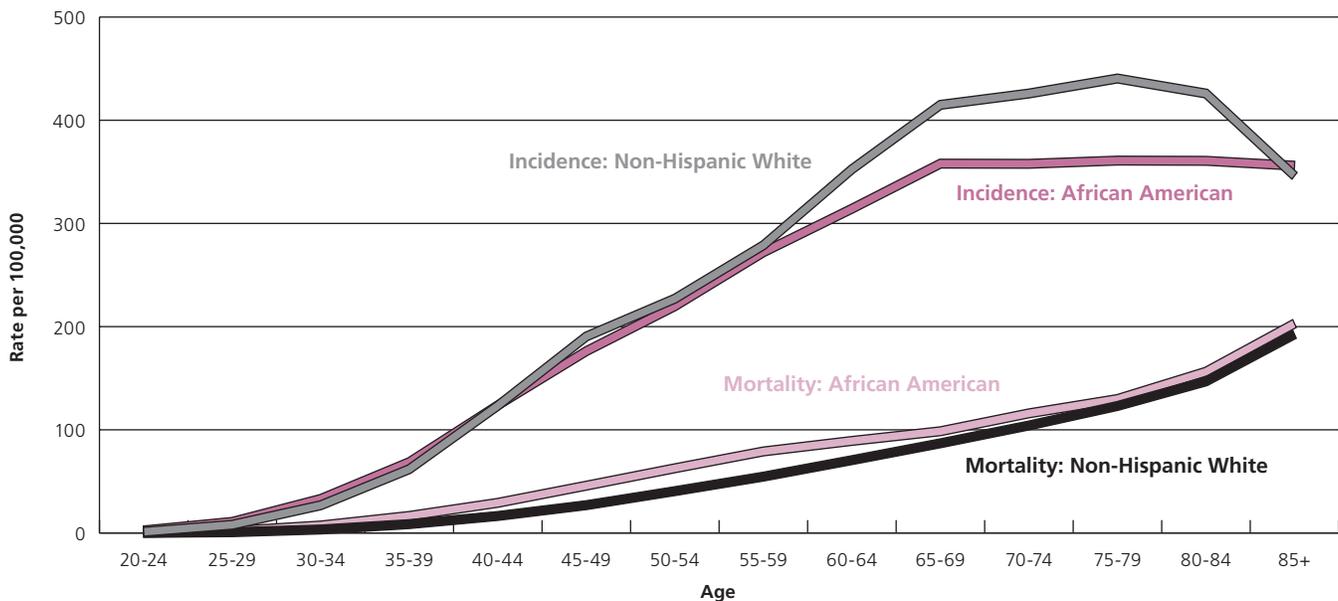
- Most masses are benign; that is, they are not cancerous, do not grow uncontrollably or spread, and are not life-threatening.
- Some breast cancers are called in situ because they are confined within the ducts (ductal carcinoma in situ or DCIS) or lobules (lobular carcinoma in situ or LCIS) where they originated. Many oncologists believe that LCIS (also known as lobular neoplasia) is not a true cancer, but an indicator of increased risk for developing invasive cancer in either breast.
 - The majority of in situ breast cancers are DCIS, which accounted for about 83% of in situ cases diagnosed during 2004-2008.

- LCIS is much less common than DCIS, accounting for about 11% of female in situ breast cancers diagnosed during 2004-2008.
- Other in situ breast cancers have characteristics of both ductal and lobular carcinomas or have unspecified origins.
- Most breast cancers are invasive, or infiltrating. These cancers started in the lobules or ducts of the breast but have broken through the duct or glandular walls to invade the surrounding tissue of the breast.

While clinical assessment clues (such as findings on breast exam or breast imaging results) may be strongly suggestive of a cancer diagnosis, microscopic analysis of breast tissue is necessary for a definitive diagnosis of breast cancer and to determine whether the cancer is in situ or invasive and lobular or ductal. The microscopic analysis can be obtained via a needle biopsy or a surgical biopsy. Selection of the type of biopsy is based on individual factors and availability.

The seriousness of invasive breast cancer is strongly influenced by the stage of the disease; that is, the extent or spread of the cancer when it is first diagnosed. There are two main staging systems for cancer. The TNM classification of tumors uses information on tumor size and how far it has spread within the breast and nearby organs (T), lymph node involvement (N), and the presence or absence of distant metastases (spread to distant organs) (M).¹ Once the T, N, and M are determined, a stage of 0, I, II, III, or IV is assigned, with stage 0 being in situ, stage I being

Figure 1. Age-specific Female Breast Cancer Incidence (2004-2008) and Mortality (2003-2007) Rates



Sources: Incidence: North American Association of Central Cancer Registries. Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention, as provided by the Surveillance, Epidemiology, and End Results Program, National Cancer Institute.

American Cancer Society, Surveillance Research, 2011

Table 1. Estimated New Female Breast Cancer Cases and Deaths by Age, US, 2011*

Age	In Situ Cases	Invasive Cases	Deaths
Under 40	1,780	11,330	1,160
Under 50	14,240	50,430	5,240
50-64	23,360	81,970	11,620
65+	20,050	98,080	22,660
All ages	57,650	230,480	39,520

*Rounded to the nearest 10.

Source: Total estimated cases are based on 1995-2007 incidence rates from 46 states as reported by the North American Association for Central Cancer Registries. Total estimated deaths are based on data from US Mortality Data, 1969-2007, National Center for Health Statistics, Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2011

Breast Cancer Occurrence

How many cases and deaths are estimated to occur in 2011?

- In 2011, an estimated 230,480 new cases of invasive breast cancer will be diagnosed among women, as well as an estimated 57,650 additional cases of in situ breast cancer (Table 1).
- In 2011, approximately 39,520 women are expected to die from breast cancer (Table 1). Only lung cancer accounts for more cancer deaths in women.
- In 2011, about 2,140 cases of breast cancer are expected to occur among men, accounting for about 1% of all breast cancers. In addition, approximately 450 men will die from breast cancer.

How many women alive today have ever had breast cancer?

The National Cancer Institute estimates that approximately 2.6 million US women with a history of breast cancer were alive in January 2008, more than half of whom were diagnosed less than 10 years earlier.³ Most of these individuals were cancer-free, while others still had evidence of cancer and may have been undergoing treatment.

Who gets breast cancer?

Sex

- Excluding cancers of the skin, breast cancer is the most common cancer among women, accounting for nearly 1 in 3 cancers diagnosed in US women.
- Men are generally at low risk for developing breast cancer; however, they should report any change in their breasts to a physician.

Age

- Breast cancer incidence and death rates generally increase with age (Figure 1, page 1). Ninety-five percent of new cases and 97% of breast cancer deaths occurred in women 40 years of age and older.
- During 2004-2008, among adult women, those 20-24 years of age had the lowest incidence rate, 1.5 cases per 100,000 women; women 75-79 years of age had the highest incidence rate, 421.3 cases per 100,000. The decrease in incidence rates that occurs in women 80 years of age and older may reflect lower rates of screening, the detection of cancers by mammography before 80 years of age, and/or incomplete detection.
- During 2004-2008, the median age at the time of breast cancer diagnosis was 61 years.³ This means that 50% of women who developed breast cancer were 61 years of age or younger at the time of diagnosis.

early stage invasive cancer, and stage IV being the most advanced. The TNM staging system is commonly used in clinical settings.

A simpler system used for staging of cancers is known as the Surveillance, Epidemiology, and End Results (SEER) Summary Stage system and is more commonly used in reporting by cancer registries and for public health research and planning.² According to this system:

- Local-stage tumors are cancers confined to the breast.
- Regional-stage tumors have spread to surrounding tissue or nearby lymph nodes.
- Distant-stage cancers have metastasized (spread) to distant organs.

As the biologic properties of breast cancer have become better understood, molecular markers (including hormone receptor status and HER2 expression) are increasingly used in addition to stage information for prognosis and treatment.

What are the signs and symptoms of breast cancer?

Breast cancer typically produces no symptoms when the tumor is small and most treatable. Therefore, it is very important for women to follow recommended screening guidelines for detecting breast cancer at an early stage, before symptoms develop. When breast cancer has grown to a size that can be felt, the most common physical sign is a painless lump. Sometimes breast cancer can spread to underarm lymph nodes and cause a lump or swelling, even before the original breast tumor is large enough to be felt. Less common signs and symptoms include breast pain or heaviness; persistent changes to the breast, such as swelling, thickening, or redness of the breast's skin; and nipple abnormalities such as spontaneous discharge (especially if bloody), erosion, inversion, or tenderness. It is important to note that pain (or lack thereof) does not indicate the presence or the absence of breast cancer. Any persistent abnormality in the breast should be evaluated by a physician as soon as possible.

Table 2. Female Breast Cancer Incidence (2004-2008) and Mortality (2003-2007) Rates* by Race/Ethnicity and State

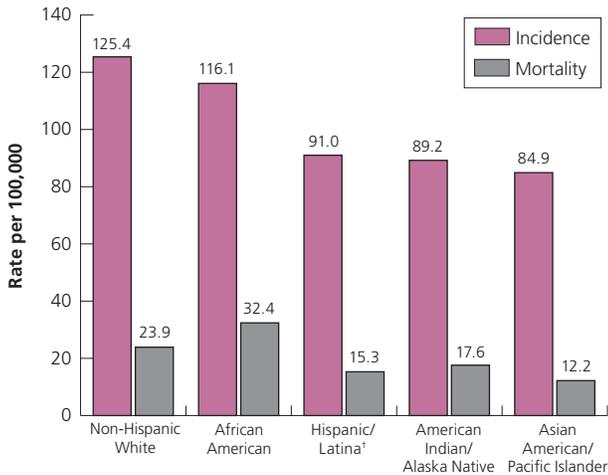
State	Non-Hispanic White		African American		Hispanic	
	Incidence	Mortality	Incidence	Mortality	Incidence	Mortality
Alabama	117.2	22.7	115.8	32.3	56.1	†
Alaska	132.6	23.9	122.1	†	110.9	†
Arizona	112.6	22.1	95.8	27.3	82.7	16.2
Arkansas	110.8	23.3	101.5	33.4	44.6	†
California	140.4	25.5	121.0	33.4	85.8	15.3
Colorado	125.0	22.4	103.5	20.7	97.2	14.3
Connecticut	139.4	24.0	112.8	27.4	126.7	12.1
Delaware	125.5	24.7	131.0	25.4	133.3	†
Dist. of Columbia [§]	140.4	22.9	122.4	31.8	78.9	–
Florida	118.6	22.1	102.3	29.7	99.4	16.5
Georgia	121.2	22.2	118.5	30.4	83.8	9.4
Hawaii	136.3	24.2	78.9	†	124.5	22.3
Idaho	118.6	22.3	†	†	78.9	†
Illinois	128.7	24.4	119.5	36.9	84.9	11.7
Indiana	115.1	24.1	113.8	35.1	92.0	10.4
Iowa	123.7	22.1	110.3	30.9	72.0	†
Kansas	124.7	23.9	127.0	33.3	87.6	10.2
Kentucky	120.2	23.9	128.3	33.0	62.1	†
Louisiana	118.5	24.2	122.3	37.7	75.9	9.4
Maine	128.7	22.5	†	†	†	†
Maryland [§]	127.3	24.7	117.8	31.8	84.3	8.7
Massachusetts	136.6	23.5	109.0	27.3	103.8	12.1
Michigan	120.1	23.4	119.2	33.8	92.7	14.6
Minnesota	127.3	22.0	109.0	28.0	87.7	†
Mississippi	111.7	22.1	115.4	34.6	34.1	†
Missouri	120.9	25.2	125.6	35.3	73.3	†
Montana	119.6	21.5	†	†	91.1	†
Nebraska	126.1	22.3	129.1	29.9	99.4	†
Nevada [§]	115.7	25.7	104.4	27.4	86.1	10.7
New Hampshire [‡]	132.5	23.3	†	†	96.1	–
New Jersey	138.8	28.0	111.9	32.4	95.2	13.7
New Mexico	124.4	24.4	73.2	†	96.0	19.8
New York	133.5	24.3	106.7	27.7	98.0	16.4
North Carolina	124.5	23.0	122.3	33.7	83.3	†
North Dakota [‡]	123.7	22.0	†	†	†	–
Ohio	119.4	25.9	120.7	34.5	61.9	14.9
Oklahoma	125.1	25.1	125.3	32.7	101.2	10.9
Oregon	129.9	23.9	93.4	19.9	94.6	10.1
Pennsylvania	124.9	25.3	125.5	32.4	96.9	13.8
Rhode Island	136.1	23.7	118.8	†	69.8	†
South Carolina	121.5	22.2	114.5	31.2	101.1	†
South Dakota	118.3	22.7	†	†	†	†
Tennessee	117.3	23.7	116.4	38.0	85.8	†
Texas	121.6	23.3	117.1	35.3	90.3	17.0
Utah	112.1	23.4	75.7	†	89.8	16.6
Vermont	131.5	23.8	†	†	†	†
Virginia	125.8	24.3	126.4	34.7	87.4	13.2
Washington	131.6	23.9	117.7	25.7	84.6	13.6
West Virginia	113.3	24.2	98.9	33.9	79.3	†
Wisconsin [¶]	123.4	22.8	113.0	26.5	–	†
Wyoming	116.3	23.8	†	†	102.0	†

*Rates are per 100,000 and age adjusted to 2000 US standard population. †Statistic not displayed due to fewer than 25 cases or deaths. ‡Mortality rates for white women in these states are not exclusive of Hispanic origin and are not shown for Hispanic women due to unreliable ethnicity data. §This state's registry did not achieve high-quality data standards for one or more years during 2004-2008, according to NAACCR data quality indicators. ¶The incidence rate for white women in Wisconsin is not exclusive of Hispanic origin.

Sources: Incidence: North American Association of Central Cancer Registries. Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention, as provided by the Surveillance, Epidemiology, and End Results Program, National Cancer Institute.

American Cancer Society, Surveillance Research, 2011

Figure 2. Female Breast Cancer Incidence (2004-2008) and Mortality (2003-2007) Rates* by Race and Ethnicity



*Rates are age adjusted to the 2000 US standard population.
†Persons of Hispanic origin may be any race.

Sources: Incidence: North American Association of Central Cancer Registries. Mortality: Altekruse et al.¹³
American Cancer Society, Surveillance Research, 2011

Race/Ethnicity

- Breast cancer incidence rates are higher in non-Hispanic white women compared to African American women for most age groups (Figure 1, page 1). However, African American women have a higher incidence rate before 40 years of age and are more likely to die from breast cancer at every age.
- Incidence and death rates for breast cancer are lower among women of other racial and ethnic groups than among non-Hispanic white and African American women (Figure 2).

Are there geographic differences in breast cancer rates?

- Table 2 (page 3) shows breast cancer incidence and death rates per 100,000 women for non-Hispanic white, African American, and Hispanic women by state. Breast cancer incidence rates are highest among non-Hispanic white women, ranging from 110.8 cases per 100,000 women in Arkansas to 140.4 cases per 100,000 women in California and the District of Columbia. Among African American women, incidence rates range from 73.2 in New Mexico to 131.0 in Delaware. For Hispanic women, incidence rates range from 34.1 in Mississippi to 133.3 in Delaware. Incidence rates reflect how completely the population is screened, as well as disease occurrence.
- Despite higher incidence rates, breast cancer death rates are generally lower among non-Hispanic white women compared to African American women. Breast cancer death rates among

non-Hispanic white women range from 21.5 in Montana to 28.0 in New Jersey. In contrast, breast cancer death rates range from 19.9 in Oregon to 38.0 in Tennessee among African American women. Breast cancer death rates are lowest for Hispanic women and range from 8.7 in Maryland to 22.3 in Hawaii.

- Breast cancer mortality rates among non-Hispanic white women tend to be highest in the West, Midwest, and Mid-Atlantic parts of the US. Among African American women, death rates are generally highest in the Midwest and South Central regions. (Figure 3).

How has the occurrence of breast cancer changed over time?

Incidence trends – women

Figure 4 (page 6) presents trends for in situ and invasive breast cancer incidence rates since 1975, when population-based cancer registration began in the nine oldest cancer registries.

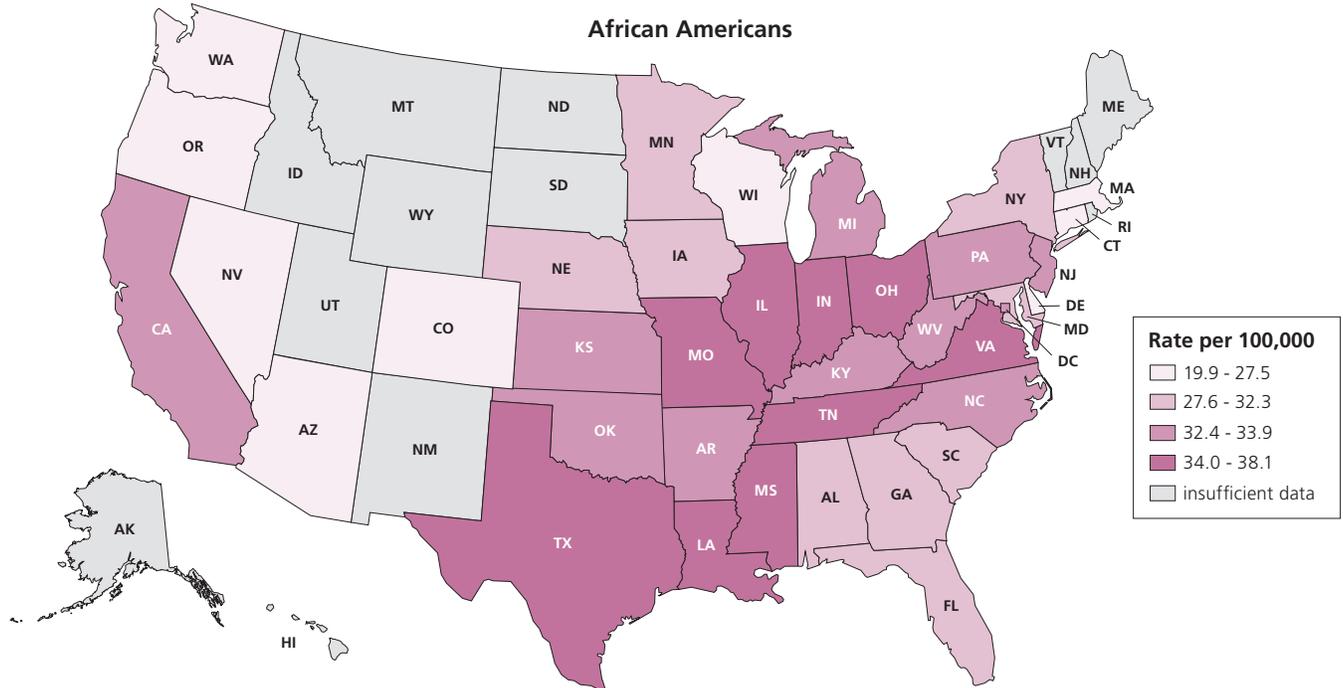
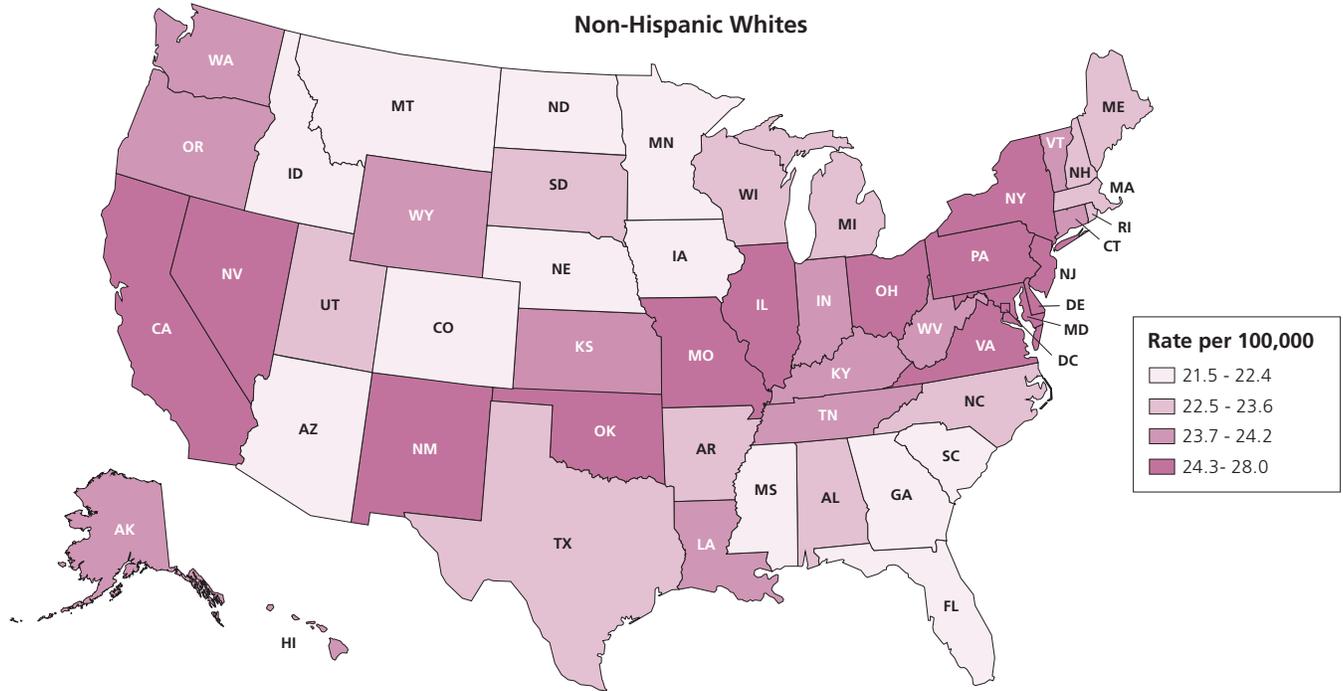
In situ breast cancer

Incidence rates of in situ breast cancer rose rapidly during the 1980s and 1990s (Figure 4a, page 6), largely because of increases in mammography screening. The increase was greater in women 50 years of age and older than in those younger than 50. Since 1999, incidence rates of in situ breast cancer have stabilized among women 50 and older, but continue to increase in younger women. The stabilization in incidence among women 50 years of age and older likely reflects trends in mammography screening rates, which peaked in 2000 and then stabilized at a slightly lower rate.⁴ It may also reflect a reduced pool of prevalent cases as a result of widespread screening.

Invasive breast cancer

Much of the historic increase in breast cancer incidence reflects changes in reproductive patterns, such as delayed childbearing and having fewer children, which are recognized risk factors for breast cancer. However, between 1980 and 1987, breast cancer incidence rates increased rapidly, due largely to greater use of mammography screening leading to increased detection of breast cancers too small to be felt. Detecting these tumors earlier has the effect of inflating the incidence rate because tumors are being detected 1 to 3 years before they would have been diagnosed if they continued to grow until symptoms developed. Rates stabilized in the early 1990s, followed by a slower increase during the latter half of the 1990s. This trend may reflect further increases in the prevalence of mammography screening, rising rates of obesity, and menopausal hormone use. Between 2002 and 2003, breast cancer rates dropped sharply (nearly 7%).⁵ This rapid decline is likely due to decreased use of menopausal hormones following the 2002 publication of the Women's Health Initiative randomized trial results.^{5,6} Similar reversals in breast cancer trends have been observed internationally, as well.⁷⁻¹⁰ The

Figure 3. Female Breast Cancer Death Rates* by Race/Ethnicity, US, 2003-2007



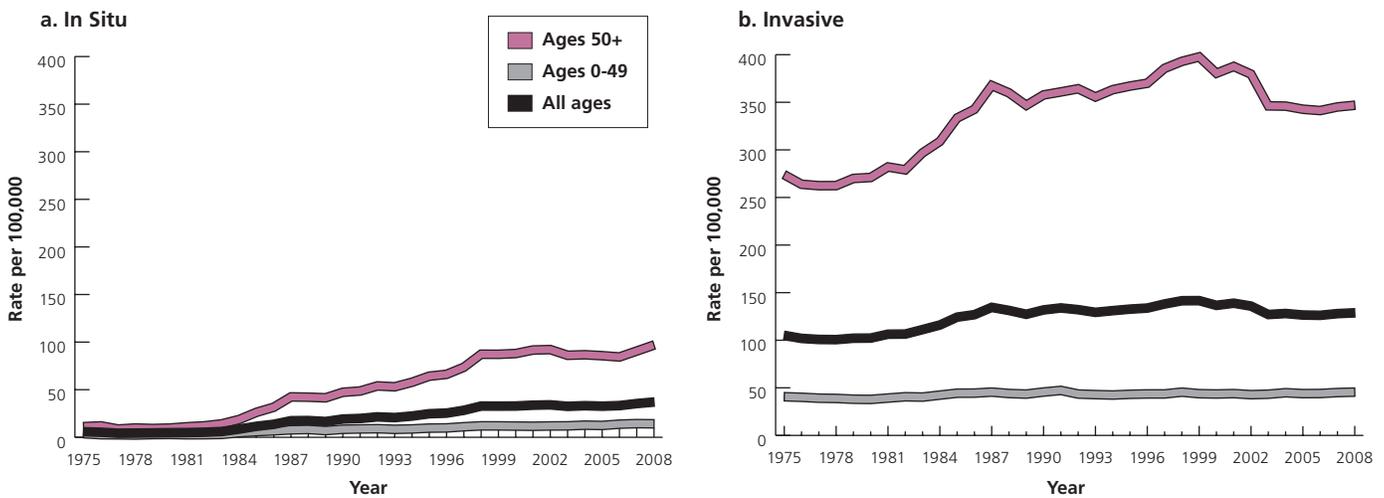
*Per 100,000 and age adjusted to the 2000 US standard population.

Note: Statistic not displayed for states with fewer than 25 deaths. Death rates for whites in DC, ND, and NH are not exclusive of Hispanic origin due to unreliable ethnicity data.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention, as provided by the Surveillance, Epidemiology, and End Results Program, National Cancer Institute.

American Cancer Society, Surveillance Research, 2011

Figure 4. Incidence Rates* of In Situ and Invasive Female Breast Cancer by Age, Adjusted for Delayed Reporting, US, 1975-2008



*Rates are age adjusted to the 2000 US standard population within each age group.
Data source: Surveillance, Epidemiology, and End Results (SEER) Program, SEER 9 Registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2011

decline may also reflect recent trends in mammography screening. The percentage of women 40 years of age and older who reported having a mammogram within the past 2 years peaked in 2000, declined slightly, and has since stabilized.⁴ Since 2003, breast cancer incidence rates have remained relatively stable.¹¹

Age: During the early 1980s, incidence rates of invasive breast cancer increased among both women 50 years of age and older and those younger than 50 (5.4% per year and 3.2% per year, respectively) (Figure 4b).³ Among women 50 years of age and older, incidence rates remained constant from 1987-1993, increased at a slow rate during 1993-1999 (1.9% per year), declined during 1999-2005 (2.6% per year), and have since stabilized.³ Among women younger than 50 years of age, incidence rates have remained stable since 1985.³

Race/Ethnicity: Figure 5a presents trends in invasive female breast cancer incidence rates by race and ethnicity. Overall breast cancer trends largely reflect the trend among white women. Breast cancer incidence rates among white women increased rapidly (4.1% per year) during the 1980s (largely due to the introduction of mammography screening) and then stabilized from 1987-1994. Subsequently, rates increased again and peaked in 1999. Between 2002 and 2003, breast cancer incidence rates dropped sharply (likely related to declines in menopausal hormone use) and then stabilized.¹¹ Among African American women, the incidence rate also increased during the 1980s; however, the rate has been stable since 1992.³ The lack of a decline in incidence among African American women may be due to his-

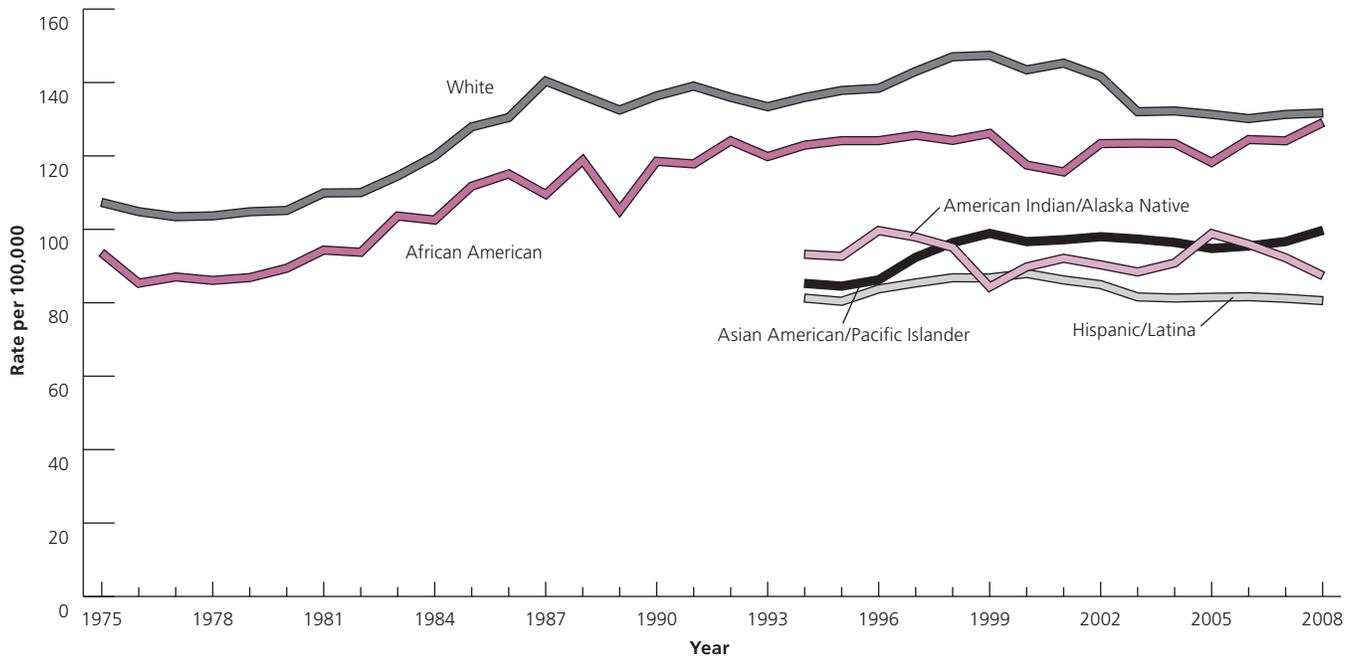
torically lower rates of combined menopausal hormone use and the lack of a significant decrease in mammography screening rates similar to that seen in white women.^{4,12}

Incidence data are available for women of other races and ethnicities only since 1992. During 1999-2008, incidence rates did not change significantly among Asian Americans/Pacific Islanders, Hispanics/Latinas, or American Indian/Alaska Natives.³ Rates for American Indians and Alaska Natives are less stable than for other racial and ethnic groups because high-quality data for this group are only available from limited geographic areas.

Tumor size: Figure 6a (page 8) presents incidence trends by race and tumor size for the most recent time period. During 1988-1999, the incidence rate of smaller tumors (≤ 2.0 cm) among women of all races combined increased by 2.0% per year; between 2002 and 2003, the rate for small tumors dropped sharply and then was relatively stable, similar to the overall trend. For tumors larger than 2 cm, the rate has remained relatively stable since 1993.

Incidence rates of breast cancer by tumor size differ between white and African American women. African American women are less likely to be diagnosed with smaller tumors (≤ 2.0 cm) and more likely to be diagnosed with larger tumors (> 5.0 cm) than white women. Incidence rates of smaller tumors have been relatively stable among white women, but have increased among African American since 2001. In both groups, incidence rates of tumors larger than 5 cm have been level.

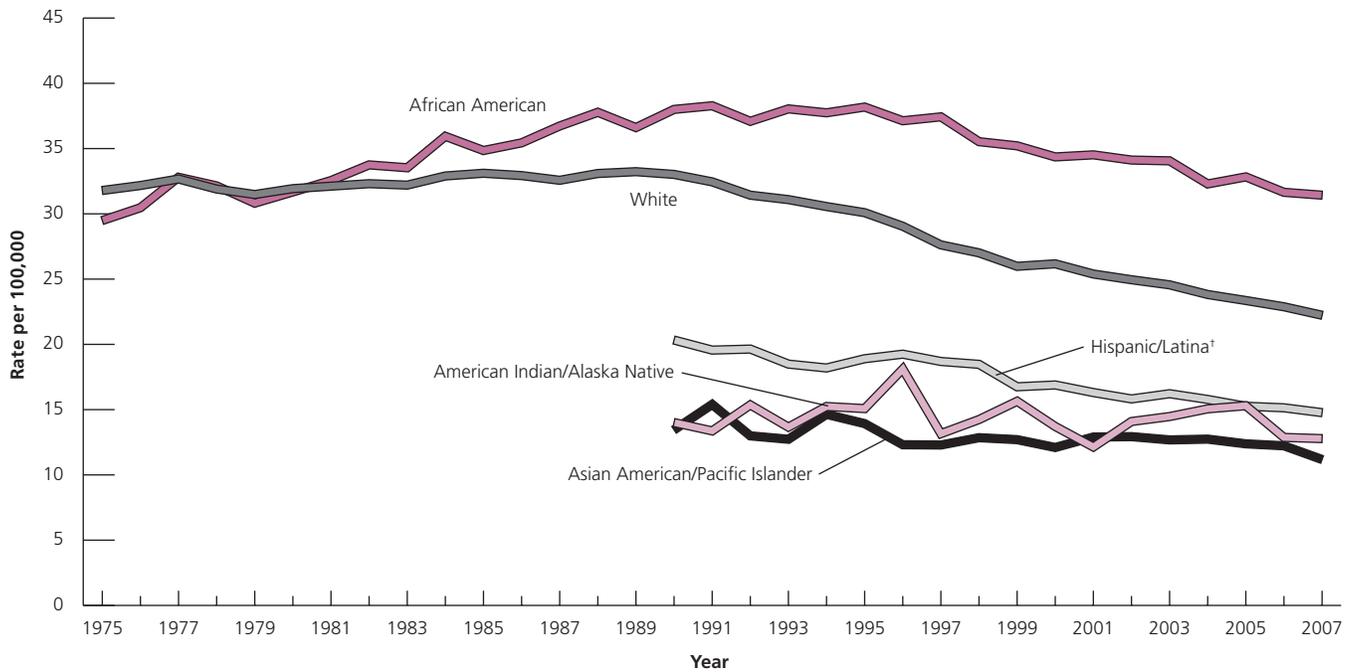
Figure 5a. Trends in Female Breast Cancer Incidence Rates* by Race and Ethnicity, US, 1975-2008



*Rates are age adjusted to the 2000 US standard population. Rates for Asian American/Pacific Islanders, Hispanic/Latinos, and American Indian/Alaska Natives are 3-year moving averages.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, National Cancer Institute. Data for whites and African Americans are from the 9 SEER registries and were adjusted for reporting delays. Data for other races/ethnicities are from the 13 SEER registries. For Hispanics, incidence data do not include cases from the Alaska Native Registry. Incidence data for American Indians/Alaska Natives are based on Contract Health Service Delivery Area (CHSDA) counties.

Figure 5b. Trends in Female Breast Cancer Death Rates* by Race and Ethnicity, US, 1975-2007



*Rates are age adjusted to the 2000 US standard population. † Information is included for all states except Connecticut, Louisiana, Maine, Maryland, Minnesota, Mississippi, New Hampshire, New York, North Dakota, Oklahoma, Vermont, and Virginia, as well as the District of Columbia.

Source: National Center for Health Statistics, Centers for Disease Control and Prevention, as provided by the Surveillance, Epidemiology, and End Results Program, National Cancer Institute.

American Cancer Society, Surveillance Research, 2011

Figure 6a. Trends in Female Breast Cancer Incidence Rates* by Tumor Size and Race, US, 1988-2008

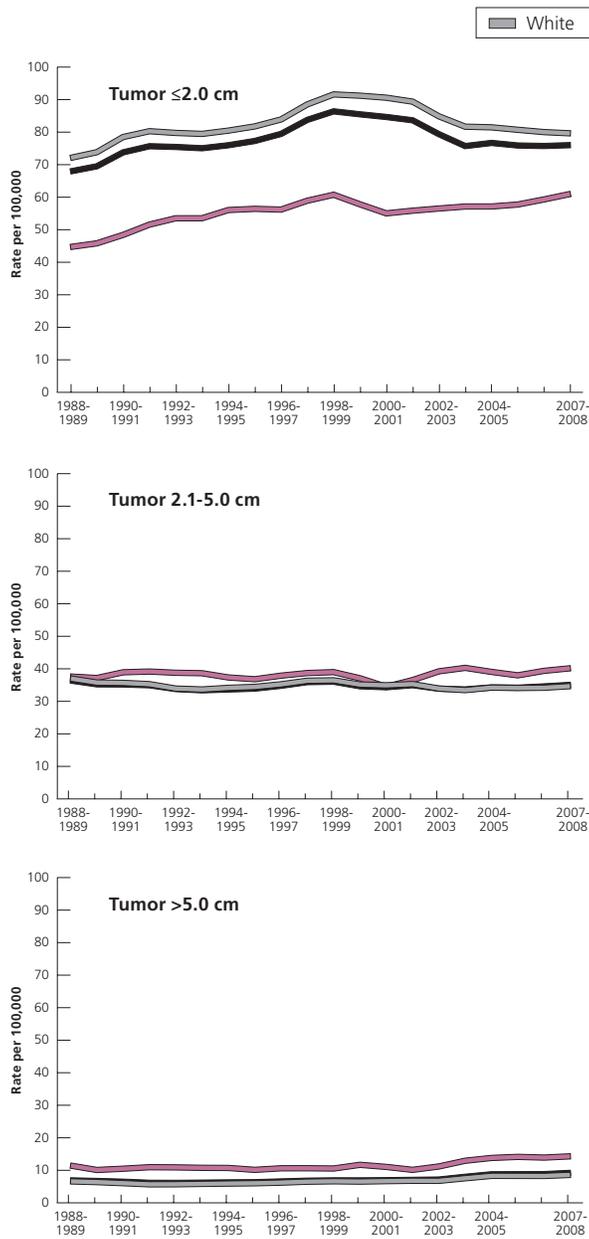
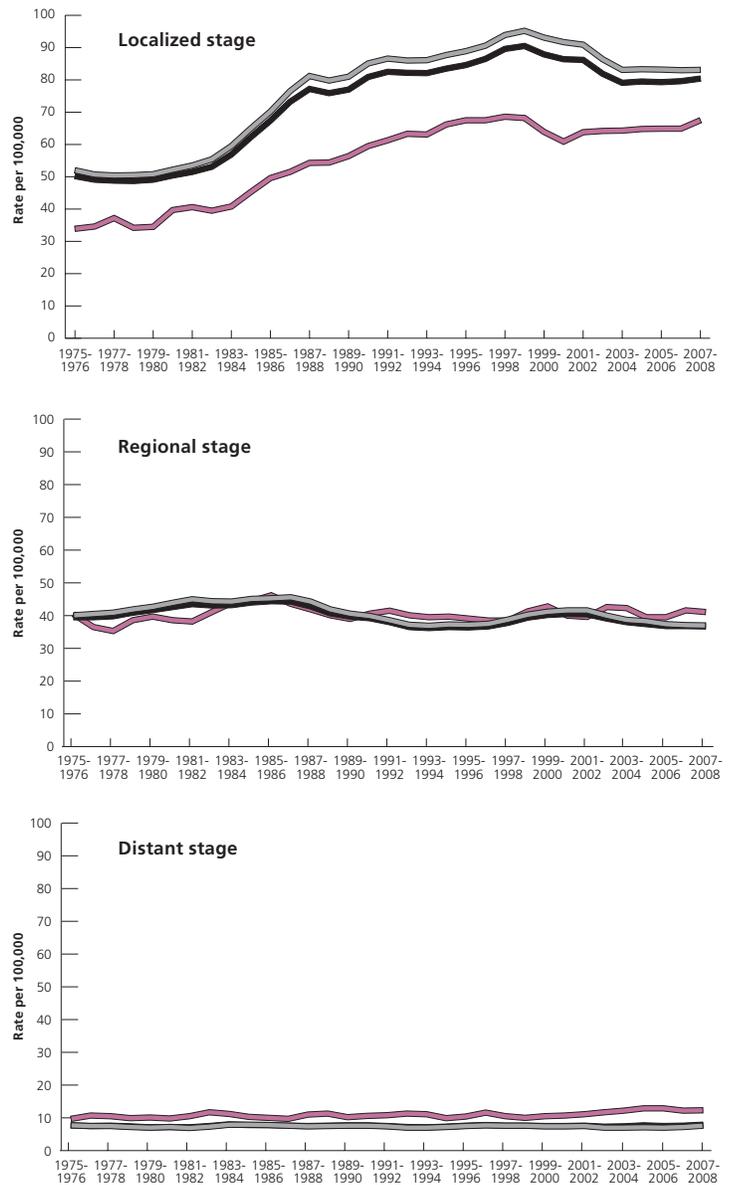


Figure 6b. Trends in Female Breast Cancer Incidence Rates* by Stage and Race, US, 1975-2008



*Rates are two-year moving averages and age adjusted to the 2000 US standard population.

Data source: Surveillance, Epidemiology, and End Results (SEER) Program, 9 SEER Registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2011

Stage: Figure 6b presents incidence trends by race and stage at diagnosis. Among all women combined, incidence rates of localized breast cancer increased through most of the 1980s and 1990s. From 1999-2004, rates of localized tumors declined 2.6% per year on average, and have since stabilized. The incidence of regional-stage disease increased during 1994-2000 and has since decreased on average by 1.5% per year.

African American women have higher rates of distant-stage breast cancer compared to white women. Rates of distant-stage breast cancer among African American women have increased slightly (0.7% per year) since 1975, whereas rates among white women have remained stable.

Mortality trends – women

After slowly increasing for many years (0.4% per year from 1975-1990), breast cancer death rates decreased 2.2% per year between 1990-2007.¹³ The percentage decline was larger among younger women. From 1990-2007, death rates decreased by 3.2% per year among women younger than 50, and by 2.0% per year among women 50 and older.¹³ The decline in breast cancer mortality has been attributed to both improvements in breast cancer treatment and early detection.¹⁴ However, not all segments of the population have benefited from these advances. From 1998 through 2007, breast cancer death rates declined annually by 1.9% in Hispanics/Latinas, 1.8% in non-Hispanic whites, 1.6% in African Americans, 0.8% in Asian Americans/Pacific Islanders, and remained unchanged among and American Indian/Alaska Natives.¹³

A striking divergence in long-term breast cancer mortality trends between African American and white women began in the early 1980s. This mortality difference may reflect earlier uptake and greater mammography usage by whites during the 1980s, as well differences in access and response to new treatments, including tamoxifen, which is only effective for hormone receptor-positive breast cancers, which are less common among African American women.^{15,16} By 2007, death rates were 41% higher in African American than white women (Figure 5b, page 7).

Trends in breast cancer death rates also vary by state. During 1998-2007, breast cancer death rates among all women combined significantly decreased in 36 states and the District of Columbia, but remained relatively unchanged in the remaining 14 states (Alabama, Alaska, Arkansas, Hawaii, Louisiana, Mississippi, Missouri, Montana, New Mexico, Oklahoma, South Dakota, Utah, Vermont, Wyoming). The lack of a decline in these states is likely related to variations in the prevalence and quality of mammography screening, as well as state differences in racial and socioeconomic composition.

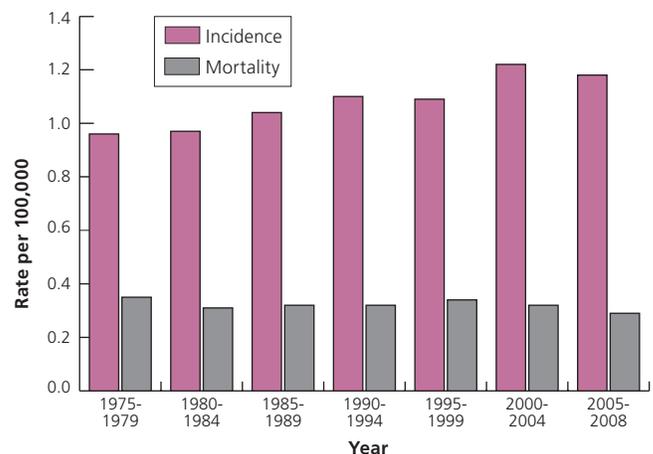
Incidence and mortality trends – men

Figure 7 presents incidence and mortality trends for male breast cancer. Although breast cancer in men is a rare disease (accounting for approximately 1% of breast cancer cases in the US), during 1975-2008 the incidence rate increased 0.8% annually. The increase has been limited to in situ and local-stage tumors, which may reflect a shift to earlier diagnoses due to increased awareness and follow up of breast symptoms.¹⁷

Mammography is not recommended for men because of the rarity of the disease. Similar to female breast cancer, the incidence of male breast cancer increases with age; however, unlike female breast cancer, incidence rates are higher in African American men compared to white men.¹⁸ Death rates for male breast cancer have decreased (3.3% per year) since 2000.

Due to the infrequency of male breast cancer, much less is known about the disease than female breast cancer. Risk factors include BRCA gene mutations, Klinefelter syndrome, testicular disorders, family history of male or female breast cancer, and obesity.¹⁹

Figure 7. Trends in Male Breast Cancer Incidence and Mortality Rates*, US, 1975-2008



*Rates are age adjusted to the 2000 US standard population.

†Mortality data are for 2005-2007.

Data sources: Incidence: Surveillance, Epidemiology, and End Results (SEER) Program, 9 SEER Registries, National Cancer Institute. Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention, as provided by the SEER program.

American Cancer Society, Surveillance Research, 2011

What factors influence breast cancer survival?

Based on the most recent data, relative survival rates for women diagnosed with breast cancer are:

- 89% at 5 years after diagnosis
- 82% after 10 years
- 77% after 15 years

Caution should be used when interpreting long-term survival rates since they are based on the experience of women treated using past therapies and do not reflect recent improvements in early detection or advances in treatment.

Stage at diagnosis

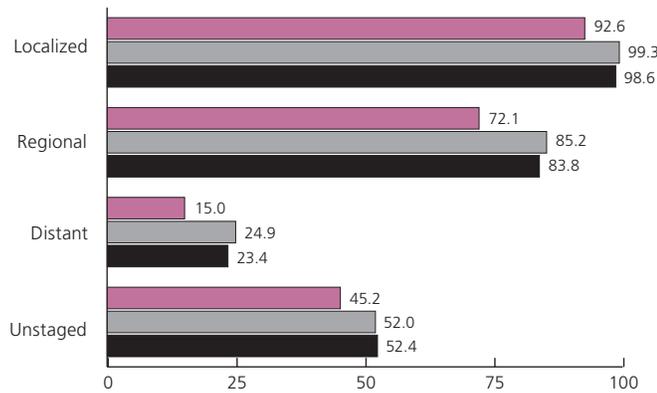
Five-year relative survival is lower among women with a more advanced stage at diagnosis (Figure 8, page 10). Considering all races, 5-year relative survival is 99% for localized disease, 84% for regional disease, and 23% for distant-stage disease.³ Larger tumor size at diagnosis is also associated with decreased survival. For example, among women of all races with regional disease, the 5-year relative survival is 95% for tumors less than or equal to 2.0 cm, 82% for tumors 2.1-5.0 cm, and 63% for tumors greater than 5.0 cm.

Age at diagnosis

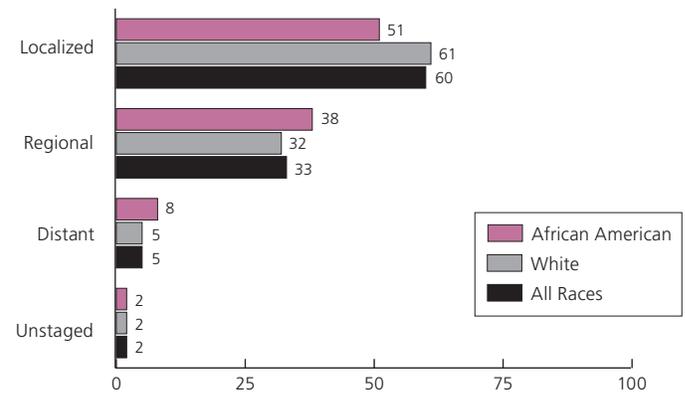
The 5-year relative survival rate is lower among women diagnosed with breast cancer before age 40 (84%) compared to women diagnosed at 40 years of age or older (90%). This may be due to tumors diagnosed at younger ages being more aggressive and/or less responsive to treatment.^{20,21}

Figure 8. Female Breast Cancer, 2001-2007

a. Five-year Relative Survival Rates* (%) by Stage at Diagnosis and Race



b. Stage Distribution (%) by Race



*Survival rates are based on patients diagnosed between 2001 and 2007 and followed through 2008.

Data source: Howlader et al.³

American Cancer Society, Surveillance Research, 2011

Race/ethnicity and socioeconomic factors

Since 1975, the breast cancer 5-year relative survival rate has increased significantly for both African American and white women; nevertheless there remains a substantial racial gap (Figure 9). In the most recent period, the 5-year relative survival rate was 77% for African American women and 90% among white women.³ This survival disparity is attributed to both later stage at detection and poorer stage-specific survival among African American women (Figure 8).

Table 3 (page 12) presents 5-year cause-specific breast cancer survival rates by race and ethnicity. Cause-specific survival rates are used instead of relative survival to describe survival in racial and ethnic minorities because estimates of normal life expectancy are not available for most racial groups. Cause-specific survival is the probability of not dying of breast cancer within 5 years of diagnosis. African American women have the lowest survival rate of any racial or ethnic group, indicating that they have the greatest probability of dying of breast cancer.

Poverty and a lack of health insurance are also associated with lower breast cancer survival.²² Breast cancer patients from lower-income areas have lower 5-year survival rates than those from higher-income areas at every stage of diagnosis.²³ The presence of additional illnesses, unequal access to medical care, and disparities in treatment likely contribute to differences in breast cancer survival.²⁴⁻³⁰ Aggressive tumor characteristics associated with poorer prognosis appear to be more common in African American women and may also contribute to lower survival rates.^{31,32}

Obesity, physical activity, and diet

Obese breast cancer patients have about a 30% higher risk of death compared to those who maintain a healthy weight.³³⁻³⁶ Research

suggests that exercise during and after treatment improves outcomes, but it is uncertain if dietary modifications, including a low-fat diet and increased fruit and vegetable consumption, have a similar effect.^{33,37} One large randomized controlled trial reported increased disease-free survival after an average of 5 years in patients with breast cancer randomly assigned to a low-fat diet.³⁸ However, another trial found no effect from a low-fat, high-vegetable/fruit diet on breast cancer prognosis.³⁹

The American Cancer Society recommends that breast cancer patients achieve and maintain a healthy weight through exercise and a diet high in fruits and vegetables and low in saturated fat.⁴⁰ In addition, regular physical activity should be maintained regardless of weight concerns.

Tumor characteristics

Increasing evidence suggests that breast cancer subtypes defined by expression of the estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) represent distinct biological entities with distinct clinical profiles. Breast cancers that are ER+ and/or PR+ are associated with the most favorable prognosis, in large part because expression of these markers is predictive of favorable response to hormonal therapy. Compared to women with tumors that are ER+ and PR+, women with tumors lacking ER and PR expression have an estimated 1.5- to 2-fold higher risk of death.^{41,42} Breast cancers that overexpress HER2 and triple-negative breast cancers (i.e., ER-, PR-, HER2-) are also associated with a less favorable prognosis.^{32,42,43} However, development and availability of targeted therapy for HER2+ cancers have reversed much of the adverse prognostic impact of HER2 overexpression. For more information, see the section on targeted therapy on page 22.

Breast Cancer Risk Factors

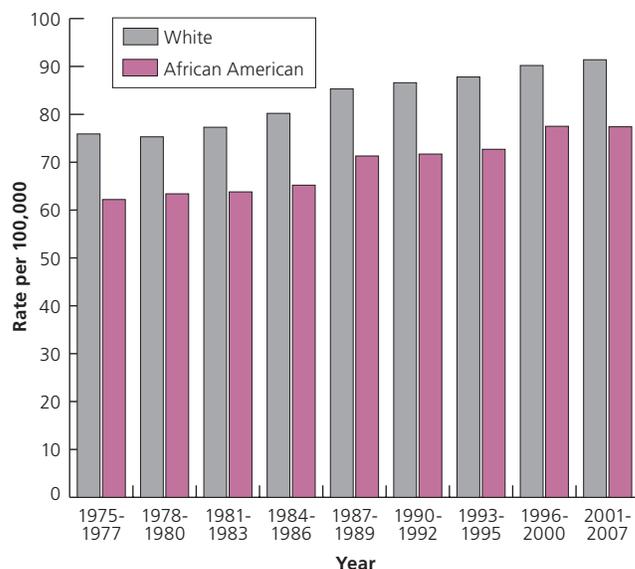
What are the known risk factors for breast cancer?

Many of the known breast cancer risk factors listed in Table 4 (page 12), such as age, family history, early menarche, and late menopause, are not modifiable. However, other factors associated with increased breast cancer risk, including postmenopausal obesity, use of combined estrogen and progestin menopausal hormones, alcohol consumption, and physical inactivity, are modifiable. Some risk factors directly increase lifetime exposure of breast tissue to hormones (early menarche, late menopause, obesity, and hormone use), whereas others, such as higher socioeconomic status, are only correlates of reproductive behavior or other factors.

The desire to explain the causes of breast cancer has led to a wide range of proposed explanations that target common exposures, including underwire bras and antiperspirants. At present, there is no conclusive scientific evidence that shows an association between these products and breast cancer.⁴⁴ Likewise, no association has been found between breast implants and an increased risk of breast cancer; however, there is growing concern that women with implants may be at increased risk of a rare type of lymphoma.⁴⁵⁻⁴⁷ There are also persistent claims that women who have had an abortion are at an increased risk for developing breast cancer based on early studies that have since been deemed by the American College of Obstetricians and Gynecology to be methodologically flawed.⁴⁸ There now exists a large body of solid scientific evidence that confirms there is no link between breast cancer and abortion (either spontaneous or induced), which includes a review by a panel of experts convened by the National Cancer Institute in 2003.⁴⁹ For more information, see the separate American Cancer Society document called *Is Abortion Linked to Breast Cancer?*, which is available at cancer.org.

Concerns have also been raised among some advocacy groups and survivors that rising breast cancer incidence in the latter half of the 20th century may be caused by environmental pollutants such as organochlorine pesticides, but studies to date have not found increased concentrations of organochlorines, when measured in adults, to be related to breast cancer risk.⁵⁰⁻⁵² Although animal studies have demonstrated that prolonged high-dose exposure to many industrial chemicals can increase mammary tumors, it is more difficult to determine whether much lower concentrations of these chemicals – which occur alone or in combination, in air, drinking water, and consumer products – increase the risk of human breast cancer.⁵³ In general, epidemiological studies have not found clear relationships between environmental pollutants and breast cancer, but these studies have had limited capability to study effects on subgroups

Figure 9. Trends in Female Breast Cancer 5-year Relative Survival Rates by Race, 1975-2007



Survival rates are based on follow up of patients through 2008.

Source: Howlander et al.³

American Cancer Society, Surveillance Research, 2011

of the population or to quantify exposures at potentially critical periods of life, such as adolescence. Furthermore, an association between environmental exposures and breast cancer may be difficult to quantify because it may reflect an indirect pathway (e.g., an effect of these exposures on early onset puberty). This continues to be an active area of research.

A comment about relative risk

Relative risk compares the risk of disease among people with a particular exposure to the risk among people without that exposure. If the relative risk is above 1.0, then risk is higher among exposed than unexposed persons. Relative risks below 1.0 reflect an inverse association between the exposure and the disease, or a protective effect. However, while relative risks are useful for comparisons, they do not provide information about the absolute amount of additional risk experienced by the exposed group. For example, one study found current users of combination estrogen and progestin menopausal hormones have a relative risk of developing breast cancer of 1.26, or a 26% increased risk.⁸³ Among 10,000 women who use estrogen and progestin for 5.2 years, the estimated number of breast cancers expected to be diagnosed is 38. Among 10,000 women of the same ages who never used menopausal hormones, 30 cases would be expected over the same period. Therefore, the 26% increased risk results in a total of 8 additional cases per 10,000 women diagnosed over a period of 5.2 years.

Table 3. Five-year Cause-specific Breast Cancer Survival Rates* by Race/Ethnicity

	Rate (%)
Non-Hispanic White	88.8
Black	77.5
American Indian/Alaska Native	85.6
Asian	90.7
Asian Indian, Pakistani	89.3
Chinese	90.4
Filipino	89.0
Japanese	93.0
Korean	89.6
Vietnamese	91.1
Other Asian	92.7
Pacific Islander	85.4
Hawaiian	88.2
Other Pacific Islander	78.9
Hispanic	83.8

*Survival rates are based on patients diagnosed between 2001 and 2007 and followed through 2008.

Source: Howlader et al.³

American Cancer Society, Surveillance Research, 2011

While limited in number, some epidemiologic studies have examined the relationship between occupational exposures and breast cancer after accounting for other important risk factors, such as reproductive history. One such study found that increasing exposure to ethylene oxide, a fumigant used to sterilize surgical instruments that also has been shown to cause breast cancer in experimental animals, was associated with higher breast cancer risk among women employed in commercial sterilization facilities.⁵⁴ Studies of nurses who work night shifts and flight attendants who experience circadian rhythm disruption caused by crossing multiple time zones find increased risks of breast cancer associated with long-term employment.⁵⁵ Animal studies suggest that exposure to light at night causes circadian rhythm disruption and increases cancer incidence.⁵⁶ Some researchers suggest that the increased risk of breast cancer may be due to decreases in melatonin levels that occur as a result of exposure to light at night; melatonin may affect estrogen levels, as well as act as a tumor suppressor.⁵⁶ Based on the results of studies in humans and experimental animals, the International Agency for Research on Cancer concluded in 2007 that shift work, particularly at night, was probably carcinogenic to humans.⁵⁷ Additional studies are needed to confirm this relationship because shift work at night is a common exposure, involving about 15-20% of workers in the US and Europe, and because much of the population in industrialized countries is exposed to artificial light at night.

Increasing age

Besides being female, age is the most important risk factor for breast cancer. Table 5 shows a woman's risk of being diagnosed with breast cancer at different ages. These probabilities are averages for the whole population. A woman's breast cancer risk may be higher or lower depending on her personal risk factors and other factors not yet fully understood.

Currently, a woman living in the US has a 12.15%, or a 1 in 8, lifetime risk of being diagnosed with breast cancer. In the 1970s, the lifetime risk of being diagnosed with breast cancer was 1 in 11. This increase in the likelihood of being diagnosed with breast cancer is due to longer life expectancy, as well as increases in breast cancer incidence due in part to changes in reproductive patterns, menopausal hormone use, the rising prevalence of obesity, and increased detection through screening. Lifetime risk reflects an average woman's risk over an entire lifetime, including the possibility that she may die from another cause before she would have developed breast cancer, and should not be confused with risk over a shorter time period.

Table 4. Factors That Increase the Risk for Breast Cancer in Women

Relative Risk	Factor
>4.0	<ul style="list-style-type: none"> • Age (65+ vs. <65 years, although risk increases across all ages until age 80) • Biopsy-confirmed atypical hyperplasia • Certain inherited genetic mutations for breast cancer (BRCA1 and/or BRCA2) • Mammographically dense breasts • Personal history of breast cancer
2.1-4.0	<ul style="list-style-type: none"> • High endogenous estrogen or testosterone levels • High bone density (postmenopausal) • High-dose radiation to chest • Two first-degree relatives with breast cancer
1.1-2.0	<ul style="list-style-type: none"> • Alcohol consumption • Ashkenazi Jewish heritage • Early menarche (<12 years) • Height (tall) • High socioeconomic status • Late age at first full-term pregnancy (>30 years) • Late menopause (>55 years) • Never breastfed a child • No full-term pregnancies • Obesity (postmenopausal)/adult weight gain • One first-degree relative with breast cancer • Personal history of endometrium, ovary, or colon cancer • Recent and long-term use of menopausal hormone therapy containing estrogen and progestin • Recent oral contraceptive use

Family history of breast cancer and genetic predisposition

Women with a family history of breast cancer, especially in a first-degree relative (mother, sister, daughter, father, or brother), are at increased risk of developing breast cancer and the risk is higher if more than one first-degree relative developed breast cancer. Compared to women without a family history, risk of breast cancer is 1.8 times higher for women with one first-degree female relative who has been diagnosed, nearly 3 times higher for women with two relatives, and nearly 4 times higher for women with three or more relatives.⁵⁸ Risk also increases the younger the relative was at the time of diagnosis. It is important to note that the majority of women with one or more affected first-degree relatives will never develop breast cancer and that most women who develop breast cancer do not have a first-degree relative with the disease. A family history of ovarian cancer is also associated with an increased risk of breast cancer. Women with a family history of breast or ovarian cancer in their mothers, sisters, daughters, aunts, or grandmothers or a male relative with breast cancer should discuss this history with their physicians.

It is estimated that 5%-10% of breast cancer cases result from inherited mutations, including those in the breast cancer susceptibility genes BRCA1 and BRCA2.⁵⁹ These mutations are present in far less than 1% of the general population, but occur more often in certain ethnic groups such as those of Ashkenazi

US Preventive Services Task Force recommendations for genetic testing for BRCA mutations

Women who are not of Ashkenazi (Eastern European) Jewish heritage should be referred for genetic evaluation if they have any of the following:

- Two first-degree relatives (mother, sisters, daughters) with breast cancer, one of whom was diagnosed when they were younger than 50
- Three or more first- or second-degree relatives (includes grandmothers, aunts) diagnosed with breast cancer
- Both breast and ovarian cancer among first- and second-degree relatives
- A first-degree relative diagnosed with cancer in both breasts
- Two or more first- or second-degree relatives diagnosed with ovarian cancer
- A male relative with breast cancer

Women of Ashkenazi (Eastern European) Jewish heritage should be referred for genetic evaluation if they have:

- A first-degree relative with breast or ovarian cancer
- Two second-degree relatives on the same side of the family with breast or ovarian cancer

Table 5. Age-specific Probabilities of Developing Invasive Female Breast Cancer*

If current age is ...	The probability of developing breast cancer in the next 10 years is:	or 1 in:
20	0.06%	1,681
30	0.43%	232
40	1.45%	69
50	2.38%	42
60	3.45%	29
70	3.74%	27
Lifetime risk	12.15%	8

*Among those free of cancer at beginning of age interval. Based on cases diagnosed 2005-2007. Percentages and "1 in" numbers may not be numerically equivalent due to rounding.

Probability derived using NCI DevCan Software, Version 6.5.0.

American Cancer Society, Surveillance Research, 2011

(Eastern European) Jewish descent.⁵⁹ Women with BRCA1 mutations are estimated to have a 44-78% risk for developing breast cancer by 70 years of age; the corresponding risk for BRCA2 mutations is 31-56%.⁶⁰

While a family history of breast cancer suggests an inherited influence on disease risk, BRCA1 or BRCA2 mutations account for only about 15-20% of familial breast cancers.⁶¹ Breast cancer can also result from the inheritance of other less common genetic syndromes (e.g., Li-Fraumeni and Cowden syndromes). A number of more common genetic mutations have also been identified that are less strongly associated with breast cancer risk.⁶¹ Any of these mutations can be inherited from either one's mother or father, and they may be inherited by sons, as well as daughters. Scientists believe that much of the occurrence of breast cancer in families results from the interaction between lifestyle factors and low-risk variations in genetic factors that may be shared by women within a family.⁶²

Molecular tests are commercially available to identify some of the BRCA mutations and many of the family cancer syndromes responsible for inherited forms of breast cancer, yet the interpretation of these tests and treatment decisions remains complicated.⁶³ It is not yet possible to predict if or when women who carry a particular mutation will develop breast cancer. Furthermore, tests are not available for all of the genes that affect breast cancer risk.

The US Preventive Services Task Force (USPTF) recommends that only women with a strong family history (about 2% of US women) be evaluated for genetic testing for BRCA mutations (see recommendations to left).⁶⁴ The American Cancer Society, the American Society for Clinical Oncology, and other organizations strongly recommend that any person considering genetic testing talk with a genetic counselor, nurse, or doctor who is qualified to interpret and explain the test results before making a decision

about testing. People should understand and carefully weigh the benefits and potential consequences before being tested. For more information, see the separate American Cancer Society document called *Genetic Testing: What You Need to Know*, which is available at cancer.org.

Hormonal factors

Reproductive hormones are thought to influence breast cancer risk by increasing cell proliferation, thereby increasing the likelihood of DNA damage, as well as promotion of cancer growth. Early menarche (<12 years) and older age at menopause (>55 years) may increase a woman's risk of breast cancer by increasing lifetime exposure to reproductive hormones produced by her body.^{65,66} Postmenopausal women with high levels of endogenous hormones (estrogen or testosterone) have about twice the risk of developing breast cancer compared to women with the lowest levels.^{67,68} Few studies have examined this relationship in premenopausal women, and the results are mixed.^{69,70} One reason for the discrepancy may be due to the complexity of measuring hormone levels in premenopausal women because levels vary throughout the menstrual cycle.

Younger age at first full-term pregnancy (<30 years) and a greater number of pregnancies decrease the risk of breast cancer over the long term; however, there also appears to be a transient increase in breast cancer risk following a full-term pregnancy, particularly among women who have a first birth at older ages.^{66,71} Interestingly, recent studies suggest that reproductive patterns are more strongly associated with risk of hormone receptor-positive breast cancer compared to triple-negative breast cancer.^{72,73} Breastfeeding has been shown to decrease a woman's risk of breast cancer, with greater benefit associated with longer duration. In a review of 47 studies in 30 countries, the risk of breast cancer was reduced by 4.3% for every 12 months of breastfeeding.⁷⁴ Recent use of oral contraceptives may slightly increase the risk of breast cancer; however, women who stopped using oral contraceptives for 10 years or more have the same risk as women who never used the pill.⁷⁵

Recent use of menopausal hormones (previously referred to as hormone replacement therapy [HRT] or menopausal hormone therapy) with combined estrogen and progestin increases the risk of developing and dying from breast cancer, with higher risk associated with longer use.⁷⁶⁻⁷⁸ Risk is also greater for women who start hormone therapy soon after the onset of menopause compared to those who begin use later.^{78,79} The increased risk appears to diminish within 5 years of discontinuation of hormone use.^{76,78,80} Estrogen alone can be prescribed for women without a uterus, and it is less clear if this therapy increases risk of breast cancer. Results from the Women's Health Initiative study suggest there is no increased risk of breast cancer associated with estrogen-only therapy;⁸¹ however, several other studies found slight increases in risk associated with use, particularly among lean women and for women who began therapy soon after menopause.^{78,80-82}

Clinical factors

High breast tissue density (a mammographic indicator of the amount of glandular tissue relative to fatty tissue in the breast) has been shown to be a strong independent risk factor for the development of breast cancer. Breast density is largely influenced by inherited genetic factors, but decreases with age and is further reduced by pregnancy and menopause.^{84,85} Women with the highest levels of breast density have consistently been found to have a 4- to 6-fold increased risk of breast cancer compared to women with less dense breasts.⁸⁶⁻⁹⁰ In addition, mammographic detection of breast cancer is impaired for dense breast tissue.⁸⁸

High bone mineral density in postmenopausal women also has been recognized as a risk factor for breast cancer in most studies.⁹¹⁻⁹⁵ Bone density is routinely measured to identify women at increased risk for osteoporosis (high bone density indicates absence of osteoporosis) and may help determine a woman's risk for developing breast cancer. The association between bone density and breast cancer is probably mediated by hormonal factors.

Some types of benign breast conditions are more closely linked to breast cancer risk than others.⁹⁶⁻⁹⁸ Doctors often categorize benign breast conditions into 3 general groups, reflecting the degree of risk: non-proliferative lesions, proliferative lesions without atypia, and proliferative lesions with atypia. Non-proliferative lesions are not associated with overgrowth of breast tissue and have little to no effect on breast cancer risk. Proliferative lesions without atypia (those with excessive growth of cells in the ducts or lobules of the breast tissue) are associated with a small increase in the risk of breast cancer (1.5 to 2 times normal).⁹⁹⁻¹⁰² Proliferative lesions with atypia (those with excessive growth of abnormal cells in the ducts or lobules of the breast tissue) are associated with the greatest breast cancer risk – 4 to 5 times that of average-risk women.^{99,101} They include atypical ductal hyperplasia (ADH) and atypical lobular hyperplasia (ALH). Women should keep detailed records of any benign breast biopsy results, as this will be useful information in the event of a future breast cancer diagnosis.

Women with breast cancer also are at risk for developing a second primary cancer. There is a strong relationship between younger age at diagnosis of the primary breast cancer and risk of subsequent cancer. Women diagnosed with early onset breast cancer (age <40) have almost a 3-fold increased risk of any subsequent cancer, with a 4.5-fold increased risk of subsequent breast cancer.¹⁰³ Genetic predisposition, notably mutations in BRCA1 and BRCA2 genes, probably contribute to the excess risk of subsequent breast and ovarian cancers, particularly among women with early onset breast cancer.¹⁰⁴ In addition, breast cancer survivors may be at increased risk of developing subsequent cancers of the breast, ovary, and uterus because of shared hormonal, genetic, and behavioral risk factors.¹⁰⁵

Radiation

The link between radiation exposure and breast cancer has been demonstrated in studies of atomic bomb survivors and women who have received high-dose radiation therapy to the chest, particularly those who were first exposed at younger ages.^{106,107} Among atomic bomb survivors, increased risk of breast cancer was greatest among women exposed during adolescence. The development period when the terminal ducts and lobules of the breast have not completed differentiation may be a time of increased susceptibility to carcinogens (cancer-causing agents).¹⁰⁸

Breast cancer is one of the most common types of second cancers among childhood cancer survivors. Secondary breast cancer is most strongly associated with high-dose radiation therapy to the chest for women treated between 10 and 30 years of age, such as for Hodgkin lymphoma. Breast cancer incidence rates among women with such exposure start to rise about 8 years after radiation treatment and continue to be elevated for more than 25 years.¹⁰³

Risk assessment tools

To estimate one's risk for developing breast cancer, risk assessment tools are available at the Siteman Cancer Center's Web site (yourdiseaserisk.wustl.edu) and the National Cancer Institute's Web site (cancer.gov/bcrisktool/).

Can breast cancer be prevented?

At this time, there is no sure way to prevent breast cancer, which is why regular mammograms are so important for early detection. Strategies that may help prevent breast cancer include avoiding weight gain and obesity, engaging in regular physical activity, and minimizing alcohol intake. Women who choose to breast-feed for an extended period of time (studies suggest a year or more) may also reduce their breast cancer risk. Women should consider the increased risk of breast cancer associated with the use of estrogen and progestin when evaluating treatment options for menopausal symptoms. Treatment with tamoxifen or raloxifene can also reduce the risk of breast cancer among women at high risk (see page 16 for section on chemoprevention).

Obesity

Obesity increases the risk of postmenopausal breast cancer, but appears to protect against breast cancer before menopause.¹⁰⁹ In postmenopausal women, circulating estrogen is primarily produced in fat tissue. Thus, having more fat tissue increases estrogen levels and the likelihood of developing breast cancer.

Weight gain during adulthood also increases the risk of breast cancer. Results from a study of more than 80,000 registered nurses found that women who gained 55 pounds or more after age 18 had almost 50% greater risk of breast cancer; a gain of 22 pounds or more after menopause was associated with an increased risk of 18%.¹¹⁰ Although some studies have found weight loss to be associated with reduced risk, results are not consistent.¹¹⁰⁻¹¹³ It is more difficult to examine the effect of weight loss on breast cancer because weight loss is often not sustained.

American Cancer Society Guidelines for Nutrition and Physical Activity for Cancer Prevention

Maintain a healthy weight throughout life.

- Balance calorie intake with physical activity.
- Avoid excessive weight gain throughout life.
- Achieve and maintain a healthy weight if currently overweight or obese.

Adopt a physically active lifestyle.

- Adults should engage in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week; 45 to 60 minutes of intentional physical activity is preferable.
- Children and adolescents should engage in at least 60 minutes per day of moderate to vigorous physical activity at least 5 days per week.

Eat a healthy diet, with an emphasis on plant sources.

- Choose foods and drinks in amounts that help achieve and maintain a healthy weight.
- Eat 5 or more servings of a variety of vegetables and fruits each day.
- Choose whole grains over processed (refined) grains.
- Limit intake of processed and red meats.

If you drink alcoholic beverages, limit your intake.

- Women should drink no more than 1 drink per day (or 2 per day for men).

Diet

Numerous studies have examined the association of dietary components (including fat, soy, dairy, meat, and fruits and vegetables) with breast cancer risk; however, no clear link has been found for any of these.¹¹⁴ A recent meta-analysis of animal fat intake and breast cancer, which included more than 20,000 breast cancer cases, concluded there was no association.¹¹⁵ Similarly, reducing dietary fat in postmenopausal women did not affect risk of breast cancer in the Women's Health Initiative dietary intervention. However, the timing of the exposure may be important, as findings from the Nurses' Health Study showed that a high-fat diet during adolescence was associated with a moderate increase in premenopausal breast cancer risk.¹¹⁶ On the other hand, soy has been suggested to reduce breast cancer risk, in part because of historically low breast cancer rates among Asian women. A recent meta-analysis showed that soy intake was inversely associated with breast cancer risk in Asian but not Western populations.¹¹⁷ The effect of diet on breast cancer risk remains an active area of research, with studies particularly focused on timing of exposure, specific dietary components, and whether risks may differ by tumor hormone receptor status.

Women at high lifetime risk (~20%-25% greater) of breast cancer include those who:

- Have a known BRCA1 or BRCA2 gene mutation
- Have a first-degree relative (mother, father, brother, sister, or child) with a BRCA1 or BRCA2 gene mutation, but have not had genetic testing themselves
- Have a lifetime risk of breast cancer of approximately 20%-25% or greater, according to risk assessment tools that are based mainly on family history
- Had radiation therapy to the chest when they were between 10 and 30 years of age
- Have Li-Fraumeni syndrome or Cowden syndrome, or have a first-degree relative with one of these syndromes

Women at moderately (15%-20% lifetime risk) increased risk include those who:

- Have a lifetime risk of breast cancer of 15%-20%, according to risk assessment tools that are based mainly on family history
- Have a personal history of breast cancer, ductal carcinoma in situ (DCIS), lobular carcinoma in situ (LCIS), atypical ductal hyperplasia, or atypical lobular hyperplasia
- Have extremely dense breasts or unevenly dense breasts when viewed by mammograms

Physical activity

Growing evidence supports a modest protective effect of physical activity on breast cancer risk, with stronger evidence for postmenopausal than premenopausal women.^{86,109,118,119} The reduction in risk is similar for both moderate and vigorous activity.¹¹⁹ The underlying mechanism of this potential protection is not well understood, although it has been hypothesized that the benefit may be due to the effects of physical activity on body mass, hormones, and energy balance.¹²⁰

Alcohol consumption

Numerous studies have confirmed that alcohol consumption increases the risk of breast cancer in women.^{121,122} A meta-analysis of more than 40 epidemiologic studies suggests that the equivalent of 2 drinks a day (or 24g of alcohol) increases breast cancer risk by 21%.¹²³ Recent studies have also reported that even low to moderate alcohol consumption (3-14 drinks per week) is associated with a slight increase in the risk of breast cancer.^{124,125} The increased risk is dose-dependent and exists regardless of the type of alcoholic beverage consumed.¹²² One of the most likely mechanisms by which alcohol increases risk of breast cancer is by increasing estrogen and androgen levels.¹²³

Tobacco

In 2009, the International Agency for Research on Cancer concluded that there was limited evidence that tobacco smoking causes breast cancer in women based on a review of 150 studies.¹²⁶ Subsequently, a large US study of nearly 80,000 women found current smokers had a 16% higher risk of breast cancer compared to women who never smoked.¹²⁷ Studies have also suggested that risk may be greater for women who begin smoking during their teenage years.^{127,128} Though the evidence remains inconclusive, secondhand smoke has also been suggested to increase the risk of breast cancer, particularly when the exposure occurs at younger ages.¹²⁹ In 2006, the US surgeon general characterized the evidence linking secondhand smoke and breast cancer as “suggestive but not sufficient” to infer a causal relationship.¹³⁰ However, a recent meta-analysis concluded that there was no association between secondhand smoke and breast cancer, regardless of the time of onset of exposure.¹³¹ Nevertheless, it is clear that not smoking cigarettes and avoiding exposure to secondhand smoke has multiple health benefits.

Chemoprevention

The use of drugs to reduce the risk of disease is called chemoprevention. Clinical trials have shown that, in women known to be at increased risk for breast cancer, the drugs tamoxifen and raloxifene significantly reduce this risk.¹³²

Tamoxifen has been used for more than 30 years as a treatment for some breast cancers. In 1998, a large randomized trial of more than 13,000 women first demonstrated that tamoxifen can also be used to reduce the risk of invasive and in situ breast cancer in women at high risk for developing the disease; however, the reduction in risk was limited to ER+ breast cancer.¹³³ After an average of 7 years of follow up, breast cancer risk was decreased by 42% in the group that received tamoxifen, with 25 cases of breast cancer diagnosed per 1,000 women in the group, compared to 43 cases per 1,000 in the group that did not receive tamoxifen. A protective effect was also observed in an international randomized prevention trial involving more than 7,000 women.¹³⁴ These long-term follow-up results indicate that the reduction in risk persists after completion of the 5-year treatment schedule. However, administration of tamoxifen resulted in some risks in both trials, particularly an increased risk of endometrial cancer.

In a study looking at raloxifene for the prevention of osteoporosis, researchers noticed that patients taking raloxifene had a lower risk of breast cancer than the control group.¹³⁵ The Study of Tamoxifen and Raloxifene (STAR) trial compared the effectiveness of tamoxifen and raloxifene and found that raloxifene was nearly as effective as tamoxifen in preventing invasive breast cancer and was associated with lower risks of certain side effects, such as endometrial cancer and blood clots in the legs or lungs.¹³⁶ Like tamoxifen, the benefit appears to be limited to reducing the risk of developing ER+ breast cancer.¹³⁷

Breast Cancer Screening

It was estimated that 15.5% of white women and 5.7% of African American women 35 to 79 years of age are eligible for tamoxifen chemoprevention based on the criteria of the US Food and Drug Administration, and that the benefits outweighed the risks for 4.9% of white women and 0.6% of African American.¹³⁸ However, in 2005, less than 0.1% of women were taking tamoxifen.¹³⁹ A woman at increased risk of breast cancer should discuss taking tamoxifen or raloxifene with her doctor.

Clinical trials are also examining another class of drugs – aromatase inhibitors – to see if they may be effective for breast cancer prevention. Currently, these drugs are approved to prevent breast cancer recurrence. Although early results are promising, these drugs are only effective in postmenopausal women.¹⁴⁰

Prophylactic surgery

Women at very high risk of breast cancer may elect prophylactic (preventive) mastectomy. This operation removes one or both breasts before breast cancer has been discovered. Some women may also choose to have their breasts reconstructed after the surgery. Removing both breasts before cancer is diagnosed reduces the risk of breast cancer by 90% or more.¹⁴¹⁻¹⁴³ Prophylactic salpingo-oophorectomy (surgical removal of the fallopian tubes and ovaries) reduces the risk of both breast and ovarian cancers in premenopausal women who carry BRCA mutations.¹⁴³ It is important to note that not all women who elect to have these surgeries would have developed cancer. A woman considering these operations should discuss this carefully with her doctor. A second opinion is strongly recommended.

Some women who are diagnosed with breast cancer in one breast choose to have the second breast removed. This is known as contralateral prophylactic mastectomy (CPM). Recent studies have shown marked increases in the rate of CPM for women diagnosed with invasive breast cancer, as well as DCIS.¹⁴⁴⁻¹⁴⁶ Although CPM nearly eliminates the risk of developing a breast cancer in the second breast, there is less evidence that it improves long-term breast cancer survival.¹⁴⁷ A large US study found that the small survival advantage associated with CPM was limited to women diagnosed before 50 years of age with early stage, ER- breast cancers.¹⁴⁸

American Cancer Society Guidelines for the Early Detection of Breast Cancer in Average-risk, Asymptomatic Women

Age 20-39

- Clinical breast examination at least every 3 years
- Breast self-examination (optional)

Age 40 and over:

- Annual mammogram
- Annual clinical breast examination (preferably prior to mammogram)
- Breast self-examination (optional)

How can breast cancer be detected early?

American Cancer Society guidelines for the early detection of breast cancer vary depending on a woman's age, and include mammography and clinical breast examination (CBE), as well as magnetic resonance imaging (MRI) for women at high risk.

In 2007, an expert panel convened by the Society reported new recommendations for the use of MRI for women at increased risk for breast cancer.¹⁴⁹ The panel recommended annual screening using MRI in addition to mammography for women at high lifetime risk (~20%-25% or greater) of the disease beginning at 30 years of age. Women at moderately increased risk (15%-20% lifetime risk) should talk with their doctors about the benefits and limitations of adding MRI screening to their yearly mammogram. MRI screening is not recommended for women whose lifetime risk of breast cancer is less than 15%.

Mammography

Mammography is a low-dose x-ray procedure that allows visualization of the internal structure of the breast. Modern, dedicated screen-film units result in higher-quality images with a considerably lower x-ray dose than the general-purpose x-ray equipment used in the past, and newer, digital mammography systems appear to be even more accurate for women under 50 years of age with dense breast tissues.¹⁵⁰

The American Cancer Society recommends that women receive an annual mammogram beginning at 40 years of age.¹⁵¹ It is especially important that women receive *regular* mammograms. Recommended screening intervals are based on the duration of time a breast cancer is detectable by mammography before symptoms develop. Numerous randomized trials, as well as population-based screening evaluations, have clearly shown that mammography reduces the risk of dying from breast cancer. Early detection of breast cancer by mammography also leads to a greater range of treatment options, including less-aggressive surgery (e.g., lumpectomy vs. mastectomy) and less-aggressive adjuvant therapy.

However, mammography does have limitations. Not all breast cancer will be detected by a mammogram, and some breast cancers detected by mammography may still have poor prognosis. Also, a small percentage of breast cancers detected by screening, particularly ductal carcinoma in situ, would not have progressed and thus may be treated unnecessarily.¹⁵² Furthermore, mammography sometimes leads to follow-up examinations, including biopsies, that are often determined not to be cancer; these are referred to as false-positive test results. Although many people are concerned about radiation exposure, the dose required for a mammogram is very small and the risk of harm from this

radiation exposure is minimal.¹⁵³ Despite these limitations, mammography is the single most effective method of early detection since it can identify cancer several years before physical symptoms develop. It is the position of the American Cancer Society that the balance of benefits to possible harms strongly supports the value of regular breast cancer screening in women who are older than 40.

There is no specific age at which mammography screening should be discontinued. Rather, the decision to stop regular mammography screening should be individualized based on the potential benefits and risks of screening within the context of overall health status and estimated longevity. As long as a woman is in good health and would be a candidate for breast cancer treatment, she should continue to be screened with mammography.

As of 2011, under the Affordable Care Act, Medicare and all new health insurance plans are required to fully cover screening mammograms without any out-of-pocket expense for patients. For help locating a free or low-cost screening mammogram in your area, contact the American Cancer Society at 1-800-227-2345.

Prevalence of mammography

According to the National Health Interview Survey, the percentage of women 40 years of age and older who report having had a mammogram within the past 2 years increased from 29% in 1987 to 70% in 2000. Screening rates declined (3.4%) between 2000 and 2005, and then stabilized.⁴ Women who have less than a high school education, who have no health insurance coverage, or who are recent immigrants to the US are least likely to have had a recent mammogram (Table 6). Furthermore, poor women are less likely to have had a mammogram within the past 2 years than women at or above the poverty level, and recent declines in mammography usage have generally been greater among poorer women (Table 7).

Table 8 (page 20) shows the percentage of US women 40 years of age and older who have had a mammogram within the past year by state, based on data from the 2010 Behavioral Risk Factor Surveillance System. Among women 40 years of age and older, reported screening rates range from 48.9% in Idaho to 71.0% in Massachusetts. Efforts to increase screening should specifically target socioeconomically disadvantaged women and recent immigrants, who are most likely to have the lowest rates of mammographic screening.

The Centers for Disease Control and Prevention's National Breast and Cervical Cancer Early Detection Program (NBCCEDP) was begun in 1990 to improve access to breast cancer screening and diagnostic services for low-income women and was recently shown to reduce mortality from breast cancer.¹⁵⁴ However, the CDC estimates that the program is currently only reaching about 14% of the women eligible to receive a screening mammogram, due in part to funding shortages.¹⁵⁵ The American Cancer

Table 6. Mammography Screening Prevalence (%) among Women 40 and Older, US, 2010

Characteristic	% Mammogram within the past year*	% Mammogram within the past 2 years*
Age		
40-49	46.8	62.3
50-64	56.1	72.7
65+	49.2	64.3
Race/Ethnicity		
Non-Hispanic White	51.5	67.0
African American	50.6	65.9
Asian American†	47.7	61.9
American Indian and Alaska Native‡	51.6	70.7
Hispanic/Latina	46.5	64.4
Education (years)		
11	37.7	51.7
12	48.5	63.7
13-15	53.3	68.6
16 or more	57.0	74.6
Health insurance coverage		
No	16.9	31.5
Yes	54.9	70.7
Immigration§		
Born in US	51.6	67.1
Born in US territory	43.0	67.9
In US fewer than 10 years	26.8	37.4
In US 10 or more years	47.7	65.2
Total	50.8	66.5

Note: Preliminary estimates subject to change.

*Percentages are age adjusted to 2000 US standard population. † Does not include Native Hawaiians and other Pacific Islanders. ‡ Estimates should be interpreted with caution because of the small sample sizes. § Definition has changed such that individuals born in the US or in a US territory are reported separately from individuals born outside of the US. Individuals born in a US territory have been in the US for any length of time.

Source: National Health Interview Survey Public Use Data File 2010, National Center for Health Statistics, Centers for Disease Control and Prevention, 2011. American Cancer Society, Surveillance Research, 2011

Society is committed to helping increase funding for NBCCEDP in order to expand the number of women who can be served through the program.

Magnetic resonance imaging (MRI)

MRI uses magnetic fields instead of x-rays to produce very detailed, cross-sectional images of the body. MRI exams for breast imaging use a contrast material (usually gadolinium DTPA) that is injected into a small vein in the arm before or during the exam. This improves the ability of the MRI to capture detailed images of breast tissue. For certain women at high risk for breast cancer based on the previously outlined criteria (page 16), a screening MRI is recommended along with a yearly mammogram beginning at age 30. MRIs should supplement, but not replace, mammography screening.

Table 7. Mammography Screening Prevalence* by Age and Poverty Status†, US, Selected Years 1987-2010

Year	40-49 years			50-64 years			65 years and over		
	Poor	Near poor	Non-poor	Poor	Near poor	Non-poor	Poor	Near poor	Non-poor
1987	18.6	18.4	36.4	14.6	24.2	36.9	13.1	19.9	29.5
1990	32.2	39.0	60.1	29.9	39.8	63.3	30.8	38.6	51.5
1991	33.0	43.8	61.2	37.3	50.2	66.0	35.2	41.8	57.8
1993	36.1	47.8	65.3	47.3	47.0	71.9	40.4	47.6	63.5
1994	43.0	47.6	66.5	46.2	49.0	73.7	43.9	47.6	64.0
1998	44.8	46.9	68.4	52.7	61.8	78.7	51.9	57.8	70.1
1999	51.3	52.8	71.6	63.3	64.9	80.2	57.6	60.2	72.5
2000	47.4	43.6	69.9	61.7	68.3	82.6	54.8	60.3	75.0
2003	50.6	54.0	68.3	58.3	64.0	80.9	57.0	62.8	72.6
2005	42.5	49.8	69.0	50.4	58.8	76.8	52.3	56.1	70.1
2008	46.6	46.5	66.6	57.5	58.9	78.9	49.1	59.4	70.5
2010	49.1	45.3	67.7	54.9	56.6	78.2	50.8	56.7	71.6

Note: Missing income data were imputed for 1997-2008. Poverty level was unknown for 8% of women over 40 in 2010.

*Percent of women having a mammogram within the past two years. † Poor persons are defined as below the poverty threshold. Near poor persons have income of 100% to less than 200% of the poverty threshold. Non-poor persons have an income greater than or equal to 200% of the poverty level.

Source: Data for 1987-2005 from *Health, United States, 2008*. Data for 2008 and 2010: National Health Interview Survey Public Use Data File, National Center for Health Statistics, Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2011.

Just as mammography uses x-ray machines designed especially to image the breasts, breast MRI also requires special equipment. Higher-quality images are produced by dedicated breast MRI equipment than by machines designed for head, chest, or abdominal MRI scanning. However, many hospitals and imaging centers do not have dedicated breast MRI equipment available. It is important that screening MRIs are done at facilities that are capable of performing an MRI-guided breast biopsy at the time of the exam if abnormalities are found. Otherwise, the scan must be repeated at another facility at the time of the biopsy.

MRI is also more expensive than mammography. Most major insurance companies will likely cover some portion of the costs if a woman can be shown to be at high risk. At this time there are concerns about costs of and access to high-quality MRI breast screening services for women at high risk of breast cancer.

Clinical breast examination (CBE)

For average-risk asymptomatic women in their 20s and 30s, it is recommended that a breast exam be a part of a regular health examination, preferably at least every 3 years. For women 40 years of age and older, annual CBE can be an important complement to mammography, since a small percentage of cancers may be missed by mammography.

Preferably, women should have their CBE shortly before their annual mammogram. For CBE, the woman undresses from the waist up. Using the pads of the fingers, the examiner gently feels the breasts, giving special attention to shape, texture, location of any lumps, and whether such lumps are attached to the skin

or to deeper tissues. The breasts should also be inspected for skin changes (e.g., dimpling, redness) and asymmetry. The area under both arms will also be examined. CBE is also an opportunity for a woman and her health care provider to discuss changes in her breasts, early detection testing, review and update family history information, as well as answer any questions she may have about her own risk, new technologies, or other matters related to breast cancer.

Breast self-awareness

All women should become familiar with both the appearance and feel of their breasts to detect any changes and report them promptly to their physician. Although the American Cancer Society no longer recommends that all women perform monthly breast self-exams (BSE), women should be informed about the potential benefits and limitations associated with BSE. Research has shown that self-awareness seems to be more effective for detecting breast cancer than structured BSE.¹⁵⁶⁻¹⁵⁸ Women who detect their own breast cancer usually find it outside of a structured breast self-exam while bathing or getting dressed. A woman who wishes to perform periodic BSE should receive instruction from her health care provider and/or have her technique reviewed periodically.

If symptoms develop, women should contact their doctor immediately, even after a recent, normal mammogram. Lumps are not necessarily abnormal, however, and for women who are still menstruating, they can appear and disappear with the menstrual cycle. Most lumps that are detected and tested are not cancerous.

Table 8. Prevalence of Screening Mammography and Clinical Breast Exam among Women 40 and Older by State, 2010

	% Recent Mammogram*					% Recent Mammogram and Clinical Breast Exam†				
	40 years and older	40 to 64 years	65 years and older	No usual source of medical care‡	No health insurance§	40 years and older	40 to 64 years	65 years and older	No usual source of medical care‡	No health insurance§
Alabama	56.2	54.6	59.7	27.8	29.4	47.1	47.3	46.5	23.9	25.4
Alaska	51.8	49.0	62.9	35.1	37.9	45.2	44.1	49.7	30.2	24.9
Arizona	58.8	57.0	63.5	31.4	34.3	50.4	50.3	50.6	27.1	31.4
Arkansas	53.9	52.6	56.3	24.3	26.2	44.8	45.5	43.3	19.0	20.0
California	60.8	59.4	64.5	35.0	31.5	50.2	50.9	48.4	27.1	27.6
Colorado	54.0	52.2	59.3	24.4	24.5	45.1	45.0	45.3	19.6	19.5
Connecticut	66.9	66.8	67.1	34.1	43.5	58.1	60.5	52.9	28.0	36.0
Delaware	65.4	63.8	68.9	26.8	38.5	55.4	56.0	54.2	22.2	31.9
District of Columbia	64.3	63.1	67.9	39.4	40.0	58.0	58.0	57.9	32.6	28.7
Florida	61.9	58.5	68.8	29.7	27.0	52.6	52.8	52.2	24.6	21.5
Georgia	64.1	62.6	68.6	34.5	29.3	56.7	57.3	54.5	25.5	24.8
Hawaii	57.7	57.9	57.3	31.2	28.2	45.2	47.4	40.9	25.6	19.5
Idaho	48.9	47.8	51.7	21.6	20.8	42.9	43.0	42.7	17.2	17.5
Illinois	54.9	54.1	56.7	22.8	33.5	45.8	46.5	44.0	18.5	26.1
Indiana	56.1	55.1	58.4	24.7	29.2	46.3	47.8	43.0	18.7	23.7
Iowa	64.3	64.6	63.7	35.5	34.8	56.3	59.4	50.3	29.8	30.2
Kansas	61.0	59.0	65.5	25.3	26.5	52.4	53.7	49.5	22.1	22.6
Kentucky	55.2	54.4	56.8	22.7	31.8	45.7	47.6	41.0	15.0	26.4
Louisiana	63.2	62.8	64.1	38.2	44.8	55.5	56.9	52.1	34.8	39.4
Maine	67.4	66.9	68.6	24.6	40.6	58.5	60.0	55.0	20.3	36.0
Maryland	67.2	66.5	69.1	29.2	33.6	59.3	60.7	55.8	27.5	27.6
Massachusetts	71.0	70.0	73.6	39.3	44.0	62.0	62.6	60.4	32.2	38.3
Michigan	61.4	59.8	65.5	26.2	36.4	53.4	53.8	52.3	19.5	31.5
Minnesota	66.2	66.4	65.7	47.1	45.9	58.7	59.9	56.1	39.4	41.9
Mississippi	52.3	51.7	53.7	23.7	26.4	44.7	45.7	42.4	19.9	22.7
Missouri	58.1	57.8	58.7	22.9	28.0	49.8	52.1	44.8	20.2	24.6
Montana	49.1	47.2	53.3	20.7	26.1	41.7	42.1	40.8	17.2	22.8
Nebraska	54.0	54.8	52.6	20.8	21.7	45.6	48.7	39.3	18.3	19.4
Nevada	52.9	51.1	57.4	30.6	20.7	41.1	42.3	38.0	23.8	13.8
New Hampshire	63.9	62.0	68.7	21.7	29.2	55.9	56.1	55.4	16.1	23.6
New Jersey	62.4	63.8	59.3	39.2	39.1	54.9	58.0	47.6	35.4	35.4
New Mexico	54.8	53.9	56.7	26.7	25.8	45.9	46.7	44.2	17.7	19.4
New York	63.3	62.7	64.5	34.8	45.5	55.8	56.2	54.8	25.7	37.6
North Carolina	63.8	61.6	69.0	30.8	35.1	55.7	55.7	55.8	25.3	29.6
North Dakota	60.4	59.6	61.8	32.3	40.6	52.9	53.6	51.6	25.5	36.9
Ohio	59.9	57.9	64.4	22.3	27.5	50.6	51.5	48.4	18.0	23.7
Oklahoma	51.1	50.2	53.0	26.5	24.0	41.6	42.9	38.8	22.6	20.0
Oregon	53.0	50.0	59.7	16.0	15.3	43.3	43.4	43.1	13.9	14.8
Pennsylvania	58.4	57.3	60.7	22.4	29.2	50.3	52.1	46.6	17.7	25.9
Rhode Island	67.8	67.7	67.9	32.5	37.9	59.3	61.1	55.4	26.8	30.8
South Carolina	58.3	56.0	63.5	24.5	30.8	48.5	49.1	47.3	19.0	25.4
South Dakota	63.3	62.5	64.9	32.3	38.2	55.7	58.0	51.2	28.8	33.9
Tennessee	61.9	61.6	62.5	30.7	30.1	54.5	56.0	50.9	24.9	27.4
Texas	53.2	51.6	57.7	26.4	33.0	45.3	46.0	43.4	23.1	28.6
Utah	49.1	45.8	57.6	23.7	24.8	39.3	38.9	40.6	16.2	18.9
Vermont	62.5	60.7	66.8	27.6	31.1	52.6	53.0	51.8	20.2	26.8
Virginia	63.2	63.1	63.4	37.0	36.3	53.9	56.3	47.5	32.0	31.8
Washington	57.1	55.0	62.3	26.1	26.1	46.9	47.2	46.1	21.1	23.3
West Virginia	58.0	57.6	58.8	21.1	31.3	48.6	51.4	43.1	17.6	29.3
Wisconsin	64.1	63.5	65.3	21.8	30.3	56.5	58.2	52.9	18.1	29.2
Wyoming	51.0	49.5	54.6	27.9	20.8	42.9	43.8	40.8	23.7	17.3
United States	59.9	58.6	62.9	29.8	31.8	51.2	52.1	48.9	24.3	27.1
Range	48.9-71.0	45.8-70.0	51.7-73.6	16.0-47.1	15.3-45.9	39.3-62.0	38.9-62.6	38.0-60.4	13.9-39.4	13.8-41.9

*A mammogram within the past year. †Both a mammogram and clinical breast exam within the past year. ‡Women who reported that they did not have a personal doctor or health care provider. §Women aged 40 to 64 who reported that they did not have any kind of health care coverage.

Source: Behavioral Risk Factor Surveillance System Public Use Data Tape 2010, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2011

Breast Cancer Treatment

How is breast cancer treated?

Treatment decisions are made by the patient and the physician after consideration of the optimal treatment available for the stage and biological characteristics of the cancer, the patient's age and preferences, and the risks and benefits associated with each treatment protocol. Most women with breast cancer will have some type of surgery. Surgery is often combined with other treatments such as radiation therapy, chemotherapy, hormone therapy, and/or targeted therapy. Treatment guidelines from the National Comprehensive Cancer Network are available via free registration on its Web site (http://www.nccn.org/professionals/physician_gls/f_guidelines.asp).

Surgery

The primary goals of breast cancer surgery are to remove the cancer from the breast and to assess the stage of disease. In a lumpectomy, only cancerous tissue plus a rim of normal tissue is removed. Simple or total mastectomy includes removal of the entire breast. Modified radical mastectomy includes removal of the entire breast and lymph nodes under the arm, but does not include removal of the underlying chest wall muscle, as with a radical mastectomy. Radical mastectomy is rarely used due to the proven effectiveness of less aggressive and disfiguring surgeries.¹⁵⁹

If a woman chooses to have a mastectomy, she may consider having the breast reconstructed. Breast reconstruction may be done with saline-filled or silicone-filled implants or tissue from other parts of the body. A woman considering this option should discuss this with her breast surgeon prior to her mastectomy surgery as it may influence the surgical facility (inpatient vs. outpatient) and type of procedure. Breast reconstruction can be performed at the same time as the mastectomy, or it can be performed as a subsequent, separate surgical procedure.

Lumpectomy is almost always followed by radiation therapy. A woman who chooses lumpectomy and radiation will have the same expected long-term survival as if she had chosen mastectomy; however, there is a higher risk of local recurrence (cancer returning to the breast) with lumpectomy.¹⁶⁰

Both lumpectomy and mastectomy are often accompanied by removal of regional lymph nodes from the axilla, or armpit, to determine if the disease has spread beyond the breast. The presence of any cancer cells in the lymph nodes will help determine the need for subsequent therapy and the course it should take. Sentinel lymph node biopsy, in which selected lymph nodes are removed and tested before any others are excised, reduces the need for full axillary lymph node dissections among most women with no evidence of lymph node involvement before surgery.^{161,162} Furthermore, findings from a recent clinical trial

suggest that for some breast cancer patients, even if cancer cells are found in one or two sentinel lymph nodes, further lymph node removal may not be necessary.¹⁶³ Prior to surgery, patients should talk with their doctors to determine whether they intend to perform sentinel lymph node biopsy. If a woman is eligible for sentinel lymph node biopsy and wishes to have this procedure, her breast cancer surgery should be performed at a facility with a medical care team experienced with the technique. Sentinel lymph node biopsy is now widely available in the US.

Surgery and radiation therapy involving the axillary lymph nodes can lead to lymphedema, a serious swelling of the arm caused by retention of lymph fluid. Sentinel lymph node biopsy is associated with lower rates of lymphedema, which was one of the motivations for the development of this technique. Most women will not develop this side effect, but many will and others may develop a mild form of lymphedema. Lymphedema can occur soon after surgery or months to years later. Early recognition and management of lymphedema are important to minimize complications related to this incurable condition. In order to prevent lymphedema, women should utilize arm exercises and skin care to take care of the arm and hand on the treated side of the body for the rest of their lives. If swelling does occur, a doctor should be consulted immediately.

Radiation therapy

Radiation is used to destroy cancer cells remaining in the breast, chest wall, or underarm area after breast-conserving surgery. Radiation may also be needed after mastectomy in patients with either a cancer that is larger than 5 cm in size or when cancer is found in the lymph nodes.

There are two types of radiation therapy. External beam radiation is the usual type of radiation for women with breast cancer. Radiation is focused from a machine outside the body on the area affected by cancer. This usually includes the whole breast and, depending on the size and extent of the cancer, may include the chest wall and underarm area as well. External beam radiation therapy is typically administered over a period of 5 to 6 weeks; however, in recent studies, shortening the treatment to 3 weeks appears to be just as effective.¹⁶⁴ Internal radiation therapy, known as brachytherapy, uses a radioactive substance sealed in needles, seeds, wires, or catheters that are placed directly into or near the cancer. Some patients are treated with both internal and external radiation therapies in combination. The way the radiation therapy is given depends on the type, stage, and location of the tumor being treated. The ability to target radiation therapy accurately has increased dramatically in recent decades, which has greatly diminished side effects and can also reduce treatment time.¹⁶⁵ For example, one form of brachytherapy (MammoSite) being tested in clinical trials is given for only 5 days and is showing promising results.^{166,167} Clinical trials are also investigating other forms of accelerated partial breast irradiation that are designed to give radiation to a smaller segment of the breast, also over a period of 5 days.¹⁶⁸

Systemic therapy

Systemic therapy uses anti-cancer drugs that are injected into a vein or given by mouth. These drugs travel through the bloodstream to all parts of the body. Systemic therapy includes targeted therapy, chemotherapy, and hormone therapy, all of which work through different mechanisms. For example, chemotherapy drugs work by attacking cells that grow quickly, such as cancer cells. Newer targeted drugs work by attacking specific parts of cancer cells. Hormone therapy works by blocking the body's natural hormones, which sometimes act to promote cancer growth.

Systemic treatment given to patients before surgery is called neoadjuvant therapy. It is often used to shrink the tumor enough to make surgical removal possible or allow for less extensive surgery. This may allow breast-conserving surgery in women who would otherwise have required mastectomy. Neoadjuvant therapy has been found to be as effective as therapy given after surgery in terms of survival, disease progression, and distant recurrence.¹⁶⁹

Systemic treatment given to patients after surgery is called adjuvant therapy. After visible cancer has been surgically removed, it is used to kill any undetected tumor cells that may have been left behind or migrated to other parts of the body. Tumor size, histology, and the presence of cancer in axillary nodes are considered in the decision whether to use adjuvant systemic therapy.

Systemic therapy is the main treatment option for women with metastatic breast cancer who may not be candidates for surgery due to the extensive spread of the disease.

Targeted therapy

Approximately 15%-30% of breast cancers overproduce the growth-promoting protein HER2/neu. These tumors tend to grow faster and are generally more likely to recur than tumors that do not overproduce HER2. Trastuzumab (Herceptin) is a monoclonal antibody that directly targets the HER2 protein of breast tumors and offers a survival benefit for women with breast cancer that overexpress HER2.¹⁷⁰ Originally used to treat metastatic breast cancer, trastuzumab has also been shown to be effective in early stage breast cancer. The combined results of two large trials indicate that adding trastuzumab to standard chemotherapy for early stage HER2-positive breast cancer reduced the risk of recurrence and death by 52% and 33%, respectively, compared to chemotherapy alone.¹⁷¹ In 2006, the US Food and Drug Administration (FDA) approved trastuzumab for all HER2-positive breast cancers. All invasive breast cancers should be tested for the HER2 gene amplification or protein overexpression in order to identify women who would benefit from this therapy. Guidelines were released in 2007 aimed at improving the accuracy of HER2 testing.¹⁷²

Another drug, lapatinib (Tykerb), has been found to be effective in delaying disease progression in women with HER2-positive

advanced breast cancers that have become resistant to trastuzumab.¹⁷³ A new generation of anti-HER2 targeted therapies are currently in development.¹⁷⁴

After granting accelerated approval of bevacizumab (Avastin) for the treatment of metastatic breast cancer in 2008, the FDA began the process of removing approval of the drug in December 2010 because subsequent studies have shown minimal benefit combined with some potentially dangerous side effects.¹⁷⁵

Chemotherapy

The benefit of chemotherapy is dependent on multiple factors, including the size of the cancer, the number of lymph nodes involved, the presence of estrogen or progesterone receptors, and the amount of HER2/neu protein made by the cancer cells. Research has established that, in most cases, combinations of drugs are more effective than one drug alone for breast cancer treatment. Many combinations are being used, and it is not clear that any single combination is the best. The most common drugs recommended to be used in combination in early breast cancer that is not HER2-positive are cyclophosphamide, methotrexate, fluorouracil, doxorubicin (Adriamycin), epirubicin, paclitaxel (Taxol), and docetaxol (Taxotere). Depending on the combination of drugs that is used, adjuvant chemotherapy is usually given for 3 to 6 months. Chemotherapy is most effective when the full dose and cycle of drugs is completed in a timely manner. These and other chemotherapy drugs may also be used to shrink cancer that has metastasized (spread to distant organs).

Hormone therapy

Estrogen, a hormone produced by the ovaries, promotes the growth of many breast cancers. Women whose breast cancers test positive for hormone receptors can be given a drug that is referred to as hormone therapy to lower estrogen levels or to block the effects of estrogen on the growth of breast cancer cells. Tamoxifen and toremifene (Fareston) are drugs that prevent estrogen from binding to breast cancer cells and are effective in both postmenopausal and premenopausal patients. Fulvestrant (Faslodex) is a newer drug (given by injection once per month) that reduces the number of estrogen receptors on breast tumors. It is often effective in postmenopausal women even if the breast cancer is no longer responding to tamoxifen.

A class of drugs known as aromatase inhibitors (AIs) are also used in treating both early and advanced hormone receptor positive breast cancer. These drugs are letrozole, anastrozole, and exemestane. They work by blocking an enzyme responsible for producing small amounts of estrogen in postmenopausal women. AIs are not an effective treatment in premenopausal women because they cannot stop the ovaries from producing estrogen. Clinical trials have demonstrated a clear advantage to using either an AI instead of tamoxifen for a total of 5 years or switching to an AI after several years of tamoxifen, as opposed to tamoxifen alone for 5 years.¹⁷⁶⁻¹⁷⁸

Clinical trials

A clinical trial is a controlled experiment that is used to assess the safety and efficacy of treatments or other interventions for human disease and health problems. Generally, participants receive either the state-of-the-art standard treatment or a new therapy that may offer improved survival and/or fewer side effects. Participation in clinical trials provides essential information on the effectiveness and risks of a new treatment. For more information about clinical trials, including how to enroll, call the American Cancer Society at 1-800-303-5691 or visit cancer.org/clinicaltrials. Information can also be obtained by visiting the National Cancer Institute's Web site at cancer.gov/clinicaltrials or by calling 1-800-4-CANCER. Patients should consult their personal doctors and cancer specialists for detailed information about appropriate treatment options.

In 2010, clinical guidelines were issued recommending that an AI be included in the treatment of postmenopausal women with hormone receptor positive breast cancer.¹⁷⁹ Clinical trials continue to assess the optimal timing and duration of treatment. Although AIs have fewer serious side effects than tamoxifen (see page 16), they can cause osteoporosis, bone fractures, and other musculoskeletal symptoms because they completely deplete postmenopausal woman of estrogen.

In premenopausal women, removing or shutting down the ovaries (ovarian ablation), which are the main source of estrogens, effectively makes the woman postmenopausal. This may allow some other hormone therapies to work better. Permanent ovarian ablation can be done by surgically removing the ovaries (oophorectomy). More often, ovarian ablation is done with a class of drugs called luteinizing hormone-releasing hormone (LHRH) analogs, such as goserelin (Zoladex) or leuprolide (Lupron). These drugs stop the signal that the body sends to the ovaries to make estrogens in premenopausal women. LHRH agonists can be used alone or with tamoxifen and are also being studied in combination with aromatase inhibitors.

What is the American Cancer Society doing about breast cancer?

The American Cancer Society is saving lives from breast cancer by helping people stay well by taking steps to reduce the risk of breast cancer or detect it early, when it is most treatable; helping people get well by guiding them through every step of the cancer experience; finding cures by funding and conducting groundbreaking research to discover breast cancer's causes and effective ways to treat and help cure it; and fighting back by working with legislators to pass laws that defeat cancer and rallying communities to join the fight.

Research

Since 1971, the American Cancer Society has awarded approximately \$450.7 million in breast cancer research grants. Society-funded research has led to the development of lifesaving breast cancer drugs such as tamoxifen and Herceptin, as well as discovery of genes linked to breast cancer (e.g., BRCA1).

The Society is currently funding \$114 million in breast cancer research through more than 200 research study grants. These grants are awarded in multiple areas relevant to breast cancer including genetics, etiology, diagnostics (imaging and biomarkers), drug development; and preclinical, clinical, and epidemiological studies in prevention, diagnosis, treatment, and quality of life.

Specific examples of ongoing breast cancer research being conducted by Society grantees include:

- Examining reasons for treatment differences between African American and white breast cancer patients, including differences in delays in starting treatment, less-frequent treatment, and choice of mastectomy over lumpectomy in African American women. Findings will help inform strategies to minimize racial differences in the treatment of breast cancer.
- Investigating how health system and contextual factors, including variations in the quality of screening, diagnostic and treatment facilities, as well as individual factors, including health insurance coverage and access to care, contribute to racial disparities in breast cancer mortality
- Exploring new therapies for the treatment of breast cancer that target cells of the immune system and evaluating whether the immune system plays a role in inflammatory responses that promote cancer progression
- Identifying and cataloging ribonucleic acids (RNAs) that are characteristic of normal and breast cancer tissues, with the goal of generating an "RNA fingerprint" of breast cancer. Researchers believe these RNA fingerprints may prove useful in detecting breast cancer at an early stage and allow for more effective treatments.

- Identifying genes that may determine susceptibility to lymphedema, an incurable side effect of breast cancer treatment that affects up to 30% of patients. Researchers hope that this will lead to the development of drugs that could prevent lymphedema.
- Developing a tool to aid women in understanding their personal breast cancer risk and identifying women at high risk who may benefit from preventive therapies and tailored screening recommendations
- Evaluating factors that influence mammography interpretation by radiologists, developing a test set that identifies radiologists who could benefit from additional training, and creating a continuing medical education course that reduces recall rates while maintaining or improving cancer detection. This project, co-funded with the National Cancer Institute, was designed in direct response to the Institute of Medicine's report "Improving Breast Imaging Quality Standards," which highlighted the need to decrease variability in mammography interpretation in the US and identified issues stalling the reauthorization of the Mammography Quality Standards Act.

The Society also internally conducts epidemiologic studies of breast cancer and performs surveillance research to monitor racial and socioeconomic disparities in breast cancer screening, incidence, survival, and mortality. Using information collected from more than 600,000 women in the Cancer Prevention Study II (CPS-II), American Cancer Society epidemiologists study the influence of many risk factors including alcohol consumption, diethylstilbestrol (DES), estrogen hormone use, family history of cancer, obesity, smoking, and spontaneous abortion on the risk of death from breast cancer. Recently published papers have also examined the effect of weight loss and vitamin D levels on breast cancer risk. The American Cancer Society is currently enrolling cancer-free adults in the Cancer Prevention Study-3 (CPS-3). These men and women will be followed for 20 to 30 years to gain a better understanding of the lifestyle, behavioral, environmental, and genetic factors that cause or prevent cancer.

American Cancer Society epidemiologists have also studied the influence of mammography on breast cancer prognostic factors, conducted long-term follow up of major breast cancer screening studies, modeled the cost-effectiveness of chemoprevention strategies, and recommended breast cancer surveillance strategies that can be applied at the local and national levels.

The Society's Behavioral Research Center is currently conducting a study of survivors of 10 cancers, including breast cancer, to examine the determinants of good quality of life. Specific areas of research include healthy lifestyle behaviors (e.g., diet, physical activity, and smoking), body image issues, sexuality and intimacy, and overall quality of life among breast cancer survivors and their caregivers.

The Surveillance Research group has recently reported that breast cancer incidence rates are no longer declining among white

women in the US following the sharp drop in rates related to declines in use of menopausal hormones. Another paper found independent associations among education, insurance status, and race with five breast cancer prognostic factors. The Health Services Research group has recently reported findings that African American breast cancer patients are less likely than whites to receive recommended breast cancer care, even after controlling for insurance and socioeconomic factors. This group also published findings that patients without health insurance or with Medicaid coverage were more likely to present with advanced stage breast cancer.

Advocacy

The American Cancer Society and its nonprofit, nonpartisan advocacy affiliate, the American Cancer Society Cancer Action NetworkSM (ACS CAN), are involved in advocacy efforts at both the federal and state levels that seek to increase access to quality breast cancer screenings, diagnostic services and treatment, and care for all women; increase government funding for breast cancer research; and be a voice for the concerns of breast cancer patients and survivors. Below are some of the efforts that the American Cancer Society and ACS CAN have been involved with in the past few years to fight back against breast cancer – and all cancers:

- **Improving Access to Affordable Care through Health Care Reform:** The Affordable Care Act (ACA) was signed into law on March 23, 2010, giving cancer patients access to quality, affordable health care. As of 2011, all new health insurance plans and Medicare are required to cover preventive services rated "A" or "B" by the US Preventive Services Task Force (USPSTF), which includes mammography screening, at no cost to patients. This requirement will be extended in 2014 to cover all insurance companies enrolled in state health insurance exchanges and individuals newly covered through the ACA's expansion of Medicaid.
- **Expanding the National Breast and Cervical Cancer Early Detection Program (NBCCEDP):** A high priority for the Society and ACS CAN, at both the state and federal level, is fighting to increase funding for the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). This successful program, which recently celebrated its 20th anniversary, provides community-based breast and cervical cancer screening to low-income, uninsured, and underinsured women. More than 55% of the women screened are from racial/ethnic minority groups. ACS CAN is asking Congress to increase funding to \$275 million for fiscal year 2012. While the Affordable Care Act will greatly improve insurance coverage, the NBCCEDP will remain an essential program for improving access to breast and cervical cancer screening and treatment in our nation's most vulnerable populations. It will be critical to use the program's infrastructure and community outreach specialists to help women and their families enroll in the various insurance options for which they qualify.

- **Protecting the Breast and Cervical Cancer Prevention and Treatment Act:** This act ensures that low-income women diagnosed with cancer through the NBCCEDP are eligible for Medicaid coverage for their treatment. ACS CAN continues to advocate at the state level to protect Medicaid dollars so that there is sufficient funding for treatment of these women.
- **Funding the Patient Navigator Program:** The Society and ACS CAN continue to work with Congress to secure additional funding for the Health Resources and Services Administration (HRSA) Patient Navigator Program, which helps patients in medically underserved communities work their way through the health care system, provides outreach and education for patients to encourage preventive screenings, and addresses needs that may impact compliance with screening and treatment. Navigators improve mammography compliance rates and follow up and decrease the average length of time between initial breast exams and biopsies to a rate comparable to patients in private care. ACS CAN supports the ACA's reauthorization of the Patient Navigator Program until 2015.
- **Funding for Cancer Research:** The American Cancer Society and ACS CAN continue to work to increase government funding for cancer research at the National Institutes of Health, including the National Cancer Institute and the National Center on Minority Health and Health Disparities.

The Society is also rallying people to fight back against the disease through our Making Strides Against Breast Cancer®, Relay For Life®, and DetermiNation® events. To learn more, to get involved, and to make a difference in the fight against cancer, visit cancer.org/involved.

Partnerships

Collaborative relationships and partnerships are established to achieve goals greater than could be achieved individually. The American Cancer Society devotes significant resources to the education of the public and health care professionals.

An educational partnership with the African Methodist Episcopal Church, the National Hispanic Medical Association, and Conrad & Associates resulted in the production of the short film and guidebook called *Taking Charge of Breast Cancer: A Guide for African American Women*. Similarly, a collaboration with the National Hispanic Medical Association, the League of United Latin American Citizens, and Conrad & Associates yielded a short film and guidebook that included information on breast cancer early detection and treatment options specifically targeting Hispanic underserved women.

In 2008, the Society was awarded a CDC grant to revise and expand the Circle Of LifeSM initiative aimed at reaching out to and partnering with American Indian and Alaska Native (AIAN) communities. With an emphasis on reaching the medically underserved, Circle Of Life enables the Society to work with and through AIAN community-based groups to address the needs of patients, caregivers, and families across the cancer continuum.

Since 1995, contributions to the American Cancer Society through the Longaberger Company Horizon of Hope® campaign have supported breast cancer research and education projects, including a series of initiatives to promote quality standards for risk reduction, early identification, and management of lymphedema and other impairments resulting from breast cancer treatment.

What resources are available in your community?

Information, 24 Hours a Day, Seven Days a Week

Help and information are available 24 hours a day, 7 days a week online at cancer.org and by calling the American Cancer Society at 1-800-227-2345. Callers are connected with a Cancer Information Specialist who can help them locate a hospital, understand cancer and treatment options, learn what to expect and how to plan, help address insurance concerns, find financial resources, find a local support group, and more. The Society can also help people who speak languages other than English or Spanish find the assistance they need, offering services in 170 languages in total.

Information on every aspect of the breast cancer experience, from prevention to survivorship, is also available on the Society's Web site, cancer.org. The Society also publishes a wide variety of pamphlets and books that cover a multitude of topics, from patient education, quality-of-life and caregiving issues to healthy living. A complete list of Society books is available for order at cancer.org/bookstore.

Day-to-day Help and Emotional Support

The American Cancer Society offers patients and their families the resources they need to guide them through every step of the cancer experience so they can focus on getting well.

Breast cancer support

Breast cancer survivors provide one-on-one support, information, and inspiration to help people facing the disease cope with breast cancer through the American Cancer Society Reach To Recovery® program. Volunteer survivors are trained to respond in person or by telephone to people facing breast cancer diagnosis, treatment, recurrence, or recovery.

Support during treatment

When women are in active cancer treatment, they want to look their best, and Look Good...Feel Better® helps them do just that. The free program, which is a collaboration of the American Cancer Society, the Personal Care Products Council Foundation, and the Professional Beauty Association | National Cosmetology Association, helps women learn beauty techniques to restore their self-image and cope with appearance-related side effects of cancer treatment. Certified beauty professionals, trained as Look Good...Feel Better volunteers, provide tips on makeup, skin care, nail care, and head coverings. Additional information and materials are available for men and teens.

Transportation to treatment

Cancer patients cite transportation to and from treatment as a critical need, second only to direct financial assistance. The American Cancer Society Road To Recovery® program matches these patients with specially trained volunteer drivers. This program offers patients an additional key benefit of companionship and moral support during the drive to medical appointments. In those cases where a Road To Recovery driver isn't available, the Society may be able to provide other transportation assistance.

Lodging during treatment

When someone diagnosed with cancer must travel far from home for the best treatment, where to stay and how to afford accommodations are immediate concerns and can sometimes affect treatment decisions. American Cancer Society Hope Lodge® facilities provide free, home-like temporary lodging for patients and their caregivers close to treatment centers, thereby easing the emotional and financial burden of finding affordable lodging.

Finding hope and inspiration

People with cancer and their loved ones do not have to face their cancer experience alone. They can connect with others who have “been there” through the American Cancer Society Cancer Survivors Network®. The online community is a welcoming and safe place that was created by and for cancer survivors and their families.

Hair-loss and mastectomy products

Some women wear wigs, hats, breast forms, and bras to help cope with the effects of mastectomy and hair loss. The American Cancer Society “tlc” Tender Loving Care®, which is a magazine and catalog in one, offers helpful articles and a line of products to help women battling cancer restore their appearance and dignity at a difficult time. All proceeds from product sales go back into the Society's programs and services for patients and survivors.

Cancer education classes

People with cancer and their caretakers need help coping with the challenges of living with the disease. Doctors, nurses, social workers, and other health care professionals provide them with that assistance by conducting the American Cancer Society I Can Cope® educational classes to guide patients and their families through their cancer journey.

Other sources of patient information and support include:

National Breast and Cervical Cancer Early Detection Program

Telephone: 1-800-CDC-INFO or 1-800-232-4636
cdc.gov/cancer/nbccedp/

This Centers for Disease Control and Prevention (CDC) program helps low-income women gain access to timely, high-quality screening programs for the detection of breast and cervical cancer.

Sisters Network

Telephone: 1-866-781-1808
sistersnetworkinc.org

This national African American breast cancer survivors support group is committed to increasing local and national attention to the devastating impact that breast cancer has in the African American community.

YourShoes 24/7 Breast Cancer Support Center

Telephone: 1-800-221-2141 (English), 1-800-986-9505 (Spanish)
y-me.org

YourShoes is a 24-hour hotline staffed by trained peer counselors who are breast cancer survivors. The hotline provides information on breast cancer and breast health to anyone touched by or concerned about this disease.

Sources of Statistics

General information. The statistics and statements in this booklet, unless otherwise stated, refer to invasive (not in situ) breast cancer.

New cancer cases. The estimated numbers of new US cancer cases are projected using a spatiotemporal model based on incidence data from 44 states and the District of Columbia for the years 1995-2007 that met the North American Association of Central Cancer Registries' (NAACCR) high-quality data standard for incidence, which covers about 90% of the US population. This method considers geographic variations in sociodemographic and lifestyle factors, medical settings, and cancer screening behaviors as predictors of incidence, as well as accounting for expected delays in case reporting. For more information about the method, see Pickle et al.¹⁸⁰

Incidence rates. Incidence rates are defined as the number of people per 100,000 who develop a disease during a given time period. Breast cancer incidence rates for the US in the most recent time period were calculated using data on cancer cases collected by the North American Association of Central Cancer Registries (NAACCR) and population data collected by the US Census Bureau. For long-term incidence trends, rates are based on American Cancer Society analysis of the SEER Public Use Dataset, 1973-2008, November 2010 submission, using *SEER*Stat 7.0.4*, a statistical software package from the National Cancer Institute. When referenced as such, US SEER incidence rates were previously made available on SEER's Web site (seer.cancer.gov) and within the *SEER Cancer Statistics Review 1975-2008*.³ Note that because of delays in reporting newly diagnosed cancer cases to the cancer registries, cancer incidence rates for the most recent diagnosis years may be underestimated. Incidence rates adjusted for delays in reporting are used when available and are referenced as such.

Cancer deaths. The estimated number of breast cancer deaths in the US in 2011 is calculated by fitting the numbers of cancer deaths from 1969 through 2007 to a statistical forecasting model. Data on the number of deaths are obtained from the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention. For more information about the method, see Tiwari, et al.¹⁸¹

Mortality rates. Similar to incidence rates, mortality rates are defined as the number of people per 100,000 who die from a disease during a given time period. Death rates used in this publication were previously made available by SEER on their Web site (seer.cancer.gov) and within the *SEER Cancer Statistics Review 1975-2007*.¹³ Death rates were calculated using data on cancer deaths compiled by NCHS and population data collected by the US Census Bureau. All death rates in this publication were age adjusted to the 2000 US standard population.

Survival rates. Five-year survival statistics are based on cancer patients diagnosed between 2001-2007; 10-year survival rates are based on diagnoses between 1995-2007; and 15-year survival rates are based on diagnoses between 1990-2007. All patients were followed through 2008. Relative survival rates are used to adjust for normal life expectancy (and events such as death from heart disease, accidents, and diseases of old age). Relative survival is calculated by dividing the percentage of observed 5-year survival for cancer patients by the 5-year survival expected for people in the general population who are similar to the patient group with respect to age, sex, race, and calendar year of observation. Relative survival rates are not calculated for Hispanics/Latinos, Asian Americans/Pacific Islanders, and American Indians/Alaska Natives because reliable estimates of normal life expectancy are not available for these groups; therefore, cause-specific survival rates are presented. Cause-specific survival rates are the probability of not dying of breast cancer within 5 years after diagnosis. Cause-specific survival does not account for stage and age at diagnosis. When referenced as such, 5-year survival statistics were originally published in *SEER Cancer Statistics Review, 1975-2008*.³

Probability of developing cancer. Probabilities of developing breast cancer were calculated using DevCan (Probability of Developing Cancer Software), developed by the National Cancer Institute. These probabilities reflect the average experience of women in the US and do not take into account individual behaviors and risk factors (e.g., utilization of mammography screening and family history of breast cancer).

Prevalence of mammography. Prevalence estimates of mammography by age and state were obtained through analysis of data from the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an ongoing system of surveys conducted by the state health departments in cooperation with the Centers for Disease Control and Prevention. Prevalence estimates of mammography by race/ethnicity are from the National Health Interview Survey.

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(AK, AZ, CO, ID, MT, ND, NM, NV, OR, UT, WA, WY)

2120 First Avenue North
Seattle, WA 98109-1140
(206) 283-1152 (O)
(206) 285-3469 (F)

High Plains Division, Inc.

(including Hawaii operations, KS, MO, NE, OK, TX)

2433 Ridgepoint Drive
Austin, TX 78754
(512) 919-1800 (O)
(512) 919-1844 (F)

Hawaii Pacific Division, Inc.

2370 Nuuanu Avenue
Honolulu, HI
(808) 595-7500 (O)
(808) 595-7502 (F)

Illinois Division, Inc.

225 N. Michigan Avenue
Suite 1200
Chicago, IL 60601
(312) 641-6150 (O)
(312) 641-3533 (F)

Mid-South Division, Inc.

(AL, AR, KY, LA, MS, TN)

1100 Ireland Way
Suite 300
Birmingham, AL 35205-7014
(205) 930-8860 (O)
(205) 930-8877 (F)

Midwest Division, Inc.

(IA, MN, SD, WI)

8364 Hickman Road
Suite D
Des Moines, IA 50325
(515) 253-0147 (O)
(515) 253-0806 (F)

New England Division, Inc.

(CT, ME, MA, NH, RI, VT)

30 Spen Street
Framingham, MA 01701-9376
(508) 270-4600 (O)
(508) 270-4699 (F)

South Atlantic Division, Inc.

(DE, GA, MD, NC, SC, VA, Washington, D.C., WV)

250 Williams Street
Atlanta, GA 30303
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