Breast Cancer Facts & Figures 2005-2006

American Cancer Society®

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For more information, contact:
Carol Smigal, MPH
Rebecca Siegel, MPH
Ahmedin Jemal, PhD
Department of Epidemiology and Surveillance Research

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What is breast cancer?

Cancers are a group of diseases that cause cells in the body to change and grow out of control. Most types of cancer cells 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 lobules to the nipple. The remainder of the breast is made up of fatty, connective, and lymphatic tissue.

- Most breast abnormalities 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 have not yet spread beyond the area where they began. In situ breast cancers are confined within the ducts (ductal carcinoma in situ) or lobules (lobular carcinoma in situ) of the breast. Nearly all cancers at this stage can be cured. Many oncologists believe that lobular carcinoma in situ (also known as lobular neoplasia) is not a true cancer but rather is an indicator of increased risk for developing invasive cancer in the future.
- Other cancerous breast tumors are invasive, or infiltrating. These cancers start in the lobules or ducts of the breast but have broken through the duct or gland walls to invade the surrounding fatty tissue of the breast.

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 classification of tumors developed by the American Joint Committee on Cancer (AJCC) uses information on tumor size (T), lymph node involvement (N), and the presence or absence of distant metastases (M), and is commonly used in clinical settings.[1] Once the T, N, and M are determined, a stage of I, II, III, or IV is assigned, with stage I being an early stage and stage IV being the most advanced.

A broader system used for the staging of cancers is known as the SEER Summary Stage system and is used more commonly in reporting cancers:[2]

– Local-stage tumors are cancers confined to the breast.

– Regional-stage tumors have spread to surrounding tissue or nearby lymph nodes.

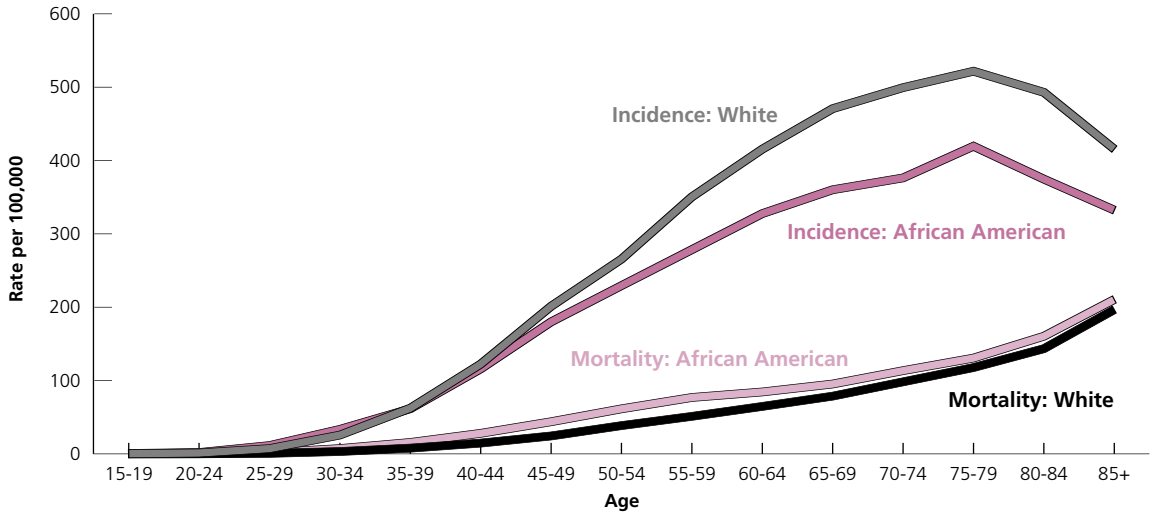
– Distant-stage cancers have metastasized (spread) to distant organs.

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 be aware of risk factors,

Figure 1. Female Breast Cancer – Age-Specific Incidence and Death Rates by Race, US, 1998-2002



Data sources: *Incidence* – Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005. *Deaths* – National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2005

especially family history, and report any change in their breasts to a physician.

Age

- Breast cancer incidence and death rates generally increase with age (Figure 1). During 1998-2002, 95% of new cases and 97% of breast cancer deaths occurred in women aged 40 and older.[3,4]
- Among women during 1998-2002, those aged 20-24 have the lowest incidence rate, 1.3 cases per 100,000 population; women aged 75-79 have the highest incidence rate, 496.6 cases per 100,000.[5] The decrease in incidence rates that occurs after age 80 may reflect lower rates of screening and incomplete detection.
- During 1998-2002, the median age at the time of breast cancer diagnosis was 61 years.[5] This means that 50% of women who developed breast cancer were age 61 or younger and 50% were older than age 61 when diagnosed.

Race/ethnicity

- White women have a higher incidence of breast cancer than African American women after age 35. In contrast, African American women have a slightly higher incidence rate before age 35 and are more likely to die from breast cancer at every age[5] (Figure 1).
- Incidence and death rates from breast cancer are lower among women of other racial and ethnic groups than among white and African American women[5] (Figure 2).
- Table 1 shows breast cancer incidence and death rates for white and African American women by state. Among white women, breast cancer incidence rates range from 118.7 in West Virginia to 163.9 in the

Table 1. Female Breast Cancer Incidence and Death Rates* by Race and State, 1998-2002

	White		African American			White		African American	
State	Incidence†	Mortality‡	Incidence†	Mortality‡	State	Incidence†	Mortality‡	Incidence†	Mortality‡
Alabama	118.9	24.8	103.0	32.3	Montana	127.9	24.5	§	¶
Alaska	143.0	23.9	143.2	¶	Nebraska	134.6	23.6	108.0	41.3
Arizona	123.4	24.8	89.7	37.0	Nevada	122.6	26.9	100.2	31.3
Arkansas	§	22.7	§	37.4	New Hampshire	§	26.5	§	¶
California	139.1	26.0	117.6	33.3	New Jersey	140.7	29.5	115.2	34.3
Colorado	136.6	23.5	99.6	30.4	New Mexico	122.7	23.6	84.9	42.0
Connecticut	145.5	26.2	116.7	31.5	New York	133.9	28.1	95.3	30.6
Delaware	131.1	26.9	117.9	35.8	North Carolina	§	23.8	§	35.1
Dist. of Columbia	163.9	28.8	124.9	40.2	North Dakota	§	25.9	§	¶
Florida	128.8	23.5	102.4	30.8	Ohio	127.9	27.9	116.8	37.8
Georgia	§	24.1	§	32.0	Oklahoma	134.3	26.2	120.6	39.5
Hawaii	154.2	25.2	85.6	¶	Oregon	145.3	26.1	122.3	25.8
Idaho	131.5	25.3	§	¶	Pennsylvania	131.4	27.3	117.7	38.1
Illinois	134.0	27.2	124.1	39.0	Rhode Island	134.1	26.8	88.2	25.8
Indiana	§	26.3	§	37.3	South Carolina	127.5	24.5	108.2	35.2
Iowa	132.0	25.3	126.9	37.8	South Dakota	§	24.0	§	¶
Kansas	§	24.9	§	38.5	Tennessee	§	25.4	§	34.0
Kentucky	126.0	26.5	130.9	36.8	Texas	§	24.4	§	36.0
Louisiana	124.8	26.4	120.6	38.6	Utah	122.2	23.6	76.6	¶
Maine	132.7	24.6	87.0	¶	Vermont	§	26.3	§	¶
Maryland	§	26.9	§	35.1	Virginia	§	26.0	§	37.4
Massachusetts	144.1	27.4	93.7	25.6	Washington	150.6	24.8	110.1	31.9
Michigan	133.9	25.9	120.6	36.0	West Virginia	118.7	25.9	118.1	38.5
Minnesota	138.7	25.4	107.8	30.0	Wisconsin	135.4	25.7	123.7	32.0
Mississippi	§	24.0	§	36.6	Wyoming	§	23.3	§	¶
Missouri	127.4	26.0	119.2	36.4					

*All rates are per 100,000 and age-adjusted to 2000 US standard population. †Source is SEER and NPCR areas reported by North American Association of Central Cancer Registries (NAACCR) as meeting high-quality standards for 1998-2002. ‡Death data are from CDC's National Vital Statistics System and cover the entire US population (http://www.cdc.gov/nchs). §Statistic could not be calculated for one of the following reasons: state did not submit data to NAACCR, failed to meet NAACCR quality standard, or had six or fewer cases.¶ 25 or fewer deaths; statistic could not be calculated.

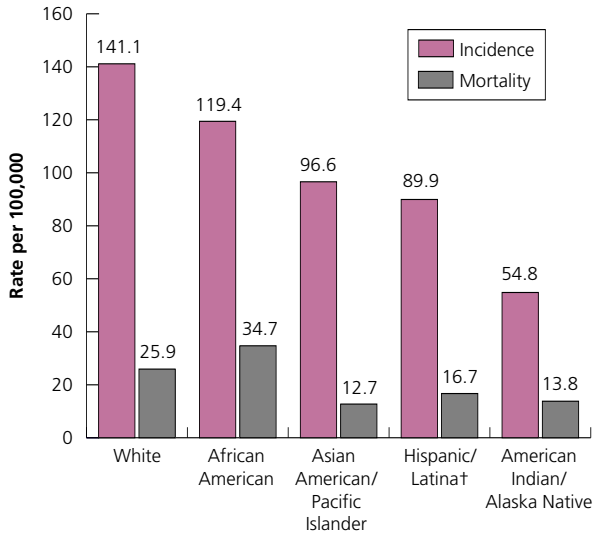
American Cancer Society, Surveillance Research, 2005

District of Columbia.[6] Breast cancer incidence rates among African American women range from 76.6 in Utah to 143.2 in Alaska.[6] Incidence rates reflect how completely the population is screened, as well as disease occurrence. Despite higher incidence rates, breast cancer death rates are lower among white women compared to African American women. Breast cancer death rates among white women range from 22.7 in Arkansas to 29.5 in New Jersey.[4] In contrast, breast cancer death rates among African American women range from 25.6 in Massachusetts to 42.0 in New Mexico.[4]

How many cases and deaths are estimated to occur in 2005?

- In 2005, an estimated 211,240 new cases of invasive breast cancer will be diagnosed among women, as well as an estimated 58,490 additional cases of in situ breast cancer[7] (Table 2).
- In 2005, approximately 40,410 women are expected to die from breast cancer[7] (Table 2). Only lung cancer accounts for more cancer deaths in women.

Figure 2. Female Breast Cancer Incidence and Death Rates* by Race and Ethnicity, US, 1998-2002



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

Data sources: *Incidence* – Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005. Incidence data for Hispanics do not include cases from Detroit, Hawaii, Alaska Native Registry, and rural Georgia. *Deaths* – National Center for Health Statistics, Centers for Disease Control and Prevention, 2005. For Hispanics, information is included for all states except Connecticut, Maine, Maryland, Minnesota, New Hampshire, New York, North Dakota, Oklahoma, and Vermont.

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Table 2. Estimated New Breast Cancer Cases* and Deaths* in Women by Age, US, 2005

Age	In Situ Cases	Invasive Cases	Deaths
Under 40	1,600	9,510	1,110
40 and older	56,890	201,730	39,300
Under 50	13,760	45,780	5,590
50 and older	44,730	165,460	34,820
Under 65	37,040	123,070	17,470
65 and older	21,450	88,170	22,940
All ages	**58,490**	**211,240**	**40,410**

*Rounded to nearest 10.

American Cancer Society, Surveillance Research, 2005

- In 2005, about 1,690 cases of breast cancer are expected to occur among men, accounting for less than 1% of all breast cancers.[7] Approximately 460 men will die from breast cancer.

How many women alive today have ever had breast cancer?

The National Cancer Institute estimates that approximately 2.3 million women with a history of breast cancer were alive in January 2002. Some of these individuals were cancer-free, while others still had evidence of cancer and may have been undergoing treatment.

How has the occurrence of breast cancer changed over time?

Incidence trends – women

Invasive breast cancer

Incidence rates of invasive female breast cancer for all races combined show three distinct phases since 1975, when broad surveillance of cancer began:

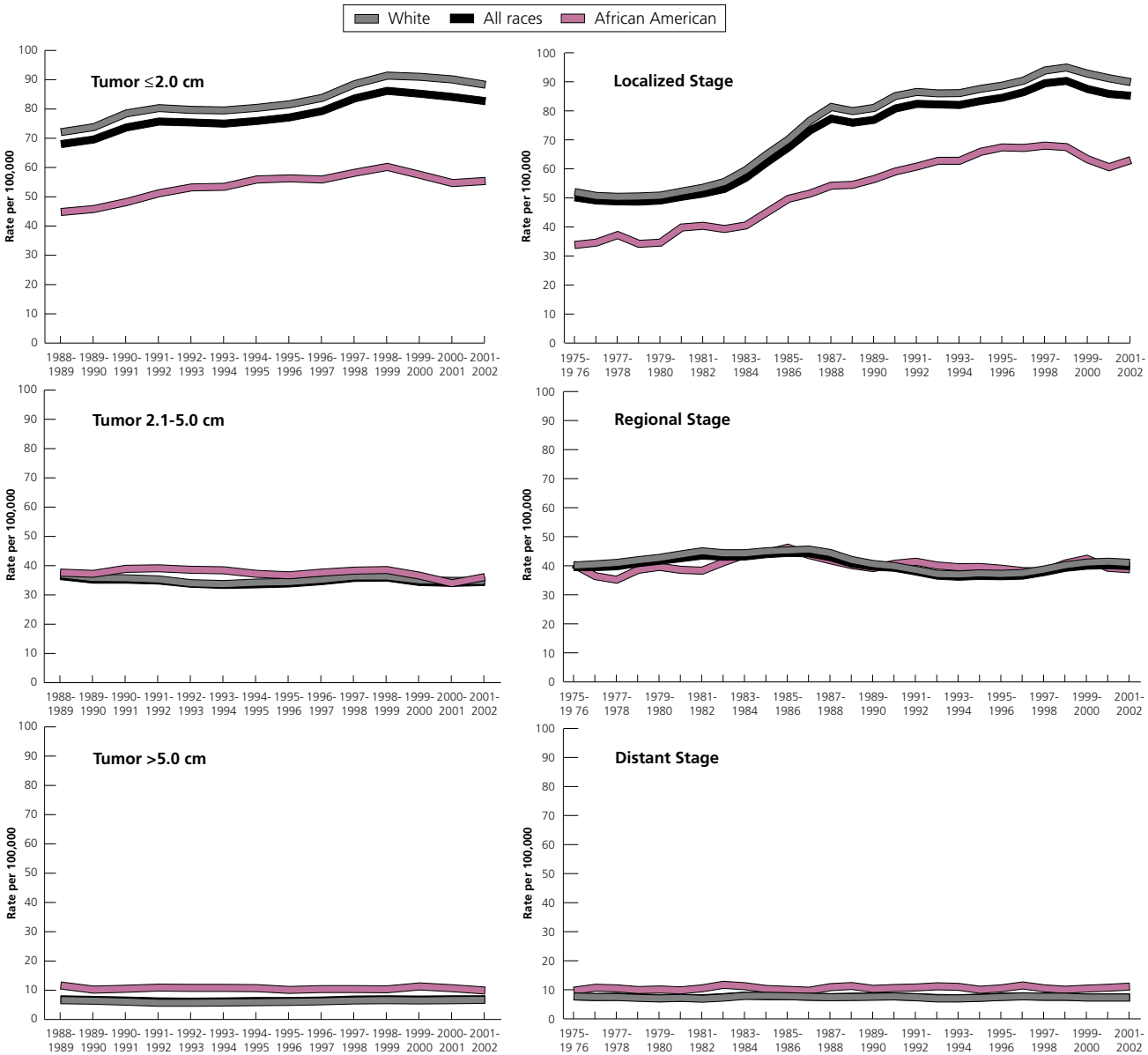
- Between 1975 and 1980, incidence was essentially constant;
- Between 1980 and 1987, incidence increased by almost 4% per year;
- Between 1987 and 2002, incidence rates increased by 0.3% per year.[5]

Much of the long-term underlying increase in incidence is attributed to changes in reproductive patterns, such as delayed childbearing and having fewer children,

which are recognized risk factors for breast cancer. The rapid increase between 1980 and 1987 is due largely to greater use of mammographic screening and increased early 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 1-3 years before they would have appeared if they continued to grow until symptoms developed. During the introduction of mammography, from 1980 to 1987, incidence rates of smaller tumors (≤2.0 cm) more than doubled, while rates of larger tumors (3.0 cm or more) decreased 27%.[8] Figure 3 presents incidence trends by tumor size for the most recent time period. During this time, the trend in diagnosis of smaller (≤2.0 cm) tumors continued, increasing by 2.1% per year from 1988 to 1999, and stabilized thereafter[3] (Figure 3). A similar

Figure 3. Trends in Female Breast Cancer Incidence Rates* by Tumor Size and Race, US (SEER), 1988-1989 to 2001-2002

Figure 4. Trends in Female Breast Cancer Incidence Rates* by Stage and Race, US (SEER), 1975-1976 to 2001-2002

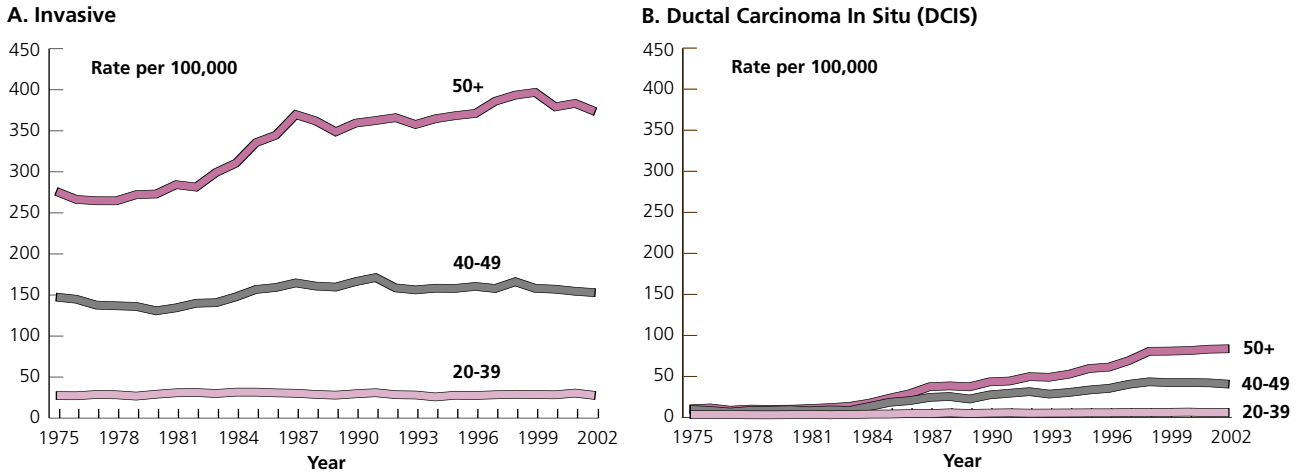


*Rates are age-adjusted to the 2000 US standard population.

Data source: Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005.

American Cancer Society, Surveillance Research, 2005

Figure 5. Female Breast Cancer – Invasive and Ductal Carcinoma In Situ (DCIS) Age-Adjusted Incidence Rates* by Age, US (SEER), 1975-2002



*Rates are age-adjusted to the 2000 US standard population within each age group.

Data source: Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005.

American Cancer Society, Surveillance Research, 2005

time trend was seen with stage at diagnosis, with increases in the rates limited to cancers diagnosed at a localized stage (Figure 4). The continued, though slight, increase in overall breast cancer incidence since 1987 may reflect increases in the prevalence of mammography, obesity, and use of hormone replacement therapy (HRT).

Age

From 1980 to 1987, incidence rates of invasive breast cancer increased among women aged 40-49 and 50 and older (3.5% and 4.2% per year, respectively)[3] (Figure 5). Since 1987, rates have continued to increase among women 50 and older, though at a much slower rate. In contrast, the rates have slightly declined among women aged 40-49. There has been relatively little change in the incidence rates of invasive breast cancer in women younger than 40.

Race/ethnicity

Figure 6 presents trends in invasive female breast cancer incidence rates by race and ethnicity. During 1992-2002, overall incidence rates increased in Asian Americans/Pacific Islanders (1.5% per year), decreased in American Indian/Alaska Natives (3.5% per year), and did not change significantly among whites, African Americans, and Hispanics/Latinas.[9]

Incidence rates of breast cancer by tumor size differed between white and African American women: African American women were less likely to be diagnosed with smaller tumors (≤2.0 cm) and more likely to be diagnosed with larger tumors (2.1-5.0 and >5.0 cm) than white women[3] (Figure 3).

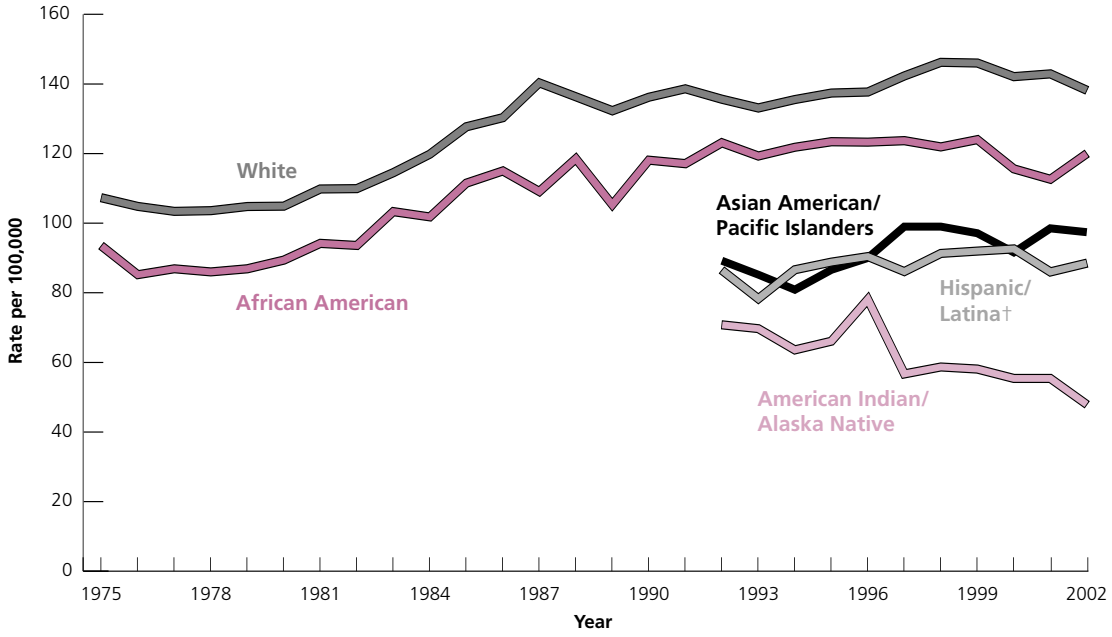
In situ breast cancer

Incidence rates of in situ breast cancer have increased rapidly since 1980[3] largely because of increased diagnosis by mammography. Most of this increase represents increased detection of ductal carcinoma in situ (DCIS), which from 1998 to 2002 accounted for about 85% of the in situ breast cancers diagnosed. Incidence rates of DCIS increased more than sevenfold during 1980-2001.[10] The increase was observed in all age groups, although it was greatest in women aged 50 and older[3,10] (Figure 5).

Most cases of DCIS are detectable only through mammography, and the large increases in DCIS incidence rates since 1982 are a direct result of mammography's ability to detect cancers that cannot be felt. Although increases in both invasive breast cancer and DCIS incidence rates have slowed since the mid-1980s,[11] the temporal increase in DCIS since 1982 is larger than the increase in invasive breast cancer.

Lobular carcinoma in situ (LCIS) is less common than DCIS, accounting for approximately 12% of female in situ breast cancers diagnosed from 1998 to 2002.[3] Similar to DCIS, the overall incidence rate of LCIS has increased more rapidly than the incidence of invasive breast cancer.[3] This increase has been limited to women older than 40 and largely to postmenopausal women.[10,12]

Figure 6. Trends in Female Breast Cancer Incidence Rates* by Race and Ethnicity, US (SEER), 1975-2002



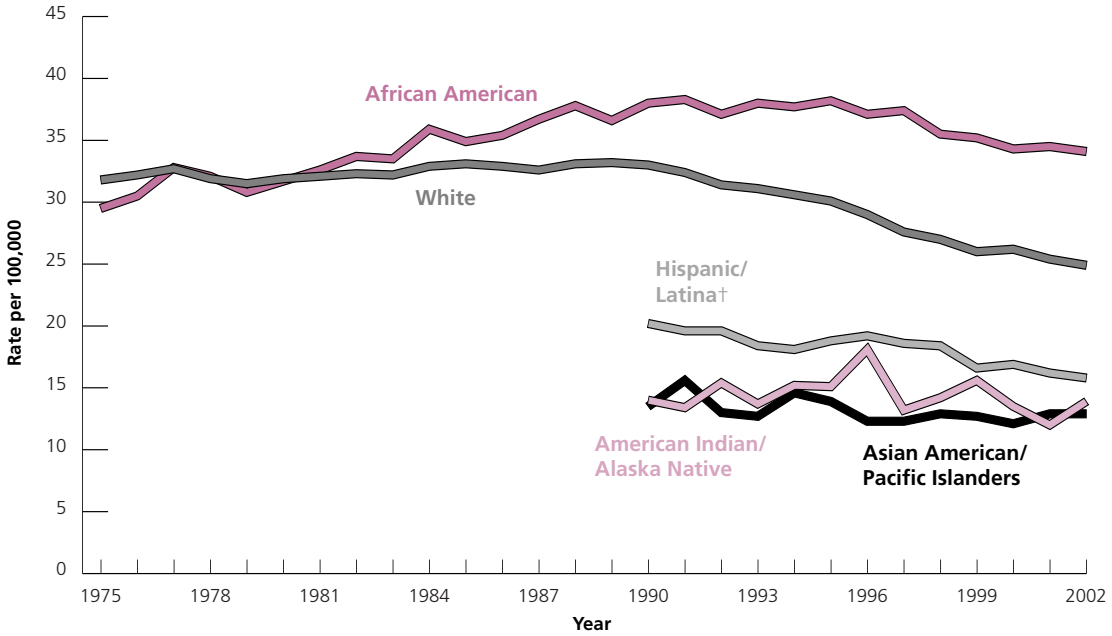
*Rates are age-adjusted to the 2000 US standard population.

†Incidence data does not include cases from Detroit, Hawaii, Alaska Native Registry, and rural Georgia.

Data source: Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005.

American Cancer Society, Surveillance Research, 2005

Figure 7. Trends in Female Breast Cancer Death Rates* by Race and Ethnicity, US, 1975-2002



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

†Information is included for all states except Connecticut, Maine, Maryland, Minnesota, New Hampshire, New York, North Dakota, Oklahoma, and Vermont.

Data source: National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2005

Mortality trends – women

The death rate from breast cancer in women has decreased since 1990:

- Between 1975 and 1990, the death rate for all races combined increased by 0.4% annually;
- Between 1990 and 2002, the rate decreased by 2.3% annually.[4]

The percentage of decline was larger among younger age groups. From 1990 to 2002, death rates decreased by 3.3% per year among women younger than 50, and by 2.0% per year among women 50 and older.[4] The decline in breast cancer mortality since 1990 has been attributed to both improvements in breast cancer treatment and to early detection.[13,14]

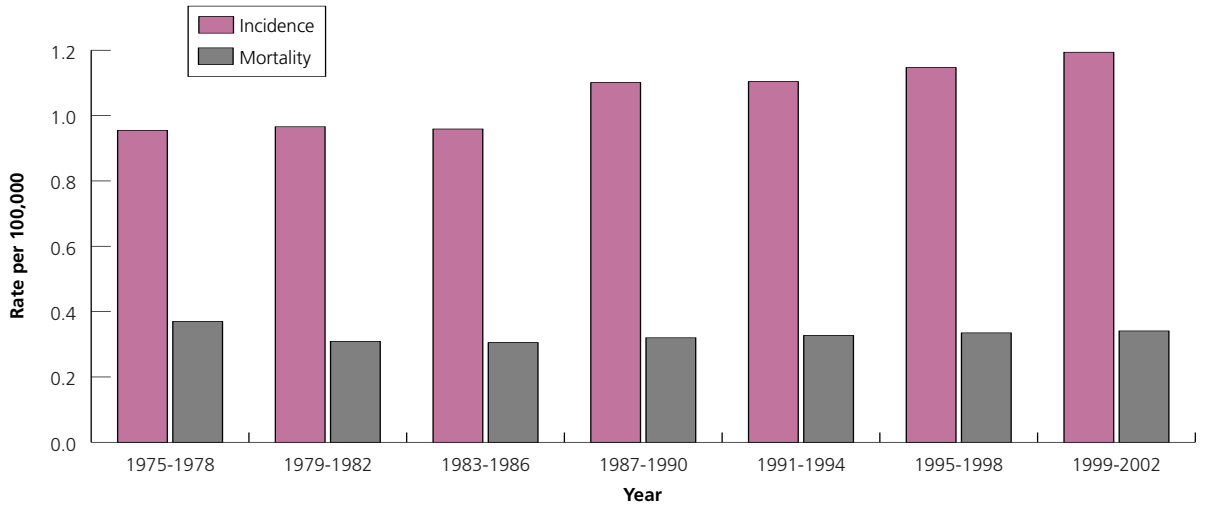
African American women and women of other racial and ethnic groups, however, have benefited less than white women from these advances. From 1990 to 2002, female breast cancer death rates declined by 2.4% per year in whites, 1.8% in Hispanics/Latinas, 1.0% in African Americans and Asian Americans/Pacific Islanders, and did not decline in American Indian/Alaska Natives.[15] A striking divergence in long-term mortality trends is seen between African American and white females (Figure 7). The disparity in breast cancer death rates between African American and white women appeared in the early 1980s; by 2002, death rates were 37% higher in African Americans than in white women.[4]

Incidence and mortality trends – men

Although breast cancer in men is a rare disease, accounting for less than 1% of breast cancer cases in the US, between 1975 and 2002, the incidence rate among males increased 1.1% annually[3] (Figure 8). The reasons for the increase are unknown and are not attributable to increased detection. Similar to female breast cancer, the incidence of male breast cancer increases with age.[16] Men, however, are more likely than women to be diagnosed with advanced disease and thus have poorer survival.[16] Death rates from male breast cancer have remained essentially constant since 1975[4] (Figure 8).

Due to the rarity of male breast cancer, much less is known about the disease than female breast cancer. Risk factors for the disease include obesity, family history of male or female breast cancer, BRCA2 gene mutations, a chromosomal disorder called Klinefelter syndrome, and testicular disorders.[17]

Figure 8. Trends in Male Breast Cancer Incidence and Death Rates*, US, 1975-2002



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

Data source: *Incidence* – Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Science, National Cancer Institute, 2005. *Deaths* – National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2005

What factors influence breast cancer survival?

Time since diagnosis

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

- 88% at 5 years after diagnosis;
- 80% after 10 years;
- 71% after 15 years;
- 63% after 20 years.[5]

Long-term survival rates reflect the experience of women treated using past therapies and do not reflect recent trends in early detection or advances in treatment. For example, the most recent data available to calculate 5-year survival rates are based on patients who were diagnosed and treated 4 to 10 years ago.

Age at diagnosis

The 5-year relative survival rate is slightly lower among women diagnosed with breast cancer before age 40 as shown below. This may be due to the tumors in this age group being more aggressive and less responsive to hormonal therapy:[19,20]

- 82% for women younger than 40;
- 89% for women aged 40-74;
- 88% for women aged 75 and older.[3]

Stage at diagnosis

Five-year relative survival is lower among women with a more advanced stage of disease at diagnosis[5,21] (Figure 9). Considering all races, 5-year relative survival is 98% for localized disease, 81% for regional disease, and 26% for distant-stage disease.[5] Larger tumor size at diagnosis is also associated with decreased survival.[22] For example, among women of all races with regional disease, the 5-year relative survival was 92% for tumors less than or equal to 2.0 cm, 77% for tumors 2.1-5.0 cm, and 65% for tumors greater than 5.0 cm.[3]

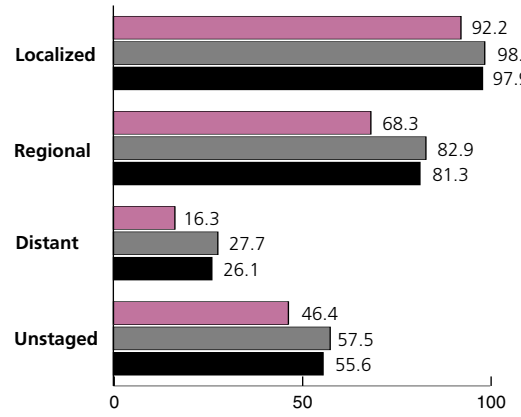
Race/ethnicity and socioeconomic factors

African American women with breast cancer are less likely than white women to survive 5 years: 76% vs. 90%, respectively.[5] This difference can be attributed to both later stage at detection and poorer stage-specific survival[23,24] (Figure 9).

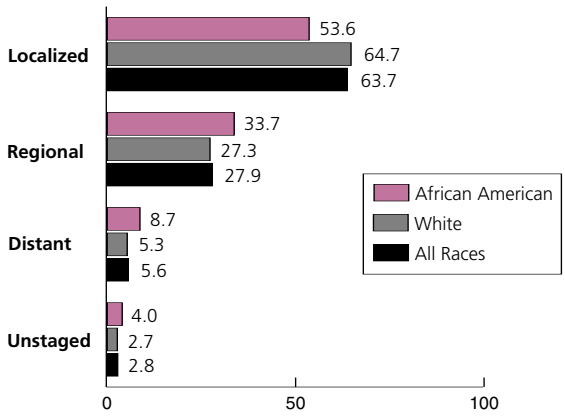
A lack of health insurance is associated with lower survival among breast cancer patients.[25,26] Moreover, breast cancer patients with lower incomes are more likely to be diagnosed with advanced stage of disease and to have lower 5-year relative survival rates than higher-income patients.[27-29] For example, low-income African American women experience lower survival than higher-income African American women.[30,31] The presence of additional illnesses, lower socioeconomic status, unequal access to medical care, and disparities in

Figure 9. Female Breast Cancer – US (SEER), 1995-2001

A. Five-Year Survival Rates* by Stage at Diagnosis and Race (%)



B. Percent Diagnosed by Stage and Race



*Survival rates are based on patients diagnosed between 1995-2001 and followed through 2002.

Data source: Surveillance, Epidemiology, and End Results Program, 1973-2002, Division of Cancer Control and Population Sciences, National Cancer Institute, 2005.

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treatment may contribute to the observed differences in survival between lower- and higher-income breast cancer patients, and between African American and white women.[32-36] Aggressive tumor characteristics associated with poorer prognosis appear to be more common in African American women and may also contribute to their lower survival rates.[37,38]

What are the known risk factors for breast cancer?

Several factors associated with increased risk of breast cancer (age, family history, age at first full-term pregnancy, early menarche, late menopause) are not modifiable. Other factors (postmenopausal obesity, use of postmenopausal hormones, alcohol consumption, physical inactivity) are modifiable.[39] Some risk factors directly increase lifetime exposure of breast tissue to circulating ovarian hormones (early menarche, late menopause, obesity, hormone

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 a risk factor 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 hormone replacement therapy (HRT) have a relative risk of developing breast cancer of 1.26, or a 26% increased risk.[61] Among 10,000 women who use HRT 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 HRT, 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 to be diagnosed over a period of 5.2 years.[65]

Table 3. Factors That Increase the Relative Risk for Breast Cancer in Women

Relative Risk	Factor
Relative Risk >4.0	• Female
	• Age (65+ vs. <65 years, although risk increases across all ages until age 80)
	• Certain inherited genetic mutations for breast cancer (BRCA1 and/or BRCA2)
	• Two or more first-degree relatives with breast cancer diagnosed at an early age
	• Personal history of breast cancer
	• Breast density
Relative Risk 2.1-4.0	• One first-degree relative with breast cancer
	• Biopsy-confirmed atypical hyperplasia
	• High-dose radiation to chest
	• High bone density (postmenopausal)
Relative Risk 1.1-2.0	
Factors that affect circulating hormones	• Late age at first full-term pregnancy (>30 years)
	• Early menarche (<12 years)
	• Late menopause (>55 years)
	• No full-term pregnancies
	• Never breastfed a child
	• Recent oral contraceptive use
	• Recent and long-term use of hormone replacement therapy
	• Obesity (postmenopausal)
Other factors	• Personal history of endometrium, ovary, or colon cancer
	• Alcohol consumption
	• Height (tall)
	• High socioeconomic status
	• Jewish heritage

Adapted, with permission, from Hulka et al, 2001.

use), whereas others, such as higher socioeconomic status, are only correlates of reproductive behavior or other factors. Established risk factors for breast cancer are listed in Table 3 in order of the strength of their association.

Although there are claims on the Internet that breast cancer risk may be increased for women who wear underwire bras or who use antiperspirants, at present, there is no scientific evidence that shows an association between these products and breast cancer.[40] There are also claims that women who have had an abortion are at increased risk for developing breast cancer, but a recent review by a panel of experts convened by the National Cancer Institute concluded that there is no association between medical abortion and developing breast cancer.[41] Subsequent to that review, a combined analysis of 53 studies, including 83,000 women with breast cancer, also found no link to a previous abortion, either spontaneous or induced.[42]

Despite concern that rising breast cancer incidence in the latter half of the 20th century may be caused by environmental pollutants such as organochlorine pesticides, studies to date have not found increased concentrations of organochlorines when measured in adults to be related to breast cancer risk in the general population.[43-45] Ongoing research is examining whether exposure to organochlorines during adolescence or at other critical periods may affect risk.

Increasing age

Besides being female, age is the most important risk factor for breast cancer.[46] Table 4 shows a woman's risk of developing breast cancer at different ages. These probabilities are averages for the whole population. An individual woman's breast cancer risk may be higher or lower depending on her personal risk factors, experiences, and other factors not yet fully understood.

Currently, a woman living in the US has a 13.2%, or 1 in 8, lifetime risk of developing breast cancer. As a result of rounding to the nearest whole number, a small decrease in the lifetime risk (from 1 in 7.47 to 1 in 7.56) led to the change in the lifetime risk from 1 in 7 previously reported in *Breast Cancer Facts & Figures 2003-2004* and *Cancer Facts & Figures 2005* to the current estimate of 1 in 8. Overall, the lifetime risk of being diagnosed with breast cancer has gradually increased over the past three decades, in part due to longer life expectancy and more complete diagnosis through the use of mammography. Lifetime risk reflects a woman's risk over an entire lifetime and should not be confused with risk over a shorter time period.

Family history of breast cancer/genetic predisposition

Women with a family history of breast cancer, especially a first-degree relative (mother, sister, or daughter), have an increased risk of developing breast cancer.[47] The risk is higher if more than one first-degree relative has developed breast cancer and increases the younger the relative was at the time of diagnosis.[48] A woman with a family history of breast or ovarian cancer in her mother, aunt, sister, or daughter should discuss this history with her physician.

It is estimated that 5% to 10% of breast cancer cases result from inherited mutations or alterations in the breast cancer susceptibility genes, BRCA1 and BRCA2.[49] These mutations are present in far less than 1% of the general population.[50] Molecular tests are now commercially available to identify some of the BRCA mutations responsible for inherited forms of breast cancer, yet the interpretation of these tests and treatment decisions remain complicated. Women who know they carry the mutated gene may use this information to make more informed decisions about their health care, including the use of tamoxifen (see page 12, section that discusses tamoxifen) and/or prophylactic surgery to delay or reduce the risk of cancer. These women should talk to their doctors about the benefits and limitations of starting mammography

Table 4. Age-Specific Probabilities of Developing Breast Cancer*

If current age is:	The probability of developing breast cancer in the next 10 years is:†	or 1 in:
20	0.05%	1,985
30	0.44%	229
40	1.46%	68
50	2.73%	37
60	3.82%	26
70	4.14%	24
Lifetime risk	13.22%	8

*Among those free of cancer at beginning of age interval. Based on cases diagnosed 2000-2002. Percentages and "1 in" numbers may not be numerically equivalent due to rounding.

†Probability derived using NCI DevCan Software, Version 6.0.

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earlier (e.g., at age 30) and having additional tests (i.e., ultrasound and MRI).[51]

It is not yet possible to predict if or when a woman who carries a particular mutation will develop breast cancer. Furthermore, tests are not available for all of the genes that affect breast cancer risk. The American Cancer Society, 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 they proceed with testing. People should understand and carefully weigh the benefits and potential consequences of genetic testing before these tests are done.

While a family history of breast cancer suggests an inherited influence on disease risk, not all familial risk results from a BRCA1 or BRCA2 mutation. Scientists believe that most of the occurrence of breast cancer in families results from the interaction between lifestyle factors and low-risk variations in genetic susceptibility that may be shared by women within a family.[52]

Hormonal factors

Reproductive hormones are thought to influence breast cancer risk through effects on cell proliferation and DNA damage, as well as promotion of cancer growth.[53] Early menarche (<12 years), older age at menopause (>55 years), older age at first full-term pregnancy (>30 years), and fewer number of pregnancies may increase a woman's risk of breast cancer by affecting the endogenous reproductive hormones her body produces.[54] Breastfeeding has consistently been shown to decrease a woman's risk of breast cancer slightly, with greater benefit associated with longer duration.[55] Recent use of oral contraceptives may slightly increase the risk of breast cancer;[56,57] however, women who have stopped using oral contraceptives for 10 years or more have the same risk as women who have never used the pill.[58]

Recent use of combination hormone replacement therapy (HRT), which combines estrogen and progestin, has been shown to increase breast cancer risk, with higher risk associated with longer use.[59-63] Estrogen alone can also be prescribed for women without a uterus. This is commonly known as estrogen replacement therapy (ERT) and does not increase the risk of developing breast cancer as much as HRT.[64]

To estimate risk for developing breast cancer, assessment tools are available at the Harvard Center for Cancer Prevention's Web site (http://www.yourcancerrisk.harvard.edu/) and the National Cancer Institute's Web site (http://bcra.nci.nih.gov/brc/).

Can breast cancer be prevented?

At this time, there is no guaranteed way to prevent breast cancer, which is why regular mammograms are so important. A woman's best overall preventive health strategy is to reduce her known risk factors as much as possible by avoiding obesity and weight gain, increasing physical activity, and minimizing alcohol intake.[39] Women should consider the increased risk of breast cancer associated with HRT use in evaluating treatment options for menopausal symptoms. Treatment with tamoxifen can also reduce the risk of breast cancer among women at high risk (see page 12, section on tamoxifen).

Obesity

Obesity increases risk of postmenopausal, but not premenopausal, breast cancer,[66] and other studies have found weight gain during adulthood may further increase risk.[67-69] In postmenopausal women, circulating estrogen is primarily produced in fat tissue. Thus, having more fat tissue can increase estrogen levels and the likelihood of developing breast cancer. A recent large American Cancer Society study showed that overweight women (BMI* >25) are 1.3 to 2.1 times more likely to die from breast cancer compared to women with normal weight (BMI*= 18.5-24.9).[70] Given the large percentage of women in the United States who are overweight, strategies to maintain a healthy body weight are important to reduce the risk of both getting and dying from breast cancer.[71]

*Body Mass Index (BMI) = [Weight (lbs.) ÷ Height (in.)^2] x 703

Physical activity

There is growing evidence that supports a small protective association between physical activity and breast cancer.[66,72,73] A recent study suggests that regular physical activity, regardless of intensity, may reduce the risk of breast cancer in postmenopausal women.[73] The protective effect may be even greater among lean women, women who have carried children to term, and premenopausal women. 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 hormones and energy balance.[66,74]

Alcohol consumption

Alcohol is consistently associated with increased breast cancer risk.[39,75] A meta-analysis of more than 40 epidemiologic investigations suggests that the equivalent of two drinks a day (or 24 g of alcohol) may increase breast cancer risk by 21%. This increased risk is dose-dependent and exists regardless of the type of alcoholic beverage consumed.[76] A recent review concluded that the most likely mechanism by which alcohol increases risk of breast cancer is by increasing estrogen and androgen levels.[77] Thus, reducing alcohol intake may be a useful strategy for reducing breast cancer risk among regular consumers of alcohol.

Tobacco

Most studies have found no link between active cigarette smoking and breast cancer.[75,78] Though both active smoking and secondhand smoke have been suggested to increase the risk of breast cancer in a number of studies that restrict the comparison group to women who report no exposure to secondhand smoke, this issue remains controversial.[78,79] However, not smoking cigarettes and minimizing exposure to secondhand smoke is beneficial for multiple health reasons.

Hormone replacement therapy (HRT)

Use of combined HRT increases the risk of breast cancer.[80] The US Preventive Services Task Force has recommended against the routine use of HRT for the prevention of chronic diseases in postmenopausal women.[81] A woman considering HRT should discuss the benefits and risks with her health care provider. If a woman and her doctor decide that HRT is appropriate to treat specific menopausal symptoms or health problems, it should be prescribed at the lowest effective dose and for as short a time as possible. Other treatments for these symptoms and conditions should also be considered.

Tamoxifen

The drug tamoxifen has been used for many years as a treatment for some breast cancers. A large randomized trial demonstrated that tamoxifen can also be used to reduce the risk of breast cancer in women at high risk for developing the disease.[82] After a median follow-up of more than 69 months, breast cancer risk decreased by 49% in the group that received tamoxifen, with 22 cases of breast cancer diagnosed per 1,000 women, compared to 43 cases per 1,000 in the group who did not receive tamoxifen. A protective effect was also observed in an international randomized prevention trial.[83] In that trial, the group that received tamoxifen reduced their breast cancer risk by 32%, with 69 cases diagnosed among 3,578 women in the tamoxifen group, compared to 101 cases among 3,566 women in the group not receiving tamoxifen. Administration of tamoxifen resulted in some risks in both trials, particularly an increased risk of endometrial cancer. A woman at increased risk of breast cancer should discuss taking tamoxifen with her doctor. It is estimated that more than two million US women could benefit from tamoxifen chemoprevention.[84]

Prophylactic surgery

Women at very high risk of breast cancer may elect preventive (prophylactic) mastectomy. This operation removes one or both breasts before breast cancer has been discovered. A recent study reported a greater than 90% reduction in risk of breast cancer in high-risk women with a family history who received prophylactic mastectomy.[85] Subsequent studies confirmed the benefit of prophylactic mastectomy in genetically susceptible women, i.e., women with a BRCA1 or BRCA2 mutation.[86-88] While the operation reduces the risk of breast cancer, it does not guarantee that cancer won't develop in the small amount of breast tissue remaining after the operation. Prophylactic oophorectomy (surgical removal of the ovaries) also appears to reduce the risk of breast cancer, as well as ovarian cancer, in carriers of BRCA mutations.[89,90] A woman considering these operations should discuss these issues carefully with her doctor. A second opinion is strongly recommended.

How can breast cancer be detected early?

Signs and symptoms of breast cancer

Early-stage breast cancer typically produces no symptoms when the tumor is small and most treatable. It is therefore very important for women to follow recommended guidelines for finding breast cancer at an early stage before symptoms develop. When breast cancer has grown to a size when it can be felt, the most important physical sign of breast cancer is a painless mass.[91] Less common signs and symptoms include breast pain and persistent changes to the breast, such as thickening, swelling, skin irritation or distortion, and nipple abnormalities such as spontaneous discharge, erosion, inversion, or tenderness.[91]

Table 5. American Cancer Society Guidelines for the Early Detection of Breast Cancer in Asymptomatic Women

Age 40 and older

- Annual mammogram
- Annual clinical breast examination
- Monthly breast self-examination (optional)

Age 20-39

- Clinical breast examination every three years
- Monthly breast self-examination (optional)

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)[51] (Table 5). In 2003, the American Cancer Society dropped its recommendation that all women perform breast self-examination (BSE) monthly. The reason for this change is that research has shown that a structured BSE is less important than self awareness. Often, a woman who does detect her own breast cancer finds it outside of a structured breast self-exam; she may detect a lump while bathing or getting dressed. The Society still recommends that women be told of the potential benefits and limitations of BSE, and those women who wish to do it should receive instruction from their health care providers. These guidelines are for women who have no symptoms of breast cancer and who have not been identified to be at significantly higher risk.

Mammography

Numerous randomized trials and population-based evaluations of screening mammography have clearly shown that early detection of breast cancer through mammography greatly improves treatment options, the chances for successful treatment, and survival.[13,92-94] Mammography is the single most effective method of early detection, since it can identify cancer several years before physical symptoms develop. Treatment is more successful when cancer is discovered early.

What is mammography?

Mammography is a low-dose x-ray procedure that allows visualization of the internal structure of the breast. Mammography is highly accurate, but like most medical tests, it is not perfect. On average, mammography will detect about 80%-90% of breast cancers in women without symptoms. Testing is somewhat more accurate in postmenopausal than in premenopausal women.[95] The small percentage of breast cancers that are not identified by mammography may be missed for any of the following reasons: breast density, faster tumor growth rate, or simply failing to see the small early signs of an abnormality. Although the overwhelming majority of women who undergo screening each year do not have breast cancer, about 5%-10% of women have their mammograms interpreted as abnormal or inconclusive until further tests are done. In most instances, additional tests (imaging studies and/or biopsy) lead to a final interpretation of normal breast tissue or benign (noncancerous) tissue.

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. Studies have shown that many breast cancers are diagnosed as larger, more advanced cancers simply because too much time has elapsed from the date of the last normal mammogram.[96,97] For this reason, women should talk with their doctors about a plan for receiving regular mammograms according to recommended guidelines.

Today's 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. The Mammography Quality Standards Act (MQSA), passed by Congress in 1992 and administered by the Food and Drug Administration, requires facilities to meet specific standards of quality in order to offer mammography.

Prevalence of mammography

According to data from the 2002 Behavioral Risk Factor Surveillance System (BRFSS), 61.5% of US women aged 40 and older have had a mammogram within the past year.[98] Table 6 shows these results by state.[99] An analysis of the National Health Interview Survey indicated that women with less than a high school education, without health insurance coverage, or who are recent immigrants to the US are the least likely to have had a recent mammogram[100] (Table 7). 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.[101] While utilization in general has been increasing, women below the poverty level are still less likely to have had a mammogram within the past two

Table 6. Mammography and Clinical Breast Exam, Women 40 and Older, by State, 2002

	Mammogram Within Past Year (%)					Mammogram and Clinical Breast Exam Within Past Year (%)				
	40+ years	40-64 years	65+ years	No usual source of medical care*	No health insurance†	40+ years	40-64 years	65+ years	No usual source of medical care*	No health insurance†
Alabama	65.3	64.9	66.4	40.4	40.8	57.1	58.9	53.3	35.1	36.2
Alaska	53.9	51.3	66.8	28.0	35.3	50.6	48.9	59.7	26.2	34.0
Arizona	63.8	60.1	71.2	36.8	30.2	56.4	56.0	57.0	27.6	25.4
Arkansas	53.5	52.7	54.9	19.7	30.9	46.6	47.8	44.3	16.8	28.0
California‡	60.7	59.1	64.6	35.7	39.7	48.5	49.7	45.8	28.4	28.3
Colorado	59.8	59.4	61.0	32.8	25.9	53.4	55.3	47.9	21.8	21.1
Connecticut	68.7	69.0	68.1	43.9	46.8	61.9	63.9	58.0	35.6	41.9
Delaware	71.6	71.5	72.0	45.9	39.8	64.2	64.8	62.8	40.2	35.3
Dist. of Columbia	68.7	68.8	68.5	39.5	§	61.9	63.7	58.4	37.5	§
Florida	66.7	65.1	69.5	44.2	41.6	60.0	60.3	59.5	40.3	39.1
Georgia	59.9	59.4	61.4	30.3	32.5	53.3	54.0	51.5	26.9	28.4
Hawaii	56.3	55.1	59.1	36.1	26.7	50.3	50.2	50.6	32.5	24.8
Idaho	51.4	50.4	53.7	29.9	27.8	46.4	47.0	45.0	28.5	25.0
Illinois	60.2	59.6	61.6	28.8	37.8	51.9	53.5	48.5	18.1	28.1
Indiana	57.1	57.8	55.7	24.0	36.3	50.0	53.2	43.0	21.3	32.5
Iowa	64.9	66.0	63.0	40.4	38.9	60.3	63.1	54.9	36.6	35.0
Kansas	63.2	60.8	68.0	34.3	29.7	57.5	57.3	58.0	30.1	29.0
Kentucky	61.7	61.8	61.5	40.9	34.5	57.2	58.1	55.2	36.4	32.0
Louisiana	64.9	64.1	66.7	46.2	43.6	56.8	57.3	55.5	40.4	38.0
Maine	67.4	65.7	70.9	§	37.3	59.4	60.0	58.0	§	29.1
Maryland	67.1	67.4	66.3	33.0	49.0	61.2	62.3	58.4	27.2	43.6
Massachusetts	70.2	70.2	70.2	34.5	41.9	64.3	64.8	63.2	31.2	42.3
Michigan	61.8	60.4	65.1	34.0	41.2	54.8	55.5	53.2	29.9	32.1
Minnesota	64.9	63.4	68.3	41.8	§	59.9	59.6	60.7	37.8	§
Mississippi	52.9	52.0	54.8	31.5	30.8	46.8	47.3	45.6	26.7	27.2
Missouri	59.0	58.8	59.3	25.8	29.6	51.5	54.3	45.5	17.9	22.9
Montana	57.1	56.0	59.6	38.3	23.2	51.6	51.6	51.6	33.9	21.1
Nebraska	59.5	61.1	56.5	25.9	31.1	55.4	58.5	49.4	20.2	28.5
Nevada	57.7	55.9	62.6	33.6	42.2	47.0	46.7	47.7	26.5	32.8
New Hampshire	66.7	66.8	66.4	31.1	33.4	60.7	61.8	58.1	28.8	29.4
New Jersey	64.2	64.2	64.1	33.6	45.2	58.2	60.3	54.1	29.7	39.4
New Mexico	51.3	50.0	54.8	26.2	23.5	46.1	45.7	47.1	22.7	20.8
New York	63.7	63.0	65.1	35.0	42.7	55.2	55.9	53.6	30.4	34.4
North Carolina	67.6	66.2	70.9	44.0	44.2	62.5	62.1	63.3	39.9	40.2
North Dakota	61.8	60.1	64.8	33.7	31.7	55.5	56.3	53.9	30.3	33.1
Ohio	61.7	60.2	64.8	42.4	40.0	54.8	55.5	53.4	39.3	37.3
Oklahoma	54.9	54.7	55.4	31.5	32.0	47.8	49.3	44.6	24.1	25.5
Oregon	57.8	54.4	65.7	27.1	25.5	49.6	48.7	51.7	24.2	23.1
Pennsylvania	62.0	61.8	62.5	30.2	38.0	54.5	56.3	51.3	26.0	33.3
Rhode Island	71.5	70.6	73.0	37.4	57.3	64.0	65.4	61.5	30.7	47.3
South Carolina	58.3	55.5	64.9	33.2	34.8	51.0	49.8	53.7	28.1	29.0
South Dakota	63.4	62.9	64.3	39.2	48.8	58.8	59.7	57.1	36.5	45.7
Tennessee	63.9	64.1	63.3	29.3	38.3	58.7	60.5	54.7	23.0	38.1
Texas	52.4	51.6	54.3	21.9	28.1	45.6	46.6	42.9	15.5	24.2
Utah	51.1	51.1	51.0	28.2	31.0	43.7	46.3	36.9	19.3	25.5
Vermont	62.8	61.0	67.1	32.9	36.8	57.0	57.1	56.8	30.3	34.1
Virginia	59.1	57.8	62.3	33.0	32.9	51.8	51.7	52.0	27.2	28.3
Washington	58.6	56.3	64.3	22.0	34.1	52.6	52.5	52.9	21.3	31.9
West Virginia	60.5	61.9	57.9	39.9	38.7	52.1	55.3	45.8	35.1	35.0
Wisconsin	64.5	63.5	66.8	24.6	44.8	57.8	58.2	57.1	22.3	39.3
Wyoming	52.8	52.3	53.9	34.1	32.2	44.5	46.3	39.8	28.5	30.3
United States¶	61.5	60.5	63.8	33.7	36.6	54.1	54.9	52.3	28.3	31.4
Range	51.1-71.6	50.0-71.3	51.0-73.0	19.7-46.2	23.2-57.3	43.7-64.3	45.7-65.4	36.9-63.3	15.5-40.4	20.8-47.3

*Women 40 and older 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, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare. ‡Questions for mammogram and clinical breast exam differed and may not be comparable to other state percentages in this table. §Sample size is insufficient to provide a stable estimate. ¶Median for all reporting states.

Source: Behavioral Risk Factor Surveillance System Public Use Data Tape 2002, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 2003.

American Cancer Society, Surveillance Research, 2005

Table 7. Mammography, Women 40 and Older, US, 2003

Characteristic	% Mammogram within the past year*	% Mammogram within the past two years*
Race/ethnicity		
White (non-Hispanic)	55.5	70.4
African American (non-Hispanic)	54.2	70.4
Hispanic/Latina	52.6	66.1
American Indian/ Alaska Native†	54.8	68.6
Asian American‡	48.0	58.8
Education (years)		
11 or fewer	43.7	57.9
12	52.2	67.5
13 to 15	57.7	72.0
16 or more	65.4	80.1
Health insurance coverage		
Yes	58.0	73.1
No	28.9	40.2
Immigration§		
Born in US	55.4	70.5
Born in US Territory	58.7	67.1
In US less than 10 years	40.6	52.3
In US 10+ years	53.0	66.5
Total	54.9	69.7

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

Note: Preliminary estimates subject to adjustment based on official statistics released by NCHS.

Source: National Health Interview Survey Public Use Data File 2003, National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2005

years than women at or above the poverty level[100] (Table 8). Efforts to increase screening should specifically target recent immigrants and socioeconomically disadvantaged women, who are most likely to have the lowest rates of mammographic screening.[102] The American Cancer Society is committed to helping increase funding for NBCCEDP to expand its reach to more eligible women and will encourage consumers to become grassroots advocates to help increase funding for this lifesaving program.

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 three years. For women 40 and older, annual CBE can be an important complement to mammography in the earlier detection of breast cancer, since a small percentage of cancers may be missed by mammography. Preferably, women should schedule their CBE to occur shortly before their annual mammogram. For CBE, the woman undresses from the waist up. Using the pads of the fingers, the examiner will gently feel the breasts, giving special attention to their shape and texture, location of any lumps, and whether such lumps are attached to the skin or to deeper tissues. 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, and factors in her history that might make her more likely to develop breast cancer.

Self-awareness

A woman who chooses to perform breast self-exams (BSE) should receive instructions and have her technique reviewed by a health care professional who performs clinical examinations.[51] However, all women should become familiar with both the appearance and feel of their breasts so that if they notice any changes, they can report them promptly to a doctor or nurse. If symptoms develop after a recent, normal mammogram, a woman should not assume that it is nothing to worry about; she should contact her doctor immediately. Lumps are not necessarily abnormal, as they can appear and disappear with a woman's menstrual cycle. Of lumps detected and tested, most are not cancerous.

How is breast cancer treated?

Treatment decisions are made by the patient and her 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.[103] 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 monoclonal antibody therapy.[104] Treatment guidelines from the National Comprehensive Cancer Network (NCCN) are available through the American Cancer Society Web site.

Surgery

The primary goal of breast cancer surgery is to remove the cancer from the breast and lymph nodes. In a lumpectomy, only cancerous tissue plus a rim of normal

Table 8. Use of Mammography* for Women by Age and Poverty Status,† US, Selected Years 1987-2003

	40-49 years		50-64 years		65 years and over	
Year	Below poverty	At or above poverty	Below poverty	At or above poverty	Below poverty	At or above poverty
1987	23.0	33.4	15.1	34.3	13.6	25.5
1990	32.2	57.0	29.9	58.5	30.8	46.2
1991	33.0	58.1	37.3	63.0	35.2	51.1
1993	36.1	62.1	47.3	66.8	40.4	56.4
1994	43.0	63.4	46.2	68.8	43.9	57.7
1998	44.9	65.0	53.5	76.7	52.3	66.2
1999	52.5	68.7	61.1	77.4	57.3	67.8
2000	47.2	65.9	62.7	80.6	55.4	70.0
2003	51.2	67.2	56.6	79.1	56.1	70.9

*Percent of women having a mammogram within the past two years. †Poor persons are defined as below the poverty threshold. Missing family income data were imputed for 13%-16% of adults in the sample in 1990-94. Poverty status was unknown for 25% of persons in the sample in 1998, 28% in 1999, and 27% in 2000, and >25% in 2003.

Note: 2003 data are preliminary and subject to adjustment based on official statistics released by NCHS.

Source: Data for 1987-2000 from *Health*, United States, 2003. Data for 2003 from National Health Interview Survey Public Use Data File 2003, National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2005

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 now due to the proven effectiveness of less disfiguring surgeries.[105]

Lumpectomy is almost always followed by 6 to 7 weeks of radiation therapy. A woman who chooses lumpectomy and radiation will have the same expected long-term survival as if she had chosen mastectomy.[106]

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 and course of subsequent therapy. Unfortunately, surgery or radiation therapy involving the axillary nodes can lead to lymphedema, a serious swelling of the arm caused by retention of lymph fluid.[107] Newer options such as sentinel lymph node biopsy, where selected lymph nodes are removed and tested before any others are excised, may reduce the need for full axillary lymph node dissections, particularly in women with early-stage disease.[108,109] If a woman is eligible for sentinel lymph node biopsy and wishes to have this procedure done, she should have her breast cancer surgery done at a facility with a medical care team experienced with the technique.

Radiation therapy

Radiation may be used to destroy cancer cells remaining in the breast, chest wall, or underarm area after surgery, or to reduce the size of a tumor before surgery.[110] The ability to target radiation therapy accurately has increased dramatically over past decades, which has greatly diminished side effects. Results of a randomized clinical trial indicate that radiation therapy, when used in addition to mastectomy and chemotherapy, improves long-term survival in women with lymph-node positive breast cancer.[111]

Systemic therapy

Systemic therapy includes biologic therapy, chemotherapy, and hormone therapy. 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. Neoadjuvant therapy has been found to be as effective as therapy given after surgery in terms of survival, disease progression, or distant recurrence.[112] This may allow women whose large tumors would require mastectomy to undergo breast-conserving surgery.

Systemic treatment given to patients after surgery is called adjuvant therapy. After all visible cancer has been surgically removed, it is used to kill any undetected

tumor cells that may have 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. Adjuvant therapy has been studied in more than 400 randomized clinical trials, and has proven to reduce rates of recurrence and death more than 15 years after treatment.[113]

Systemic therapy is also used in treating women with metastatic breast cancer. In such conditions, removal of most of the cancer by surgery is not possible, and therefore systemic therapies are the main treatment option.

Biologic therapy

Herceptin® (trastuzumab), the monoclonal antibody which directly targets the HER2/neu protein of breast tumors, offers a real survival benefit for some women with metastatic breast cancer.[114-116] Currently, trastuzumab is used to treat women with late-stage, recurring cancer and also those who are taking part in a clinical trial whose cancer is not so advanced. Recent studies have suggested that women with early-stage breast cancer may also benefit from this drug.[117] Preliminary results of two large randomized clinical trials found that women taking trastuzumab in addition to chemotherapy were half as likely to experience a cancer recurrence compared to women who were treated with chemotherapy alone.[117,118] These data have led to the use of Herceptin in the adjuvant setting.

Chemotherapy

Research has established that combinations of drugs are more effective than just one drug alone for breast cancer treatment.[113] If the disease has become resistant to the first-line therapies, which include specific combinations of cyclophosphamide, methotrexate, fluorouracil, doxorubicin (adriamycin), epirubicin, and paclitaxel (taxol), about 20% to 30% of patients will respond to second-line drugs.[91]

Hormone therapy

Estrogen, a hormone produced by the ovaries, promotes the growth of many breast cancers. Women whose breast cancers test positive for estrogen receptors can be given hormone therapy to block the effects of estrogens on the growth of breast cancer cells. Tamoxifen, the most commonly used antiestrogen drug, has been shown to provide a 26% reduction in the annual recurrence rate and a 14% reduction in the death rate.[119] Hormone therapy is effective in both post-menopausal and premenopausal patients whose cancers are positive for hormone receptors.[119]

A class of drugs known as aromatase inhibitors (AIs) have been approved for use in treating advanced breast cancer.[103,120-122] These drugs are letrozole, anastrozole, and exemestane. They work by blocking an enzyme responsible for producing small amounts of estrogen in postmenopausal women. They cannot stop the ovaries of premenopausal women from producing estrogen and for this reason they are only effective in postmenopausal women.

More recently, AIs have demonstrated their effectiveness as adjuvant therapy in postmenopausal women with hormone receptor-positive breast cancer diagnosed at earlier stages in several trials.[123-125] For example, a randomized trial comparing adjuvant treatment with anastrozole to tamoxifen found a significant improvement in disease-free survival and time to recurrence, as well as fewer side effects with anastrozole.[125] In 2005, the American Society of Clinical Oncology (ASCO) updated its recommendations for optimal hormonal therapy for postmenopausal women with receptor-positive breast cancer to include AIs as initial therapy or to be used after treatment with tamoxifen.[126] At this time, further research is necessary to determine the optimal timing and duration of AI therapy.

What research is currently being done on breast cancer?

Risk factors

Many studies are currently under way to help find the causes of breast cancer. One particular study, known as the Sister Study, will follow 50,000 women for at least 10 years and will collect information about genes, lifestyle, and environmental factors that may cause breast cancer.[128] The American Cancer Society is helping to increase awareness and promote the recruitment of women for the study. To be eligible for the study, a woman must:

– Live in the US

– Be between the ages of 35 and 74

– Have a sister (related by blood) who has had breast cancer

– Not have had breast cancer herself

Randomized Clinical Trials

A clinical trial is a controlled experiment to assess the safety and efficacy of treatments 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 randomized clinical trials provides essential information on the effectiveness and risks of a new treatment. Patients can visit American Cancer Society/EmergingMed Clinical Trials Matching Service at http://clinicaltrials.cancer.org or call the Society's National Cancer Information Center (1-800-ACS-2345) to identify clinical trial options. This free and confidential service can help people locate a cancer clinical trial based on their situations and personal preferences. People can also learn about prevention and early detection clinical trials in which they might be able to participate. The Physicians Data Query (PDQ) program of the National Cancer Institute (NCI) contains summaries of cancer clinical trials that are open for patient participation. Patients can obtain PDQ information from their physician, by contacting the NCI Cancer Information Service at 1-800-4-CANCER, or from the NCI Clinical Trials Web site at http://www.cancer.gov/clinicaltrials.[127] Patients should consult their personal doctors and cancer specialists for detailed information about appropriate treatment options.

Women who want to find out more about the Sister Study can call 1-877-4-SISTER (1-877-474-7837) or visit the Sister Study Web site (www.sisterstudy.org).

The Breast and Prostate Cancer and Hormone-related Gene Variants Cohort Consortium (BPC3 Study), established in 2003, is a collaboration to pool data from six large-scale cohorts.[129] By combining their data, the investigators are examining the role of genes and gene-environment interactions in the development of cancer in the large and powerful combined dataset.

Prevention

The antiestrogen drug tamoxifen was shown to reduce the incidence of breast cancer in high-risk women by almost half during a 5-year study period.[82] A second-generation antiestrogen, a selective estrogen receptor modulator (SERM) known as raloxifene, appears to be even more effective in reducing the risk of breast cancer in postmenopausal women taking the drug for osteoporosis.[130] The National Cancer Institute's Study of Tamoxifen and Raloxifene, or STAR trial, is comparing the efficacy and safety of the two drugs in a randomized chemoprevention trial.[131] The results of the STAR trial are expected to be released in 2006. Researchers are also looking for ways to inhibit other molecular targets involved in breast cancer progression, such as insulin-like growth factors.[132,133]

There is somewhat inconsistent evidence suggesting the regular use of aspirin-like drugs may reduce a woman's risk of breast cancer.[134-137] The potential benefits of aspirin use are known to exceed the potential risks (bleeding and stomach ulceration) only in women at high risk for heart disease. Further studies are needed, particularly clinical trials, before aspirin can be recommended for breast cancer prevention.

Early detection

Mammography is being improved by the use of computer-assisted diagnosis from digital images in addition to human interpretation of x-ray films.[138] Ultrasound is increasingly being used as an adjunct to mammography to find breast tumors in women with dense breast tissue, e.g., premenopausal women, women with fibrocystic breasts, and women taking hormone replacement therapy who have experienced increased breast density.[139] For women who are genetically predisposed for breast cancer, magnetic resonance imaging (MRI) screening finds more cancers than standard mammography; however, it is not yet known if this difference is great enough to save additional lives.[140,141]

Treatment

Several methods of accelerated partial-breast irradiation (APBI) are being tested that target smaller portions of the breast and can be completed in a shorter period of time for women with early-stage breast cancer.[142,143] A new understanding of breast tumor cell biology and molecular genetics is enabling researchers to design rational therapeutics that may have greater efficacy and fewer side effects than conventional chemotherapy. An estimated 40 to 50 antiangiogenesis compounds, drugs that block blood supply to the tumor(s), are in development for breast cancer.[144-146] Metronomic therapy, a relatively new concept in

antiangiogenic therapy, uses much lower and less toxic doses of chemotherapy agents than currently used, in combination with an antiangiogenesis drug.[147] Clinical trials of targeted therapies such as tyrosine kinase inhibitors have demonstrated benefits in patients with advanced disease and may also delay or reverse hormone resistance.[148,149] A new genetic test may be able to predict breast cancer recurrence, as well as identify breast cancer patients who are most likely to benefit from chemotherapy.[150]

Quality of life

Results of a recent study suggest that poor health-related quality of life may continue or worsen many years after adjuvant chemotherapy treatment.[151] An ongoing study seeks to provide additional information about the long-term effects of breast cancer treatments and could assist patients and physicians in discussing the risks and benefits of various treatment modalities.[152] In addition, researchers are looking at exercise programs that incorporate aerobic and resistance training to alleviate the side effects associated with breast cancer and its treatment, such as fatigue, depression, and anxiety.[153]

What resources are available in your community?

The American Cancer Society offers several resource programs for breast cancer patients and their families.

Reach to Recovery®

Breast cancer survivors provide one-on-one support and information to help individuals cope with breast cancer. Specially trained survivors serve as volunteers, responding in person or by phone to the concerns of people facing breast cancer diagnosis, treatment, recurrence, or recovery.

Goals for a National Breast Cancer Research Agenda

In 1998, the Breast Cancer Progress Review Group, a collaboration of prominent members of the scientific, medical, advocacy, and industry communities organized by the National Cancer Institute, released its recommendations for a national breast cancer research agenda.[154] The report included research goals in biology, etiology, genetics, prevention, detection and diagnosis, treatment, control, and outcomes. Among the goals in these areas are:

- To expand knowledge of normal breast development and the earliest breast lesions
- To identify modifiable risk factors, and to investigate the interaction between genes and environment
- To identify genetic mutations that occur at each stage of breast cancer development and progression, and to evaluate these changes as targets for intervention
- To identify surrogate endpoint biomarkers to serve as early indicators of intervention effectiveness
- To develop better breast imaging and other technologies for diagnosis of clinically significant disease and better prediction of clinical outcomes
- To encourage development of innovative treatments in academic settings, and to test their effectiveness through better supported, more representative clinical trials
- To gain fuller understanding of mechanisms underlying behavioral change, and to identify how psychosocial factors influence disease response and survival
- To better understand the effects of multimodal treatments, and to improve methods to study patient-focused outcomes across the continuum of age and race/ethnicity

I Can Cope®

Adult cancer patients and their loved ones learn ways to navigate the cancer experience while building their knowledge, coping skills, and positive attitude. In this series of educational classes, doctors and other health care professionals provide information, encouragement, and practical tips in a supportive environment.

Look Good . . . Feel Better®

Through this free service, women in active cancer treatment learn techniques to restore their self-image and cope with appearance-related side effects. Certified beauty professionals provide tips on makeup, skin care, nail care, and head coverings. This program is a collaboration of the American Cancer Society with the Cosmetic, Toiletry, and Fragrance Association Foundation and the National Cosmetology Association.

"tlc" Tender Loving Care®

A magazine and catalog in one, "tlc" supports women dealing with hair loss and other physical side effects of cancer treatment. The magalog offers a wide variety of affordable products, such as wigs, hats, and prostheses, through the privacy and convenience of mail order.

Hope Lodge®

Hope Lodge is a home-like environment providing free, temporary accommodations for cancer patients undergoing treatment and their family members. It makes the cancer treatment process a little easier by providing a supportive environment and lifting the financial burden of an extended stay.

American Cancer Society Web Site and National Cancer Information Center

For information about these and other programs, call the American Cancer Society at 1-800-ACS-2345 (available 24 hours a day) or visit the American Cancer Society Web site at www.cancer.org.

Other sources of information and support include:

Encore Plus Program of the YWCA
Office of Women's Health Initiatives
Telephone: 1-800-953-7587 or 202-467-0801
Call to find a program in your area.

National Breast Cancer Coalition
1101 17th Street, NW, Suite 1300
Washington, DC 20036
Telephone: 1-800-622-2838 or 202-296-7477
www.natlbcc.org

National Cancer Institute (NCI)
Telephone: 1-800-4-CANCER
www.cancer.gov

Susan G. Komen Breast Cancer Foundation
Telephone: 1-800-IM-AWARE or 1-800-462-9273
www.komen.org

Y-ME National Breast Cancer Organization
Hotlines: 1-800-221-2141 (English);
1-800-986-9505 (Spanish)
www.y-me.org

US Department of Health & Human Services
Breast Cancer Information (Web site only)
www.hhs.gov/breastcancer/index.html

National Breast and Cervical Cancer Early Detection Program
Centers for Disease Control and Prevention
Telephone: 1-888-842-6355
www.cdc.gov/cancer/nbccedp/index.htm

What is the American Cancer Society doing about breast cancer?

The American Cancer Society is involved in the fight against breast cancer in many areas. Since 1972, the American Cancer Society has awarded more than $271 million to breast cancer research grants. As of January 1, 2005, the Society's Extramural Research Grants program

is supporting 175 research projects related to breast cancer, totaling more than $98.2 million in funding.

Specific examples of breast cancer research include:

- Identifying biological markers that will increase our understanding of the pathways from benign breast lesions to cancer
- Looking at two genes that help maintain chromosome structure to see whether breast cancer will develop if mutations occur in these genes
- Studying the over-stimulation or over-activation of estrogen receptors that can cause excessive cell growth, leading to cancer in the tissues where estrogens act

Other Society grantees are investigating ways to improve early detection techniques through the following methods:

- Exploring the psychological factors that influence a woman's ability to adhere to a surveillance program specially tailored to her hereditary cancer risk
- Implementing a community health advisor program to improve breast cancer screening and primary prevention behaviors among a population of underserved, primarily Hispanic/Latina, women 18 and older
- Studying the relationship between tumor growth and body mass index (BMI)
- Identifying the characteristics of women who are not receiving appropriate treatment for breast cancer, which increases their risk of recurrence and death from their disease

The Society also conducts epidemiologic studies of breast cancer and performs surveillance research to monitor long-term trends and statistics. Using information collected from more than 600,000 women in the Cancer Prevention Study II, American Cancer Society epidemiologists have studied the influence of many risk factors including alcohol consumption, diethylstilbestrol exposure, estrogen replacement therapy, family history of cancer, obesity, smoking, and spontaneous abortion on the risk of death from breast 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, and recommended breast cancer surveillance strategies that can be applied at the local and national levels. In addition, the Society's Behavioral Research Center is currently conducting a study of cancer survivors to examine the determinants of a good quality of life following a breast cancer diagnosis. Specific areas of interest include identifying the unmet needs of cancer survivors and their caregivers, the use of complementary therapies, and the needs of minority women with breast cancer.

The Society has a strong advocacy program through which it works with other organizations, such as the National Breast Cancer Coalition and the Susan G. Komen Breast Cancer Foundation, in order to speak with one voice about the importance of increased government funding for breast cancer research; access to screening, quality treatment, and care for all women; protection from discrimination for women who may have a genetic predisposition for breast cancer; and concerns of breast cancer patients and survivors. 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. Educational partnerships with organizations such as the Discovery Health Channel, as well as public outreach, encourage more women to take advantage of mammography and clinical breast examinations, and provide comprehensive information on all aspects of breast cancer.

Sources of Statistics

General Information. The statistics and statements in this booklet, unless otherwise stated, refer to invasive (not in situ) breast cancer. Except for rates designated as age-specific, all incidence rates and death rates in this booklet are age-adjusted to the 2000 US standard population.

Age Adjustment to the Year 2000 Standard. Since the publication of *Breast Cancer Facts & Figures 2003-2004*, we used the most recent US census (2000) as the basis for calculating age-adjusted rates. Formerly, our statistics were age-adjusted to the 1970 census. This change follows federal agencies that publish statistics. The change will also require a recalculation of age-adjusted rates for previous years to allow valid comparison between current and past years. The purpose of shifting to the Year 2000 Standard is to more accurately reflect contemporary incidence and mortality rates, given the aging of the population. Using the Year 2000 Standard in age-adjustment instead of the 1970 Standard allows age-adjusted rates to be closer to the actual, unadjusted rate in the population. Rates standardized to the 2000 Standard are 20%-30% higher than rates age-adjusted to the 1970 Standard.

Cancer Deaths. The estimated number of US breast cancer deaths in 2005 is calculated by fitting the numbers of cancer deaths from 1969 through 2002 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.

New Cancer Cases. The estimated number of new US breast cancer cases in 2005 is calculated by fitting the estimated numbers of cancer cases that occurred each year in the US from 1979 through 2001 to a statistical forecasting model. Estimates of the numbers of US cancer cases from 1979 through 2001 are used because case data are not available for 50 states and the District of Columbia. The estimated numbers of US cases from 1979 through 2001 are extrapolated from numbers of cases occurring in regions of the United States included in the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute and census data.

Death Rates. Death rates are defined as the number of people per 100,000 who die from a disease during a one-year interval. Death rates used in this publication were previously made available by SEER on its Web site, http://seer.cancer.gov, within the *SEER Cancer Statistics Review 1975-2002*, and other Web documents.[5,155] Death rates were calculated using data on cancer deaths compiled by NCHS and population data collected by the US Bureau of the Census. All death rates in this publication were age-adjusted to the 2000 US standard population.

Incidence Rates. Incidence rates are defined as the number of people per 100,000 who develop disease during a one-year interval. When referenced as such, US SEER incidence rates were previously made available on its Web site, http://seer.cancer.gov, within the *SEER Cancer Statistics Review 1975-2002*, and other Web documents.[5,155] When not referenced otherwise, US SEER incidence rates are based on American Cancer Society analysis of the SEER Public Use Dataset, 1973-2002, April 2005 submission, using *SEER*Stat 6.1.4*, a statistical software package from the National Cancer Institute.[3,156] State incidence rates were previously published in *Cancer in North America, 1998-2002*, a publication of the North American Association of Central Cancer Registries.[157] (These rates were calculated using data on cancer cases collected by the SEER program and National Program of Cancer Registries programs and population data collected by the US Bureau of the Census.) Except for the age-specific incidence rates described in Figure 1, all incidence rates in this publication are age-adjusted to the 2000 US standard population.

Annual Percent Change in Incidence Rates. When not referenced otherwise, annual percent changes in the incidence rate were estimated based on American Cancer Society analysis of the SEER Public Use Dataset, 1973-2002, April 2005 submission, using *SEER*Stat 6.1.4*.[3,156]

Survival Rates. A survival rate represents the proportion of patients who remain alive at some given amount of time since their diagnosis, such as 5 years. To adjust for normal life expectancy (factors such as dying of heart disease, accidents, and diseases of old age), a *relative survival rate* is calculated. The relative survival rate is obtained by dividing the observed survival among a group of cancer patients by the expected survival for persons in the general population who are similar to the patient group with respect to age, gender, race, and calendar year of observation. When referenced as such, survival statistics were originally published in the *SEER Cancer Statistics Review, 1975-2002*.[5] When not referenced otherwise, survival rates are based on American Cancer Society analysis of the SEER Public Use Dataset, 1973-2002, April 2005 submission, using *SEER*Stat 6.1.4*, a statistical software package from the National Cancer Institute.[3,156] All 5-year survival statistics are based on cases diagnosed 1995-2001 with follow-up of patients through 2002.

Probability of Developing Cancer. Probabilities of developing breast cancer were calculated using DevCan (Probability of Developing Cancer Software), developed by the National Cancer Institute.[158] These probabilities reflect the average experience of women in the United States and do not take into account individual behaviors and risk factors (e.g., use of mammography screening and family history of breast cancer).

Prevalence of Mammography. The prevalence of mammography by age and state was obtained through analysis of data from the Behavioral Risk Factor Surveillance System (BRFSS).[98] The BRFSS is an ongoing system of surveys conducted by the state health departments in cooperation with the Centers for Disease Control and Prevention.[98] The prevalence of mammography by race/ethnicity is from the National Health Interview Survey.

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