

DATA REPORT on *In Situ* Breast Cancer in Massachusetts

The Massachusetts Cancer Registry, Massachusetts Department of Public Health

INTRODUCTION

The purpose of this report is to provide baseline descriptive information about the incidence of *in situ* breast cancer among Massachusetts females. This is the first report from the Massachusetts Cancer Registry to include data on *in situ* breast cancer. *In situ* breast cancer is commonly referred to as **breast carcinoma *in situ* (BCIS)**. The incidence of this subgroup of breast cancers has increased dramatically since the early 1980's when widespread screening mammography was implemented. BCIS is not considered to be life threatening, but is associated with an increased risk of invasive breast cancer in the future.

INFORMATION INCLUDED

This booklet provides incidence rates for all types of breast carcinoma *in situ* combined, and for the two main types: ductal carcinoma *in situ* (DCIS), and lobular carcinoma *in situ* (LCIS). The Massachusetts Cancer Registry began collecting breast carcinoma *in situ* cases in 1992. Therefore, annual rates describing trends are presented for the period 1992-2001 for Massachusetts, and are compared to U.S. data for the same period. All other Massachusetts rates are presented for a combined period 1997-2001. Additionally, descriptive data on treatment combinations are presented for DCIS patients who received either breast conserving surgery or mastectomy for the period 1995-2001.

SOURCES OF DATA

The Massachusetts Cancer Registry (MCR):

All Massachusetts incidence data are provided by the Massachusetts Cancer Registry, which is part of the Massachusetts Department of Public Health. The MCR collects reports of all cancer cases newly diagnosed in Massachusetts residents and began collecting *in situ* cases in 1992. Prior to 1992, only cancers that were invasive were required to be reported to the MCR. The most recent year of MCR data available at this time is 2001.

Surveillance, Epidemiology and End Results (SEER):

National data on cancer incidence are from the National Cancer Institute's SEER Program, an authoritative source of cancer incidence in the United States. The SEER data presented in this booklet reflect data from nine SEER registries. The most recent year of SEER data available at this time is 2001(1).

DEFINITIONS

in situ – A term that literally means 'in place' and refers to cancer in its earliest stage. In general, a cancer that is diagnosed at an *in situ* stage indicates that abnormal cancer cells are present, but have not spread past the boundaries of tissues where they initially developed. *In situ* cancer may also be referred to as non-invasive.

invasive – A term used to describe a cancer that has spread beyond the layer of tissue in which it developed and is growing into surrounding healthy tissues.

TYPES OF BREAST CARCINOMA *IN SITU*:

There are two main types of breast carcinoma *in situ*:(2)

Ductal carcinoma *in situ* (DCIS) – Also called intraductal carcinoma.

- ❖ DCIS is the most common type of noninvasive breast cancer. Abnormal cell growth begins in the ducts, which are the milk passages that connect the lobules and the nipple, but the abnormal cells have not spread outside the duct to the other tissues in the breast.
- ❖ Most new cases of DCIS are discovered by mammography.
- ❖ In some cases, DCIS may become invasive cancer and spread to other tissues, although it is not known at this time how to predict which cases will become invasive.
- ❖ DCIS comprises 73% of all *in situ* breast cancers.

Lobular carcinoma *in situ* (LCIS) - Also called lobular neoplasia.

- ❖ A condition in which abnormal cells are found in the lobules (milk producing glands) of the breast, but the abnormal growth does not penetrate through the lobule walls.
- ❖ LCIS is generally not detectable by clinical exam or by mammography, but is usually an incidental finding of a breast biopsy conducted for another lesion.
- ❖ LCIS comprises 15% of all *in situ* breast cancers.

INCIDENCE OF BREAST CARCINOMA *IN SITU*

In situ Breast Cancer as a Percentage of All Breast Cancers

Table 1. *In situ* breast cancer as a percentage of all breast cancers diagnosed in Massachusetts for 1992, 1996 and 2000

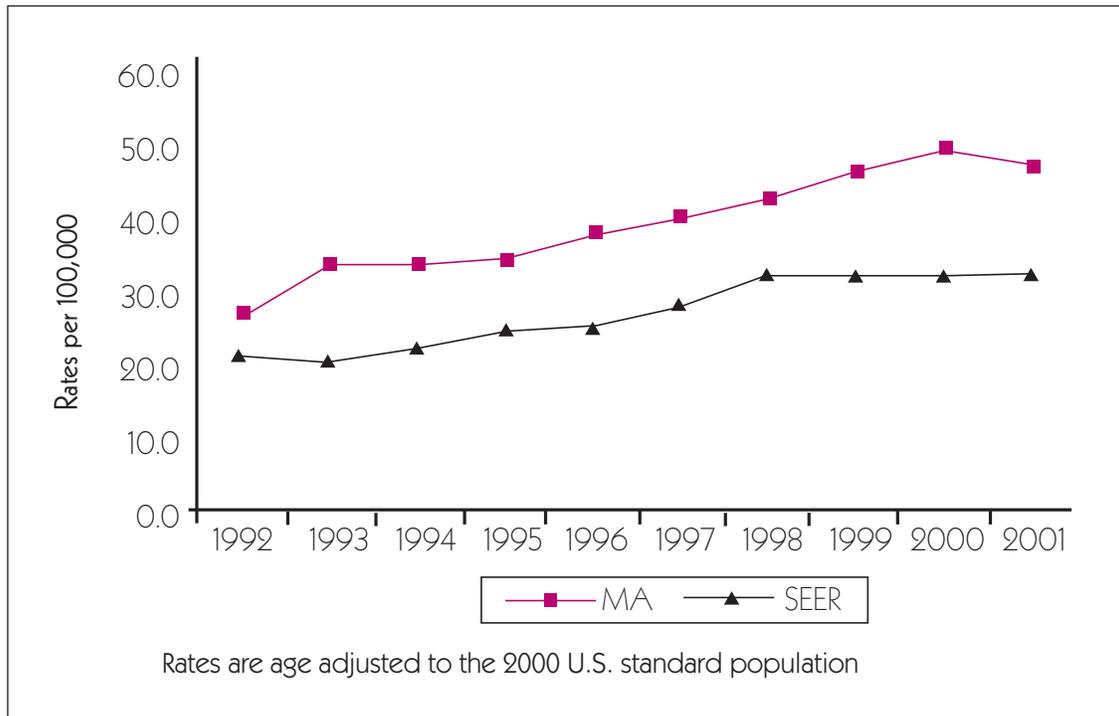
Age groups	1992		1996		2000	
	<i>In situ</i>	All Breast	<i>In situ</i>	All Breast	<i>In situ</i>	All Breast
20-44	140 (20.3%)	690	203 (25.2%)	807	261 (28.9%)	903
45-64	386 (19.1%)	2019	634 (25.4%)	2500	910 (29.1%)	3127
65+	287 (10.8%)	2647	370 (13.7%)	2706	577 (19.4%)	2974
All ages	813 (15.2%)	5357	1207 (20.1%)	6013	1650 (23.9%)	6906

Data Source: Massachusetts Cancer Registry (MCR)

- ❖ Prior to widespread screening by mammography, *in situ* breast cancer represented fewer than 1% of all newly diagnosed cases of breast cancer(3). In 2000, for all ages combined, *in situ* breast cancers comprised approximately 24% of all breast cancers diagnosed.
- ❖ The percentage of all breast cancers that are reported as *in situ* breast cancers among women age 65 and over is lower than the percentage in younger age groups.
- ❖ For each of the broad age groups, and for all ages combined, the proportion of all breast cancers that are diagnosed at *in situ* stage has increased approximately 9% from 1992 to 2000.

U.S. AND MASSACHUSETTS *IN SITU* BREAST CANCER TRENDS ALL TYPES OF BREAST CARCINOMA *IN SITU* COMBINED

Figure 1. Annual female age-adjusted incidence rates of *in situ* breast cancer (all histological types combined), by year of diagnosis, Massachusetts vs. SEER areas, 1992-2001



Age-adjusted rates per 100,000

BCIS	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
MA	26.9	33.9	33.9	34.7	38.2	40.5	43.3	46.8	50.2	47.4
SEER	21.5	20.8	22.3	24.7	25.5	28.4	32.7	32.7	32.6	32.8

BCIS = Breast Carcinoma *In Situ*

Rates are adjusted to the 2000 U.S. standard population.

Data Sources:

Massachusetts Cancer Registry (MCR)

Surveillance, Epidemiology and End Results Program (SEER)

- ❖ For the period 1992-2001, the average annual age-adjusted incidence rate of *in situ* breast cancer was significantly higher in Massachusetts than in the U.S. ($p < 0.05$; 39.0 per 100,000 vs. 27.0 per 100,000 respectively).
- ❖ Age-adjusted rates in Massachusetts increased an average of about 7% per year for the period 1992-2001.
- ❖ In general, both Massachusetts and the U.S. showed similar patterns of increasing incidence during the period 1992-2000. However, rates in the U.S. peaked in 1998 at 32.7 per 100,000 and appear to be leveling off, while in Massachusetts, rates continued to increase to a peak of 50.2 per 100,000 in 2000 and then decreased slightly in 2001.

U.S. AND MASSACHUSETTS *IN SITU* BREAST CANCER TRENDS DUCTAL CARCINOMA *IN SITU* (DCIS) AND LOBULAR CARCINOMA *IN SITU* (LCIS)

Figure 2. Annual female age-adjusted incidence rates of DCIS and LCIS by year of diagnosis, Massachusetts vs. SEER areas, 1992-2001



Age-adjusted rates per 100,000

DCIS	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
MA	19.6	24.2	23.8	25.7	28.5	30.6	33.1	35.7	37.2	28.7
SEER	16.1	15.9	17.1	19.1	19.92	23.3	25.1	24.7	24.3	17.7

DCIS = Ductal Carcinoma *In Situ*

LCIS	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
MA	3.9	5.1	5.4	5.0	6.0	6.4	6.5	7.0	7.7	7.7
SEER	3.2	3.0	3.2	3.2	3.1	3.1	3.8	3.8	3.6	3.7

LCIS = Lobular Carcinoma *In Situ*

Rates are adjusted to the 2000 U.S. standard population.

Data Sources:

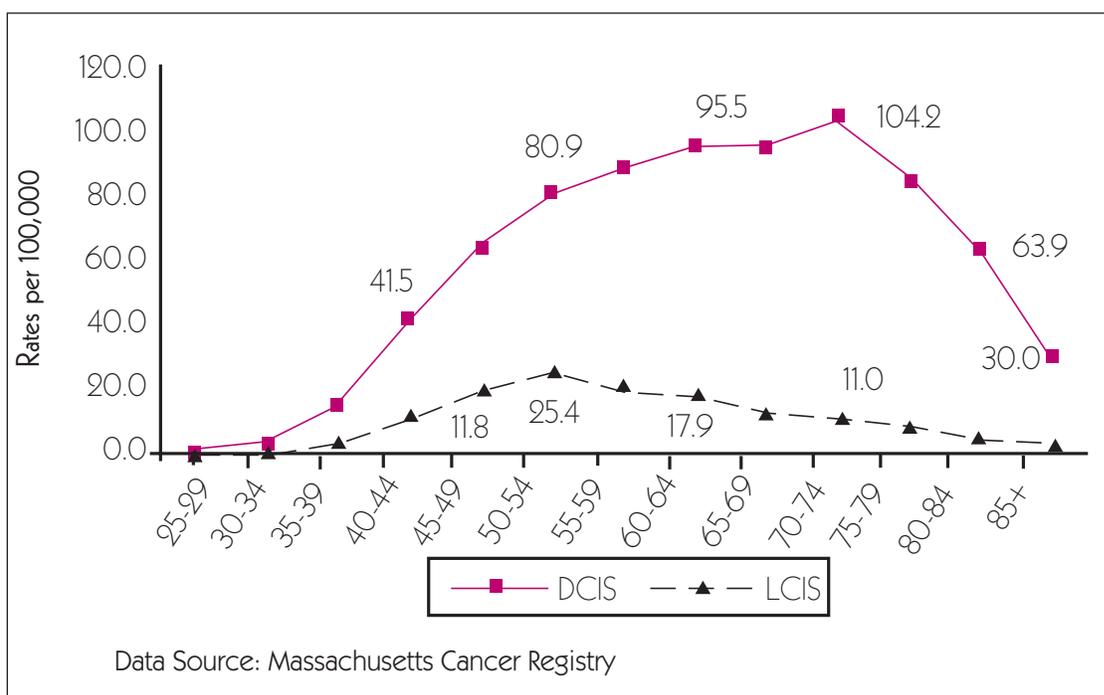
Massachusetts Cancer Registry (MCR)

Surveillance, Epidemiology and End Results Program (SEER)

- ❖ In Massachusetts, incidence rates of DCIS are on average 4.7 times higher than incidence rates of LCIS.
- ❖ In Massachusetts, DCIS comprises approximately 73% of all *in situ* breast cancers, while LCIS comprises 15% of all *in situ* breast cancers.
- ❖ The overall increase of *in situ* breast cancer in both Massachusetts and the U.S. is largely attributable to an increase in DCIS.
- ❖ The incidence patterns of DCIS for Massachusetts and SEER areas are similar to the incidence pattern of all breast carcinoma *in situ* until the year 2000. In 2001, the incidence rate of DCIS decreased sharply in Massachusetts and in the U.S. Additional years of data will be needed to see if this is the beginning of a decreasing trend.
- ❖ Incidence of LCIS in Massachusetts increased from approximately 4 cases per 100,000 in 1992 to 8 cases per 100,000 in 2000 and then leveled off in 2001. Incidence of LCIS in the SEER areas remained relatively flat over the years 1992-2001.

IN SITU BREAST CANCER BY AGE

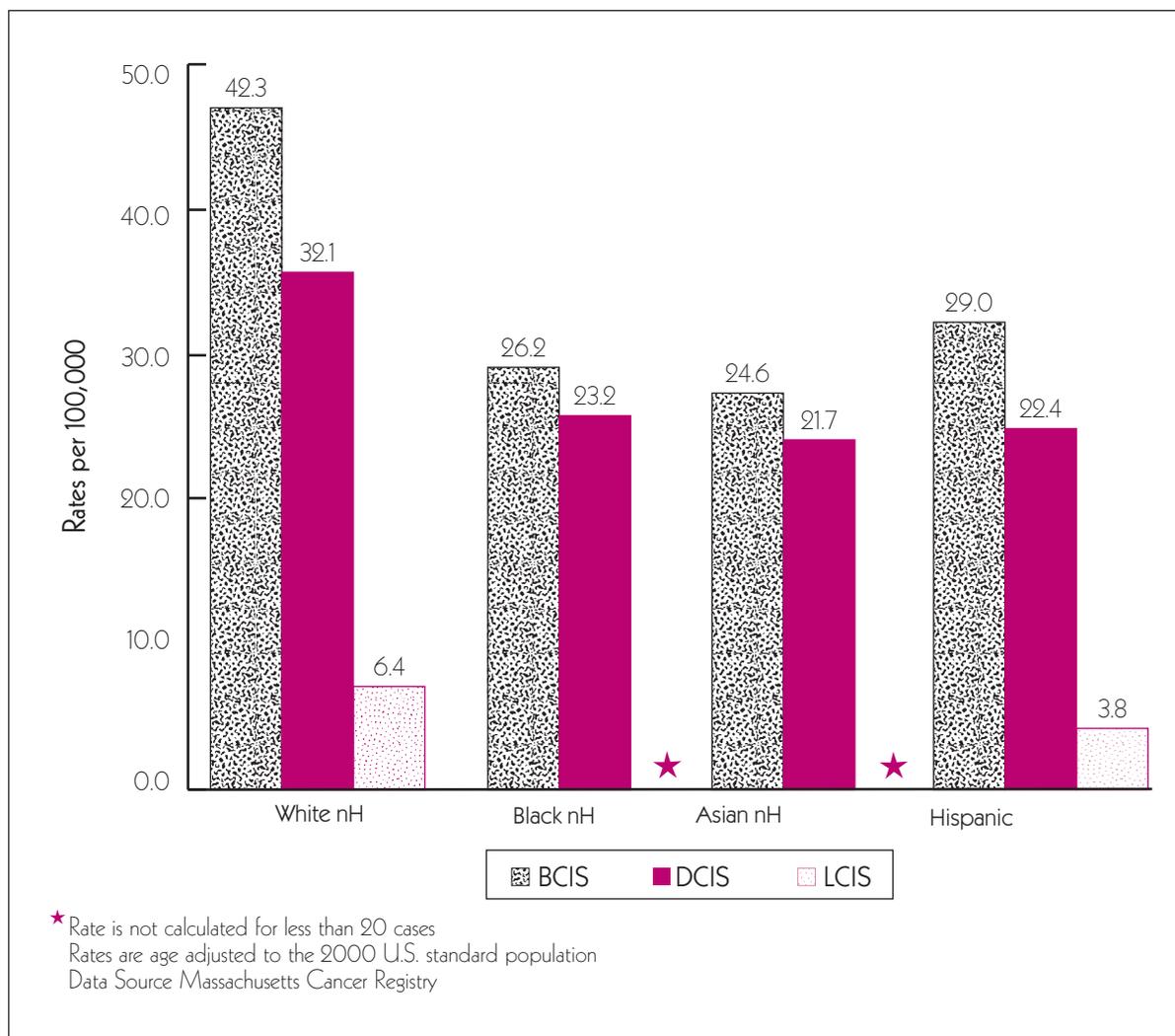
Figure 3. Age-specific incidence rates of *in situ* breast cancer by histological type Massachusetts, 1997-2001



- ❖ DCIS rates increase sharply among women 40-44 years of age, and continue to increase thereafter reaching a peak of 104.2 per 100,000 for women 70-74 years of age. There is a sharp decline in rates among women aged 75 and older.
- ❖ LCIS rates increase gradually with increasing age, reaching a peak of 25.4 per 100,000 for women aged 50-54, and then gradually decline.

IN SITU BREAST CANCER BY RACE AND ETHNICITY

Figure 4. Average annual age-adjusted incidence rates of breast carcinoma *in situ* (BCIS), ductal carcinoma *in situ* (DCIS), and lobular carcinoma *in situ* (LCIS), by race and ethnic group, Massachusetts, 1997-2001

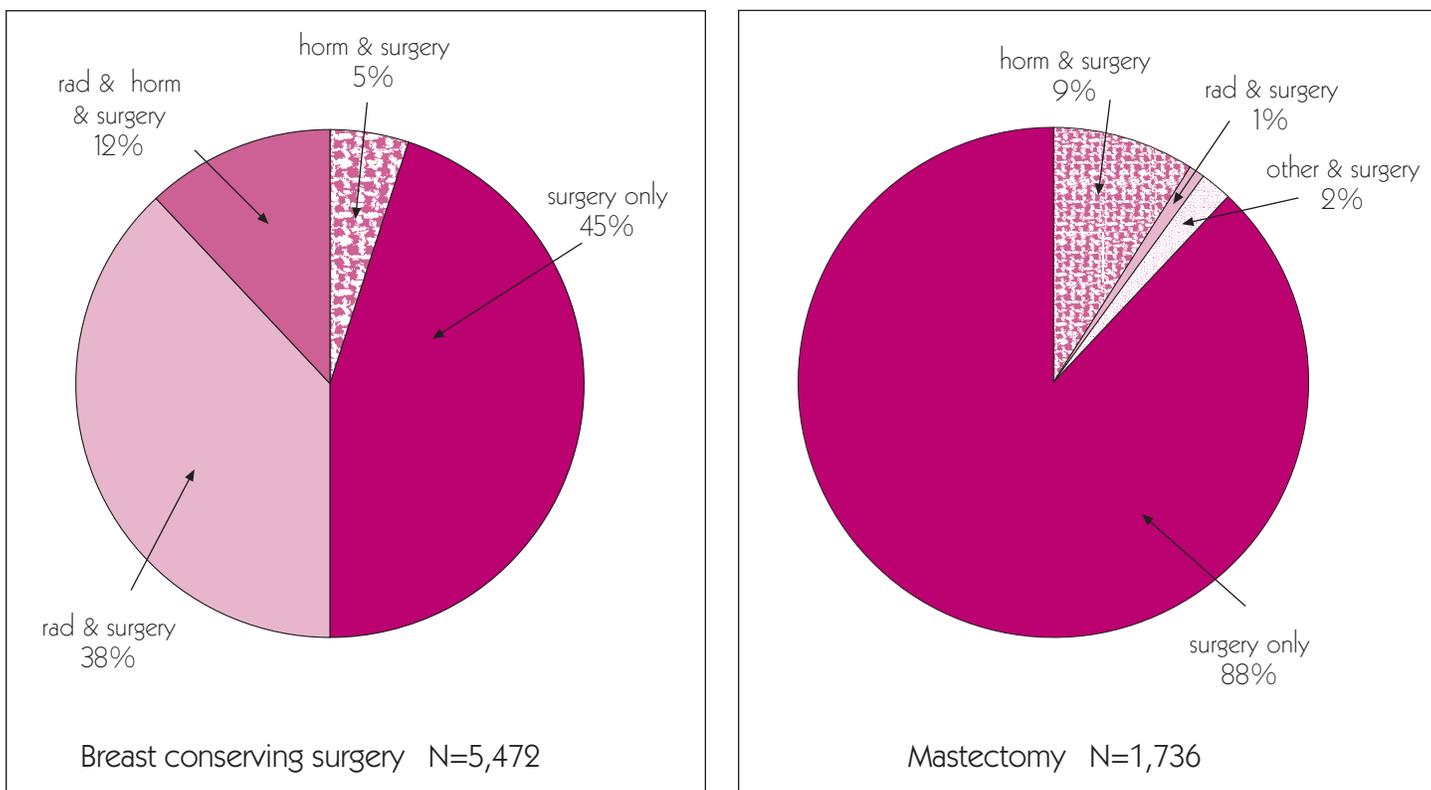


Abbreviation: nH = non-Hispanic

- ❖ For the period 1997-2001, white non-Hispanic women have the highest age-adjusted incidence rates among Massachusetts females for all *in situ* breast cancer, as well as for the two main sub-types — DCIS and LCIS (42.3 per 100,000 for BCIS, 32.1 per 100,000 for DCIS, and 6.4 per 100,000 for LCIS).
- ❖ Age-adjusted incidence rates among black, Asian and Hispanic women in Massachusetts are similar for all breast cancer *in situ* and for DCIS, and are significantly lower than for white women ($p < 0.05$).
- ❖ LCIS rates for Hispanic women are lower than for white women (3.8 per 100,000 vs. 6.4 per 100,000). Age-adjusted incidence rates for LCIS among black and Asian women are not presented here because the total number of cases for these population groups was less than 20 each.

TREATMENT OF DUCTAL CARCINOMA *IN SITU*

Figure 5. Treatment among Massachusetts DCIS patients who received surgery (mastectomy vs. breast-conserving surgery), 1995-2001



Abbreviations:

rad&surg=radiation and surgery

rad&horm&surg=radiation, hormone therapy and surgery

horm&surg=hormone therapy and surgery

other&surg=other and surgery

Data Source: Massachusetts Cancer Registry

- ❖ Of DCIS patients treated with surgery, 76% received breast-conserving surgery, and 24% had a mastectomy.
- ❖ Among DCIS patients receiving breast-conserving surgery, 45% received surgery alone, and 55% were treated by surgery combined with radiation therapy, hormone therapy, or both.
- ❖ Among DCIS patients receiving a mastectomy, 88% received surgery alone, and 10% were treated by surgery combined with hormone therapy or radiation therapy.

DISCUSSION

Ductal Carcinoma *In Situ* (DCIS)

The increase in *in situ* breast cancer overall, in both Massachusetts and the U.S., is largely due to increases in DCIS. Massachusetts age-adjusted rates of DCIS increased steadily since 1992 and decreased in 2001 (Figure 2). Nationally, increases in DCIS are largely attributed to increased use of mammography, because most cases of DCIS are detectable only through mammography.(4) Mammography use is part of the explanation of the increasing rates in Massachusetts, and may also be contributing the increasing percentage of *in situ* breast cancer among all breast cancer patients during the period 1992-2000 (Table 1). According to the Behavioral Risk Factor Surveillance System (BRFSS), the percentage of Massachusetts women aged 40 and older who ever had a mammogram has increased steadily over time since 1987. In addition, there has been a significant increase since 1992 in the percentage of women age 50 and older who were screened in the previous two years.(5)

Massachusetts and national age-adjusted rates of DCIS decreased in 2001 (Figure 2). This decrease may be the start of a predictable pattern that occurs after widespread screening. After an initial increase in rates due to earlier detection, there is a decline due to the fewer number of cases that are left to be detected in subsequent years. Additional years of monitoring will be necessary before we know if this is the start of a downward trend in the incidence of this type of *in situ* breast cancer.

Although age-adjusted rates are higher in Massachusetts compared to the U.S. for both DCIS and invasive breast cancer, the age and race patterns are similar to the national patterns. The higher incidence rates in Massachusetts may be partly due to the relatively high rates of breast cancer screening compared with the national average. Results from the Behavioral Risk Factor Surveillance System (BRFSS) from 2000 showed that 84.2 % of Massachusetts women aged 40 and above had a mammogram in the past two years, compared with the US median of 76.1%. Out of all states, Massachusetts ranked 3rd in the year 2000 with regard to the percentage of women aged 40+ receiving a mammogram in the past two years.(6)

Differences in socioeconomic and reproductive characteristics may also be contributing to higher breast cancer rates in Massachusetts. The Massachusetts BRFSS consistently showed that women with higher levels of income and education were more likely to have had a

recent mammogram or a clinical breast exam.(5,6) According to the American Community Survey conducted by the U.S. Census Bureau, Massachusetts had the 2nd highest percentage of college graduates and had the 5th highest median income of all states.(7) Women of high socioeconomic status have about twice the risk of breast cancer than women of low socioeconomic status (8) and this relationship may be due to differences in reproductive risk factors between high and low socioeconomic groups.(9) In general, women of higher socioeconomic status and higher education had lower fertility, later age at first birth, a greater prevalence of childlessness, shorter duration of breastfeeding and later age at menopause (10), all of which have been associated with an increased risk of breast cancer.

The age-specific incidence patterns of DCIS of the breast in Massachusetts are similar to the patterns of invasive breast cancer in Massachusetts. DCIS peaks at age 70-74 (Figure 3), slightly earlier than invasive breast cancer, which peaks at age 75-79, after which age-specific rates for both DCIS and invasive breast cancer decline. The decline in rates in the older age groups may be a reflection of screening patterns. Data from the Behavioral Risk Factor Surveillance System from 1998 through 2000 consistently showed that older women (aged 70+) are less likely to be screened.(5,6,11) Alternatively, the decrease in rates in the older age groups may be the result of the biology of breast cancer. Mammograms are better at detecting masses in older women since their breast tissue is less dense. If a cancer was present in the older age groups it would be more likely to be found than in younger women whose breasts are more dense.(M. Costanza, personal communication, January 11, 2005)

Likewise, the incidence patterns by race/ethnic group of DCIS are similar to those of invasive breast cancer. White non-Hispanic women have the highest age-adjusted incidence rates for both DCIS and invasive breast cancer. Age-adjusted rates among black, Asian and Hispanic women are significantly lower for DCIS and invasive breast cancer than for white women (Figure 4). The prevalence of several well established risk factors differ across racial and ethnic subpopulations and may contribute to the higher incidence rates in whites compared with other racial and ethnic groups. These include differences in underlying reproductive risk factors (older age at first birth), use of hormone replacement therapy (HRT), and access to and use of screening. White women tend to have delayed child bearing and more commonly use hormone replacement therapy (HRT).(4) Mammography use has also been historically higher in white than African

American women, although rates have become comparable in the more recent years.(4)

Lobular Carcinoma *In Situ* (LCIS)

Estimating the true incidence of LCIS is challenging because it is generally not detectable clinically or by mammogram, but rather is identified incidentally through biopsies conducted for another purpose.(12) Rates of LCIS in Massachusetts increased from 3.9 per 100,000 in 1992 to 7.7 per 100,000 in 2000 and remained level in 2001. National rates for the period covered in this report were lower than Massachusetts and remained relatively flat (3.2 per 100,000 in 1992 vs. 3.7 per 100,000 in 2001.) Though LCIS is not readily detectable by mammogram, it has been suggested that the increased use of mammography has indirectly led to an increase in the number of cases. Mammography leads to the identification of lesions other than LCIS, which then result in an increase in the number of breast biopsies performed and consequently, to an increase in the number of LCIS diagnoses.(12) Therefore, the high rates of screening in Massachusetts may also be contributing to the higher LCIS rates seen in Massachusetts. The fact that the increase in annual age-adjusted rates parallels a significant increase since 1992 in mammography use in Massachusetts also supports this as a possible explanation for the rise in rates. Another reason for the increase in LCIS from the late 1970's to the mid 1990's may be the use of combined estrogen and progestin for menopausal hormone replacement therapy (HRT).(12)

SUMMARY

In Massachusetts, all *in situ* breast cancers combined now represent 24% of all newly diagnosed breast cancers. Age-adjusted incidence rates in Massachusetts are significantly higher than U.S. rates. Rates steadily increased from 1992 through 2000, and then decreased in 2001. Rates among white women are significantly higher than rates among black, Asian or Hispanic women. The higher rates in Massachusetts may be due to high rates of mammography screening in Massachusetts compared to the national average. Reproductive and socioeconomic factors may also be contributing to higher rates in Massachusetts and to the differences in rates between white women and other race/ethnic groups. Of patients with ductal carcinoma *in situ* who are treated with surgery, 76% received breast-conserving surgery and 24% had a mastectomy. Patients receiving breast-conserving surgery are more likely to have additional treatment such as radiation therapy, hormone therapy, or both.

TECHNICAL NOTES AND DEFINITIONS

incidence rate – The number of new cases of a disease in a given size population in a given period of time. Usually, an incidence rate is given as the number of new cases per 100,000 persons per year.

age-adjusted incidence rate – An overall rate that takes into account that different areas have different population age structures. For example, some areas may have a lot of retirees, while others may have a substantially younger population. Without taking into account these different age structures, we can't be sure if an area has a higher number of cancer cases because rates are really higher in that area, or just because there are more older people living there. Rates are age-adjusted to the 2000 U.S. standard population.

age-specific incidence rate – A rate that looks at the number of people who have been diagnosed with a disease in a particular age group in a given period of time. Age-specific rates allow us to compare how the rates of disease change with age.

statistical significance – An estimate of the probability that the difference between two rates as large as the one we are observing is due to *chance alone* (for example, the difference between the Massachusetts rate and the U.S. rate). Usually the level of statistical significance is stated by the “p” value. By convention, when a p value is less than or equal to 0.05 the difference is considered statistically significant. In other words, when the p value is less than or equal to 0.05, there is no more than a 5 percent, or 1 in 20, probability that the difference in rates as large as the one we are seeing is due to chance alone.(13)

population estimates – Incidence rates were computed using the population estimates obtained from the Massachusetts Department of Public Health.

race/ethnicity categories – The categories presented in this report are mutually exclusive. Cases are only included in one race/ethnicity category. The race/ethnicity tables include the categories white, non-Hispanic; black, non-Hispanic; Asian, non-Hispanic; and Hispanic.

codes used for classification of *in situ* breast cancer – Primary site and histology are coded according to the International Classification of Diseases for Oncology. Cases diagnosed from 1992-2000 were coded using the Second Edition (ICD-O-2), and for 2001, using the Third Edition (ICD-O-3). The specific codes used for the data presented here are as follows:

All breast cancer *in situ* (BCIS)

Primary site C50.0 – C50.9 and behavior code = 2 excluding histology codes 9590-9989;

Ductal carcinoma *in situ* (DCIS)

Primary site C50.0 – C50.9 and histology codes 8500 – 8504 and behavior code = 2;

Lobular carcinoma *in situ* (LCIS)

Primary site C50.0 – C50.9 and histology code 8520 and behavior code = 2.

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