

Racial/Ethnic Differences in Incidence

Figure 8.7 depicts the comparable incidence of bone cancer among various racial/ethnic groups over the past decade. The overall incidence for white non-Hispanics in the 15- to 29-year age group was slightly higher, 11.3 per year per million, in comparison to incidence for other races/ethnicities—8.1, 10.2, and 9.1 per year per million for African Americans/blacks, Hispanics, and Asians/Pacific Islanders, respectively (Figure 8.7). However, this was not true across histological subtypes. For osteosarcoma, Hispanics had the highest incidence in those 15 to 29 years of age (Figure 8.8). For Ewing sarcoma, racial variation was dramatic. There was no discernable incidence of Ewing sarcoma in African Americans/blacks and Asians/Pacific Islanders over 15 years of age. For those over 30 years of age, this disease occurred nearly exclusively in the white non-Hispanic population

(Figure 8.9). An absence of Ewing sarcoma has also been observed in several African countries.⁵ The underlying biological mechanism behind these observations is yet to be elucidated (see *Risk Factors* section).

Trends in Incidence

The incidence of osteosarcoma, Ewing sarcoma and all bone cancers, according to 5-year periods between 1975 and 1995, is shown in Table 8.2.

Figure 8.10 (left panel) shows an increase in the incidence of malignant bone tumors of 0.92% per year ($p < 0.05$) during the period 1975 to 1999 in the adolescent and young adult population as compared to children < 15 years of age. This increase was due to more male patients being diagnosed, the reasons for which are unclear. Histology-specific incidence by single year of diagnosis for 1975 to

Table 8.1: Incidence of Malignant Bone Tumors in Persons Younger Than 30 Years of Age, U.S., 1975-2000

AGE AT DIAGNOSIS (YEARS)	<5	5-9	10-14	15-19	20-24	25-29
U.S. population, year 2000 census (in millions)	19.176	20.550	20.528	20.220	18.964	19.381
ALL MALIGNANT BONE TUMORS						
Average incidence per million, 1975-2000, SEER	1.3	5.0	13.1	14.8	8.0	6.2
Average annual % change in incidence, 1975-2000, SEER	^	1.4%	0.9%	1.0%	1.0%	2.2%
Estimated incidence per million, year 2000, U.S.	^	5.7	14.5	16.5	9.0	7.5
Estimated number of persons diagnosed, year 2000, U.S.	^	118	298	333	170	146
OSTEOSARCOMA						
Average incidence per million, 1975-2000, SEER	0.4	2.4	7.6	8.2	3.5	2.1
Average annual % change in incidence, 1975-2000, SEER	^	1.0%	1.8%	1.1%	1.5%	4.8%
Estimated incidence per million, year 2000, U.S.	^	10.8	9.0	9.4	4.2	2.8
Estimated number of persons diagnosed, year 2000, U.S.	^	65	184	190	80	55
EWING SARCOMA						
Average incidence per million, 1975-2000, SEER	0.6	2.3	4.3	4.6	2.1	1.9
Estimated incidence per million, year 2000, U.S.	^	2.0	4.1	5.1	2.1	1.1
Estimated number of persons diagnosed, year 2000, U.S.	^	41	85	103	39	21
CHONDROSARCOMA						
Average incidence per million, 1975-2000, SEER	^	0.1	0.6	1.2	1.3	1.9
Average annual % change in incidence, 1975-2000, SEER	^	3.3%	2.8%	-20.5%	4.9%	3.3%
Estimated incidence per million, year 2000, U.S.	^	0.2	0.7	1.3	1.7	2.5
Estimated number of persons diagnosed, year 2000, U.S.	^	3	15	27	33	49

^Too few for a reliable estimate

Table 9.1: Incidence of Breast Cancer in Persons Younger Than 30 Years of Age, U.S., 1975-2000

AGE AT DIAGNOSIS (YEARS)	<5	5-9	10-14	15-19	20-24	25-29
U.S. population, year 2000 census (in millions), females	9.365	10.026	10.008	9.829	9.276	9.583
Average incidence per million, 1975-2000, SEER	^	^	^	1.3	12.1	81.1
Average annual % change in incidence, 1975-2000, SEER	^	^	^	0	0	0
Estimated incidence per million, year 2000, U.S.	^	^	^	1.3	12.1	81.1
Estimated number persons diagnosed, year 2000, U.S.	^	^	^	13	112	777

^ Too few for a reliable estimate

Over the period 1975 to 2000, there was an increase in incidence of breast cancer with increasing age, from an average incidence per million of 1.3 in 15- to 19-year-olds, to 12.1 in 20- to 24-year-olds, to 81.1 in 25- to 29-year-olds (Table 9.1). However, there was no annual increase within each age group apparent over the same time period.

As shown in Figure 9.3, the incidence of regional spread of disease was higher for adolescents and young adults than for women older than 30 years of age.

Racial/Ethnic Differences in Incidence

From 1992 to 2002, African American/black women from 10 to 34 years of age had a higher rate of breast cancer than any other race/ethnicity (Figure 9.4). Above age 50, however, breast cancer predominated in non-Hispanic white women (data not shown). At all ages, American Indian/Alaska Native women had the lowest incidence of breast cancer (Figure 9.4; data not shown for older females).

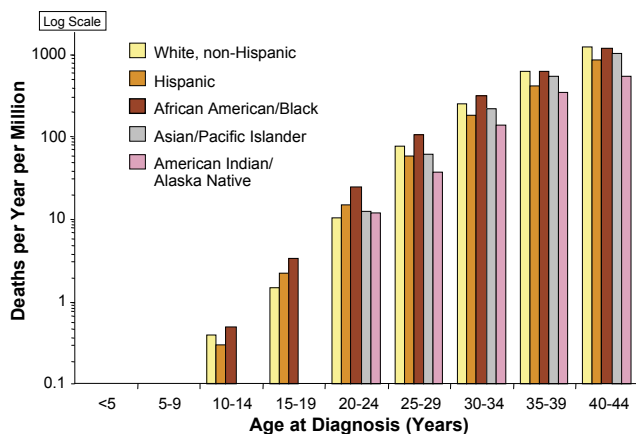


Figure 9.4: Incidence of Breast Cancer in Females by Race/Ethnicity, SEER 1992-2001

Trends in Incidence

The incidence of breast cancer in young women has remained relatively stable over the period 1975 to 2000 (Figures 9.5).

OUTCOME

Mortality

During the period 1975 to 2000, breast cancer mortality rose steadily with age (Figure 9.6), reflecting an increasing breast cancer incidence (Figure 9.2). The mortality:incidence ratio was lower in the 15- to 29-year age range than in the 30- to 44-year range (Figure 9.7), implying that survival was better among the younger patients. This apparent advantage for the younger age group may be due either to a higher cure rate or to a longer interval to death, such that the deaths from breast cancer among those diagnosed between 15 and 29 years of age occur primarily after age 30. Survival data shown below indicate that it was not due to a higher survival rate.

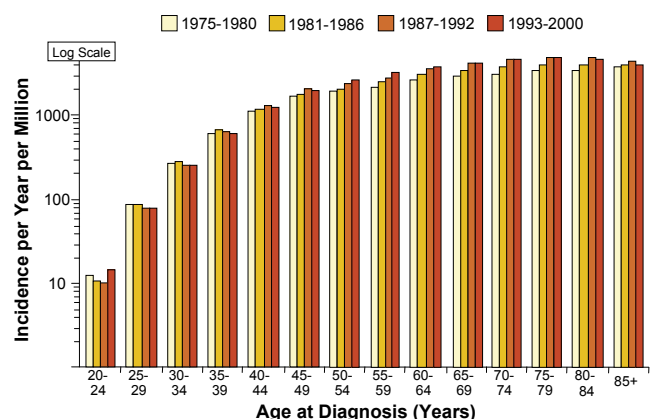


Figure 9.5: Change in Incidence of Breast Cancer in Females by Era, SEER

Mortality for all age groups remained stable or dropped since 1981. The decrease in mortality was more pronounced for those over 30 years of age, particularly in the most recent treatment era (Figure 9.8), and likely reflects the use of screening programs, improved diagnostic techniques, and adjuvant chemotherapy and radiation therapy. There was a more significant improvement in mortality over time for older age groups.

Racial/Ethnic Differences in Mortality

For women younger than 45 years of age, mortality for African Americans/blacks was nearly twice as high as for other racial/ethnic groups (Figure 9.9). Although African Americans/blacks had an increased incidence of breast cancer compared to other groups, the death rate for this group was disproportionately higher than the incidence difference (Figure 9.4). African American/black patients have been reported to present with higher stage or more advanced disease.^{6,7} White non-Hispanic women were significantly more likely to be older and to have smaller tumors, have less lymph node involvement, have tumors with positive estrogen receptor and progesterone receptor status compared with Hispanic or African American/black women.⁶

An additional analysis of treatment modalities used for women under 35 years of age with invasive breast cancer revealed that African American/black women—and to some extent Hispanic females—received less aggressive initial therapy than white non-Hispanic women, despite similar prognostic variables. These analyses were multivariate and were adjusted for stage, grade, lymph node status, and treatment. Overall, 9% of the women in this study were registered on clinical trials, yet African American/black women were less likely than others to be among those registered. African American/black and Hispanic women had poorer outcomes and a higher mortality than white, non-Hispanic women.⁶

Figure 9.10 displays mortality data for white and African American/black women over the period 1975 to 2000. For white Americans there was a relatively consistent decline in the death rate across all age groups, but for African Americans/blacks, either an increase in death rate or stable death rate was observed.

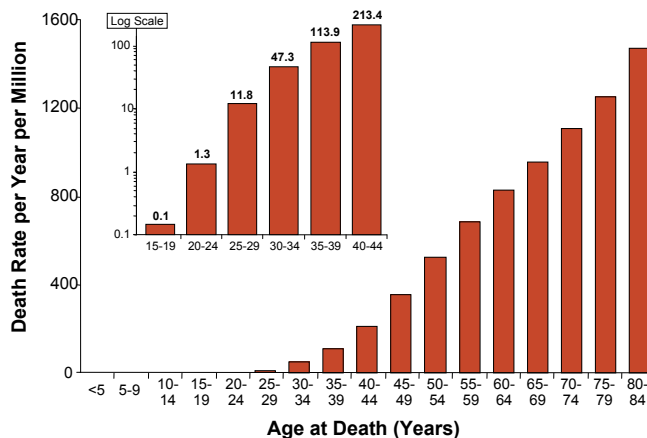


Figure 9.6: National Mortality for Breast Cancer in Females, U.S., 1975-2000

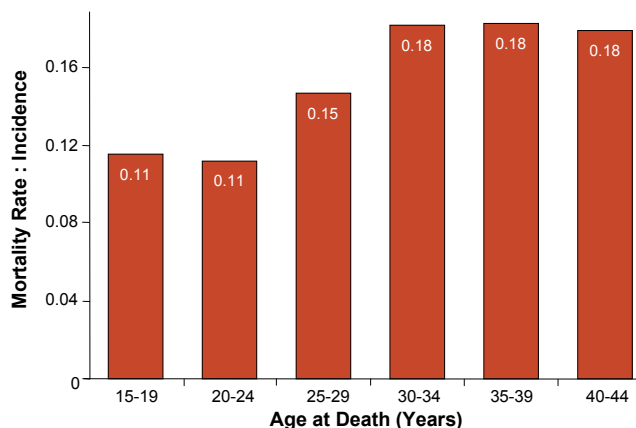


Figure 9.7: Ratio of National Mortality to SEER Incidence for Breast Cancer in Females, U.S., 1975-2000

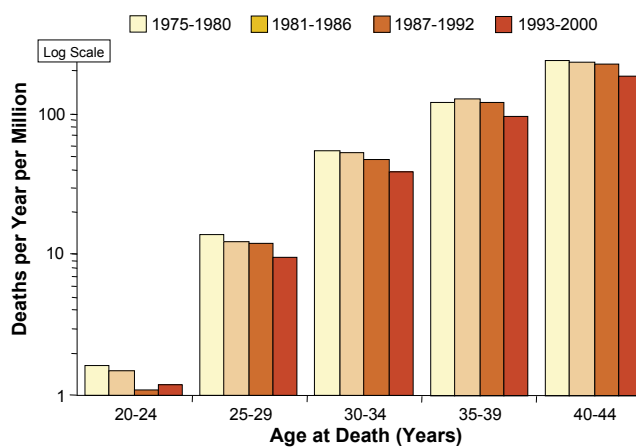


Figure 9.8: National Mortality for Breast Cancer in Females, U.S., by Era

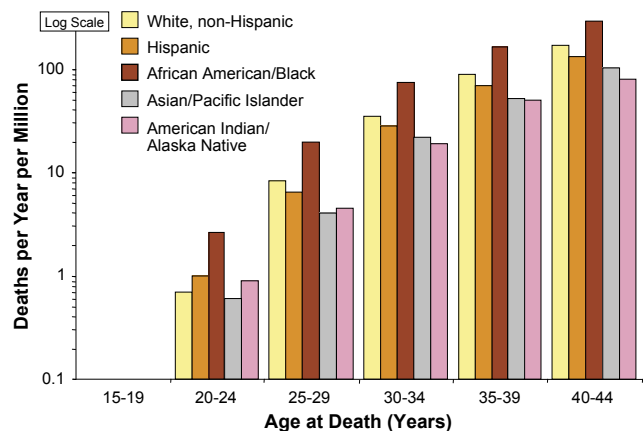


Figure 9.9: National Mortality for Breast Cancer in Females by Race/Ethnicity, 1990-2000

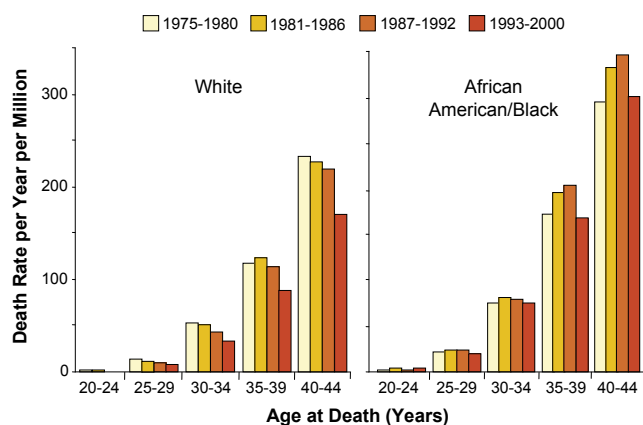


Figure 9.10: National Mortality for Breast Cancer in Females by Era, 1975-2000

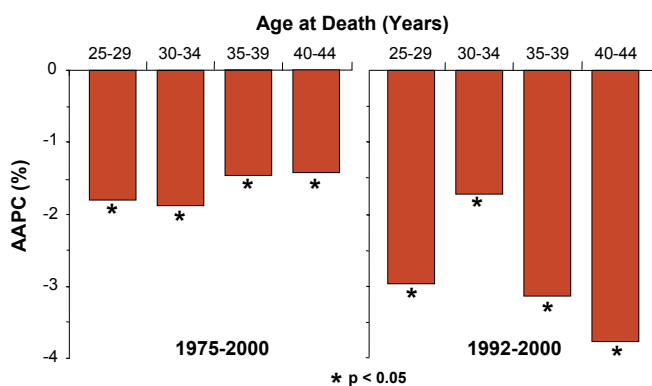


Figure 9.11: Average Annual Percent Change (AAPC) in National Mortality for Breast Cancer in Females, 1975-2000

Data analysis of death from breast cancer (1973 to 2000) and its association to age at diagnosis, stage, and ethnicity indicates that breast cancer was the cause of death more often in younger patients as compared to older patients, and was associated with advanced stage and race. African American/black women did not achieve survival rates similar to white non-Hispanic women.⁸

Trends in Mortality

A reduction in breast cancer mortality occurred over time, and was significant for each age group. This improvement has been considerable in more recent years (Figure 9.11).

The average annual percent change in mortality for whites compared to African Americans/blacks reveals a significant discrepancy between the two racial groups. Whites experienced substantial improvements in survival in all age groups in the period 1975 to 2000—improvements not observed in the African American/black population. Decreases in mortality during this period were three times greater for whites than for African Americans/blacks (Figure 9.12).

Survival

Five-year survival rates for breast cancer, by age, revealed that survival was lowest for those in the adolescent and young adult age group. Within that group, 25- to 29-year-old women had slightly lower survival rates than those younger or older (Figure 9.13). This lower survival rate for 15- to 29-year-old women may be due to several factors: breast cancer in young women is typically invasive, more aggressive and associated with a worse prognosis

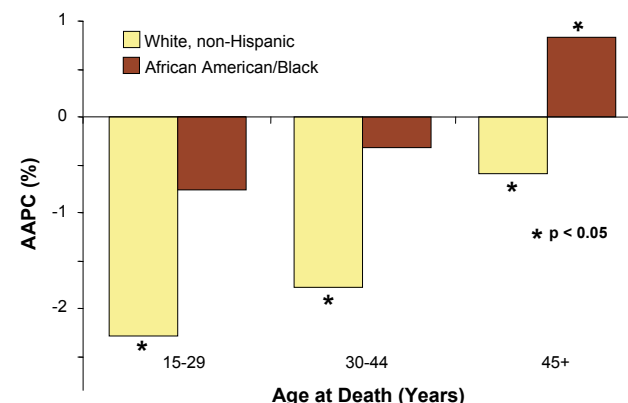


Figure 9.12: Average Annual Percent Change (AAPC) in National Mortality for Breast Cancer in Females, by Race, 1975-2000

than in older women,^{1,2} detection rates are lower due to lack of suspicion in the general population and medical community, and breast tissue in younger women is commonly more dense than in older women, resulting in mammography results which may be inconclusive.

Five-year survival rates, by era, revealed that although survival rates for the adolescent and young adult population remained relatively stable over time, slight improvement was seen in the most recent era (Figure 9.14).

Breast cancer survival is consistently lower for adolescent and young adult women than for other age groups, regardless of histologic type. For all age groups, 5-year survival is limited for women with inflammatory disease (Figure 9.15). Lower survival rates reflect the aggressive biologic and pathologic characteristics of tumors specific to this age group, and the fact that routine screening for breast cancer is not the standard of care in adolescents and young adults. Although treatment modalities have improved considerably over the last 30 years, due to National Cancer Institute initiatives for the care of breast cancer patients, improvements in survival have not been observed in adolescents and young adults to the extent seen in older females.

Five-year survival rates were generally low for 20- to 24-year-old women, except for those with localized disease at diagnosis. For localized disease, women in the age groups 20 to 24 and 40 to 44 had high survival rates, although rates were relatively high for all ages (Figure 9.16). For regional and distant disease, survival rates increased with age. As expected, survival for all women was best for those with localized disease, followed by those with regional disease. Survival was poor for all women with distant disease (Figure 9.16).

The average annual percent change in 5-year survival rates from 1975 to 2000 is shown in Figure 9.17. For young women 15 to 29 years of age, decreases in 5-year survival rates were noted for localized and regional disease. Decreases were also seen for women 30 to 44 years of age with regional disease, but significantly better survival was noted for those with localized or distant disease. For those over 45 years of age, improvement—which was significant—was observed only for those with localized disease. This may indicate the benefit of awareness campaigns and breast cancer screening in the older population.

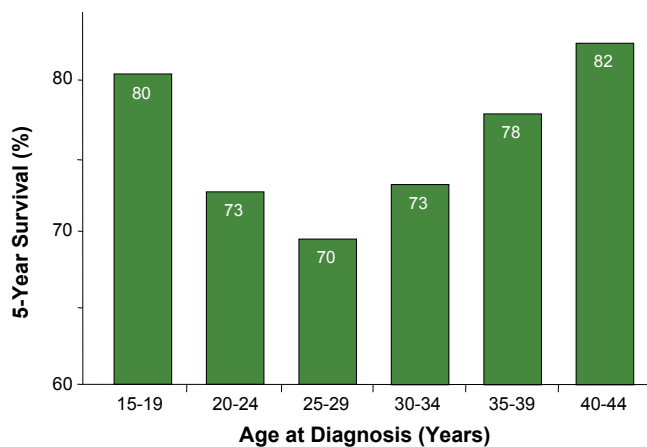


Figure 9.13: 5-Year Survival Rate for Breast Cancer in Females, SEER 1975-1999

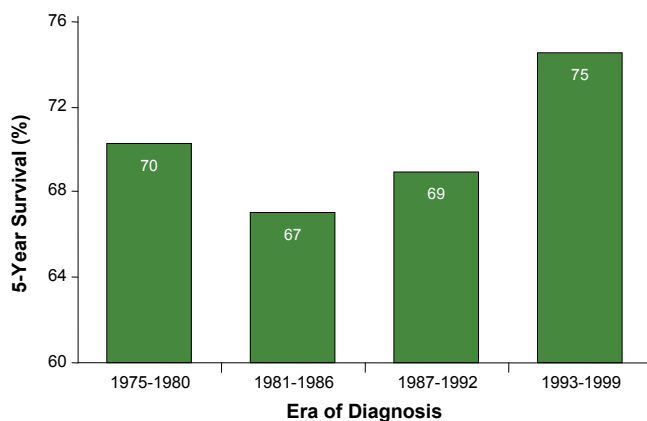


Figure 9.14: 5-Year Survival Rate for Breast Cancer in 15- to 29-Year-Old Females, by Era, SEER 1975-1999

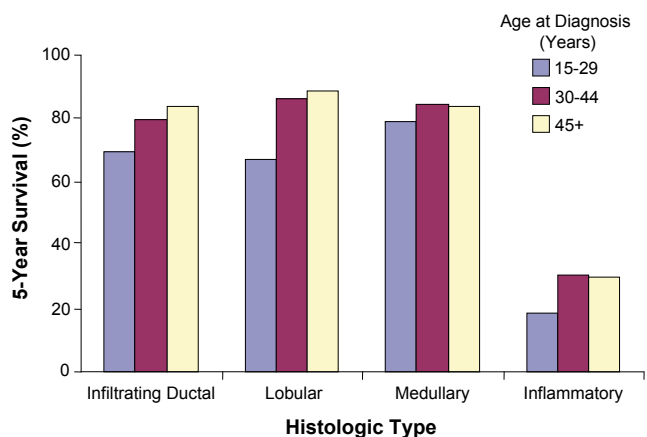


Figure 9.15: 5-Year Survival Rate for Breast Cancer in Females by Histologic Type and Age, SEER 1975-1999

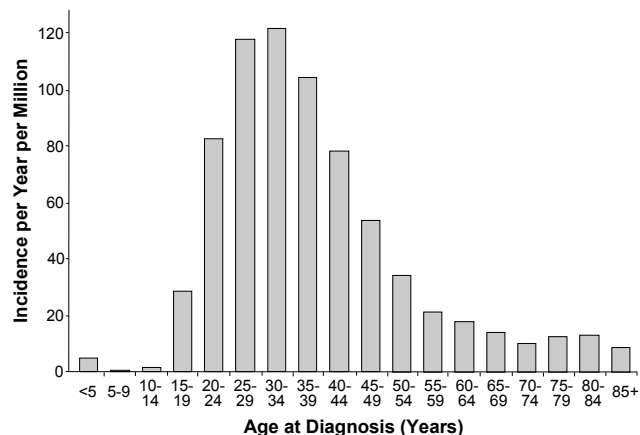


Figure 13.4: Incidence of Testicular Cancer in Males, All Ages, SEER 1975-2000

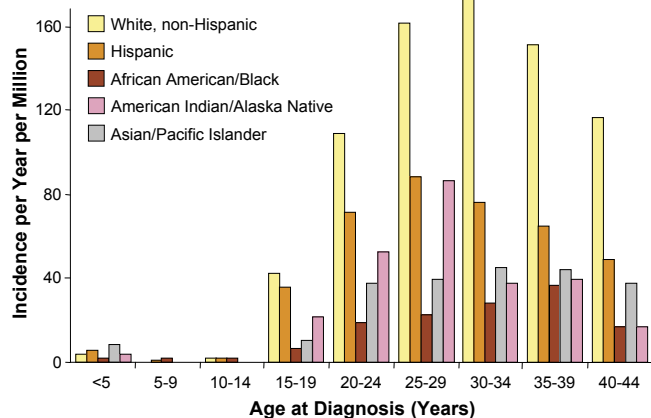


Figure 13.5: Incidence of Testicular Cancer in Males by Race/Ethnicity, SEER 1990-2000

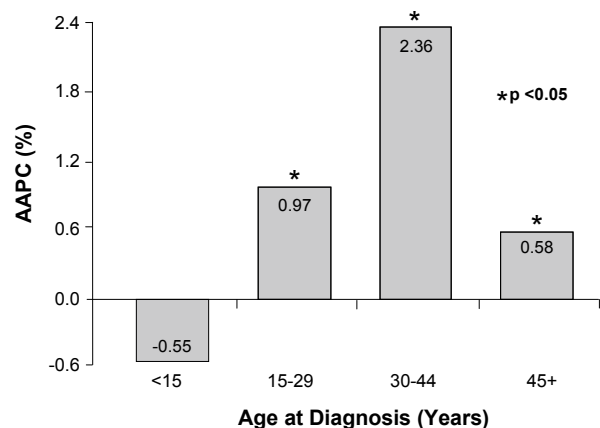


Figure 13.6: Average Annual Percent Change (AAPC) in Incidence for Testicular Cancer in Males, SEER 1975-2000

For some analyses the entire age range from birth to 85+ years is included. The absence of data in any figure or table within this chapter means that too few cases were available for analysis; it does not mean that the rate or change in rate was zero.

Since the ICCC was set up as a classification for childhood cancer, it does not have a separate category for testicular cancer alone. Topography and histology from ICD-O can be used to examine differences among very young testicular cancer patients compared to older patients, but it does not capture the molecular biology of testicular cancer. Males aged 15 to 29 are at a transition point from pediatric to adult biologic characteristics of testicular neoplasms. For example, the isochromosome of the short arm of chromosome 12, i(12p) is a specific genetic marker of all histologies of germ cell tumor in adults. This marker is rarely found in children or young adolescents with germ cell cancer.

INCIDENCE

The incidence of testicular cancer rose slowly in the 15- to 29-year age group during the observation period 1975 to 2000 (Figure 13.2). By comparison, there was a substantial increase in incidence for individuals 30 to 44 years of age.

Age-Specific Incidence

The incidence of testicular cancer as a function of age at diagnosis over the period 1975 to 2000 is presented in Figure 13.3. Relative to other tumors, the proportion of testicular cancers increased from 1% of all cancers in 10- to 14-year-old individuals to 21.8% of cancers diagnosed in the 25- to 29-year age group. There was an increase in all tumors combined in this older group, but the main contribution for the increase was the greater number of testicular cancers diagnosed (Figure 13.4). The incidence of testicular cancer peaked in the 25- to 29- and 30- to 34-year age groups, then decreased in successive 5-year age groups. At its peak, the annual incidence of testicular cancer exceeded 120 per million males.

Racial/Ethnic Differences in Incidence

At all adolescent and adult ages, the incidence of testicular cancer was highest in non-Hispanic whites and lowest in African Americans/blacks (Figure 13.5). Between 25 and 45 years of age, the incidence in non-Hispanic whites was more than 2-fold greater than in all other race/ethnicity groups.

Within the ICD-O, the topographic sites of the female genital tract are the vulva (C51.0-C51.9), vagina (C52.9), cervix uteri (C53.0-C53.9), corpus uteri (C54.0-C54.9), uterus NOS (C55.9), ovary (C56.9), fallopian tube (C57.0), and other specified and unspecified sites of female genital tract (C57.1-C57.9). The ICD-O morphology categories include carcinomas and adenocarcinomas (8010-8041, 8140, many others). Also included are malignant gonadal neoplasms [malignant thecomas (8600), malignant granulosa cell tumors (8620), malignant androblastomas (8630), Sertoli cell carcinoma (8640, and malignant Leydig cell tumor (8650)]. The germ cell neoplasms span categories 9060 to 9085 and include dysgerminoma (9060-9063), germinoma (9064), embryonal carcinoma (9070), endodermal sinus (yolk sac) tumor (9071), polyembryoma (9072), and teratoma/teratocarcinoma (9080-9083), and mixed germ cell tumor (9085).

Most cancers of the genital tract in 15- to 29-year-old females occur within the ovary and uterine cervix. Hence, this chapter focuses on cancer at these two sites. As explained in the *Methods* chapter, data are presented for 15- to 29-year-olds with comparisons to the age groups 0 to 15 years and 30 to 44+ years, as appropriate. For some analyses the entire age range from birth to 85+ years is included. The absence of data in any figure or table within this chapter means that too few cases were available for analysis; it does not mean that the rate or change in rate was zero.

Since the ICC was set up as a classification for childhood cancer, it does not have a separate category for female genital cancer or for specific sites such as ovary and cervix uteri. Topography and histology from ICD-O can be used to examine differences among young females with cancer of the genital tract compared to older patients, but it is not expected to capture the intermediate biology of these cancers in females aged 15 to 29, which is at a transition point from pediatric to adult features.

INCIDENCE

In the United States, genital tract tumors accounted for 17.8% of all invasive cancers in females 15 to 29 years of age who were diagnosed between 1975 and 2000 at SEER sites (Figure 14.1). In the year 2000, approximately

1,700 U.S. women aged 15 to 29 years were diagnosed to have a genital tract cancer (Table 14.1). Among 15- to 19-year-old females, the proportion of all invasive cancers that were genital tract tumors was 11.9%. Among 20- to 24-year-olds, the proportion was 15.4%, and among 25- to 29-year-olds it was 21.4% (Figure 14.2).

Age-Specific Incidence

The most common cancers in females 10 to 44 years of age are shown in Figure 14.3, each as a proportion of all cancers that occurred in women during 1975 to 2000. In 25- to 29-year-olds, genital tract tumors peaked as a proportion of all cancer and accounted for more cancers than any other category. In the 15- to 24-year age group, the genital-tract-cancer proportion was third to melanoma and thyroid malignancies.

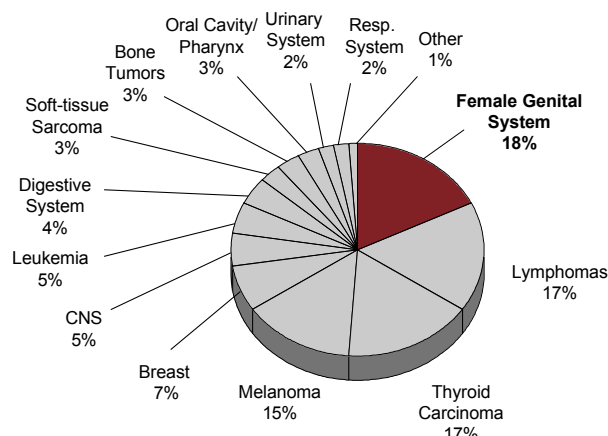


Figure 14.1: Cancer Incidence in 15- to 29-Year-Old Females

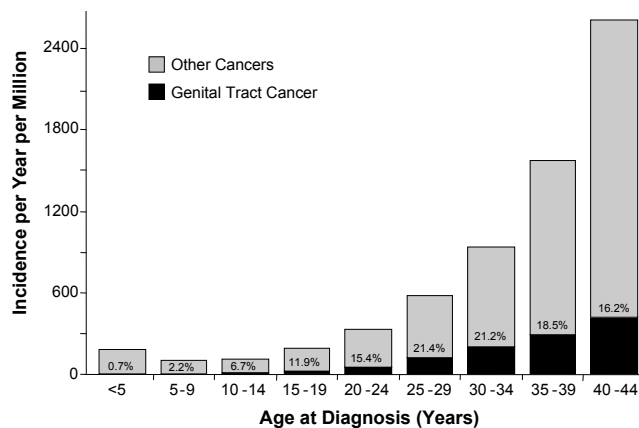


Figure 14.2: Incidence of Genital Tract Cancer Relative to All Cancer in Females, U.S., SEER 1975-2000

Racial/Ethnic Differences in Incidence

In 15- to 29-year-olds, the incidence of cervical cancer during 1992 to 2002 was higher in white non-Hispanic, Hispanic, and African American/black females than it was in females of other races/ethnicities (Figure 14.6). Among females over 30 years of age, however, Hispanics had the highest incidence of cervical cancer (Figure 14.6), a pattern that became more prominent with increasing age (data not shown).

Cancer of the ovary, however, occurred most frequently in Asian/Pacific Islander females and was distinctly less common in American Indian/Alaska Native females (Figure 14.7). Among females over 30 years of age, however, non-Hispanic whites had the highest incidence of ovarian cancer, a difference that became more prominent with increasing age (data not shown).

Trends in Incidence

The incidence of cancer of the cervix was 33.6 per year per million in 15- to 29-year-olds; this increased dramatically for those over 30 years of age (Figure 14.8). Over time, however, the incidence of cervical cancer declined slightly in the 20- to 24-year-old group (Figure 14.9), a trend that was also noted in older age groups. This reduction in incidence is attributable to a decline in the incidence of squamous cell carcinoma of the cervix, although the incidence of adenocarcinoma of the cervix actually increased.¹

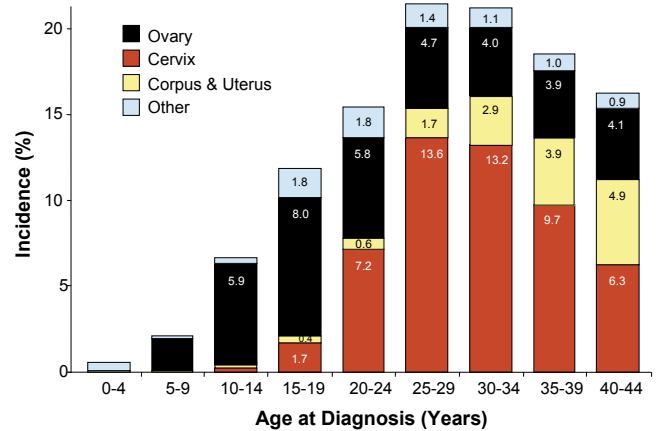


Figure 14.4: Incidence of Female Genital Tract Tumors as a Proportion of All Cancer, by Age and Tumor Type, SEER 1975-2000

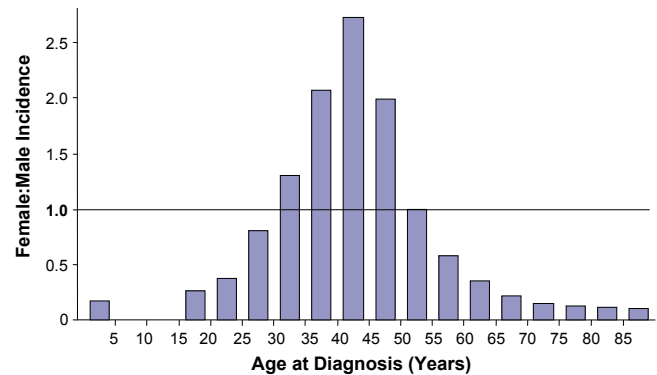


Figure 14.5: Incidence of Genital Tract Cancer, Female:Male Ratio, SEER 1975-2000

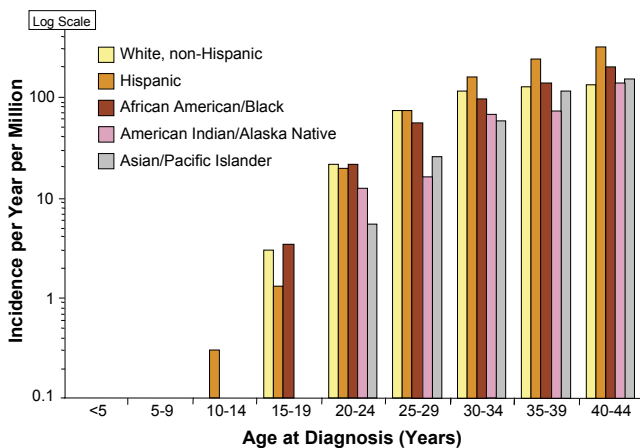


Figure 14.6: Incidence of Cervical Cancer in Females by Race/Ethnicity, SEER 1992-2002

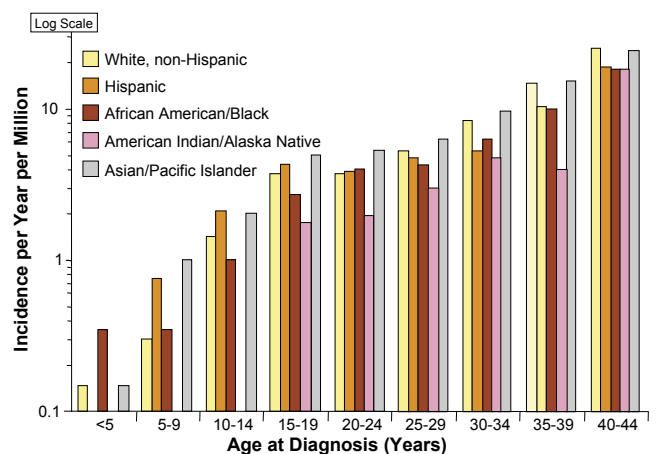


Figure 14.7: Incidence of Ovarian Cancer in Females by Race/Ethnicity, SEER 1992-2002

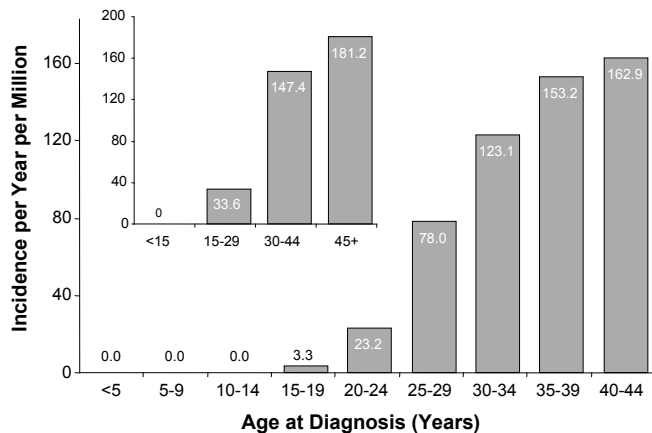


Figure 14.8: Incidence of Cervical Cancer, SEER 1975-2000

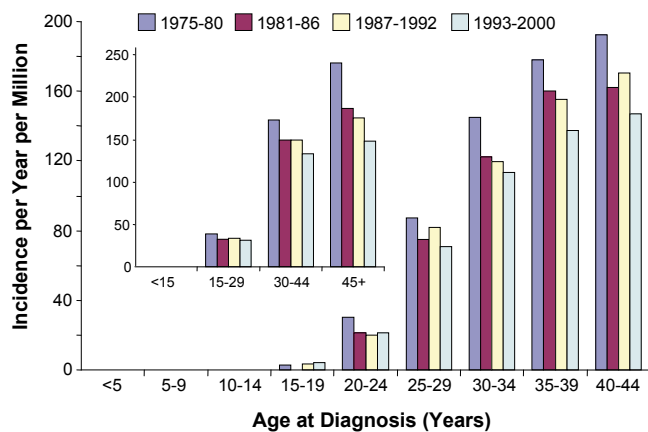


Figure 14.9: Incidence of Cervical Cancer by Era, SEER

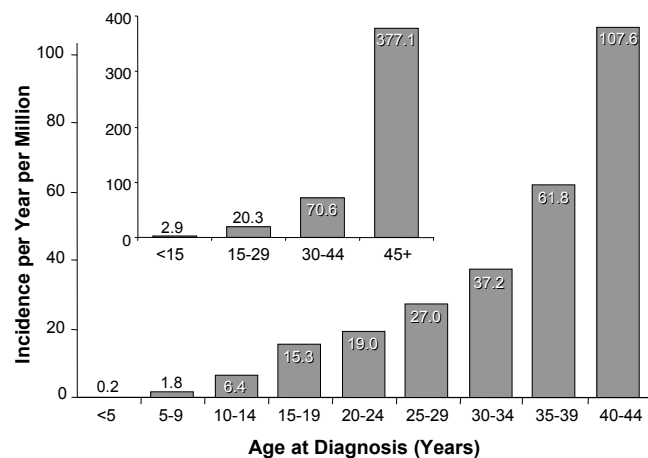


Figure 14.10: Incidence of Ovarian Cancer, Excluding Borderline Histology, SEER 1975-1999

The incidence of cancer of the ovary is depicted in Figure 14.10. In 15- to 29-year-olds the incidence was 20.3 per year per million, but this increased dramatically to 377 per year per million in adults over 45 years of age.

OUTCOME

Mortality

The U.S. mortality for cervical carcinoma from 1975 to 2000 is shown in Figure 14.11. In the 15- to 19-year age group, the death rate was 0.1 deaths/year/million; in 20- to 24-year-olds the rate was 1.9 deaths/year/million, and in 25- to 29-year-olds it was 8.4 deaths/year/million, reflecting increasing incidence. The African American/black population had the highest mortality for cervical carcinoma at all ages (Figures 14.12 and 14.13). Among 15- to 29-year-olds, Asians/Pacific Islanders had the lowest mortality (Figure 14.13). The mortality differential in African Americans/blacks, relative to other races/ethnicities, was greater than the corresponding difference in incidence.

Mortality for cancer of the ovary in persons younger than age 45 is shown in Figure 14.14. The pattern reflects the incidence-versus-age profile. Mortality according to race/ethnicity (Figure 14.15) was generally similar among adolescents and young adults and reflective of the incidence patterns. American Indians/Alaska Natives were an exception, in that 20- to 39-year-olds had a disproportionately higher death rate in comparison to incidence (Figure 14.7).

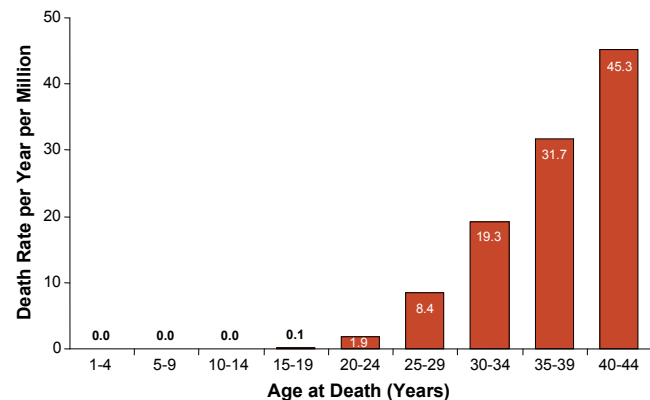


Figure 14.11: National Mortality for Cervical Carcinoma, U.S., 1975-2000

Survival

The 5-year survival rate of women diagnosed between 1975 and 2000 with cervical carcinoma was 91% in 15- to 19-year-olds, 89% in 20- to 24-year-olds, and 87% in 25- to 29-year-olds (Figure 14.16). The survival rate in older patients plummeted as a function of age.

The 5-year survival rate of women diagnosed between 1975 and 2000 with cancer of the ovary was between 83% and 87% for the 5-year age intervals between 15- and 29-years of age (Figure 14.17). In older patients, the survival rate declined dramatically as a function of age, and at a steeper slope than that of cervical carcinoma.

Trends in Survival

Figure 14.18 depicts the change in 5-year survival rates for carcinoma of the cervix as a function of era, from 1975 to 1998. According to these data, there was no improvement in survival over the last quarter century among 15- to 29-year-olds with cervical carcinoma. Figure 14.19 shows analogous data for ovarian cancer, and similarly indicates that there was no improvement in the 5-year survival rate among 15- to 29-year-olds with ovarian cancer, in contradistinction to the improvement in survival noted for women older than 30 years when diagnosed with ovarian cancer.

RISK FACTORS

The risk of developing ovarian carcinoma is influenced by genetic, hormonal, and environmental factors.

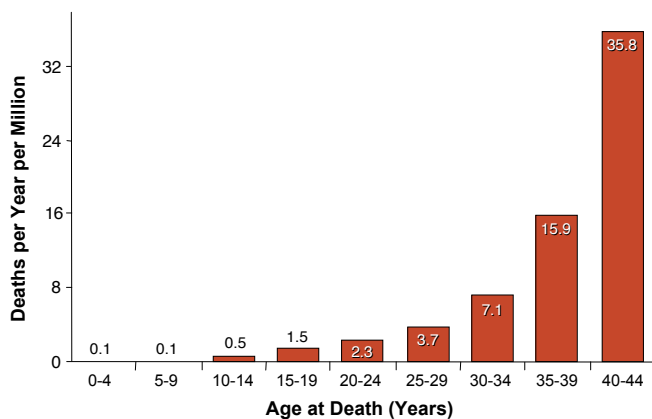


Figure 14.14: National Mortality for Ovarian Cancer, U.S., 1975-2000

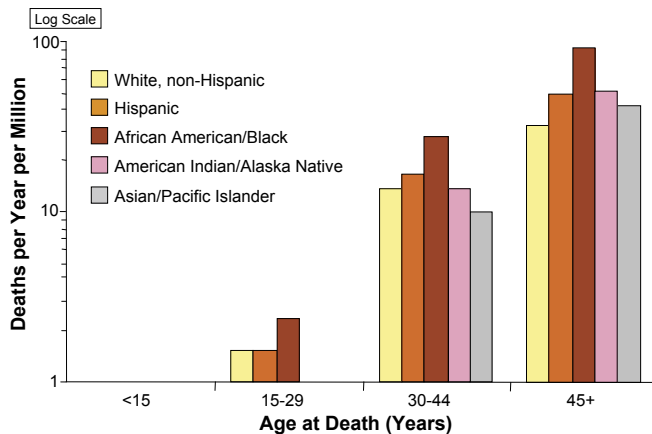


Figure 14.12: National Mortality for Cervical Carcinoma in Females, by Race/Ethnicity, SEER 1992-2002

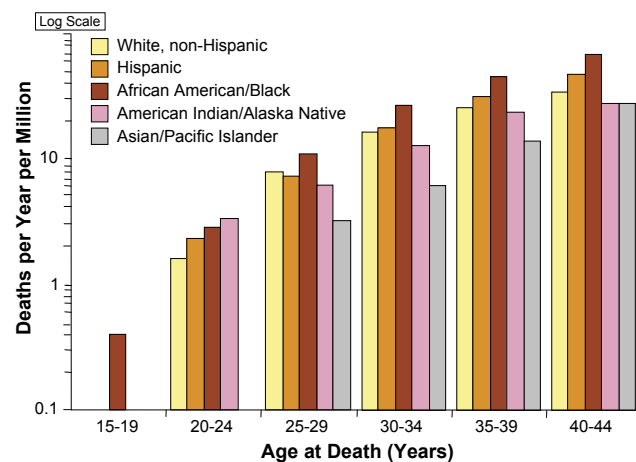


Figure 14.13: National Mortality for Cervical Carcinoma by Race/Ethnicity, U.S., 1975-2000

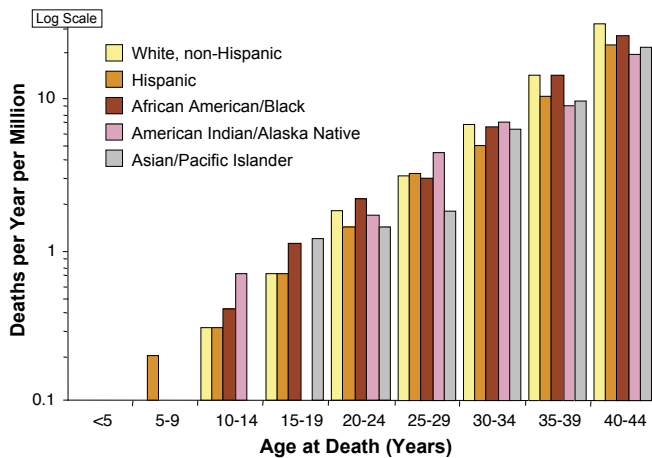


Figure 14.15: National Mortality for Ovarian Cancer by Race/Ethnicity, U.S., 1990-2000