CANCER INCIDENCE AND MORTALITY IN DELAWARE, 2009-2013

DELAWARE HEALTH AND SOCIAL SERVICES
DIVISION OF PUBLIC HEALTH
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CHAPTER 1: EXECUTIVE SUMMARY

This report presents the 2009-2013 cancer incidence and mortality data and statistics in Delaware. This annual report is published in conjunction with the Delaware Cancer Consortium (DCC) as a source of information for Delawareans on cancer incidence and mortality in the State. It is also used by the Division of Public Health (DPH) and other stakeholders to inform decisions on how to outreach and program strategies to combat cancer incidence and mortality in Delaware.

Cancer incidence (the number of new cases of cancer in a population over a time period)[1] and mortality (the number of deaths from cancer in a population over a time period)[2] rates and other analysis are performed by the Delaware Comprehensive Cancer Control Program staff. Incidence data is obtained from the Delaware Cancer Registry (DCR) and mortality data is obtained from the Delaware Health Statistics Center.

This report includes cancer statistics for all cancer sites combined (all-site cancer), as well as eight specific cancer types. These cancer statistics reflect incidence and mortality data for 2009-2013. The Division of Public Health (DPH) compares Delaware's cancer incidence and mortality trends for 2009-2013 to those of the U.S. over the same time period. DPH also summarizes how Delaware and U.S. cancer rates have changed from 1999-2003 to 2009-2013.

Despite fluctuations in all-site cancer incidence from 1999-2003 to 2009-2013, Delaware's 2009-2013 all-site cancer incidence rate was only 1 percent less than in 1999-2003. During the same time period, the comparable U.S. all-site cancer incidence rate fell 7 percent. While progress continues to be made, Delaware's 2009-2013 all-site cancer incidence rate (507.3 per 100,000) remains 13 percent higher than the comparable U.S. rate (448.7 per 100,000).

From 1999-2003 to 2009-2013, all-site cancer incidence decreased by 4 percent among Delaware males but rose 2 percent among Delaware females. African American Delawareans have experienced especially noteworthy declines in all-site cancer incidence. From 1999-2003 to 2009-2013, the all-site cancer incidence rate fell 9 percent among African Americans in Delaware. Among Caucasian Delawareans, the all-site cancer incidence rate increased by 1 percent during the same time period.

Delaware's 2009-2013 all-site cancer mortality rate of 176.1 per 100,000 was 5 percent higher than the U.S. rate of 168.5 per 100,000 and the difference in rates was statistically significant.

Although Delaware's all-site cancer mortality rate has historically been higher than the U.S. rate, the gap has narrowed over the last decade as the state continues to make excellent strides in reducing the cancer mortality rate through cancer screening and early detection. **Delaware's ranking of 16 among the states for highest all-site cancer mortality is two spots lower than the ranking of 14 highest in last year's report which looked at the 2008-2012 time period, and represents considerable continued progress since the 1990s, when the state ranked second.**

In the early 1990s, Delaware ranked second highest among U.S. states for all-site cancer mortality; for the 2009-2013 time period, Delaware ranked 16th highest among U.S. states**. From 1999-2003 to 2009-2013, Delaware's cancer death rate decreased 15 percent, an improvement that was similar to the decline seen nationally (14 percent).**

Male Delawareans experienced a slightly greater rate of decline in cancer mortality (18 percent) than females (14 percent). **The all-site cancer mortality rate among African American Delawareans declined 24 percent, compared to 13 percent among Caucasian Delawareans.**

[1] https://seer.cancer.gov/statistics/types/incidence.html
[2] https://seer.cancer.gov/statistics/types/mortality.html

Many factors contribute to Delaware's progress in reducing its cancer burden. Below is a brief summary of key factors, broken down by cancer type, that impact cancer in Delaware.

LUNG CANCER

- **Lung cancer continues to account for an enormous share of Delaware's overall cancer burden**. From 2009-2013, lung cancer accounted for 14 percent of all newly-diagnosed cancer cases and 30 percent of all cancer deaths in Delaware.
- **According to the U.S. Department of Health and Human Services, an estimated 85 to 90 percent of all lung cancer cases are caused by tobacco use.** Delaware has reaped the benefits of statewide reductions in tobacco use that began decades ago. While tobacco use rates have fallen sharply among Delaware males, tobacco use rates are high among Delaware females.
- Prior to January 2013, there were no early lung cancer screening recommendations endorsed by the American Cancer Society. Unfortunately, the majority of lung cancer cases continue to be diagnosed in the distant stage (i.e., when the cancer has spread from the primary site to distant tissues or organs or to distant lymph nodes). From 2009-2013, Delaware and the U.S. had a similar proportion of lung cancers diagnosed at the distant stage (53 percent). Additionally, treatment options are not as effective for lung cancer as for some other forms of cancer.
- Beginning in 2015, the DPH's Screening for Life Program covers lung cancer screenings for qualified Delawareans. The screening – known as a low-dose CT scan – aims to catch lung cancer early, when it is most treatable. The screening is available to current and former smokers deemed at high risk for lung cancer.
- Delaware ranked 10th in the nation for lung cancer incidence (compared to 12th in 2008-2012). From 1999-2003 to 2009-2013, lung cancer rates declined 15 percent for Delaware males, compared to 17 percent for U.S. males. **The lung cancer incidence rate for Delaware females decreased 1 percent during the same time period, compared to a 5 percent decline in the U.S. rate.**
- Historically, Delaware's lung cancer mortality rates have been higher than U.S. rates; however, the gap in rates has narrowed among males. Delaware's male lung cancer mortality rate for 1980-1984 was 19 percent greater than the U.S. rate, compared to 2009-2013, when the rate was 13 percent higher than the U.S.
- Between 1999-2003 and 2009-2013, Delaware's lung cancer mortality rate fell 15 percent while the U.S. rate dropped 17 percent.
- **Delaware's lung cancer mortality rates have declined noticeably among African Americans.** From 1999-2003 to 2009-2013, Delaware's lung cancer mortality rates declined 36 percent among African American males and 23 percent among African American females.
- Among Caucasian Delawareans, males experienced greater reductions in lung cancer mortality compared to females. From 1999-2003 to 2009-2013, Delaware's lung cancer mortality rate decreased 18 percent among Caucasian males and 6 percent among Caucasian females.
- **For the 2009-2013 time period, Delaware females ranked 11th highest in the nation in lung cancer mortality while Delaware males ranked 16th.**

COLORECTAL CANCER

- From 1999-2003 to 2009-2013, Delaware's colorectal cancer incidence rate decreased 33 percent while the comparable U.S. rate fell 23 percent. For both males and females, Delaware's colorectal cancer incidence rates declined faster than the U.S. Among males, Delaware's incidence rate declined 34 percent

while the U.S. incidence rate declined 25 percent. Among females, Delaware's incidence rate declined 32 percent while the U.S. incidence rate declined 22 percent.

- From 1999-2003 to 2009-2013, Delaware's greatest improvements in colorectal cancer rates were observed among African Americans; incidence rates for African American males and females declined 37 percent and 39 percent, respectively.
- **For 2009-2013, the colorectal cancer incidence rate among African Americans in Delaware (38.3 per 100,000) was statistically significantly lower than the U.S. (41.0 per 100,000).**
- For the 2009-2013 time period, 56 percent of all colorectal cancer cases diagnosed in Delaware were detected in the regional or distant stages (i.e. after the cancer had spread from its original location). This reflects an 11 percent decline since 1999-2003 in the percentage of regional and distant stage colorectal cancer diagnoses.
- **Historically, Delaware's colorectal cancer mortality rate has been higher than the U.S. rate. However, for 2009-2013, Delaware's colorectal cancer mortality rate was lower than that of the U.S. (14.1 per 100,000 vs 15.1 per 100,000, respectively) but this difference was not statistically significant.**
- From 1999-2003 to 2009-2013, Delaware's colorectal cancer mortality rate decreased 33 percent while the national rate decreased 25 percent. Delaware ranked 38th in 2009-2013 compared to 37th in 2008-2012.
- **The reduction in colorectal cancer mortality rates is especially noteworthy among African American Delawareans.** From 1999-2003 to 2009-2013, Delaware's colorectal cancer mortality rates declined 45 percent among African American males, compared to 30 percent among Caucasian males. During the same time period, colorectal cancer mortality declined 52 percent among African American females, compared to 34 percent among Caucasian females.
- Improvements in the number of colorectal cancer cases diagnosed in the earliest, most treatable stages contributed to Delaware's reduction in colorectal cancer mortality rates. Data from the 2014 Behavioral Risk Factor Survey (BRFS) showed that **in 2014, Delaware ranked fifth highest in prevalence in the U.S. for colorectal cancer screening.** Nearly 77 percent of Delawareans age 50 and older reported ever having had a sigmoidoscopy or colonoscopy. The U.S. national median of ever having a sigmoidoscopy or colonoscopy was 69 percent.

BREAST CANCER

- The 2009-2013 breast cancer incidence rate for Delaware (130.1 per 100,000) was higher than the U.S. rate (125.0 per 100,000), but the difference was not statistically significant. Delaware was ranked 12th in 2009-2013 compared to 17th in 2008-2012.
- From 1999-2003 to 2009-2013, Delaware's breast cancer incidence rate increased by 1 percent while the comparable U.S. rate fell 6 percent. During this time period, there was no change in the breast cancer incidence rate for Caucasian females. In contrast, the breast cancer incidence rate increased 9 percent among African American females.
- The proportion of breast cancer cases diagnosed in the earliest, most treatable stage has greatly improved in Delaware over the past three decades. The proportion of Delaware breast cancers diagnosed at the local stage increased from 42 percent in 1980-1984 to 67 percent in 2009-2013.
- Although Delaware's 2009-2013 breast cancer mortality rate (21.7 per 100,000) was nearly identical to the U.S. rate (21.5 per 100,000), African American females in Delaware had a lower mortality rate (24.9 per 100,000) than African American females in the U.S. (29.6 per 100,000). These differences were not statistically significant.

- **From 1999-2003 to 2009-2013, Delaware's decline in breast cancer mortality (19 percent) was greater than the decline seen nationally (17 percent).** Delaware was ranked 22nd in 2009-2013 compared to 23rd in 2008-2012.
- **Delaware's decline in breast cancer mortality rates was especially pronounced among African Americans.** From 1999-2003 to 2009-2013, Delaware's female breast cancer mortality rate decreased 29 percent among African Americans and 15 percent among Caucasians.
- It is highly likely that improvements in the early detection of breast cancer contributed to Delaware's progress seen in breast cancer mortality. Data from the 2014 Behavioral Risk Factor Survey (BRFS) showed that Delaware females ranked third highest nationally in the prevalence of females age 40 and over who have had a mammogram within the past two years (80 percent).

PROSTATE CANCER

- From 1999-2003 to 2009-2013, Delaware's prostate cancer incidence rate decreased 14 percent while the U.S. rate fell 28 percent. Delaware's 2009-2013 prostate cancer incidence rate (151.4 per 100,000) was statistically significantly higher than the U.S. (129.4 per 100,000). These trends most likely reflect a greater prevalence of prostate cancer screening in Delaware compared to the U.S.
- **Results from the 2014 BRFS show that Delaware ranked 12th in the nation in the prevalence of males age 40 and over who have had a PSA (protein-specific antigen) test within the past two years.**
- Delaware's prostate cancer incidence was ranked 3rd in 2009-2013 compared to 5th in 2008-2012.
- The proportion of prostate cancer cases detected in the local stage has increased dramatically during the past 30 years in Delaware. From 1980-1984 through 2009-2013, Delaware's percentage of prostate cancer cases diagnosed in the local stage increased substantially, from 50 percent to 81 percent.
- **The prostate cancer incidence rate among African American Delawareans continues to be significantly greater than the comparable rate for Caucasians. Delaware's 2009-2013 prostate cancer incidence rate was 230.5 per 100,000 for African Americans, compared to 137.2 per 100,000 for Caucasians. This same trend is observed in the U.S.**
- Delaware's mortality rate for prostate cancer was ranked 35th in 2009-2013, compared to 18th in 2008-2012.
- Although the prostate cancer mortality rate for African American Delawareans remains nearly double the comparable rate for Caucasians, Delaware has made progress in reducing this health disparity. From 1999-2003 to 2009-2013, prostate cancer mortality declined 34 percent among African American Delawareans, compared to 30 percent among Caucasian Delawareans.
- From 1987-1991 to 1995-1999, Delaware's prostate cancer mortality rate among African Americans was substantially elevated compared to Caucasians. Beginning in 2000-2004, however, the racial disparity began to narrow with each successive time period considered.
- **As of 2009-2013, the African American (2000-2004: 49.9 per 100,000; 2009-2013: 37.9 per 100,000) and Caucasian (2000-2004: 25.1 per 100,000; 2009-2013: 17.6 per 100,000) prostate cancer mortality rates were the most similar since cancer data surveillance efforts began in 1980.**

TRENDS IN CANCER INCIDENCE

For 2009-2013, Delaware's all-site cancer incidence was statistically significantly higher than the U.S. Delaware's incidence rates were also statistically significantly higher than the U.S. for female breast, lung, melanoma, oral, and prostate cancers.

Delaware's all-site cancer incidence rate declined 1 percent from 1999-2003 to 2009-2013; however, during the same time period, incidence rates for several cancer sites experienced more substantial fluctuations. In Delaware, melanoma cancer incidence increased 78 percent from 1999-2003 to 2009-2013, while the comparable U.S. rate increased 14 percent.

Table 1-1 summarizes 2009-2013 age-adjusted incidence rates and 95 percent confidence intervals for Delaware and the U.S. for all-site cancer and the eight individual cancer sites included in this report. Included in the table is the percentage change in rates (both for Delaware and the U.S.) from 1999-2003 to 2009-2013.

TABLE 1-1: AVERAGE ANNUAL AGE-ADJUSTED CANCER INCIDENCE RATES WITH 95 PERCENT CONFIDENCE INTERVALS; DELAWARE VS. U.S., 2009-2013

Cancer Site	DE Incidence Rate 2009-2013	U.S. Incidence Rate 2009-2013	DE % Change: 99-03 to 09-13	U.S. % Change: 99-03 to 09-13
All-Site*	507.3 (501.2, 513.5)	448.7 (448.1, 449.4)	-1	-7
Brain	6.6 (5.9, 7.3)	6.4 (6.3, 6.5)	+3	-4
Female breast*	130.1 (125.9, 134.5)	125.0 (124.5, 125.5)	+1	-6
Cervical	8.3 (7.2, 9.6)	7.5 (7.4, 7.6)	-3	-3
Colorectal	38.3 (36.6, 40.0)	41.0 (40.8, 41.2)	-33	-23
Lung/bronchus*	71.4 (69.2, 73.8)	57.3 (57.1, 57.5)	-8	-11
Melanoma*	30.1 (28.6, 31.7)	21.8 (21.7, 21.9)	+78	+14
Oral*	12.2 (11.3, 13.2)	11.1 (11.0, 11.2)	+5	+4
Prostate*	151.4 (146.6, 156.3)	129.4 (128.9, 129.9)	-14	-28

* = Delaware incidence rate is statistically significantly higher than the U.S. rate at the 95 percent confidence level
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

TRENDS IN CANCER MORTALITY

Although Delaware's 2009-2013 all-site cancer mortality rate was significantly greater than the U.S., Delaware's rate for the 1999-2003 to 2009-2013 time period declined 15 percent, compared to 14 percent for the U.S. From 1999-2003 to 2009-2013, Delaware has made great strides in reducing its cancer mortality burden for several cancer types (especially female breast, cervical, colorectal, and prostate cancer). The only cancer with an increase in mortality in Delaware is oral cancer (increase of 13 percent).

TABLE 1-2: AVERAGE ANNUAL AGE-ADJUSTED CANCER MORTALITY RATES WITH 95 PERCENT CONFIDENCE INTERVALS; DELAWARE VS. U.S., 2009-2013

Cancer Site	DE Mortality Rate 2009-2013	U.S. Mortality Rate 2009-2013	DE % Change: 99-03 to 09-13	U.S. % Change: 99-03 to 09-13
All-Site*	176.1 (172.5, 179.7)	168.5 (168.3, 168.7)	-15	-14
Brain	4.1 (3.6, 4.7)	4.3 (4.3, 4.3)	-13	-4
Female breast	21.7 (20.0, 23.5)	21.5 (21.4, 21.6)	-19	-17
Cervical	2.6 (2.0, 3.3)	2.3 (2.3, 2.3)	-26	-15
Colorectal	14.1 (13.1, 15.1)	15.1 (15.0, 15.2)	-33	-25
Lung/bronchus*	52.0 (50.0, 54.0)	46.0 (45.9, 46.1)	-15	-17
Melanoma	2.9 (2.4, 3.4)	2.7 (2.7, 2.7)	-9	-4
Oral	2.6 (2.2, 3.1)	2.4 (2.4, 2.5)	+13	-11
Prostate	19.9 (18.1, 22.0)	20.7 (20.5, 20.8)	-30	-29

* = Delaware mortality rate is statistically significantly higher than the U.S. rate at the 95 percent confidence level
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Source (Delaware): Delaware Health Statistics Center, 2016; (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

CENSUS TRACT ANALYSES

This report also includes cancer incidence rates for each of Delaware's census tracts as required by Title 16, Chapter 292 of the Delaware Code (Appendix E). Census tract analyses were conducted for 2009-2013. Census tracts were determined by the Census 2010 designations since they were in effect at the time of analysis. The Census 2010 subdivided Delaware into 214 census tracts rather than the 197 census tracts in the Census 2000.

Results for 2009-2013 show that:

- In 30 of Delaware's 214 census tracts, the all-site cancer incidence rate was statistically significantly higher than Delaware's average 2009-2013 incidence rate (510.0 per 100,000)[3].
- In 20 of Delaware's 214 census tracts, the all-site cancer incidence rate was statistically significantly lower than Delaware's average 2009-2013 incidence rate (510.0 per 100,000).
- All-site cancer incidence rates for the remaining 164 census tracts were not significantly different from the state's average rate for the 2009-2013 time period.
- Age-adjusted five-year cancer incidence rates for 2009-2013 by census tract with 95 percent confidence intervals are presented in Appendix H. Census tract maps color-coded by rate quintiles are located in Appendix I. Census tract maps that indicate tracts with significantly high or significantly low incidence rates are located in Appendix J.

There is an inherent instability in calculating cancer incidence rates at the census tract level. In a small group, such as a census tract, the snapshot changes considerably from year to year. If one case of cancer is diagnosed in a census tract one year, and three cases of cancer are diagnosed in the same census tract the next year, the cancer rate for that census tract will change dramatically from one year to the next. These large fluctuations do not typically occur in larger populations. If we compare the cancer rate for a census tract to the cancer rate for the whole state of Delaware for a given time period, it would not be unusual to find the comparison different (perhaps even reversed) in the following time period.

When assessing cancer incidence data by census tract, the occurrence of cancer may differ across census tracts for a variety of reasons. For example, lifestyle behaviors may cluster in a homogeneous community. In addition, the presence or absence of exposure to environmental or occupational carcinogen(s) is often limited to a defined geographic area. In addition, residents in certain geographic areas may be more impoverished than other residents, which will affect their availability of health insurance coverage as well as their level of access to health care, particularly cancer screening services. Finally, chance or random variation can play a role, since approximately 5 percent of all comparisons would be significantly different due to chance alone.

[3] 510.0 is average 2009-2013 Delaware incidence rate calculated by Excel rather than SEER*Stat (503.9).

CHAPTER 2: INTRODUCTION

DELAWARE CANCER REGISTRY

The Delaware Cancer Registry (DCR) is managed by the Division of Public Health (DPH) and serves as the state's central cancer information center. The DCR was founded in 1972 and legally established in 1980 under the Delaware Cancer Control Act[4]. The act stipulated that all hospitals, clinical laboratories, and cancer treatment centers in the state report all new cancer cases to the DCR. In 1996, the Delaware Cancer Control Act was amended to require any health care practitioner who diagnoses or provides treatment to report cancer cases to the DCR. Further enhancements of the Delaware Cancer Control Act took effect in 2002 with the passage of Senate Bill 372 that requires physicians to provide additional information to the DCR, including patients' duration of residence in Delaware and their occupational history. Senate Bill 372 also extended the reporting deadline to 180 days from initial diagnosis or treatment.

Today, Delaware is one of 45 states whose central cancer registry is supported by the National Program of Cancer Registries (NPCR) of the Centers for Disease Control and Prevention (CDC).[5] The DCR ensures accurate, timely, and routine surveillance of cancer trends among Delawareans.

REPORTING FACILITIES

There are seven Delaware hospitals currently reporting cancer cases to the DCR. Forty-nine non-hospital offices submit data to the DCR: 11 diagnostic laboratories, 24 physician offices and 14 free-standing ambulatory surgery centers. Additionally, the DCR has reciprocal data exchange agreements with Alaska, Florida, Maryland, New Jersey, Pennsylvania, South Carolina, Texas, Washington, Wyoming, and the District of Columbia. Interstate data exchange agreements assist in identifying Delaware residents whose cancer was diagnosed and/or treated in another state.

DATA CONFIDENTIALITY

The DCR maintains patient confidentiality using a combination of techniques. Reporting facilities submit cancer data using computerized data encryption techniques. Published reports and data releases are limited to aggregate data. DCR datasets are released only after removal of all personal identifiers. Researchers who use DCR data must comply with regulations stated in DPH data use agreements and obtain clearance from Delaware's Human Subjects Review Board.

DATA QUALITY

Internal quality control procedures were implemented at the DCR to verify the consistency of cancer data. Data consistency standards are set by the North American Association of Central Cancer Registries (NAACCR). The DCR also conducts record consolidation using a computerized matching program to identify multiple reports on the same individual. This scenario often arises when a patient is diagnosed and treated in two or more facilities and each facility submits a cancer case reporting form to the DCR.

NAACCR CERTIFICATION AND NPCR STANDARD STATUS

In 1997, the NAACCR instituted a program to independently and annually review data from member registries for their completeness, accuracy, and timeliness. The registry certification metrics are pre-determined and established by NAACCR[6]. Gold or Silver Standard certifications are awarded following an evaluation of data quality, completeness, and timeliness of reporting. The DCR received Gold Standard certification for diagnosis years 1999, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, and 2013 (most recent year for

[4] http://delcode.delaware.gov/title16/c032/index.shtml
[5] https://nccd.cdc.gov/dcpc_Programs/index.aspx#/3
[6] https://www.naaccr.org/certification-criteria/

which complete data are currently available). The DCR received Silver Standard certification in 1998 and 2002.

Additionally, the NPCR provides an annual Standard Status Report to state cancer registries supported by CDC. Delaware's data submissions for diagnosis years 2000 through 2013 surpassed all standard levels for quality, completeness, and timeliness.

USES OF DATA

DPH uses DCR data to support various programs and initiatives, including the Screening for Life program and the Delaware Cancer Treatment Program. DPH also uses DCR data to investigate citizen inquiries and provide up-to-date cancer statistics to Delaware residents, hospitals, health care providers, community organizations, federal agencies, research institutions, and academic institutions. Committees associated with the Delaware Cancer Consortium rely heavily on DCR data to monitor cancer trends across the state, promote research, and guide policy planning.

ORGANIZATION OF THIS REPORT

This report includes cancer statistics for all cancer sites combined (all-site cancer), as well as eight specific cancer types. These cancer statistics reflect incidence and mortality data for 2009-2013. We compare Delaware's cancer incidence and mortality trends for 2009-2013 to those of the U.S. over the same time period. We also summarize how Delaware and U.S. cancer rates have changed from 1999-2003 to 2009-2013. In addition to incidence and mortality, stage at diagnosis and age-specific statistics are evaluated for each cancer type. In many cases, these statistics are also calculated separately by sex, race, county of residence, and age group.

Limited data on cancer incidence and mortality rates by Hispanic ethnicity are presented in Appendix C. Chapter 12 serves as a special topic chapter highlighting the evidence-based association between tobacco use and cancer. Additional behavioral risk factor data relevant to adult Delawareans are presented throughout the report and Appendix D.

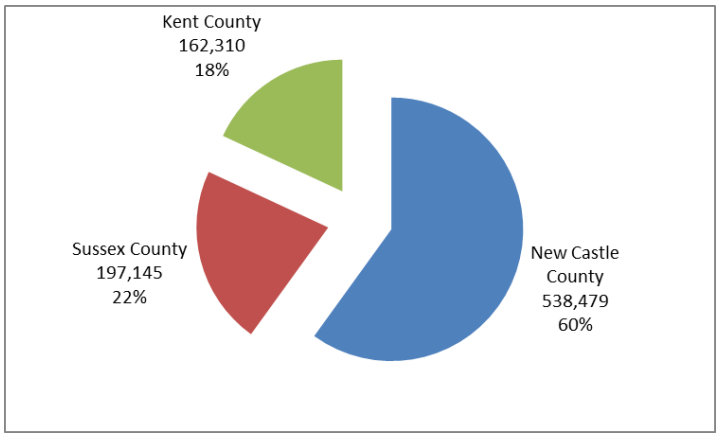
Delaware's 2009-2013 cancer incidence and mortality rankings among all 50 U.S. states are provided for each cancer site included in the report. State rankings for cancer incidence and mortality were obtained from the U.S. Cancer Statistics Working Group[7].

DELAWARE'S POPULATION

In 2010, census data estimated Delaware's total population at 897,934. The majority of Delawareans – 60 percent – reside in New Castle County. Kent and Sussex Counties are home to 18 percent and 22 percent of Delawareans, respectively (Figure 2-1).

[7] U.S. Cancer Statistics Working Group. United States Cancer Statistics: 1999-2012 Incidence and Mortality Web-based Report. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2015. www.cdc.gov/uscs.

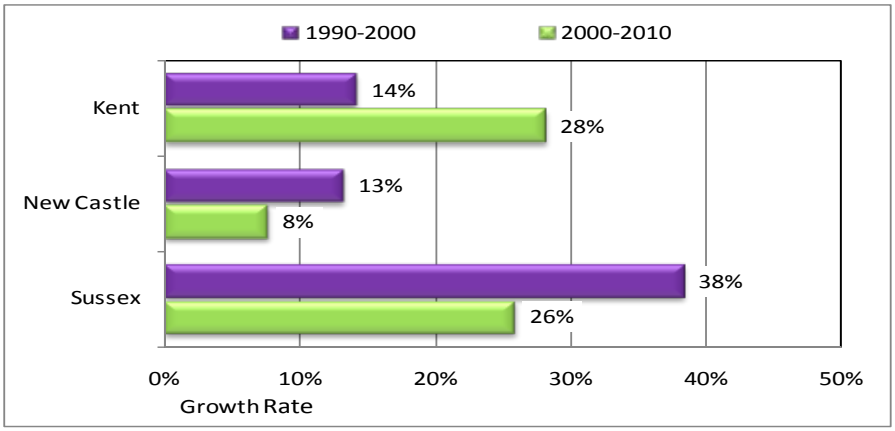
FIGURE 2-1: DELAWARE POPULATION BY COUNTY, 2010



Source: U.S. Census Bureau, American FactFinder http://factfinder2.census.gov/

Since 1990, population growth rates have varied across Delaware counties. New Castle County – the most populated of Delaware's three counties – demonstrated the smallest population growth, increasing its total population by 13 percent from 1990-2000 and just 8 percent from 2000-2010. Kent County grew in total population by 14 percent from 1990-2000, and by 28 percent from 2000-2010. Sussex County – Delaware's southernmost county – experienced the largest population growth from 1990-2000 with an increase in total population of nearly 40 percent. Population growth slowed slightly in Sussex County from 2000-2010, as total population increased by 26 percent. These changes are illustrated in Figure 2-2.

FIGURE 2-2: DELAWARE POPULATION GROWTH RATE BY COUNTY AND DECADE: 1990-2000 AND 2000-2010



Source: U.S. Census Bureau 2010, American FactFinder http://factfinder2.census.gov/

The most recently available census data (Table 2-1) show that nearly 70 percent of all Delawareans are Caucasian. Just fewer than 80 percent of all Sussex County residents are Caucasian; approximately 68 percent of Kent County residents and 66 percent of New Castle County residents are Caucasian. African Americans comprise roughly 21 percent of Delaware's population. Approximately 13 percent of Sussex County residents are African American. The other counties are comparatively more racially diverse, with African American residents making up 24.0 percent of Kent County residents and 23.7 percent of New Castle County residents. Three percent of Delawareans are Asian. Another 6 percent of Delawareans are considered "other" race, which is defined as: (a) any other race group that was too small to enumerate separately; (b) unknown race; or (c) mixed race (i.e., two or more races). Regardless of race, persons of Hispanic ethnicity make up just over 8 percent of Delaware's population.

TABLE 2-1: DELAWARE POPULATION PERCENTAGE BY RACE/ETHNICITY AND COUNTY, 2010

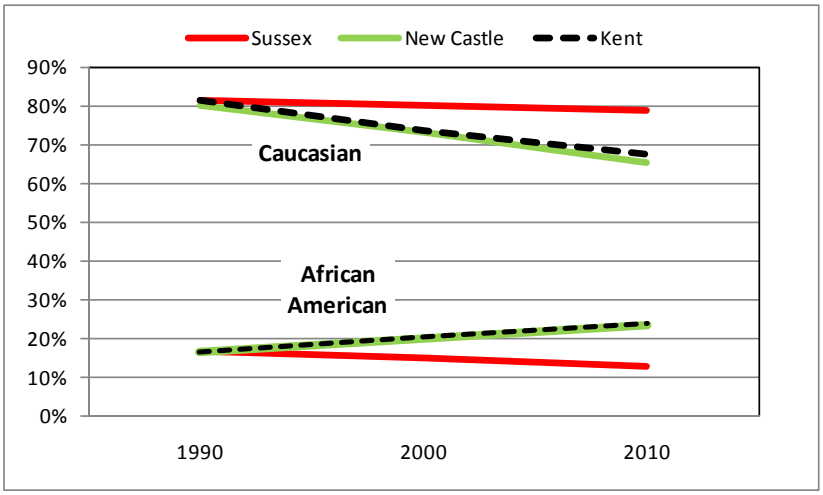
Race	Delaware	Kent	New Castle	Sussex
Caucasian	68.9	67.8	65.5	79.0
African American	21.4	24.0	23.7	12.7
American Indian/Alaska Native	0.5	0.6	0.3	0.8
Asian	3.2	2.0	4.3	1.0
Other or 2 or more races	6.1	5.5	6.1	6.4
TOTAL	100.0	100.0	100.0	100.0
Hispanic ethnicity	8.2	5.8	8.7	8.6

Source: U.S. Census Bureau 2010, American FactFinder http://factfinder2.census.gov/

In 1990, the proportion of African American residents was essentially equal across all three Delaware counties (ranging from 16.5 percent to 16.8 percent), as was the proportion of Caucasian residents (ranging from 80.3 percent to 81.6 percent). From 1990-2000, Delaware's total Caucasian population decreased to 74.6 percent; from 2000-2010, it declined further to just under 69 percent. Over this 20-year time period, the decrease in proportion of Caucasians in Delaware was accompanied by increases in the African American and Asian populations, as well as among persons considered "other" race. The increase in the "other" category is largely due to revisions in data standards implemented in 1997 that modified the manner in which race data are collected by the Census Bureau. Beginning in 2000, respondents have the option of selecting one or more race categories to indicate racial identities. Because of this change, the 2000 Census data on race are not directly comparable with data from 1990 or earlier censuses.

Since 1990, racial diversity has expanded at different rates across Delaware's counties. Both Kent and New Castle Counties experienced substantial increases in the proportion of African American residents (and concurrent decreases in the proportion of Caucasian residents) from 1990 to 2010 (Figure 2-3). An opposite trend was observed in Sussex County, where the African American population decreased from 16.8 percent in 1990 to 12.7 percent in 2010. During the same time period, the Caucasian population in Sussex County declined from 81.6 percent to 79.0 percent. The declines in the proportion of both African American and Caucasian residents in Sussex County were accompanied by an increase (from 0.5 percent to 6.4 percent) in the proportion of persons of other and unknown race (not shown in Figure 2-3).

FIGURE 2-3: PROPORTIONS OF CAUCASIAN AND AFRICAN AMERICAN RESIDENTS IN DELAWARE, BY COUNTY: 1990, 2000 AND 2010



Source: U.S. Census Bureau 2010, American FactFinder http://factfinder2.census.gov/

GUIDELINES FOR INTERPRETATION OF INCIDENCE AND MORTALITY RATES

Incidence and mortality rates for Delaware are expressed per 100,000 Delawareans and rates for the U.S. are expressed per 100,000 U.S. residents. Due to Delaware's small population base, cancer rates were calculated using five-year calendar year groupings for both cancer incidence and mortality.

Cancer incidence and mortality rates were adjusted by age to enable comparisons between populations that may have different age distributions (e.g., Delaware vs. the U.S.). Thus, age-adjusted cancer rates can be compared without any concern about how differences in age distribution of the populations would affect cancer rates. The standard population used to adjust for age is the 2000 U.S. population.

Ninety-five percent confidence intervals were computed for each cancer rate. Confidence intervals represent the range of values in which the cancer rate could reasonably fall 95 percent of the time. They are used to determine whether the amount by which two cancer rates differ is statistically significant. If the confidence interval for one rate does not overlap with the confidence interval for another rate, the two rates are significantly different. When one rate is significantly different from another rate, we assume that the difference between the rates is larger than would be expected by chance alone. If the confidence interval for one rate overlaps with the confidence interval for another rate, the two rates are not statistically significantly different and this is commonly referred to as "no meaningful difference" between rates.

For this report, cancer frequencies and rates were suppressed according to the DPH's Policy Memorandum 49 (Data and Data Release Standards):

- Incidence and mortality frequencies of fewer than six were not shown to protect patient privacy and confidentiality. In some instances, additional cells were suppressed so that one cannot deduce the actual count in the initially-suppressed cell. Suppressing incidence and mortality statistics based on a small number of cancer cases or deaths helps protect patient privacy and confidentiality[8,9].
- Age-adjusted incidence and mortality rates based on fewer than 25 cases or deaths were suppressed as they are inherently unstable and cannot be reliably interpreted.

[8] Coughlin SS, Clutter GG, Hutton M. Ethics in Cancer Registries. *Journal of Cancer Registry Management, 2:* 5-10, 1999.
[9] McLaughlin CC. Confidentiality protection in publicly released central registry data. *Journal of Cancer Registry Management, 2:* 84-88, 2002.

CHAPTER 3: ALL-SITE CANCER

INCIDENCE

For 2009-2013, Delaware ranked 2nd in the U.S. for all-site cancer incidence (2nd in 2008-2012); males ranked 3rd (3rd in 2008-2012) and females ranked 8th (10th in 2008-2012)[10].

2009-2013 DATA

TABLE 3-1: NUMBER OF ALL-SITE CANCER CASES, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	27,194	14,254	12,940	22,185	11,657	10,528	4,457	2,343	2,114
Kent	4,968	2,577	2,391	3,931	2,029	1,902	946	510	436
New Castle	14,458	7,443	7,015	11,275	5,829	5,446	2,861	1,472	1,389
Sussex	7,768	4,234	3,534	6,979	3,799	3,180	650	361	289

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- In 2009-2013, there were 27,194 new all-site cancer cases diagnosed in Delaware, an average of 5,439 per year.
- Delaware males accounted for 52 percent of all-site cancer cases.
- Caucasians in Delaware accounted for 82 percent of all-site cancer cases.

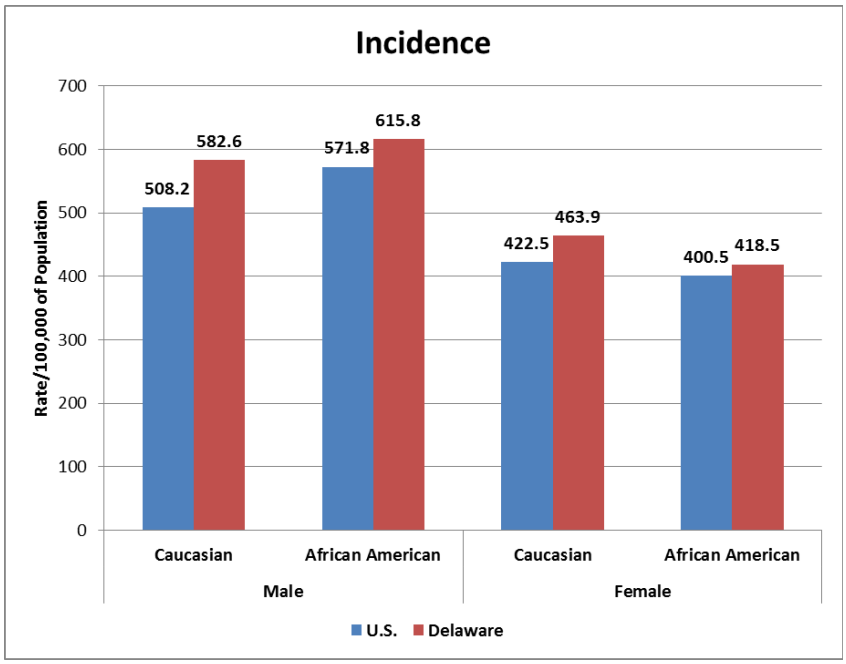
TABLE 3-2: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	448.7	504.5	409.9
Delaware	507.3	582.8	451.8
Kent	539.6	614.8	482.4
New Castle	494.9	570.7	441.6
Sussex	510.8	585.3	453.1

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

[10] U.S. Cancer Statistics Working Group. *United States Cancer Statistics: 1999–2012* INCIDENCE AND MORTALITY WEB-BASED REPORT. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention and National Cancer Institute; 2015. Available at: www.cdc.gov/uscs.

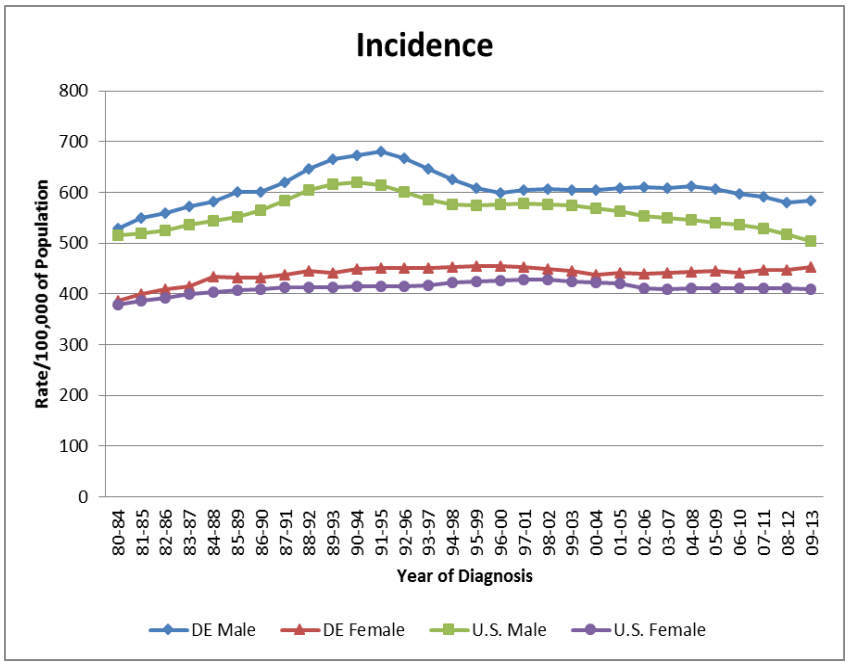
FIGURE 3-1: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in all-site cancer incidence rates between Caucasians (514.0 per 100,000) and African Americans (499.1 per 100,000) was not statistically significant.
  - Caucasian females (463.9 per 100,000) had a statistically significantly higher all-site cancer incidence rate than African American females (418.5 per 100,000).
  - The difference in all-site cancer incidence rates between Caucasian males (582.6 per 100,000) and African American males (615.8 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware had a statistically significantly higher all-site cancer incidence rate (507.3 per 100,000) than the U.S. (448.7 per 100,000).
  - Delaware males (582.8 per 100,000) and females (451.8 per 100,000) had statistically significantly higher all-site cancer incidence rates than U.S. males (504.5 per 100,000) and females (409.9 per 100,000).
  - Caucasians in Delaware (514.0 per 100,000) had a statistically significantly higher all-site cancer incidence rate than Caucasians in the U.S. (457.4 per 100,000).
  - African Americans in Delaware (499.1 per 100,000) had a statistically significantly higher all-site cancer incidence rate than African Americans in the U.S. (470.2 per 100,000).

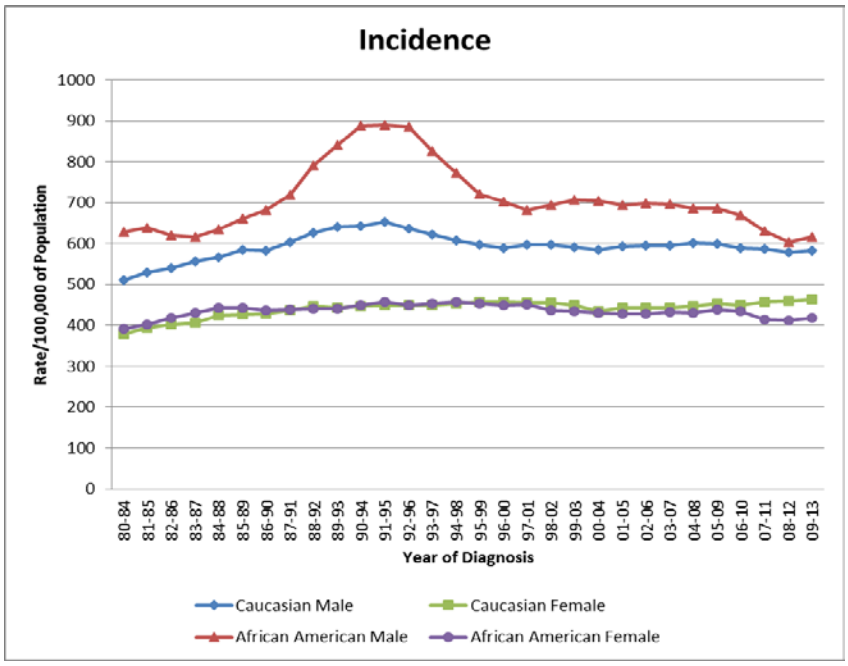
FIGURE 3-2: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for all-site cancer declined 1 percent in Delaware and 7 percent in the U.S.
  - U.S. males saw big declines in all-site cancer incidence (12 percent) while Delaware male all-site cancer incidence rates declined by 4 percent.
  - U.S. females saw a 3 percent decline in the all-site cancer incidence and Delaware females saw an increase of 2 percent.

FIGURE 3-3: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 1980-2013

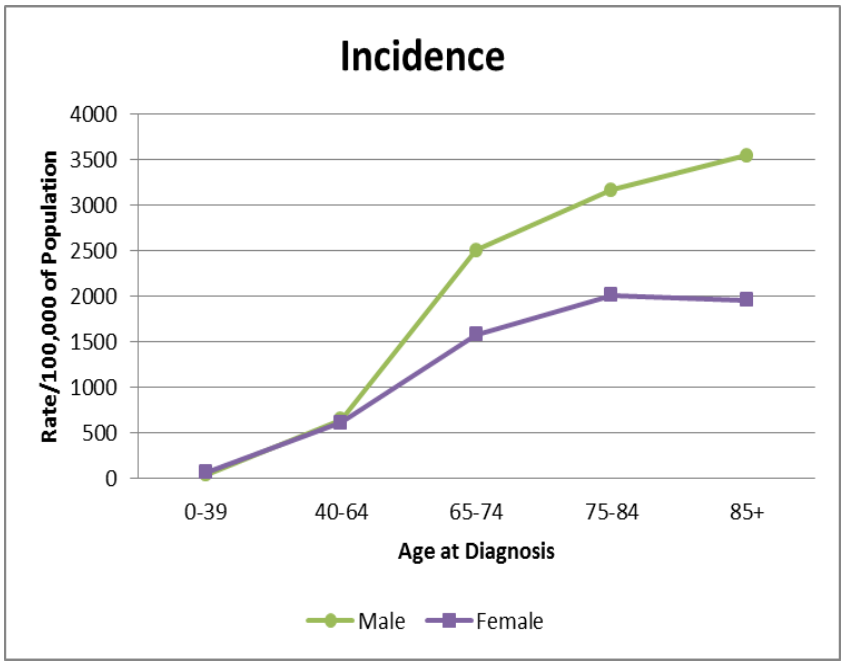


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African American males in Delaware saw the sharpest decline in all-site cancer incidence (13 percent).
  - African American females saw the all-site cancer incidence rate decline by 4 percent.
  - Caucasian males had a 2 percent decline in all-site cancer incidence while Caucasian females had a 3 percent increase.

AGE-SPECIFIC INCIDENCE RATES – DELAWARE

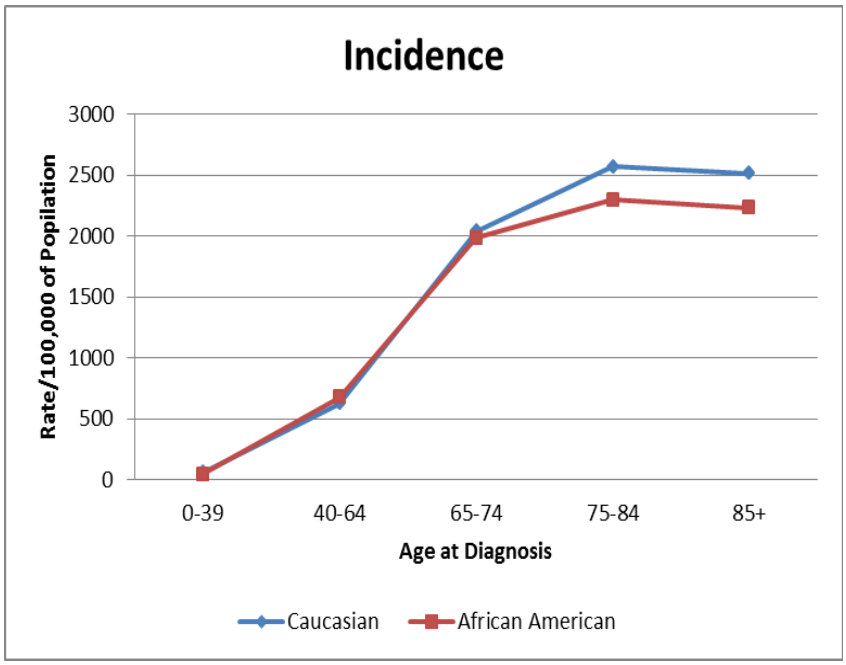
FIGURE 3-4: AGE-SPECIFIC ALL-SITE CANCER INCIDENCE RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for all-site cancer incidence in Delaware is 75-84 years.
- For females, the peak age for all-site cancer incidence is 75-84 and for males, the peak is age 85 and older.

FIGURE 3-5: AGE-SPECIFIC ALL-SITE CANCER INCIDENCE RATES BY RACE; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- Caucasians have a peak age for all-site cancer incidence of 75-84 which is the same for African Americans.

TABLE 3-3: AGE-SPECIFIC ALL-SITE CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	45.5	29.8	73.2	55.3
40-64	628.2	782.8	632.1	593.8
65-74	2,507.8	2,676.2	1,630.2	1,443.8
75-84	3,225.2	2,934.1	2,044.6	1,890.3
85+	3,576.2	3,394.7	1,983.5	1,701.8

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- After stratifying by race, Caucasian and African American males have peak all-site cancer incidence at age 85 and older.
- Caucasian and African American females have peak all-site cancer incidence at 75-84 years of age.

MORTALITY

For 2009-2013, Delaware ranked 16th in the U.S. for all-site cancer mortality (14th in 2008-2012); males ranked 19th (18th in 2008-2012) and females ranked 16th (12th in 2008-2012)[11].

2009-2013 DATA

TABLE 3-4: NUMBER OF ALL-SITE CANCER DEATHS, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	9,427	4,922	4,505	7,689	4,030	3,659	1,566	801	765
Kent	1,722	896	826	1,377	711	666	304	167	137
New Castle	5,102	2,616	2,486	3,992	2,058	1,934	1,016	503	513
Sussex	2,603	1,410	1,193	2,320	1,261	1,059	246	131	115

Source: Delaware Health Statistics Center, 2016

- In 2009-2013, there were 9,427 deaths from cancer in Delaware, an average of 1,885 per year.
- Delaware males accounted for 52 percent of all-site cancer deaths.
- Caucasians accounted for 82 percent of all-site cancer deaths.

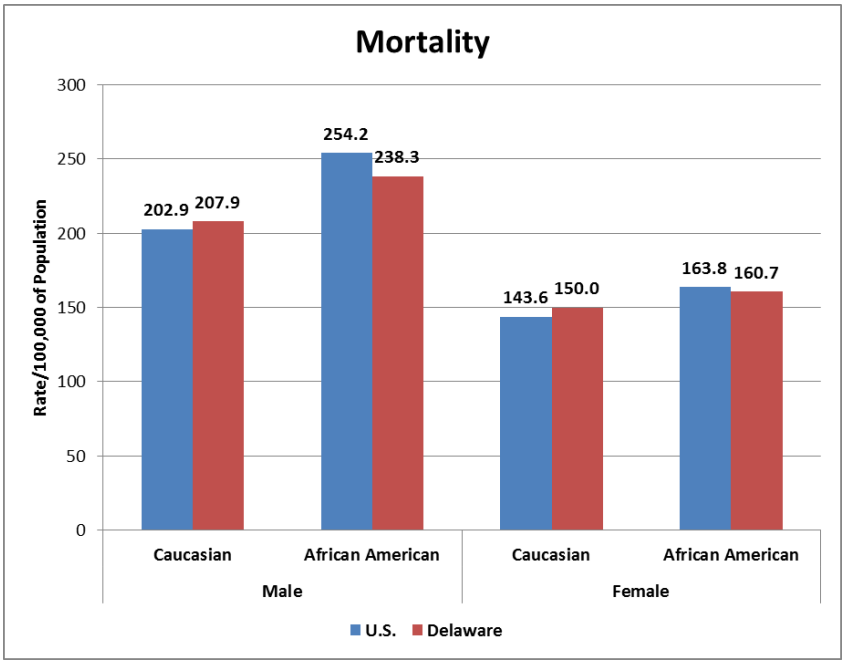
[11] Howlader N, Noone AM, Krapcho M, Garshell J, Miller D, Altekruse SF, Kosary CL, Yu M, Ruhl J, Tatalovich Z, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2012, National Cancer Institute. Bethesda, MD, http://seer.cancer.gov/csr/1975_2012/, based on November 2014 SEER data submission, posted to the SEER web site, April 2015.

TABLE 3-5: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	168.5	204.0	143.4
Delaware	176.1	211.4	151.0
Kent	189.5	226.0	163.5
New Castle	176.9	212.8	151.9
Sussex	167.5	202.9	141.4

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 3-6: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



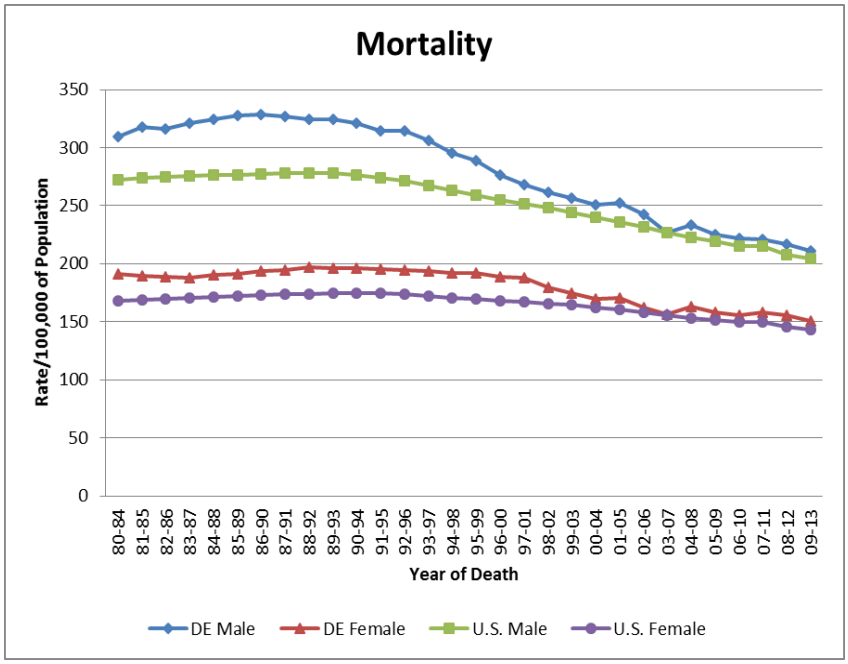
Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Males had a statistically significantly higher all-site cancer mortality rate (211.4 per 100,000) compared to females (151.0 per 100,000).
  - The difference in all-site cancer mortality rates between Caucasian females (150.0 per 100,000) and African American females (160.7 per 100,000) was not statistically significant.
  - Caucasian males (207.9 per 100,000) had a statistically significantly lower all-site cancer mortality rate than African American males (238.3 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a statistically significantly higher all-site cancer mortality rate (176.1 per 100,000) than the U.S. (168.5 per 100,000).

- Both males (204.0 per 100,000) and females (143.4 per 100,000) in the U.S. had statistically significantly lower all-site cancer mortality rates than their counterparts in Delaware (male: 211.4 per 100,000; female: 151.0 per 100,000).
- Caucasians had a statistically significantly higher all-site cancer mortality rate in Delaware (174.2 per 100,000) compared to Caucasians in the U.S (168.4 per 100,000).
- The difference in all-site cancer mortality rates between African Americans in Delaware (191.4 per 100,000) and the U.S. (197.9 per 100,000) was not statistically significant.

TRENDS OVER TIME – DELAWARE AND U.S.

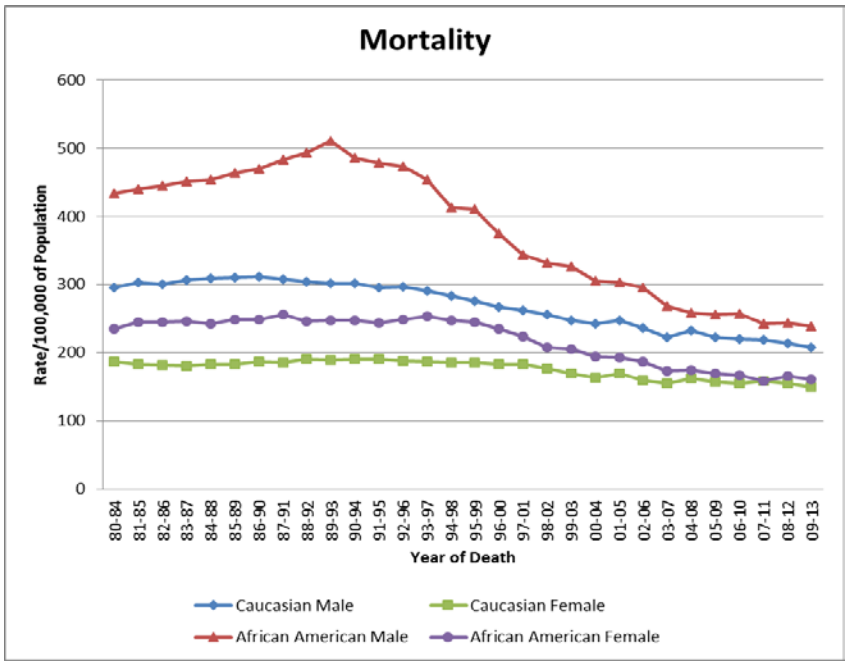
FIGURE 3-7: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for all-site cancer declined by 15 percent in Delaware and 14 percent in the U.S.
  - U.S. and Delaware males saw big declines in all-site cancer mortality (17 percent and 18 percent, respectively).
  - U.S. and Delaware females experienced declines in all-site cancer mortality (13 percent and 14 percent, respectively).

FIGURE 3-8: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 1980-2013

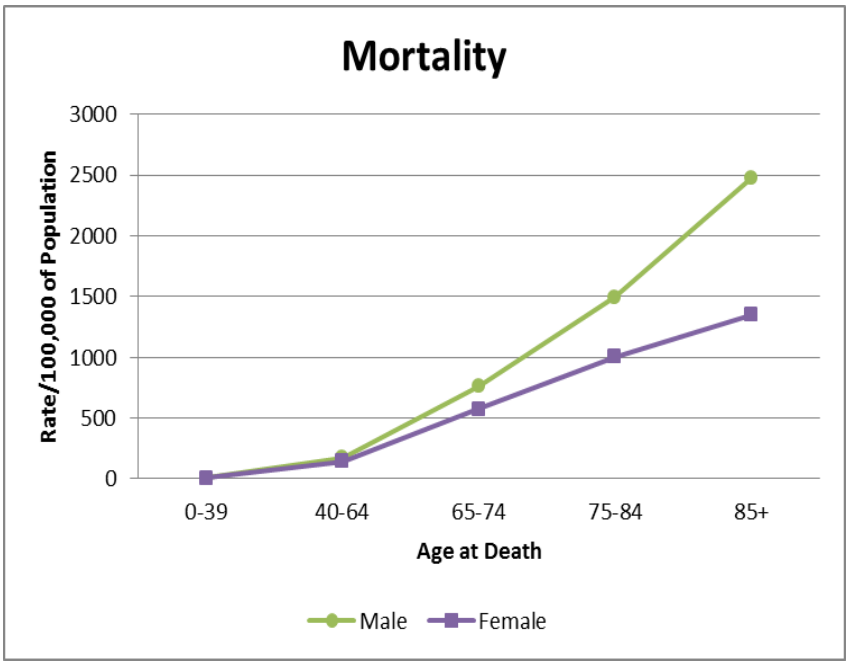


Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Among African American males in Delaware, all-site cancer mortality declined by 27 percent.
  - Among African American females in Delaware the all-site cancer mortality rate declined 22 percent.
  - Caucasian males in Delaware saw a 16 percent decline in the all-site cancer mortality, compared to a 12 percent decline among Caucasian females in Delaware.

AGE-SPECIFIC MORTALITY RATES – DELAWARE

FIGURE 3-9: AGE-SPECIFIC ALL-SITE CANCER MORTALITY RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware, the peak age for all-site cancer mortality is age 85 and older.
- Males and females in Delaware also have peak all-site cancer mortality at age 85 and older; it is the same for Caucasians and African Americans.

TABLE 3-6: AGE-SPECIFIC ALL-SITE CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	5.3	---	7.2	---
40-64	164.8	218.3	137.4	166.6
65-74	750.8	893.8	585.3	569.1
75-84	1,476.9	1,693.9	992.8	1,065.2
85+	2,512.6	2,166.8	1,349.6	1,292.8

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- After stratifying by race, male and female Caucasians and African Americans in Delaware have peak mortality at age 85 and older.

CHAPTER 4: BRAIN AND OTHER CENTRAL NERVOUS SYSTEM CANCER[12]

RISK FACTORS

The following are *lifestyle risk factors* which a person can modify to reduce their risk of getting brain cancer:

- Ingestion of aspartame (a sugar substitute)
- Cell phone use (there is limited evidence on the effects of long-term use)

The following are *environmental and medically-related* causes of brain cancer:

- Exposure to radiation (usually radiation therapy)
- Workplace exposures including vinyl chloride (used to manufacture plastics), petroleum products, and certain other chemicals
- Exposure to electromagnetic fields from power lines and transformers

The following are *non-modifiable* risk factors (these cannot be changed):

- Family history (there is genetic predisposition in about 4 percent of cases)

While there are no known lifestyle risk factors for brain cancer, managing lifestyle risk factors such as diet (high in fruits, vegetables, and whole grains), tobacco use, alcohol use, and physical activity will help promote better overall health.

EARLY DETECTION

There are currently no tests recommended for the screening of brain tumors. For people who have certain inherited syndromes which may put them at higher risk for brain tumors, health care professionals may recommend frequent physical exams and other tests starting when they are young.

INCIDENCE

For 2009-2013, Delaware ranked 31st in the U.S. for brain cancer incidence (26th in 2008-2012); males ranked 46th (41st in 2008-2012) and females ranked 9th (8th in 2008-2012)[10].

2009-2013 DATA

TABLE 4-1: NUMBER OF BRAIN CANCER CASES, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	326	161	165	282	140	142	40	20	20
Kent	56	27	29	48	23	25	---	---	---
New Castle	188	89	99	157	75	82	29	14	15
Sussex	82	45	37	77	42	35	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 326 brain cancer cases (1 percent of all cancer cases) diagnosed in Delaware.
- Delaware females accounted for 51 percent of brain cancer cases.
- Delaware Caucasians accounted for 87 percent of brain cancer cases.

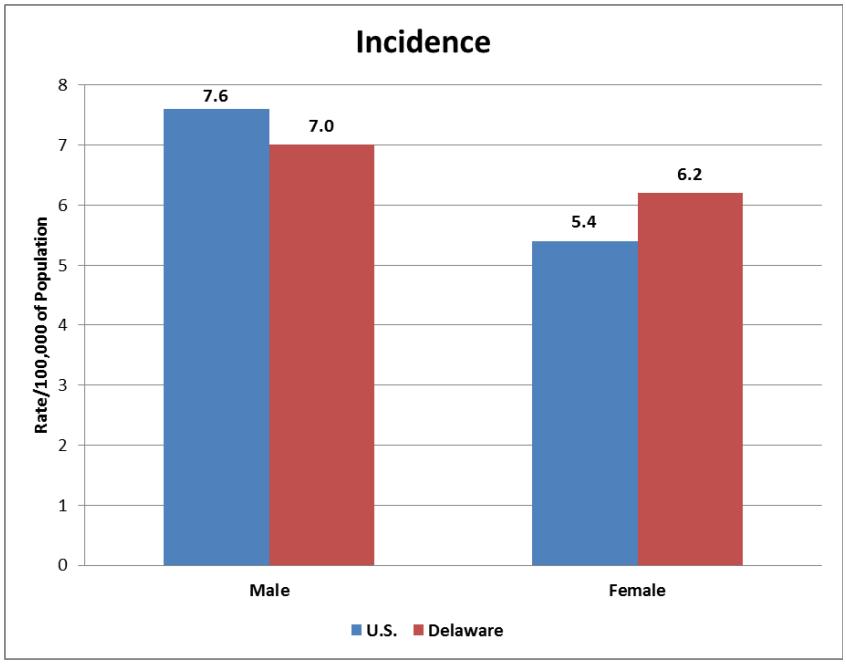
[12] "Brain cancer" is used instead of "Brain and other central nervous system cancer" throughout this chapter.

TABLE 4-2: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	6.4	7.6	5.4
Delaware	6.6	7.0	6.2
Kent	6.4	6.6	6.1
New Castle	6.7	7.1	6.5
Sussex	6.4	7.1	5.7

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 4-1: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 2009-2013



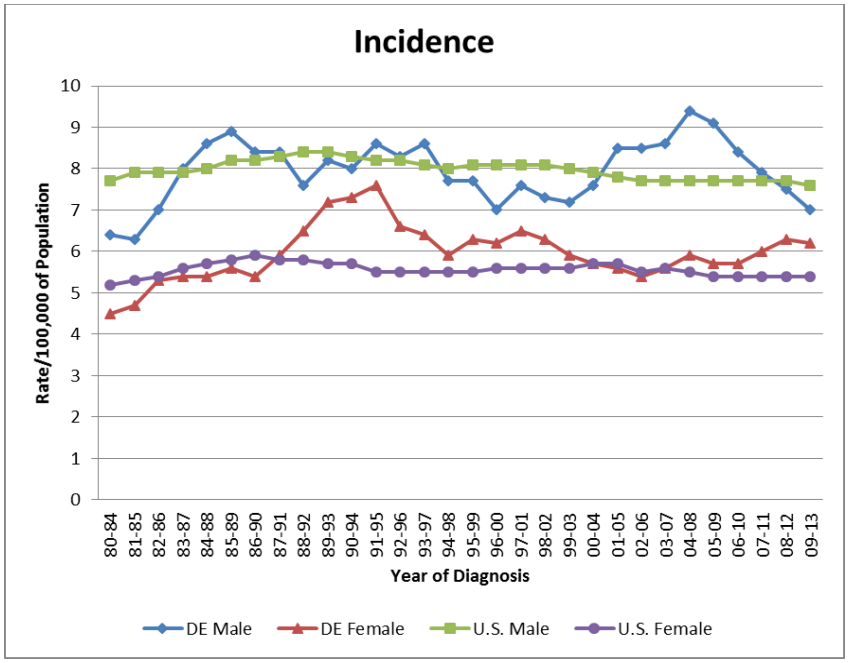
Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Caucasians (7.5 per 100,000) had a significantly higher brain cancer incidence rate than African Americans (4.3 per 100,000).
  - The difference in brain cancer incidence rates between males (7.0 per 100,000) and females (6.2 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - The difference in brain cancer incidence rates between Delaware (6.6 per 100,000) and the U.S. (6.4 per 100,000) was not statistically significant.
  - The difference in brain cancer incidence rates for Delaware males (7.0 per 100,000) and females (6.2 per 100,000) compared to U.S. males (7.6 per 100,000) and females (5.4 per 100,000) was not statistically significant.

- The difference in brain cancer incidence rates between Caucasians in Delaware (7.5 per 100,000) and the U.S. (7.1 per 100,000) was not statistically significant.
- The difference in the brain cancer incidence rates between African Americans in Delaware (4.3 per 100,000) and the U.S. (4.1 per 100,000) was not statistically significant.

TRENDS OVER TIME - DELAWARE AND U.S.

FIGURE 4-2: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2013

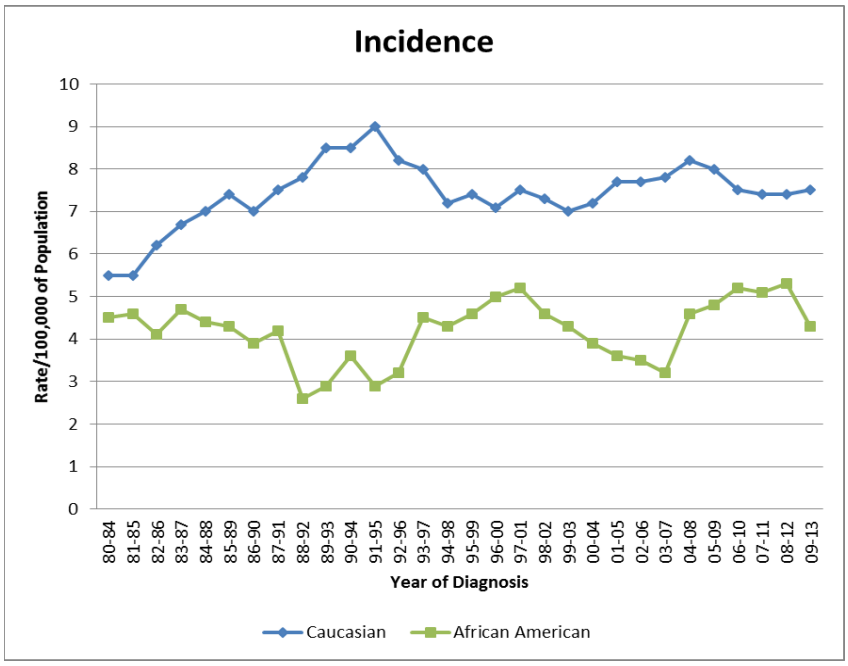


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Brain cancer incidence rates increased 3 percent in Delaware and declined 4 percent in the U.S.
  - Brain cancer incidence rates declined among males in Delaware (3 percent) and the U.S. (5 percent).
  - Delaware females saw a 5 percent increase in brain cancer incidence; U.S. females saw a 4 percent decline.

TRENDS OVER TIME - DELAWARE

FIGURE 4-3: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African Americans saw no changes in brain cancer incidence while Caucasians saw an increase of 7 percent.

AGE-SPECIFIC INCIDENCE RATES - DELAWARE

TABLE 4-3: AGE-SPECIFIC BRAIN CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	4.5	---	3.8	---
40-64	7.7	---	8.8	---
65-74	19.5	---	---	---
75-84	---	---	---	---
85+	---	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for brain cancer incidence is 75-84 years of age for females and 65-74 years of age for males. Due to low numbers, incidence rates were not able to be computed for some of the age groups for males and females.

- Caucasians had peak brain cancer incidence at 75-84 years of age. Due to low numbers, incidence rates could not be computed for African Americans.

STAGE OF DIAGNOSIS - DELAWARE

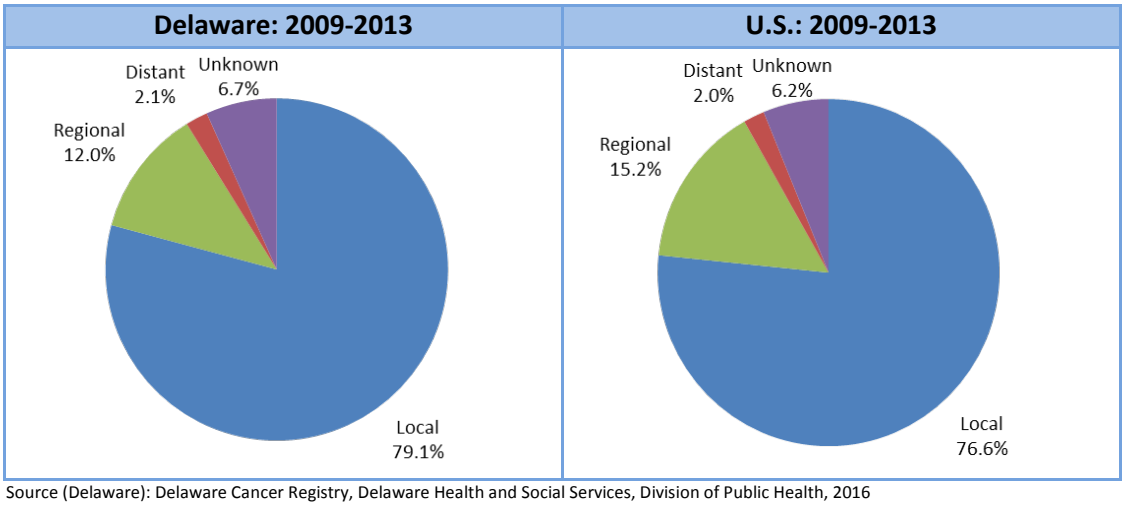
TABLE 4-4: BRAIN CANCER CASES BY STAGE AT DIAGNOSIS BY SEX AND RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Local	258 (79)	129 (80)	129 (78)	230 (82)	115 (82)	115 (81)	24 (60)	13 (65)	11 (55)
Regional	39 (12)	20 (12)	19 (12)	29 (10)	15 (11)	14 (10)	10 (25)	---	---
Distant	7 (2)	---	---	---	---	---	---	---	---
Unknown	22 (7)	---	---	---	---	---	---	---	---
Total	326	161	165	282	140	142	40	20	20

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 258 (79 percent) brain cancers diagnosed at the local stage; 39 (12 percent) at the regional stage; 7 (2 percent) at the distant stage; and 22 (7 percent) had an unknown stage.
- Caucasians had a higher proportion of brain cancers (82 percent) diagnosed at the local stage than African Americans (60 percent).
- Males also had more brain cancers diagnosed at the local stage (80 percent) than females (78 percent). Caucasian males had the highest proportion diagnosed at the local stage (82 percent), compared to African American males (65 percent).

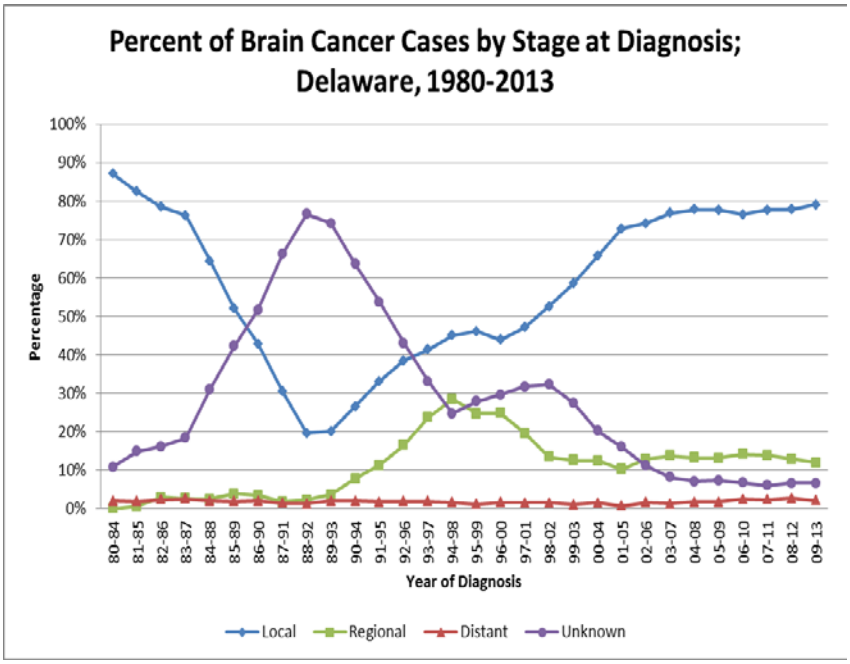
FIGURE 4-4: DISTRIBUTION OF BRAIN CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware data, the stage of brain cancer diagnosis is similar.

FIGURE 4-5: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR BRAIN CANCER CASES; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - Brain cancer cases diagnosed at the local stage decreased from 87 percent to 79 percent.
  - Brain cancer cases diagnosed at the distant stage remained the same at 2 percent.

MORTALITY

For 2009-2013, Delaware ranked 38th in the U.S. for brain cancer mortality (32nd in 2008-2012); males ranked 45th (39th in 2008-2012) and females ranked 17th (23rd in 2008-2012)[11].

2009-2013 DATA

TABLE 4-5: NUMBER OF BRAIN CANCER DEATHS, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	213	108	105	190	97	93	19	9	10
Kent	29	11	18	26	10	16	---	---	---
New Castle	126	65	61	111	58	53	14	6	8
Sussex	58	32	26	53	29	24	---	---	---

Source: Delaware Health Statistics Center, 2016
Counts less than 6 are not shown to protect patient privacy

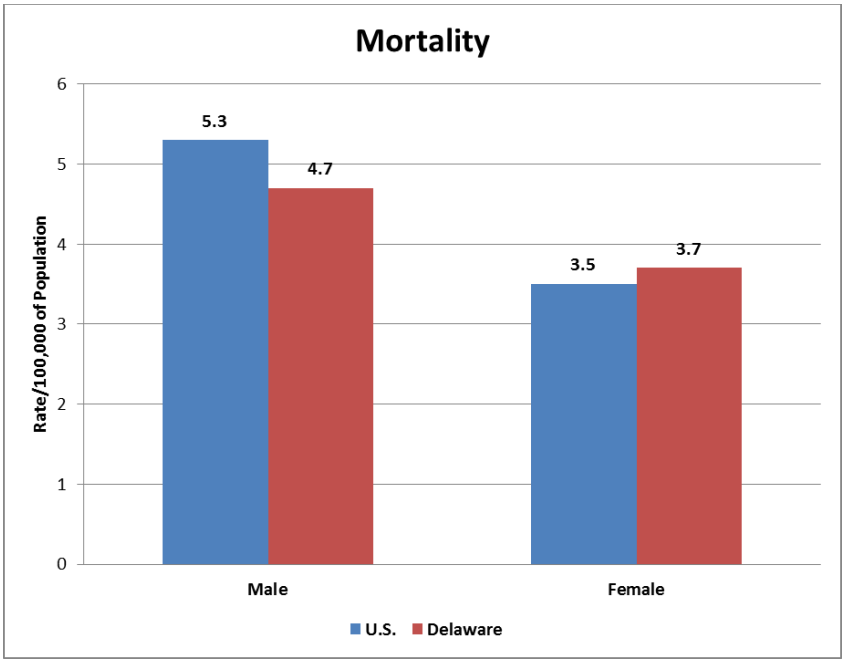
- In 2009-2013, there were 213 deaths (2 percent of all cancer deaths) from brain cancer.
- Delaware Caucasians accounted for 89 percent of brain cancer deaths.

TABLE 4-6: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	4.3	5.3	3.5
Delaware	4.1	4.7	3.7
Kent	3.3	---	---
New Castle	4.4	5.2	3.9
Sussex	4.0	4.7	3.4

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

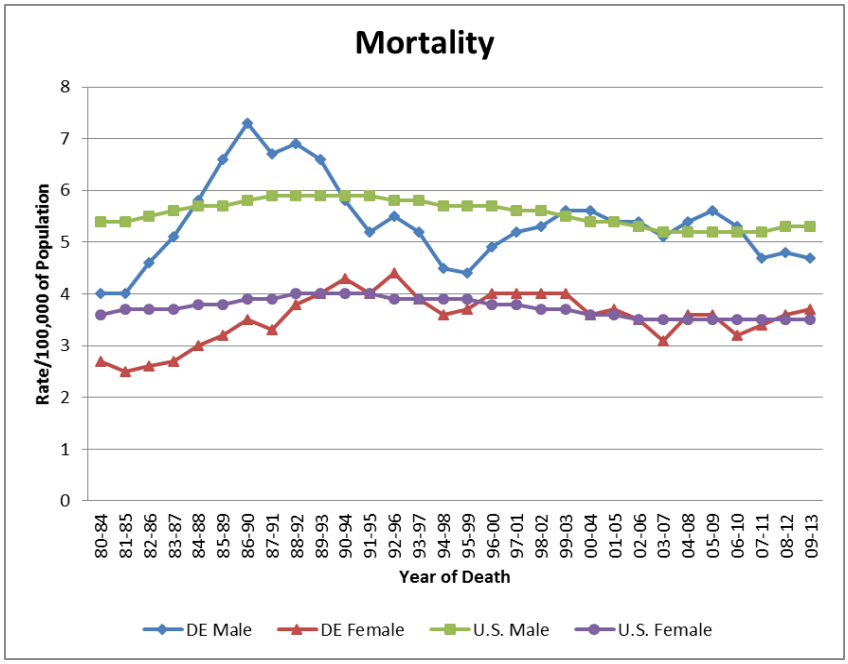
FIGURE 4-6: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in the brain cancer mortality rates between males (4.7 per 100,000) and females (3.7 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - The difference in the brain cancer mortality rates between Delaware (4.1 per 100,000) and the U.S. (4.3 per 100,000) was not statistically significant.
  - The difference in the brain cancer mortality rates between males (5.3 per 100,000) and females (3.5 per 100,000) in the U.S. compared to Delaware males (4.7 per 100,000) and females (3.7 per 100,000) was not statistically significant.
  - The difference in the brain cancer mortality rates between Caucasians in Delaware (4.6 per 100,000) and the U.S (4.7 per 100,000) was not statistically significant.

FIGURE 4-7: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2013

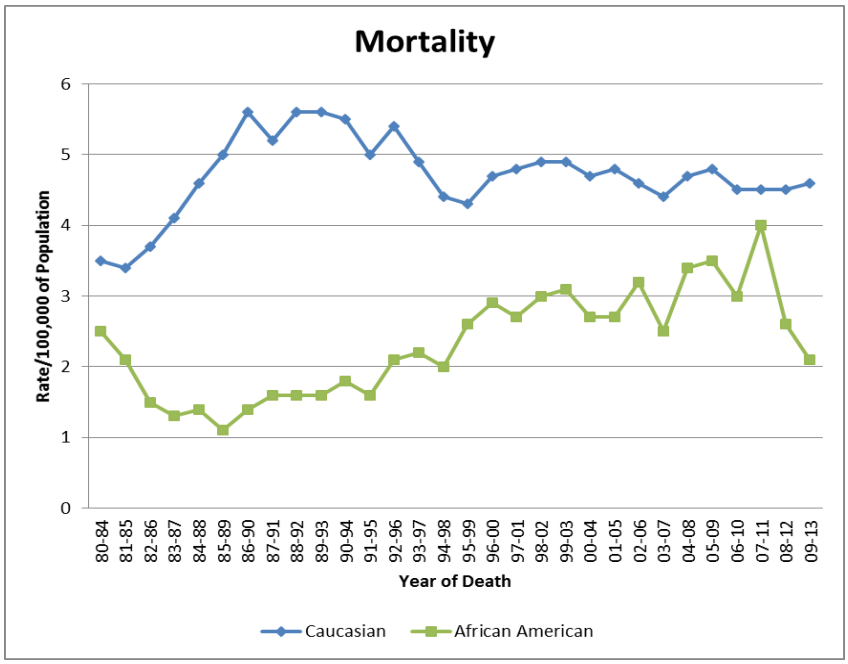


Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for brain cancer declined 13 percent in Delaware and 4 percent in the U.S.
  - Delaware males saw big declines in brain cancer mortality (16 percent) with U.S. male brain cancer mortality declining by 4 percent.
  - Delaware female brain cancer mortality decreased by 8 percent and the U.S. female brain cancer mortality rate declined by 5 percent.

TRENDS OVER TIME - DELAWARE

FIGURE 4-8: FIVE-YEAR AVERAGE AGE-ADJUSTED BRAIN CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African Americans saw a 32 percent decline in brain cancer mortality; Caucasians saw a 6 percent decline.

AGE-SPECIFIC MORTALITY RATES - DELAWARE

TABLE 4-7: AGE-SPECIFIC BRAIN CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	5.8	---	4.2	---
65-74	---	---	---	---
75-84	---	---	---	---
85+	---	---	---	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for brain cancer mortality is 75-84 years of age. Due to low numbers, mortality rates were not able to be computed for many age groups for males and females or stratified by race.

CHAPTER 5: BREAST CANCER (FEMALE)

RISK FACTORS

Most females who have one or more breast cancer risk factors never develop the disease. Some females who develop breast cancer have no apparent risk factors other than being a female and growing older. Even when a woman with one or more risk factors develops breast cancer, it is difficult to know how much these factors might have contributed to the development of the disease.

The following are *lifestyle risk factors* which a woman can modify to reduce her risk of getting female breast cancer:

- Alcohol use (two to five drinks daily)
- Obesity or overweight status, especially after menopause
- Reproductive history (breast cancer risk increases among females who have never had children or who had their first child after age 30)
- High-fat diet, low intake of fruits and vegetables
- Smoking and secondhand smoke.

The following are *environmental and medically-related* causes of female breast cancer:

- Birth control use in the past 10 years
- Combined hormone therapy (estrogen and progesterone) for two or more years after menopause – risk returns to normal five years following discontinued use
- History of high-dose radiation therapy to the chest area as a child or young adult
- Diethylstilbestrol (DES) – personal use or having a mother who used DES during pregnancy
- Exposure to chemical compounds in the environment which may have estrogen-like properties (pesticides like dichlorodiphenyldichloroethylene (DDE)), polychlorinated biphenyls (PCBs) and substances found in some plastics, cosmetics, and personal care products.

The following are *non-modifiable* risk factors (these cannot be changed):

- Gender – Breast cancer is 100 times more common in females than in males.
- Increasing age – Only one out of eight invasive breast cancers are diagnosed in females under 45; two-thirds of invasive cancers are in females 55 and older.
- Family history – Having a first-degree relative (mother, sister, or daughter) with breast cancer doubles a woman's risk of developing breast cancer; having two first-degree relatives triples the risk.
- Gene defects or mutations – Five to 10 percent of breast cancer cases may result from gene defects or mutations inherited from a parent. The most common inherited mutation is the BRCA1 or BRCA2 gene found mostly in Jewish females of eastern European origin.
- Personal history of breast cancer – This triples the risk of developing a new cancer in another part of the body, another part of the previously affected breast, or the other breast.
- Race – Caucasian females age 45 and over are more likely to develop breast cancer when compared to African American females. African American females are more likely to be diagnosed at a younger age and more likely to die from breast cancer when compared to Caucasian females.
- Dense breast tissue is thought to increase risk because it is more difficult to detect potential problems on mammograms.
- Personal history of benign breast conditions
- Early age at menarche (before age 12) and/or later age at menopause (after age 55)

To protect against breast cancer, individuals should maintain a healthy weight; consume a diet high in fruits, vegetables, and whole grains; limit calcium intake; and engage in regular physical activity.

EARLY DETECTION

A screening mammogram (x-ray of the breast) is used to detect breast disease in females who appear to have no breast problems. For early breast cancer detection in females without breast symptoms, the Delaware Cancer Consortium (DCC) recommends that[13]

- Females age 40 and older should get a mammogram and clinical breast exam annually.
- Females ages 18-39 should get a clinical breast exam annually.

Also, females should know how their breasts normally look and feel, and report any breast change promptly to their health care provider. Breast self-exam is encouraged for females starting in their 20s[13]. Females at increased risk for breast cancer should discuss with their health care provider the benefits and limitations of beginning mammograms when they are younger, having additional tests, and/or having more frequent exams.

FEMALE BREAST CANCER SCREENING IN DELAWARE

The BRFS has collected yearly mammogram use data through 2000; after 2000, mammogram use data are collected biennially. The BRFS asks a female respondent's mammogram use during the previous two years (as opposed to the annual mammogram screening schedule recommended by the DCC) to account for minor variations in scheduling that may cause a woman to miss the one-year threshold (e.g., two mammogram screening appointments 14 months apart).

Data from the 2014 BRFS provides information on breast cancer screening among Delaware females:

- Of Delaware females age 40 and older, 80 percent reported having a mammogram within the previous two years, compared to the national median of 73 percent of U.S. females age 40 and older. Delaware females ranked third highest nationally for this response.
- In Delaware, 80 percent of Caucasian females age 40 and older reported having a mammogram in the past two years, compared to 79 percent of African American females, but the difference was not significantly different.
- Females age 40 and older in the three highest income categories had the highest percentages of mammography use (82 percent for females with an annual income of $35,000-$49,999, 82 percent for females with an annual income of $50,000-$74,999, and 87 percent for females with an annual income of $75,000 and over).
- Delaware females (age 40 and older) who were college graduates (87 percent) were more likely to have had a mammogram than those who had some post high school education (75 percent); this difference was statistically significant.

[13] American Cancer Society recommendations for early breast cancer detection in women without breast symptoms. Accessed March 15, 2016. http://www.cancer.org/Cancer/BreastCancer/MoreInformation/BreastCancerEarlyDetection/breast-cancer-early-detection-acs-recs

INCIDENCE

For 2009-2013, Delaware ranked 12th in the U.S. for female breast cancer incidence (17th in 2008-2012)[10].

2009-2013 DATA

TABLE 5-1: NUMBER OF FEMALE BREAST CANCER CASES, BY RACE; DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
Delaware	3,716	2,954	668
Kent	641	489	141
New Castle	2,106	1,594	451
Sussex	969	871	76

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

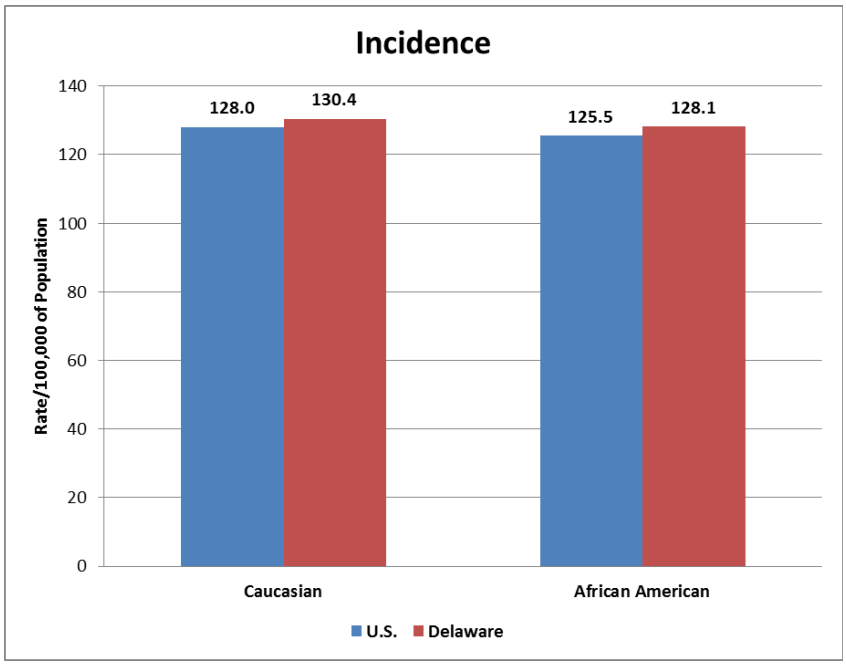
- Breast cancer is the most commonly diagnosed cancer among females in the U.S. and Delaware.
- There were a total of 30 breast cancers diagnosed in males; 87 percent were in Caucasian males. While these data are collected, only breast cancer in females will be addressed in this section.
- In 2009-2013, there were 3,716 female breast cancer cases (29 percent of all cancer cases in females) diagnosed in Delaware.
- Caucasians accounted for 79 percent of female breast cancer cases in Delaware.

TABLE 5-2: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
U.S.	125.0	128.0	125.5
Delaware	130.1	130.4	128.1
Kent	129.1	129.2	134.3
New Castle	132.5	133.9	130.6
Sussex	125.2	123.6	111.8

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

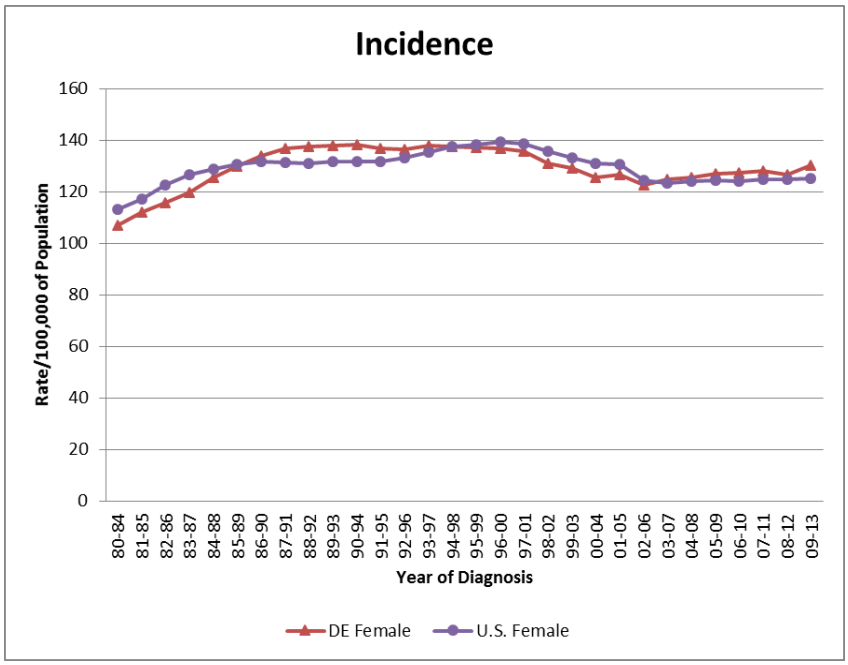
FIGURE 5-1: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES BY RACE; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in female breast cancer incidence rates between Caucasians (130.4 per 100,000) and African Americans (128.1 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware (130.1 per 100,000) had a statistically significantly higher female breast cancer incidence rate than the U.S. (125.0 per 100,000).
  - The difference in female breast cancer incidence rates between Caucasians in Delaware (130.4 per 100,000) and the U.S. (128.0 per 100,000) was not statistically significant.
  - The difference in female breast cancer incidence rates between African Americans in Delaware (128.1 per 100,000) and the U.S. (125.5 per 100,000) was not statistically significant.

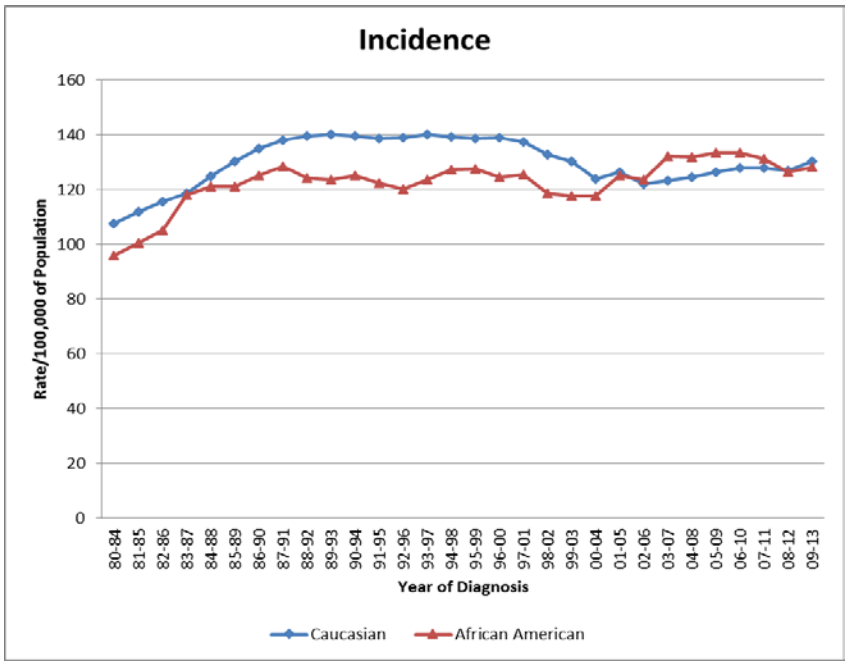
FIGURE 5-2: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for female breast cancer increased slightly in Delaware (1 percent) and declined in the U.S. (6 percent).

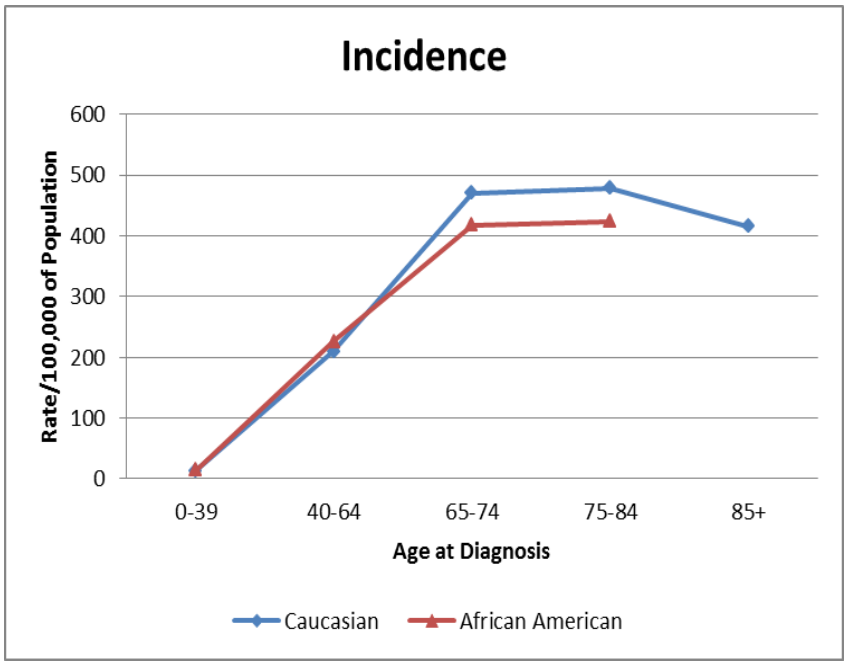
FIGURE 5-3: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Caucasian females in Delaware saw no change in female breast cancer incidence while African Americans saw a 9 percent increase.

FIGURE 5-4: AGE-SPECIFIC FEMALE BREAST CANCER INCIDENCE RATES BY RACE; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

TABLE 5-3: AGE-SPECIFIC FEMALE BREAST CANCER INCIDENCE RATES BY RACE; DELAWARE, 2009-2013

Age at Diagnosis	All Females	Caucasian	African American
0-39	13.9	13.4	14.1
40-64	213.2	209.9	225.9
65-74	459.3	470.3	417.4
75-84	464.9	478.6	423.8
85+	400.1	415.6	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for female breast cancer incidence is 75-84 years of age for both Caucasians and African Americans.
- Due to low numbers, incidence rates were not able to be computed for African American females in Delaware age 85 and older.

STAGE OF DIAGNOSIS - DELAWARE

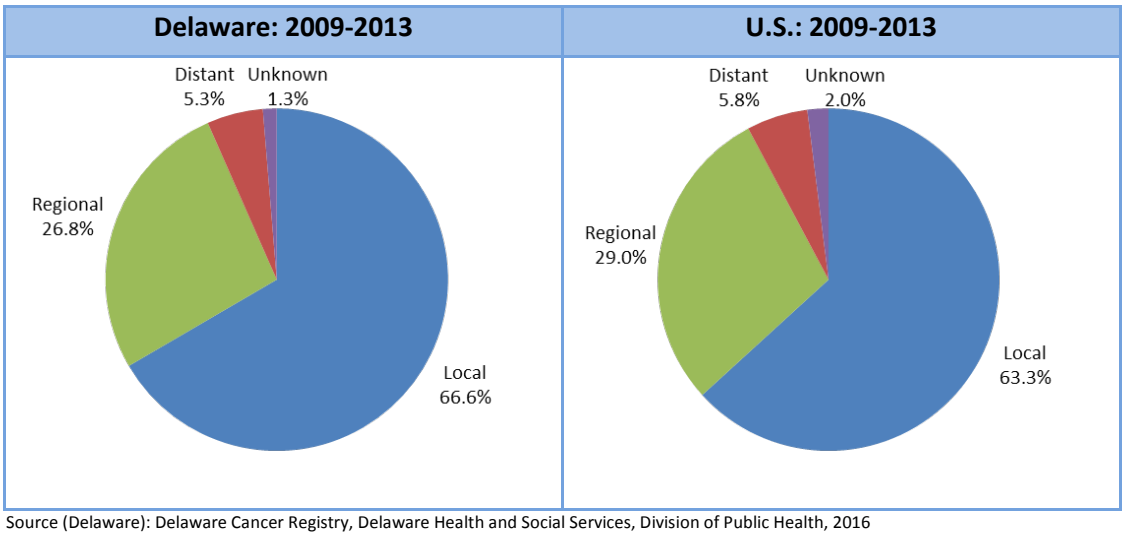
TABLE 5-4: FEMALE BREAST CANCER CASES BY STAGE AT DIAGNOSIS BY RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Females	Caucasian	African American
Local	2,475 (67)	2,022 (68)	394 (59)
Regional	997 (27)	747 (23)	222 (33)
Distant	197 (5)	149 (5)	42 (6)
Unknown	47 (1)	36 (1)	10 (2)
Total	3,716	2,954	668

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- In 2009-2013 in Delaware, there were 2,475 (67 percent) breast cancers diagnosed at the local stage; 997 (27 percent) at the regional stage; 197 (5 percent) at the distant stage; and 47 (1 percent) had an unknown stage.
- Caucasian females in Delaware had a higher proportion (68 percent) of breast cancer diagnosed at the local stage than African American females in Delaware (59 percent).

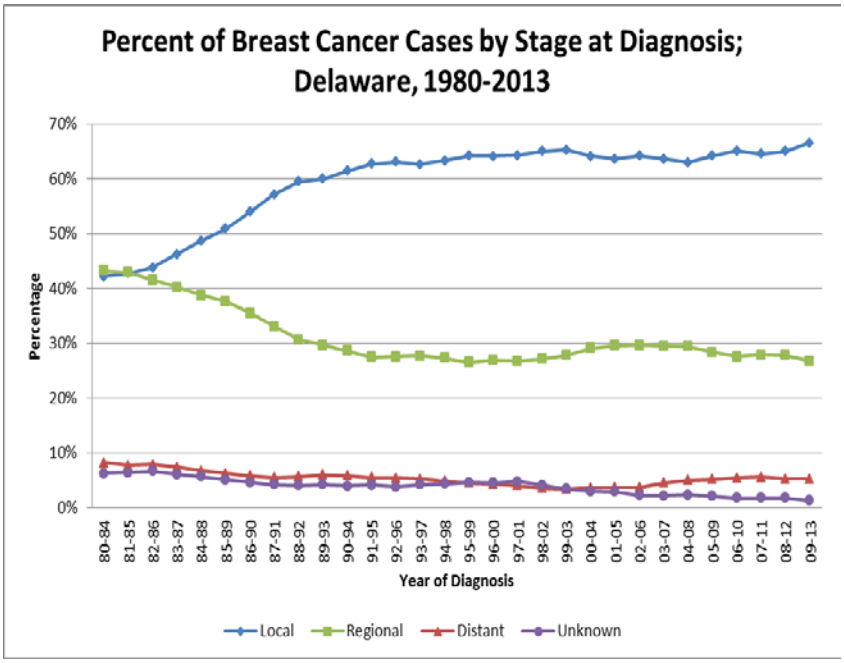
FIGURE 5-5: DISTRIBUTION OF FEMALE BREAST CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware data, the proportion of female breast cancer diagnosed at each of the stages is similar.

FIGURE 5-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR FEMALE BREAST CANCER CASES; DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of female breast cancer cases diagnosed at the local stage increased from 42 percent to 67 percent.
  - Cases diagnosed at the distant stage decreased from 8 percent to 5 percent.

MORTALITY

For 2009-2013, Delaware ranked 22nd in the U.S. for female breast cancer mortality (23rd in 2008-2012)[11].

2009-2013 DATA

TABLE 5-5: NUMBER OF FEMALE BREAST CANCER DEATHS, BY RACE; DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
Delaware	637	501	126
Kent	123	89	31
New Castle	340	258	76
Sussex	174	154	19

Source: Delaware Health Statistics Center, 2016

- Breast cancer is the second most common cause of cancer death among females in the U.S. and Delaware.
- Six Delaware males died from breast cancer from 2009 through 2013 (four deaths in Caucasian males, one African American male death, and one death in a male of another race). Further analysis of male deaths due to breast cancer are not included in this section.

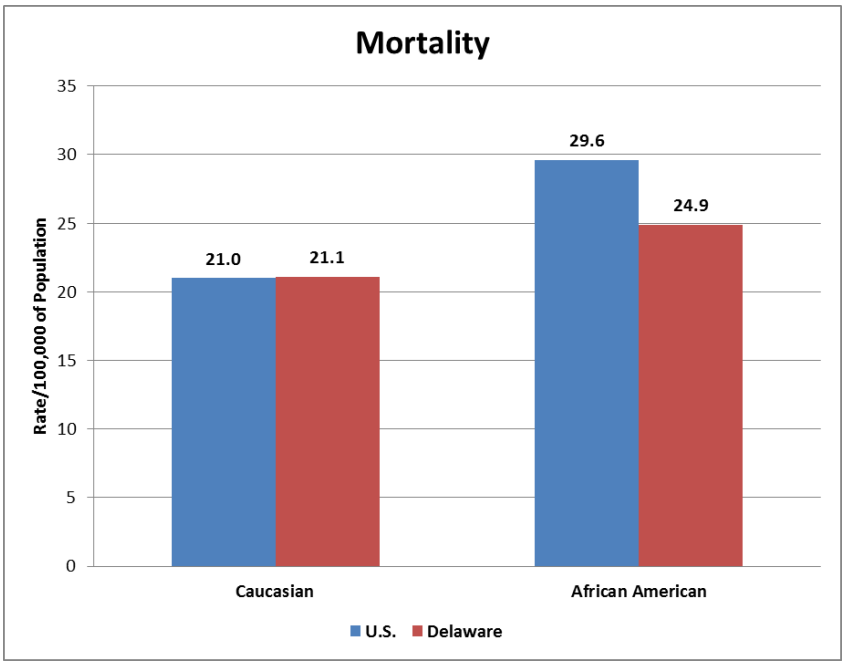
- In 2009-2013, there were 637 female deaths (14 percent of all female cancer deaths) from breast cancer.
- Caucasian females accounted for 79 percent of breast cancer deaths in Delaware.

TABLE 5-6: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
U.S.	21.5	21.0	29.6
Delaware	21.7	21.1	24.9
Kent	24.8	23.5	31.1
New Castle	20.7	20.3	22.6
Sussex	21.4	20.8	---

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

FIGURE 5-7: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES BY RACE; U.S. AND DELAWARE, 2009-2013



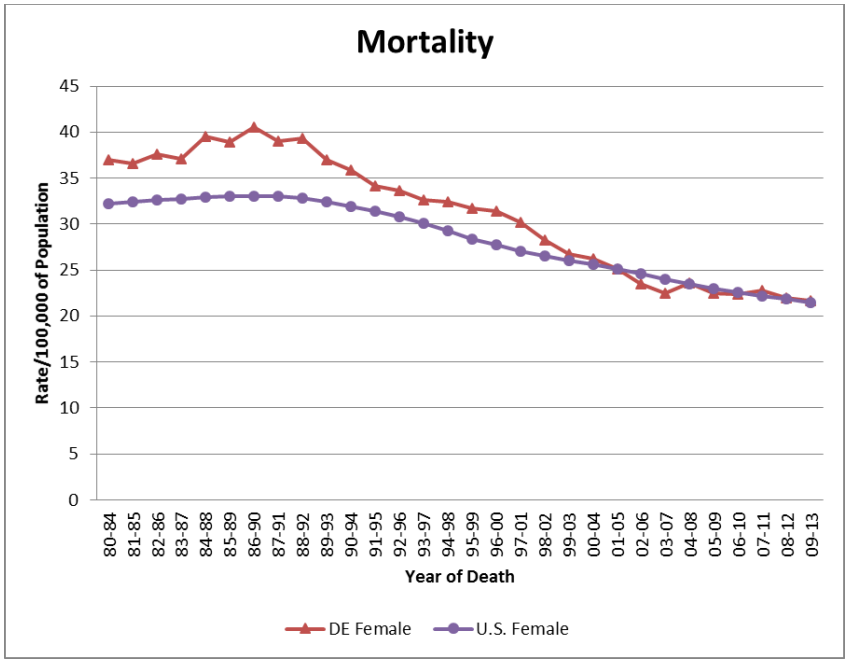
Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in female breast cancer mortality rates between Caucasians (21.1 per 100,000) and African Americans (24.9 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - The difference in female breast cancer mortality rates between Delaware (21.7 per 100,000) and the U.S. (21.5 per 100,000) was not statistically significant.

- The difference in female breast cancer mortality rates between Caucasians in Delaware (21.1 per 100,000) and the U.S (21.0 per 100,000) was not statistically significant.
- The difference in female breast cancer mortality rates between African Americans in Delaware (24.9 per 100,000) and the U.S. (29.6 per 100,000) was not statistically significant.

TRENDS OVER TIME – DELAWARE AND U.S.

FIGURE 5-8: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES; U.S. AND DELAWARE, 1980-2013

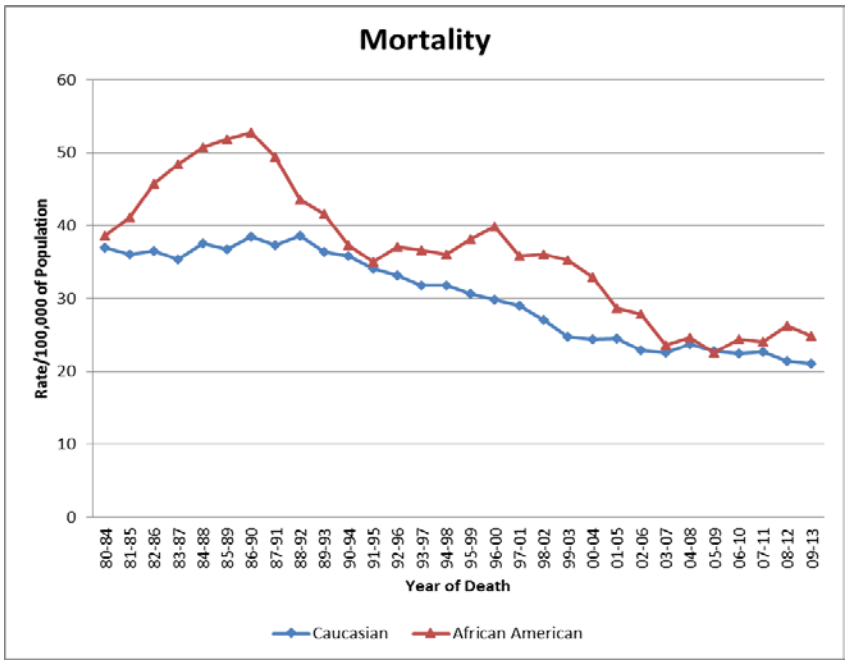


Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for female breast cancer declined 19 percent in Delaware and 17 percent in the U.S.

TRENDS OVER TIME - DELAWARE

FIGURE 5-9: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African American females in Delaware saw a 29 percent decline in breast cancer mortality while Caucasians saw a 15 percent decline in mortality.

AGE-SPECIFIC MORTALITY RATES - DELAWARE

TABLE 5-7: AGE-SPECIFIC FEMALE BREAST CANCER MORTALITY RATES BY RACE; DELAWARE, 2009-2013

Age at Death	All Females	Caucasian	African American
0-39	---	---	---
40-64	28.8	26.0	39.7
65-74	67.5	68.8	---
75-84	113.2	114.0	---
85+	168.8	167.9	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for female breast cancer mortality is age 85 and older. Due to low numbers, mortality rates were not able to be computed for the 0-39 age group.
- After stratifying by race, Caucasian females had peak mortality at 85 years and over. Due to low numbers, the mortality rates could not be calculated for most of the African American age groups.

CHAPTER 6: CERVICAL CANCER

RISK FACTORS

The most important risk factor for cervical cancer is infection from the human papilloma virus (HPV). HPV is a group of more than 100 related viruses. About two-thirds of all cervical cancers are caused by HPV 16 and 18.

The following are *lifestyle risk factors* which a woman can modify to reduce her risk of getting cervical cancer:

- Obesity or overweight (increases the risk of adenocarcinoma of the cervix)
- Cigarette smoking (doubles the risk)
- Diet low in fruits and vegetables
- Infection with the human immunodeficiency virus (HIV), the virus that causes AIDS, damages the body's immune system and places one at higher risk for HPV infection.
- Infection from Chlamydia, a relatively common bacteria that can infect the reproductive system
- Certain sexual practices can increase the risk of getting cervical cancer:
    - sexual intercourse at a young age
    - multiple partners
    - a partner who has had many sexual partners
    - intercourse with uncircumcised males.
- Long-term use (five or more years) of oral contraceptives can increase the risk of cervical cancer.
- Three or more full-term pregnancies can increase the risk of cervical cancer.
- Having a first full-term pregnancy before age 17 – doubles the risk later in life, compared to a woman whose first pregnancy was at age 25 or later.

The following are *environmental and medically-related* causes of female cervical cancer:

- Having a mother who took diethylstilbestrol (DES) during pregnancy to prevent miscarriage (1940 through 1971) increases the risk of clear cell adenocarcinoma of the cervix.

The following are *non-modifiable* risk factors (these cannot be changed):

- Family history – Having a mother or sister with cervical cancer increases the risk two- to three-fold.
- Race/ethnicity – African American, American Indian and Hispanic females are more likely to get cervical cancer.

To protect against cervical cancer, individuals should consume a diet high in fruits, vegetables, and whole grains; increase physical activity; stop smoking; and have safe sexual practices. There are also two HPV vaccines that have Food and Drug Administration (FDA) approval for use to protect against cervical cancer for the following groups:

- Routine vaccinations for girls starting at age 11 or 12 (the vaccination series can be started as early as age 9).
- Females ages 13-26 who have not started the vaccines or who have started but not completed the series. It is important to note that vaccination at older ages is less effective in lowering cancer risk.
- Women with weakened immune systems, including those with HIV infection, if they have not been previously vaccinated.

EARLY DETECTION

The Pap test detects changes in cells in the cervix that are caused by HPV infection. HPV tests look for HPV infections by finding genes from HPV in the cervical cells. In March 2012, the American Cancer Society, the American Society for Colposcopy and Cervical Pathology, and the American Society for Clinical Pathology jointly released new cervical cancer screening guidelines that extend the time interval between screening tests for most women. The Delaware Cancer Consortium also endorses these guidelines (shown in Table 6-1):

TABLE 6-1: CERVICAL CANCER SCREENING GUIDELINES

Population	Recommended Screening	Comments
Under 21 years	No screening	HPV testing should not be used for screening or management of ACS–US^ in this age group.
21 – 29 years	Cytology alone every 3 years	
30 – 65 years	HPV and cytology 'co-testing' every 5 years (preferred) **OR** Cytology alone every 3 years (acceptable)	Screening by HPV testing alone is not recommended for most clinical settings
Older than 65 years	No screening following adequate negative prior screening	Women with a history of CIN2 or a more severe diagnosis should continue routine screening for at least 20 years
After hysterectomy	No screening	Applies to women without a cervix and without a history of CIN2^^ or a more severe diagnosis in the past 20 years or cervical cancer ever.
HPV vaccinated	Follow age-specific recommendations (same as unvaccinated women)	

Source: https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/cervical-cancer-screening#consider
^ASC–US: atypical squamous cells of undetermined significance
^^CIN2: cervical intraepithelial neoplasia grade 2

CERVICAL CANCER SCREENING IN DELAWARE

The BRFS has collected data on cervical cancer screening in Delaware annually from 1995 to 2000 and biannually since then. In 2015 the BRFS showed that:

- Eighty-three percent of Delaware women age 18 and older reported that they had had a Pap test within the previous three years, compared to 81 percent of U.S. women of the same age.
- In Delaware, the rates of receiving a Pap test were comparable in Caucasians (84 percent) and African Americans (85 percent).
- Significantly fewer Delaware females ages 65 and older reported having had a Pap test in the last three years (69 percent), compared to women ages 55-64 (87 percent).

INCIDENCE

For 2009-2013, Delaware ranked 13th in the U.S. for cervical cancer incidence (9th in 2008-2012)[10].

2009-2013 DATA

TABLE 6-2: NUMBER OF CERVICAL CANCER CASES, BY RACE DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
Delaware	209	164	43
Kent	37	31	6
New Castle	122	92	29
Sussex	50	41	8

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

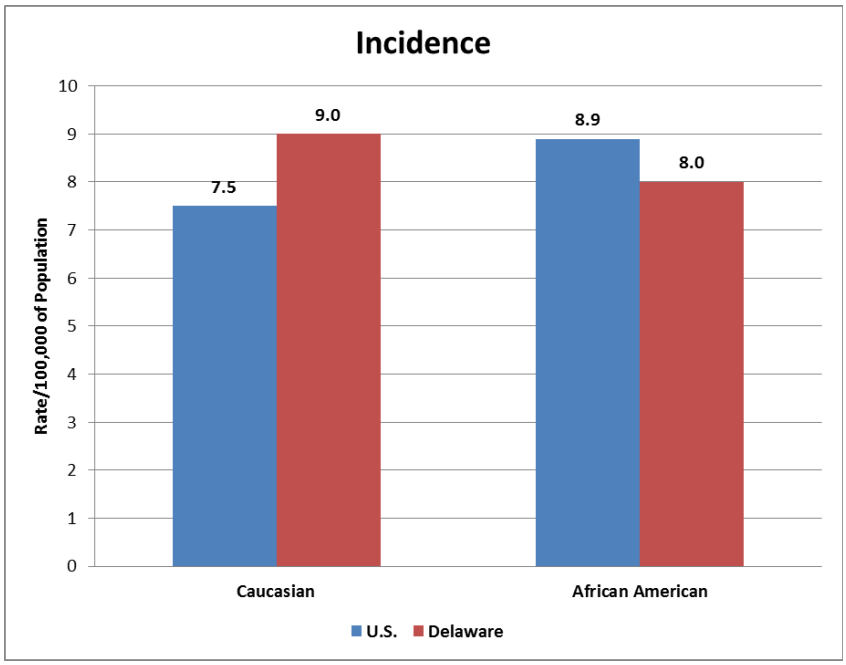
- In 2009-2013, there were 209 cervical cancer cases (2 percent of all cancer cases in females) diagnosed in Delaware.
- Caucasians accounted for 78 percent of cervical cancer cases in Delaware.

TABLE 6-3: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER INCIDENCE RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
U.S.	7.5	7.5	8.9
Delaware	8.3	9.0	8.0
Kent	8.7	10.2	---
New Castle	8.1	8.8	8.3
Sussex	9.0	9.0	---

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

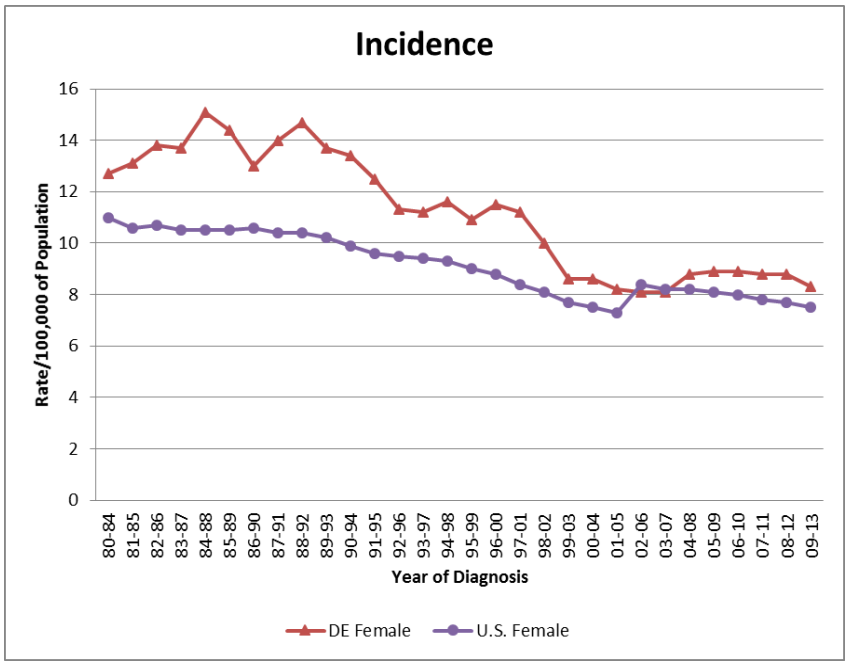
FIGURE 6-1: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER INCIDENCE RATES BY RACE; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in cervical cancer incidence rates between Caucasians (9.0 per 100,000) and African Americans (8.0 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - The difference in cervical cancer incidence rates between Delaware (8.3 per 100,000) and the U.S. (7.5 per 100,000) was not statistically significant.
  - The difference in cervical cancer incidence rates between Caucasians in Delaware (9.0 per 100,000) and the U.S. (7.5 per 100,000) was not statistically significant.
  - The difference in cervical cancer incidence rates between African Americans in Delaware (8.0 per 100,000) and the U.S. (8.9 per 100,000) was not statistically significant.

FIGURE 6-2: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER INCIDENCE RATES; U.S. AND DELAWARE, 1980-2013

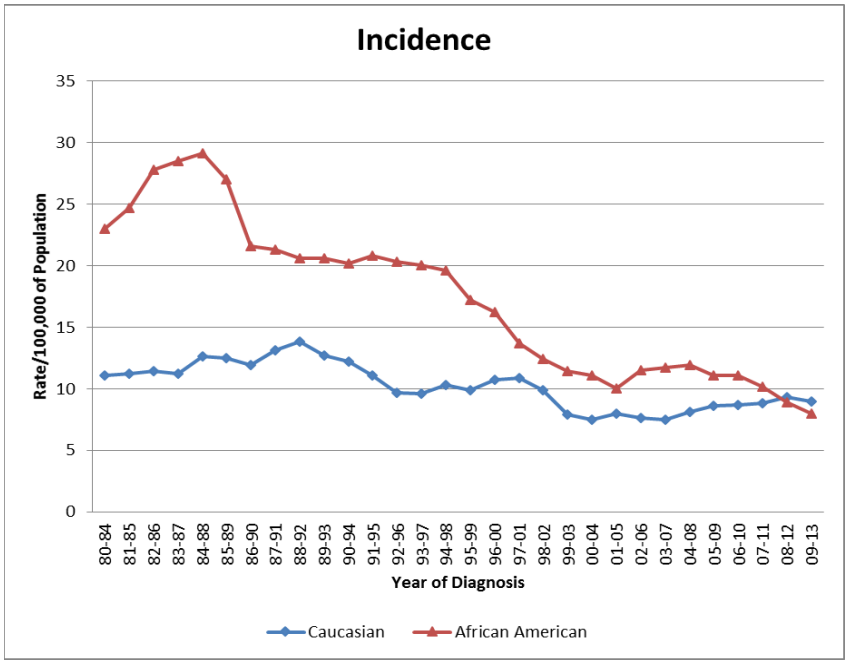


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for cervical cancer declined in both Delaware and the U.S. by 3 percent.

TRENDS OVER TIME - DELAWARE

FIGURE 6-3: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Caucasian females in Delaware saw an increase in cervical cancer incidence by 14 percent while African Americans saw a 30 percent decline.

AGE-SPECIFIC INCIDENCE RATES - DELAWARE

TABLE 6-4: AGE-SPECIFIC CERVICAL CANCER INCIDENCE RATES BY RACE; DELAWARE, 2009-2013

Age at Diagnosis	All Females	Caucasian	African American
0-39	3.9	5.0	---
40-64	14.9	15.3	15.8
65-74	15.9	15.5	---
75-84	---	---	---
85+	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for cervical cancer incidence is 65-74 years of age.
- Due to low numbers, incidence rates were not able to be computed for some age categories when stratifying by race.

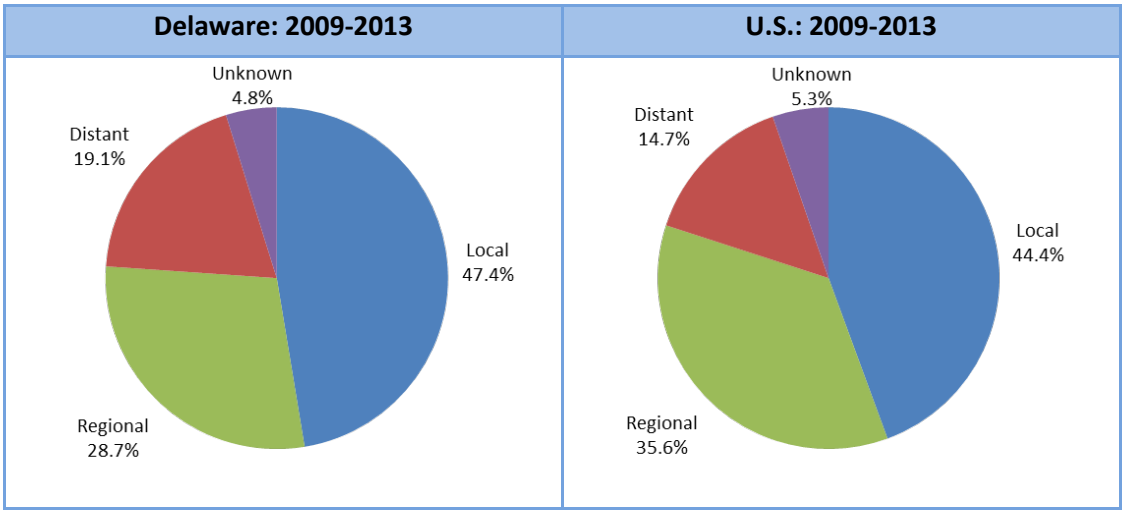
TABLE 6-5: CERVICAL CANCER CASES BY STAGE AT DIAGNOSIS BY RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Females	Caucasian	African American
Local	99 (47)	80 (49)	18 (42)
Regional	60 (29)	48 (29)	12 (28)
Distant	40 (19)	29 (18)	---
Unknown	10 (5)	7 (4)	---
Total	209	164	43

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 99 (47 percent) cervical cancers diagnosed at the local stage; 60 (29 percent) at the regional stage; 40 (19 percent) at the distant stage; and 10 (5 percent) had an unknown stage.
- Caucasian females in Delaware had a higher proportion (49 percent) of cervical cancer diagnosed at the local stage than African American females in Delaware (42 percent).

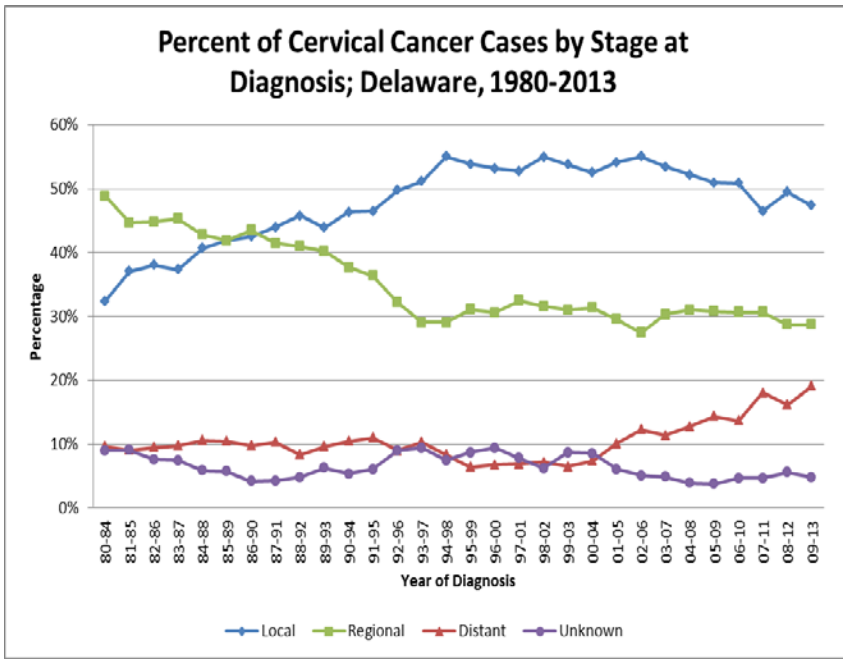
FIGURE 6-4: DISTRIBUTION OF CERVICAL CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- The proportion of cervical cancers diagnosed at the regional stage is higher in Delaware (29 percent) than the U.S. (36 percent).

FIGURE 6-5: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR CERVICAL CANCER CASES; DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of cervical cancer cases diagnosed at the local stage increased from 32 percent to 47 percent.
  - Cases diagnosed at the distant stage increased from 10 percent to 19 percent.

MORTALITY

For 2009-2013, Delaware ranked 15th in the U.S. for cervical cancer mortality (17th in 2008-2012)[11].

2009-2013 DATA

TABLE 6-6: NUMBER OF CERVICAL CANCER DEATHS, BY RACE; DELAWARE AND COUNTIES, 2009-2013

	All Females	Caucasian	African American
Delaware	69	47	20
Kent	15	7	---
New Castle	38	27	10
Sussex	16	13	---

Source: Delaware Health Statistics Center, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 69 female deaths (2 percent of all female cancer deaths) from cervical cancer.
- Caucasian females accounted for 68 percent of cervical cancer deaths in Delaware.

TABLE 6-7: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER MORTALITY RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2009-2013

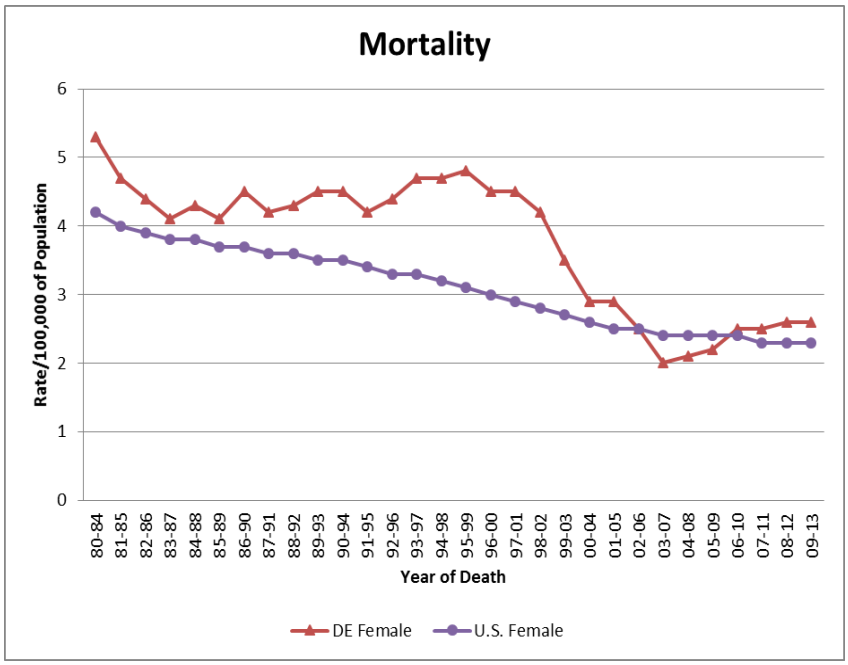
	All Females	Caucasian	African American
U.S.	2.3	2.1	3.9
Delaware	2.6	2.3	---
Kent	---	---	---
New Castle	2.5	2.4	---
Sussex	---	---	---

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- Comparing Delaware and the U.S.
  - The difference in cervical cancer mortality rates between Delaware (2.6 per 100,000) and the U.S. (2.3 per 100,000) was not statistically significant.
  - The difference in cervical cancer mortality rates between Caucasians in Delaware (2.3 per 100,000) and the U.S (2.1 per 100,000) was not statistically significant.

TRENDS OVER TIME – DELAWARE AND U.S.

FIGURE 6-6: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER MORTALITY RATES; U.S. AND DELAWARE, 1980-2013

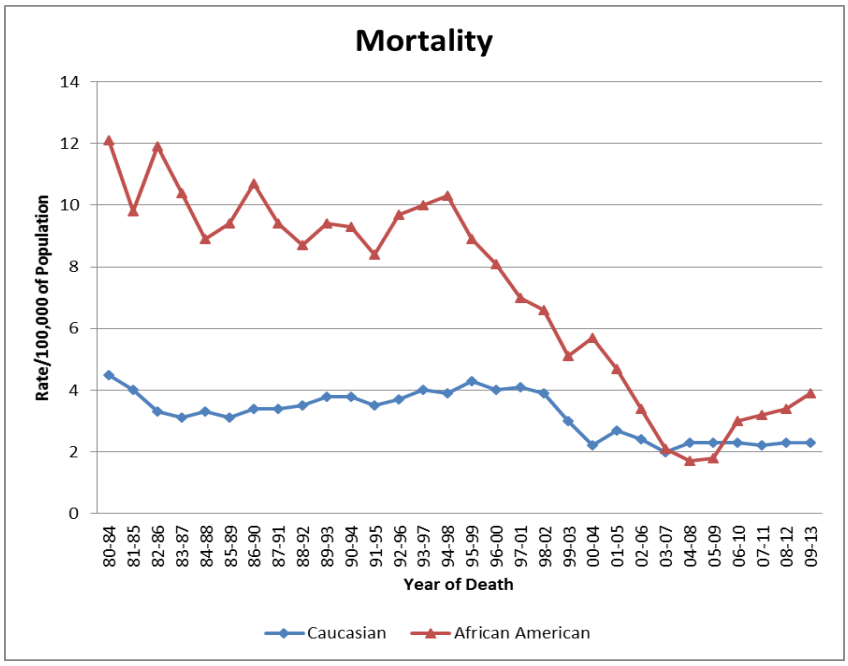


Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for cervical cancer declined 26 percent in Delaware and 15 percent in the U.S.

TRENDS OVER TIME - DELAWARE

FIGURE 6-7: FIVE-YEAR AVERAGE AGE-ADJUSTED CERVICAL CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African American females in Delaware saw a 24 percent decline in cervical cancer mortality while Caucasians saw a 23 percent decline in mortality.

AGE-SPECIFIC MORTALITY RATES - DELAWARE

TABLE 6-8: AGE-SPECIFIC CERVICAL CANCER MORTALITY RATES BY RACE; DELAWARE, 2009-2013

Age at Death	All Females	Caucasian	African American
0-39	---	---	---
40-64	4.2	4.1	---
65-74	---	---	---
75-84	---	---	---
85+	---	---	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- There was not enough information to analyze age-specific cervical cancer mortality rates in Delaware.

CHAPTER 7: COLORECTAL CANCER

RISK FACTORS

The following are *lifestyle risk factors* which a person can modify to reduce their risk of getting colorectal cancer:

- A diet high in red and processed meats
- Heavy alcohol consumption
- Lack of physical activity/obesity
- Long-term tobacco use
- Type 2 diabetes.

The following are *environmental and medically-related* causes of colorectal cancer:

- Personal history of testicular cancer (possibly due to testicular cancer treatment strategies)
- History of radiation treatment for prostate cancer
- Night-shift work may increase risk among females (limited data on this factor).

The following are *non-modifiable* risk factors (these cannot be changed):

- Age (risk increases after age 50)
- Race (African Americans are at greater risk than Caucasians.)
- Ethnicity (Jewish males and females of Eastern European descent are at greater risk.)
- Personal history of colorectal adenomatous polyps or previous history of colorectal cancer
- History of Inflammatory Bowel Disease, Ulcerative Colitis or Crohn's disease
- Familial adenomatous polyposis (FAP) is responsible for 1 percent of colorectal cancers
- Family history of colorectal cancer or adenomatous polyps in one or more first-degree relatives

To protect against colorectal cancer, individuals should get regular screenings because the early removal of colorectal polyps can prevent colorectal cancer from developing. People should also manage lifestyle risk factors (diet, alcohol, and physical activity) and take a daily multivitamin. (Studies have shown that a multivitamin containing folic acid, vitamin D and/or magnesium could decrease colorectal cancer risk.)

People who use aspirin and other anti-inflammatory drugs (i.e. ibuprofen) show a lower risk of colorectal cancer but long-term use may lead to other side effects. Combined hormone replacement therapy (including both estrogen and progesterone) may reduce a woman's postmenopausal risk of colorectal cancer.

EARLY DETECTION

The American Cancer Society (ACS) and the Delaware Cancer Consortium's (DCC) colorectal cancer screening guidelines recommend that at age 50, males and females at average risk of developing colorectal cancer should use one of the following screening options[14]:

a. Fecal occult blood tests (FOBT) every year
b. Fecal immunochemical test (FIT) every year
c. Flexible sigmoidoscopy every five years
d. Double-contrast barium enema every five years
e. CT colonography (virtual colonoscopy) every five years
f. Colonoscopy every 10 years

[14] Detailed screening guidelines for colorectal cancer: http://www.cancer.org/Cancer/ColonandRectumCancer/MoreInformation/ColonandRectumCancerEarlyDetection/colorectal-cancer-early-detection-acs-recommendations

For options a-e, a follow-up colonoscopy should be performed if results from an initial screening test are positive. ACS and DCC screening guidelines offer suggested screening schedules for individuals with an elevated risk of developing colorectal cancer[15].

COLORECTAL CANCER SCREENING IN DELAWARE

Data from the 2014 BRFS provides information on colorectal cancer screening patterns among Delawareans.

- Delaware ranked fifth highest nationally in the prevalence (77 percent) of adults age 50 and older who reported that they had ever had a colonoscopy or sigmoidoscopy. The U.S. national median of ever having had a sigmoidoscopy or colonoscopy was 69 percent.
- The percentage of Delawareans who have ever had a colonoscopy or sigmoidoscopy increased with age. Significantly more Delawareans ages 60-64 (79 percent) and 65+ (86 percent) reported ever having had a colonoscopy or sigmoidoscopy, compared to those ages 50-59 (55 percent).
- In Delaware, the proportion of Caucasians age 50 and older who had ever had a colonoscopy or sigmoidoscopy (78 percent) was higher than for African Americans (70 percent). However, this difference was not statistically significant.
- In Delaware, the proportion of adults age 50 and over who had ever had a colonoscopy or sigmoidoscopy increased by level of education.
- 27 percent of Delawareans reported ever having taken a test using a blood stool home kit.
- Compared to the U.S., Delaware residents in the lowest income category were more likely to have ever been screened for colorectal cancer (73 percent for Delaware vs. 55 percent for the U.S.).

INCIDENCE

For 2009-2013, Delaware ranked 37th in the U.S. for colorectal cancer incidence (36th in 2008-2012); males ranked 34th (36th in 2008-2012) and females ranked 41st (37th in 2008-2012)[10].

2009-2013 DATA

TABLE 7-1: NUMBER OF COLORECTAL CANCER CASES, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	2,043	1,063	980	1,656	868	788	350	171	179
Kent	367	185	182	287	146	141	74	36	38
New Castle	1,089	561	528	841	437	404	226	109	117
Sussex	587	317	270	528	285	243	50	26	24

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- Colorectal cancer is the third most commonly diagnosed cancer in the U.S. and Delaware.
- In 2009-2013, there were 2,043 colorectal cancer cases (8 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 52 percent of colorectal cancer cases.
- Delaware Caucasians accounted for 81 percent of colorectal cancer cases.

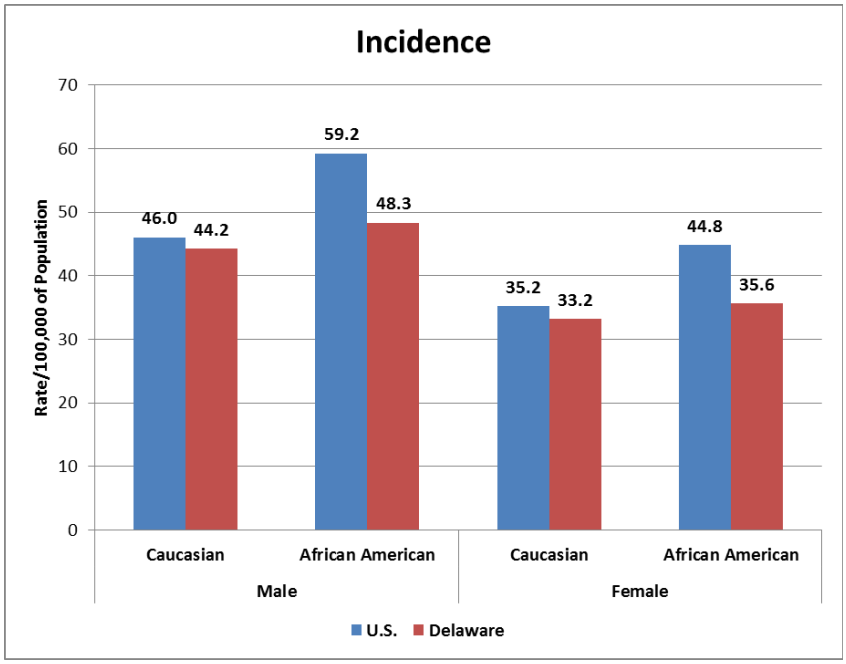
[15] https://www.cancer.org/cancer/colon-rectal-cancer/detection-diagnosis-staging/acs-recommendations.html

TABLE 7-2: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	41.0	47.1	36.0
Delaware	38.3	44.4	33.4
Kent	40.7	45.7	36.8
New Castle	37.5	43.8	32.8
Sussex	38.5	44.7	32.8

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 7-1: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



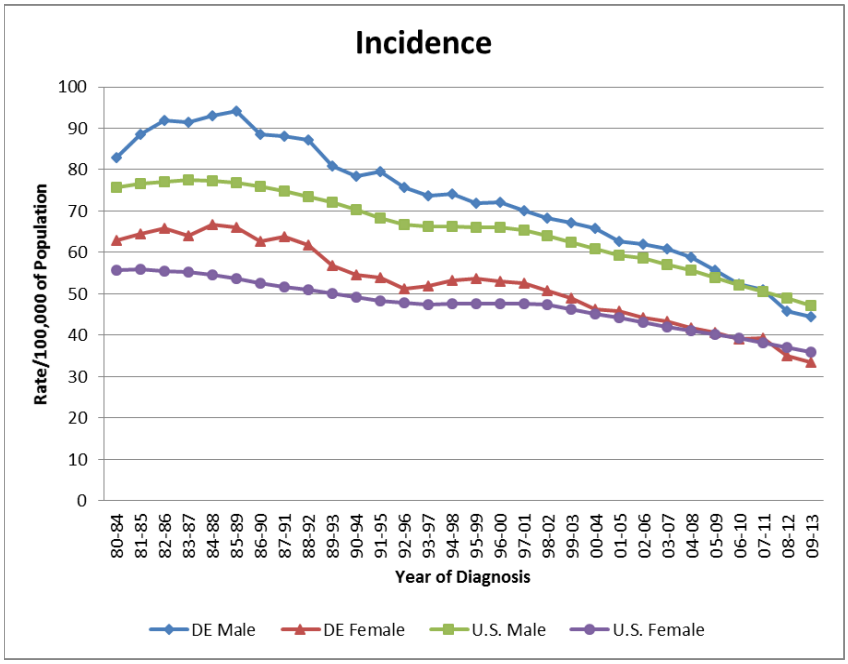
Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in colorectal cancer incidence rates between Caucasians (38.2 per 100,000) and African Americans (40.6 per 100,000) was not statistically significant.
  - The difference in colorectal cancer incidence rates between Caucasian females (33.2 per 100,000) and African American females (35.6 per 100,000) was not statistically significant.
  - The difference in colorectal cancer incidence rates between Caucasian males (44.2 per 100,000) and African American males (48.3 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware had a statistically significantly lower colorectal cancer incidence rate (38.3 per 100,000) than the U.S. (41.0 per 100,000).

- The difference in colorectal cancer incidence rates between Delaware males (44.4 per 100,000) and U.S. males (47.1 per 100,000) was not statistically significant.
- Delaware females (33.4 per 100,000) had a statistically significantly lower colorectal cancer incidence rate than U.S. females (36.0 per 100,000).
- The difference in colorectal cancer incidence rates between for Caucasians in Delaware (38.2 per 100,000) and the U.S. (40.1 per 100,000) was not statistically significant.
- African Americans in Delaware (40.6 per 100,000) had a statistically significantly lower colorectal cancer incidence rate than African Americans in the U.S. (50.7 per 100,000).

TRENDS OVER TIME - DELAWARE AND U.S.

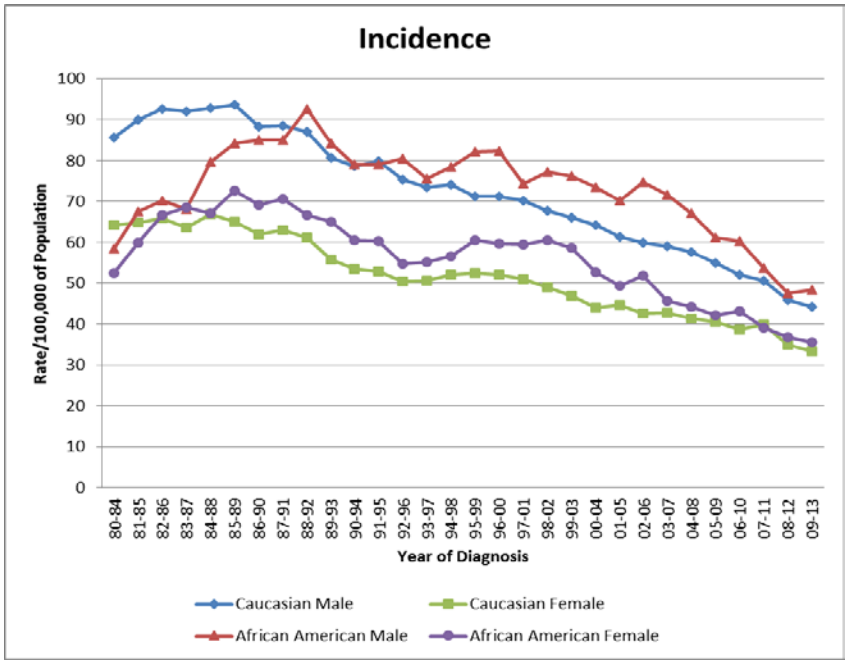
FIGURE 7-2: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for colorectal cancer declined 33 percent in Delaware and 23 percent in the U.S.
  - Delaware and U.S. males saw big declines in colorectal cancer incidence (34 percent and 25 percent, respectively).
  - Delaware and U.S. females saw big declines in colorectal cancer incidence (32 percent and 22 percent, respectively).

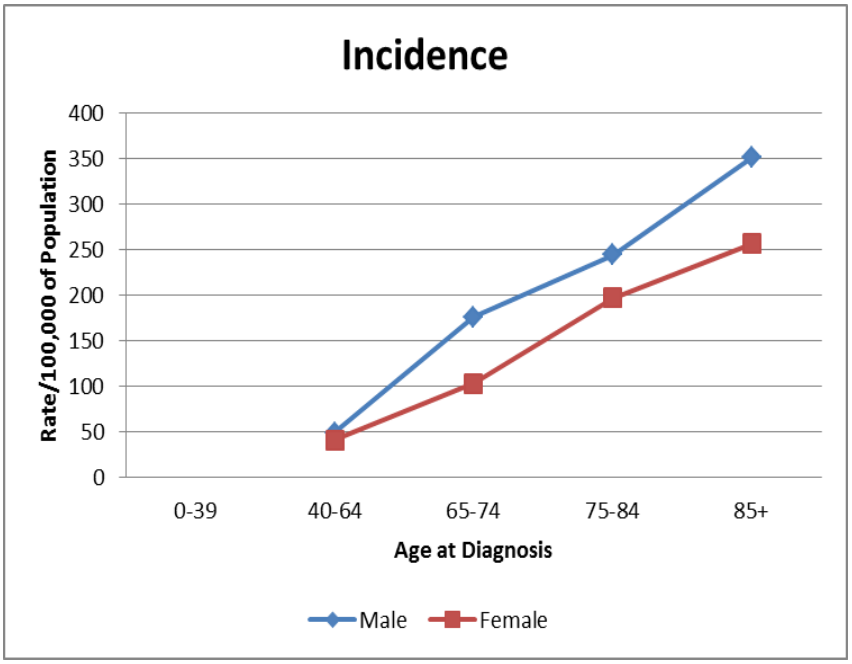
FIGURE 7-3: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - There was a sharp decline in colorectal cancer incidence among African American males (37 percent) and African American females (39 percent).
  - In the same time period, Caucasian males saw a 33 percent decline in colorectal cancer incidence and Caucasian females saw a decline of 29 percent.

FIGURE 7-4: AGE-SPECIFIC COLORECTAL CANCER INCIDENCE RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for colorectal cancer incidence is age 85 and older for both males and females. Due to low numbers, incidence rates were not able to be computed for females in the 0-39 age group.

TABLE 7-3: AGE-SPECIFIC COLORECTAL CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	49.1	52.6	40.0	49.2
65-74	176.9	179.3	103.2	117.2
75-84	238.0	318.2	205.5	163.5
85+	355.9	---	260.3	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- Both Caucasian males and females have peak colorectal cancer incidence at age 85 and older. Due to low numbers, the incidence rates could not be calculated for some age groups.

STAGE OF DIAGNOSIS - DELAWARE

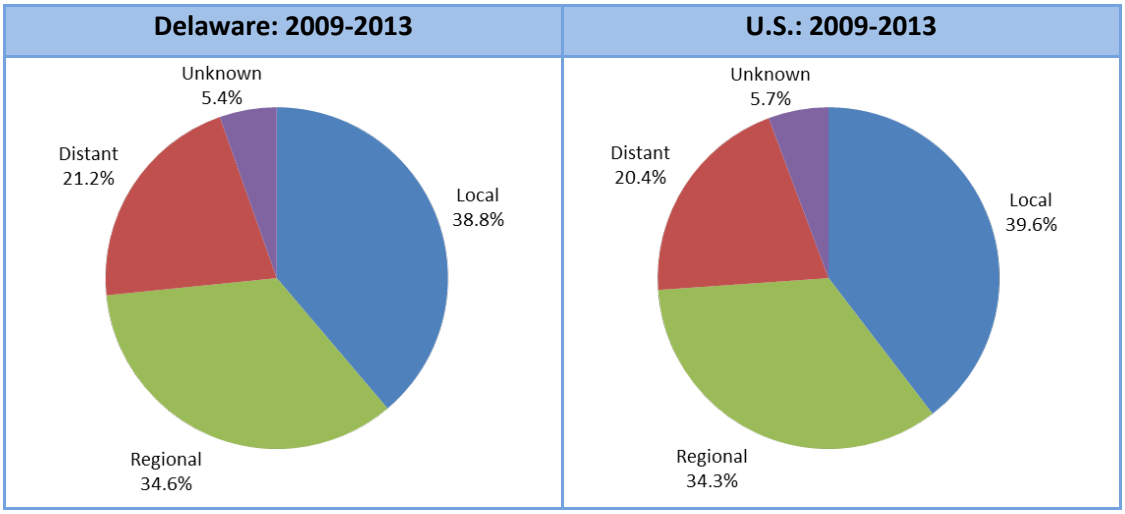
TABLE 7-4: COLORECTAL CANCER CASES BY STAGE AT DIAGNOSIS BY SEX AND RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Local	793 (39)	422 (40)	371 (38)	639 (39)	333 (38)	306 (39)	141 (40)	78 (46)	63 (35)
Regional	706 (35)	362 (34)	344 (35)	583 (35)	304 (35)	279 (35)	111 (32)	52 (30)	59 (33)
Distant	433 (21)	232 (22)	201 (21)	349 (21)	192 (22)	157 (20)	75 (21)	35 (21)	40 (22)
Unknown	111 (5)	47 (4)	64 (7)	85 (5)	39 (5)	46 (6)	23 (7)	6 (4)	17 (10)
Total	2,043	1,063	980	1,656	867	788	350	171	179

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- In 2009-2013, there were 793 (39 percent) colorectal cancers diagnosed at the local stage; 706 (35 percent) at the regional stage; 433 (21 percent) at the distant stage; and 111 (5 percent) had an unknown stage.
- African Americans had a higher proportion of colorectal cancers (40 percent) diagnosed at the local stage than Caucasians (39 percent).
- Males also had more colorectal cancers diagnosed at the local stage (40 percent) than females (38 percent). African American males had the highest proportion diagnosed at the local stage (46 percent), compared to African American females (35 percent).

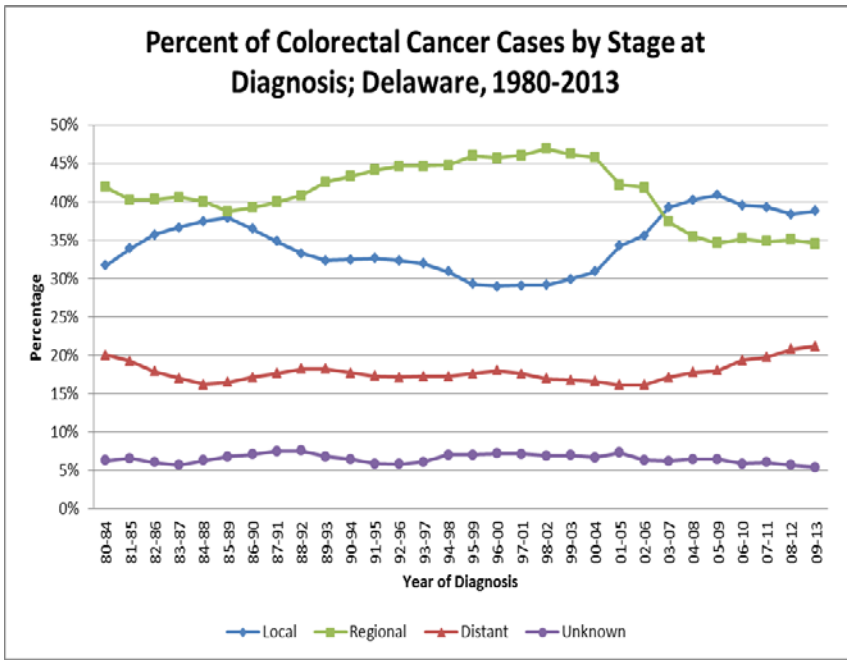
FIGURE 7-5: DISTRIBUTION OF COLORECTAL CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware data, the stage of colorectal cancer diagnosis is similar.

FIGURE 7-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR COLORECTAL CANCER CASES; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of colorectal cancer cases diagnosed at the local stage increased from 32 percent to 39 percent.
  - Colorectal cancer cases diagnosed at the distant stage increased slightly, from 20 percent to 21 percent.

MORTALITY

For 2009-2013, Delaware ranked 38th in the U.S. for colorectal cancer mortality (37th in 2008-2012); males ranked 28th (35th in 2008-2012) and females ranked 48th (39th in 2008-2012)[11].

2009-2013 DATA

TABLE 7-5: NUMBER OF COLORECTAL CANCER DEATHS, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	748	414	334	609	338	271	122	64	58
Kent	134	76	58	104	58	46	26	16	10
New Castle	418	224	194	327	178	149	81	39	42
Sussex	196	114	82	178	102	76	15	9	6

Source: Delaware Health Statistics Center, 2016

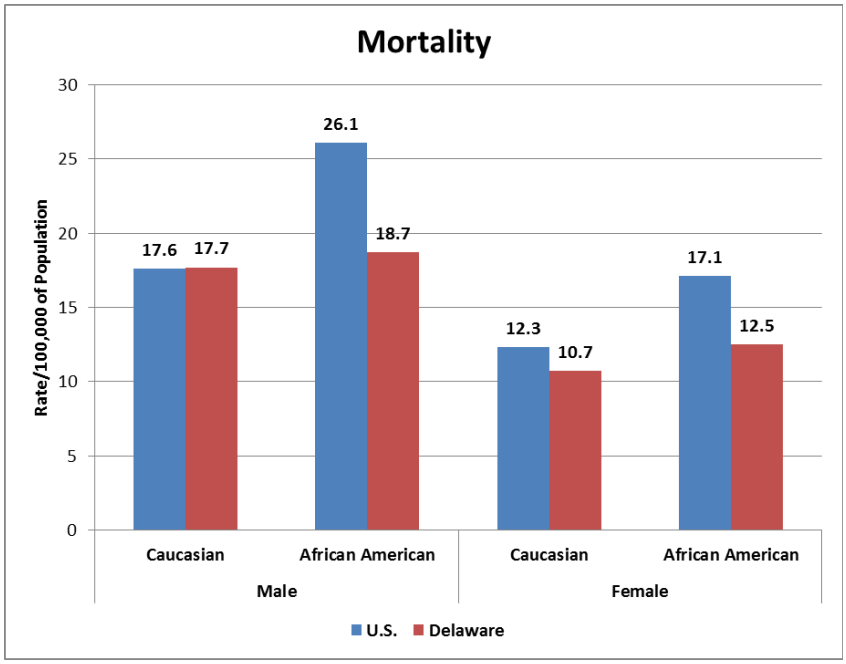
- Colorectal cancer is the third most common cause of cancer death in the U.S. and Delaware.
- In 2009-2013, there were 748 deaths (8 percent of all cancer deaths) from colorectal cancer.
- Delaware Caucasians accounted for 81 percent of colorectal cancer deaths.

TABLE 7-6: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	15.1	18.1	12.7
Delaware	14.1	17.9	10.9
Kent	14.8	19.1	11.3
New Castle	14.4	18.3	11.5
Sussex	13.1	17.1	9.6

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 7-7: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



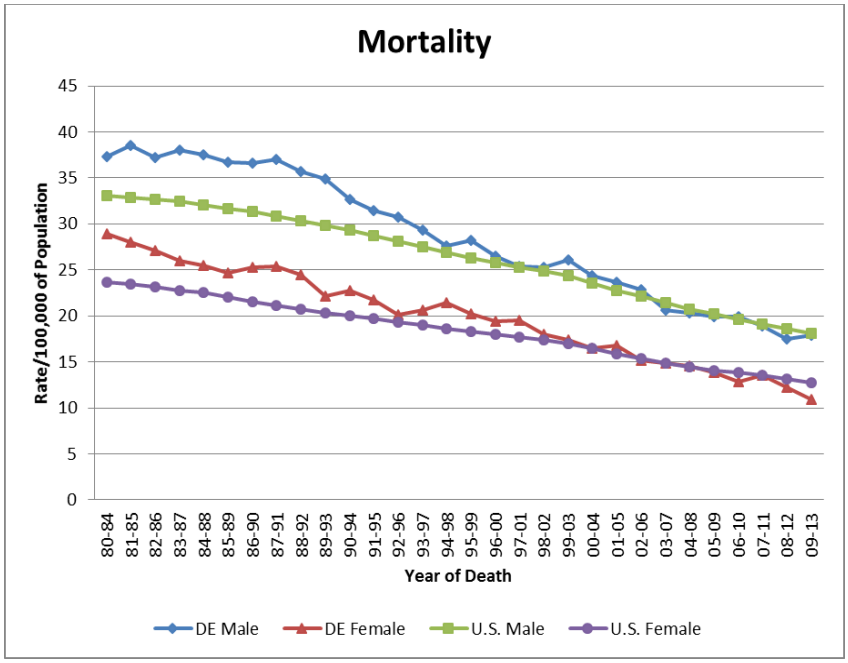
Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Males had a statistically significantly higher colorectal cancer mortality rate (17.9 per 100,000) compared to females (10.9 per 100,000).
  - The difference in colorectal cancer mortality rates between Caucasian females (10.7 per 100,000) and African American females (12.5 per 100,000) was not statistically significant.
  - The difference in colorectal cancer mortality rates between Caucasian males (17.7 per 100,000) and African American males (18.7 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - The difference in colorectal cancer mortality rates between Delaware (14.1 per 100,000) and the U.S. (15.1 per 100,000) was not statistically significant.

- Both males (18.1 per 100,000) and females (12.7 per 100,000) in the U.S. had higher colorectal cancer mortality rates than their counterparts in Delaware (male: 17.9 per 100,000; female: 10.9 per 100,000). Only the differences in females were statistically significant.
- The difference in colorectal cancer mortality rates between Caucasians in Delaware (13.9 per 100,000) and Caucasians in the U.S. (14.7 per 100,000) was not statistically significant.
- African Americans in Delaware (15.1 per 100,000) had a statistically significantly lower colorectal cancer mortality rate than African Americans in the U.S. (20.7 per 100,000).

TRENDS OVER TIME – DELAWARE AND U.S.

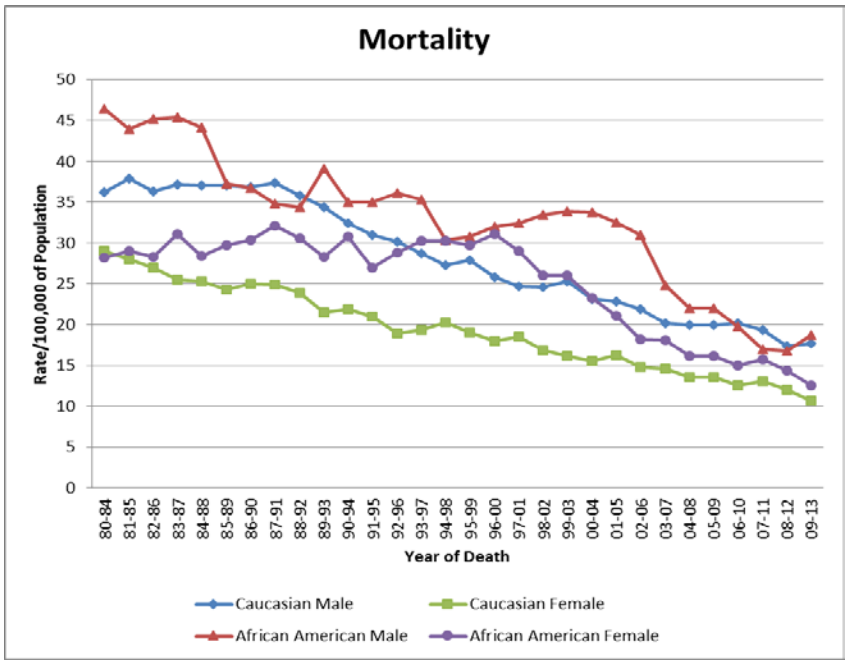
FIGURE 7-8: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for colorectal cancer declined 33 percent in Delaware and 25 percent in the U.S.
  - Delaware males saw big declines in colorectal cancer mortality (31 percent), with U.S. male colorectal cancer mortality declining by 26 percent.
  - U.S. female colorectal cancer mortality decreased by 25 percent and the Delaware female colorectal cancer mortality rate declined by 37 percent.

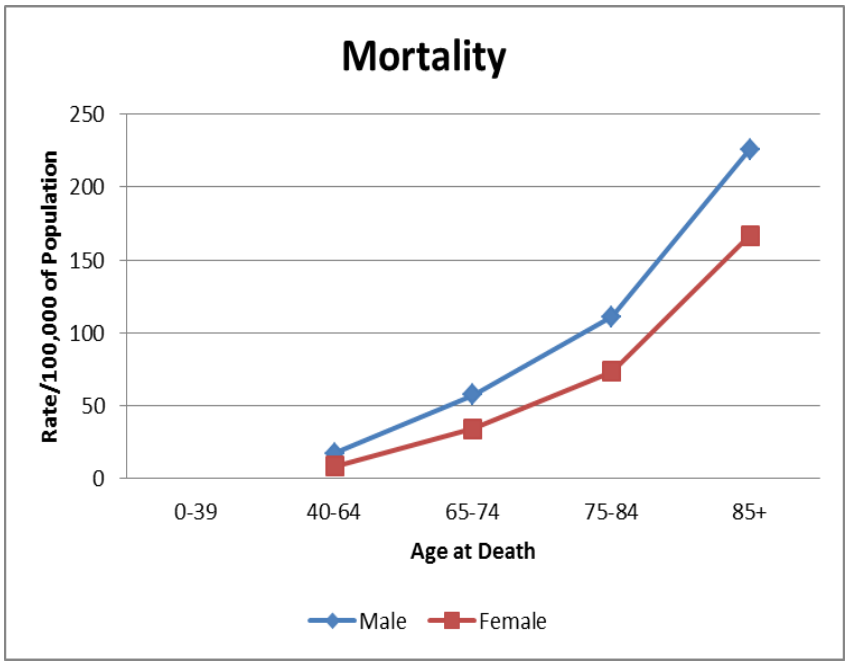
FIGURE 7-9: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Huge declines in colorectal cancer mortality were evident among African American males (45 percent) and females (52 percent).
  - Caucasian males (30 percent) and females (34 percent) also saw declines in colorectal cancer mortality.

FIGURE 7-10: AGE-SPECIFIC COLORECTAL CANCER MORTALITY RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for colorectal cancer mortality is age 85 and older for both males and females. Due to low numbers, mortality rates were not able to be computed for the 0-39 age group.

TABLE 7-7: AGE-SPECIFIC COLORECTAL CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	17.3	18.6	8.3	---
65-74	57.0	---	32.5	---
75-84	108.0	---	74.6	---
85+	230.3	---	170.0	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- After stratifying by race, Caucasian males and females have peak mortality in Delaware at 85 years and over. Due to low numbers, the mortality rates could not be calculated for most of the African American male and female age groups.

CHAPTER 8: LUNG AND BRONCHUS CANCER[16]

RISK FACTORS

The following are *lifestyle risk factors* which a person can modify to reduce their risk of getting lung cancer:

- The use of tobacco products: An estimated 85 to 90 percent of all lung cancer cases are caused by tobacco use, according to the U.S. Department of Health and Human Services.
- Exposure to secondhand smoke: When a person breathes in secondhand smoke, it is like he or she is smoking.
- Other suspected lifestyle risk factors include: a diet low in fruits and vegetables, a diet high in cholesterol, heavy alcohol use, and smoking marijuana.

The following are *environmental and medically-related* causes of lung cancer:

- Occupational exposures: asbestos, mustard gas, radioactive ores, metals (chromium, cadmium, and arsenic), certain organic chemicals, paint
- Environmental exposures: radon gas released from soil or building materials, asbestos (among smokers), air pollution, high levels of arsenic in drinking water
- Radiation therapy to the chest (especially for people who smoke)

The following are *non-modifiable* risk factors (these cannot be changed):

- Family history of lung cancer
- Personal history of tuberculosis

To protect against lung cancer, individuals should avoid tobacco and secondhand smoke, consume a diet rich in fruits and vegetables, engage in recommended levels of physical activity, and maintain a healthy weight.

EARLY DETECTION

In January 2013, the American Cancer Society (ACS) published new lung cancer screening guidelines[17] recommending that doctors discuss screening options with patients who meet certain criteria for high risk of developing the disease. High-risk patients are defined as those who:

- Are ages 55-74 years and in fairly good health
- Have a smoking history equivalent to a pack a day for 30 years or longer
- Currently smoke or have quit within the past 15 years

If a high-risk individual decides to be screened for lung cancer, the ACS recommends that the testing be performed using a low-dose computed tomography (CT) scan and take place at a facility with experience in lung cancer screening. The guidelines emphasize that screening is not a substitute for quitting smoking.

CURRENT TRENDS IN SMOKING IN DELAWARE

The Behavioral Risk Factor Survey (BRFS) collects data annually on tobacco use among the Delaware population. Current smoking trends may be predictive of cancer rates in the 2030s. In the 1980s (i.e., the time period relevant to current lung cancer rates in terms of tobacco use behaviors), Delaware's smoking prevalence rates were among the highest in the country. Historical BRFS data show that in 1982, 30 percent of

[16] "Lung cancer" is used instead of "lung and bronchus cancer" throughout this chapter.
[17] Wender R, et al. American Cancer Society Lung Cancer Screening Guidelines. Published early online January 11, 2013 in *CA:A Cancer Journal for Clinicians*

adult Delawareans smoked cigarettes. By the 1990s, Delaware's smoking rate among adults had declined to approximately 25 percent.

In recent years, tobacco use prevalence has leveled off among adult Delawareans, while continuing to decline among high school students. In 2014, 20 percent of adult Delawareans smoked cigarettes regularly. The following are some highlights of smoking trends in Delaware:

- The prevalence rate for current smokers in Delaware (20 percent) is close to the 2014 U.S. median prevalence of 18 percent.
- Delaware males are more likely to report being current smokers (24 percent) than females. This prevalence rate is statistically significantly higher than the rate among females in Delaware (17 percent).
- Caucasians in Delaware had a higher prevalence rate of current smokers (22 percent) compared to 17 percent of African Americans. However, this difference is not statistically significant.
- When smoking prevalence rates were stratified by age group, Delawareans ages 25-34 reported the highest rate of current smoking (29 percent). This rate was statistically significantly higher than that for Delawareans ages 55-64 and 65 and older.
- Current smoking prevalence decreased with education level. In Delaware, 40 percent of residents who did not complete their high school education said they were current smokers. As education level increased, smoking prevalence decreased. Current smoking rates were 24 percent for those with a high school diploma or equivalent, 15 percent for those with some post-high school education, and 9 percent for those who completed college.
- Current smoking prevalence also decreased with income level. In Delaware, 40 percent of those earning less than $15,000 were current smokers. The lowest smoking prevalence was among those who earned $75,000 or more per year (13 percent).

INCIDENCE

For 2009-2013, Delaware ranked 10th in the U.S. for lung cancer incidence (12th in 2008-2012); males ranked 16th (16th in 2008-2012) and females ranked 7th (7th in 2008-2012)[10].

2009-2013 DATA

TABLE 8-1: NUMBER OF LUNG CANCER CASES, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	3,871	2,016	1,855	3,261	1,694	1,567	558	296	262
Kent	734	371	363	605	306	299	115	59	56
New Castle	1,935	1,002	933	1,562	805	757	354	185	169
Sussex	1,202	643	559	1,094	583	511	89	52	37

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

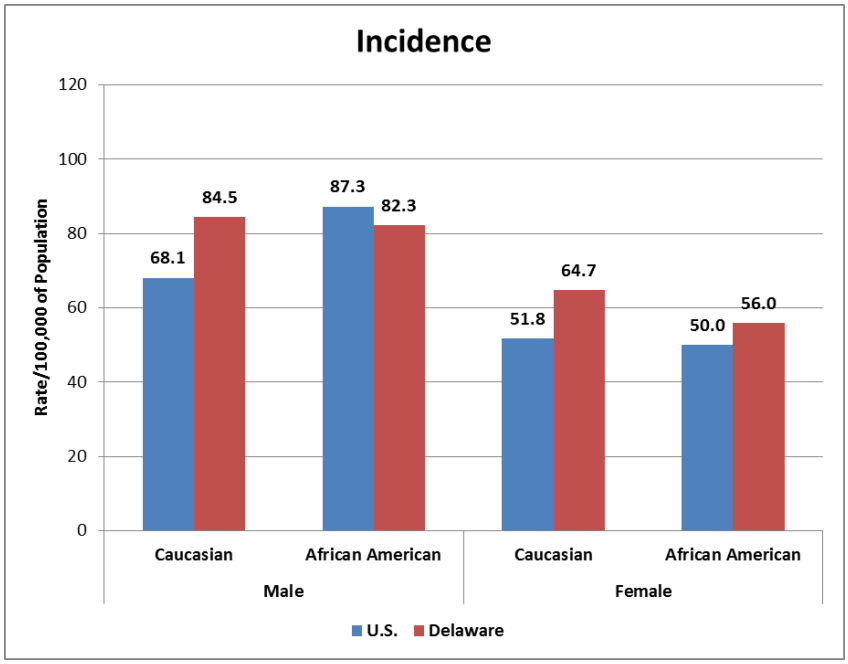
- Lung cancer is the most frequently diagnosed cancer in the U.S. and Delaware.
- In 2009-2013, there were 3,871 lung cancer cases (14 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 52 percent of lung cancer cases.
- Caucasians accounted for 84 percent of lung cancer cases.

TABLE 8-2: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	57.3	67.9	49.4
Delaware	71.4	83.7	62.4
Kent	79.2	90.5	71.0
New Castle	67.3	79.7	58.2
Sussex	74.5	86.7	65.2

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 8-1: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



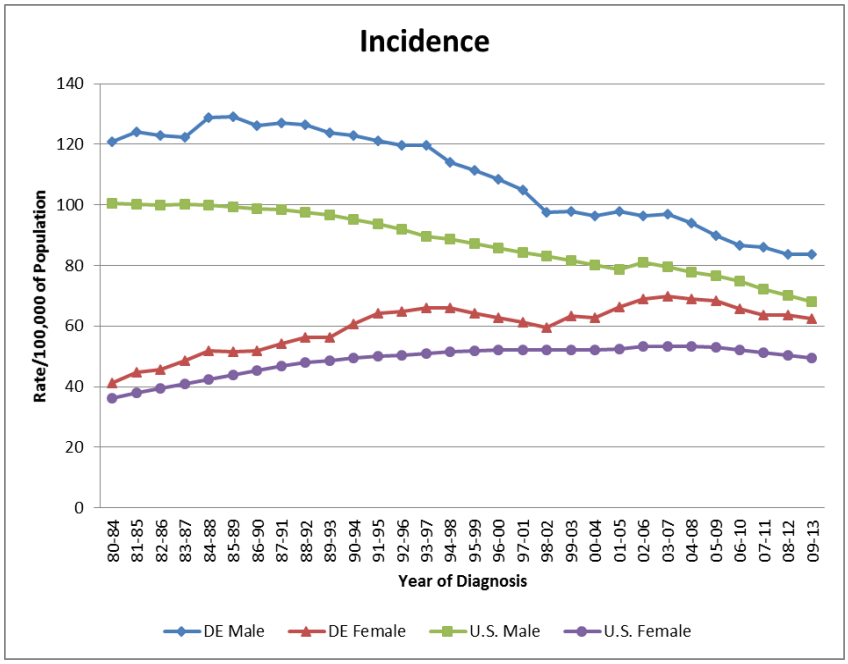
Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - The difference in lung cancer incidence rates between Caucasians (73.1 per 100,000) and African Americans (67.1 per 100,000) was not statistically significant.
  - The difference in lung cancer incidence rates between Caucasian females (64.7 per 100,000) and African American females (56.0 per 100,000) was not statistically significant.
  - The difference in lung cancer incidence rates between Caucasian males (84.5 per 100,000) and African American males (82.3 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware (71.4 per 100,000) had a statistically significantly higher lung cancer incidence rate than the U.S. (57.3 per 100,000).

- Delaware males (83.7 per 100,000) and females (62.4 per 100,000) had statistically significantly higher lung cancer incidence rates than U.S. males (67.9 per 100,000) and females (49.4 per 100,000), respectively.
- Caucasians in Delaware (73.1 per 100,000) had a statistically significantly higher lung cancer incidence rate than Caucasians in the U.S. (58.8 per 100,000).
- The difference in lung cancer incidence rates between African Americans in Delaware (67.1 per 100,000) and the U.S. (65.0 per 100,000) was not statistically significant.

TRENDS OVER TIME - DELAWARE AND U.S.

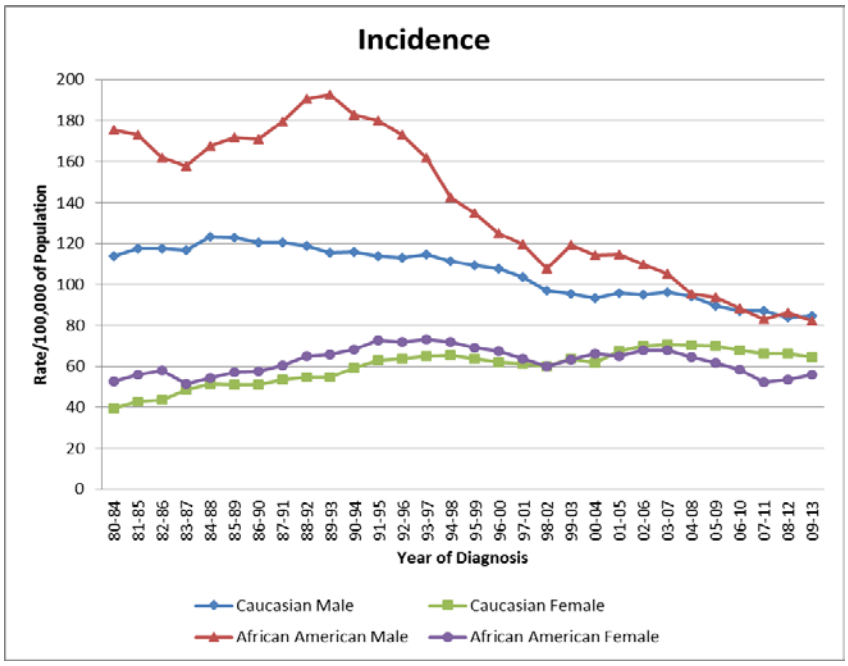
FIGURE 8-2: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for lung cancer declined 8 percent in Delaware and 11 percent in the U.S.
  - Delaware males saw big declines in incidence (15 percent), along with the U.S. male lung cancer incidence rate, which declined 17 percent.
  - U.S. female lung cancer incidence rates saw a decline of 5 percent and Delaware female lung cancer incidence rates saw a decrease of 1 percent.

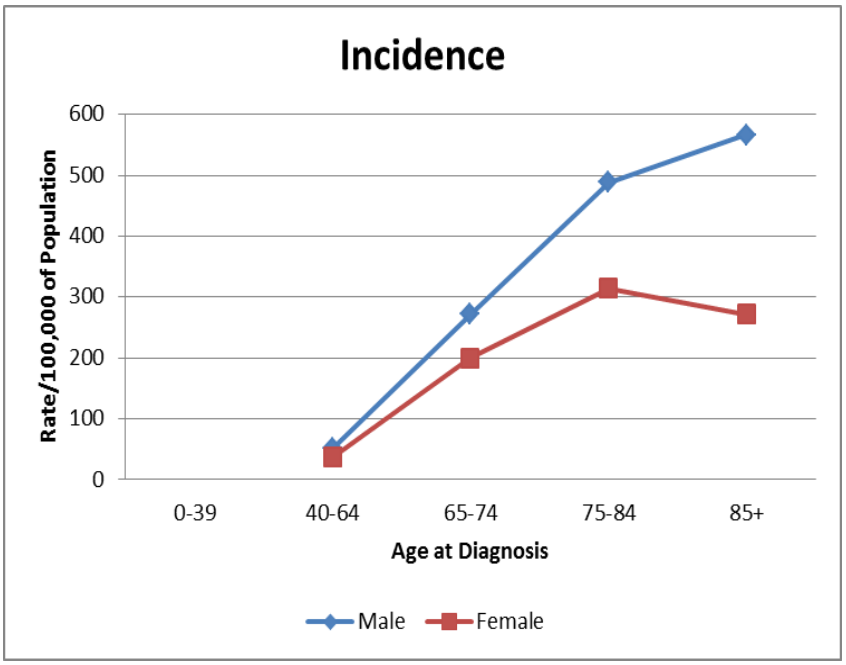
FIGURE 8-3: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Lung cancer incidence declined 31 percent among African American males in Delaware, compared to a 12 percent decline among African American females.
  - While lung cancer incidence declined 11 percent among Caucasian males, among Caucasian females it increased by 2 percent in the same time period.

FIGURE 8-4: AGE-SPECIFIC LUNG CANCER INCIDENCE RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for lung cancer incidence is 75-84 years for both males and females. Due to low numbers, incidence rates were not able to be computed for the 0-39 age group.

TABLE 8-3: AGE-SPECIFIC LUNG CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	69.6	85.9	66.0	54.5
65-74	392.0	394.3	319.9	209.9
75-84	622.4	520.2	413.2	448.8
85+	594.6	---	298.1	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- After stratifying by race, Caucasian and African American males have peak lung cancer incidence at 75-84 years of age.
- Caucasian and African American females have peak lung cancer incidence at 75-84 years of age. Due to low numbers, the incidence rates could not be calculated for the 0-39 age group or for the 85 and older age group for African American males and females.

STAGE OF DIAGNOSIS - DELAWARE

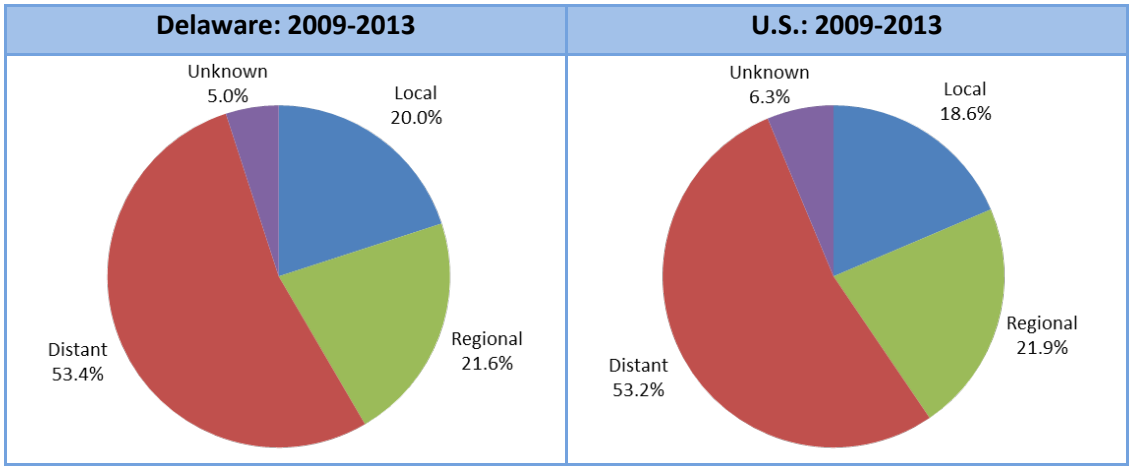
TABLE 8-4: LUNG CANCER CASES BY STAGE AT DIAGNOSIS BY SEX AND RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Local	774 (20)	357 (18)	417 (23)	661 (20)	301 (18)	360 (23)	95 (17)	47 (16)	48 (18)
Regional	838 (22)	411 (20)	427 (23)	706 (22)	348 (21)	358 (23)	124 (22)	58 (20)	66 (25)
Distant	2,067 (53)	1,139 (57)	928 (50)	1,729 (53)	953 (56)	776 (50)	315 (57)	175 (59)	140 (53)
Unknown	192 (5)	109 (5)	83 (5)	165 (5)	92 (5)	73 (5)	24 (4)	16 (5)	8 (3)
Total	3,871	2,016	1,855	3,261	1,694	1,567	558	296	262

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 774 (20 percent) lung cancers diagnosed at the local stage; 838 (22 percent) at the regional stage; 2,067 (53 percent) at the distant stage; and 192 (5 percent) had an unknown stage.
- African Americans had a higher proportion (57 percent) diagnosed at the distant stage than Caucasians (53 percent).
- Males also had more diagnosed at the distant stage (57 percent) than females (50 percent).

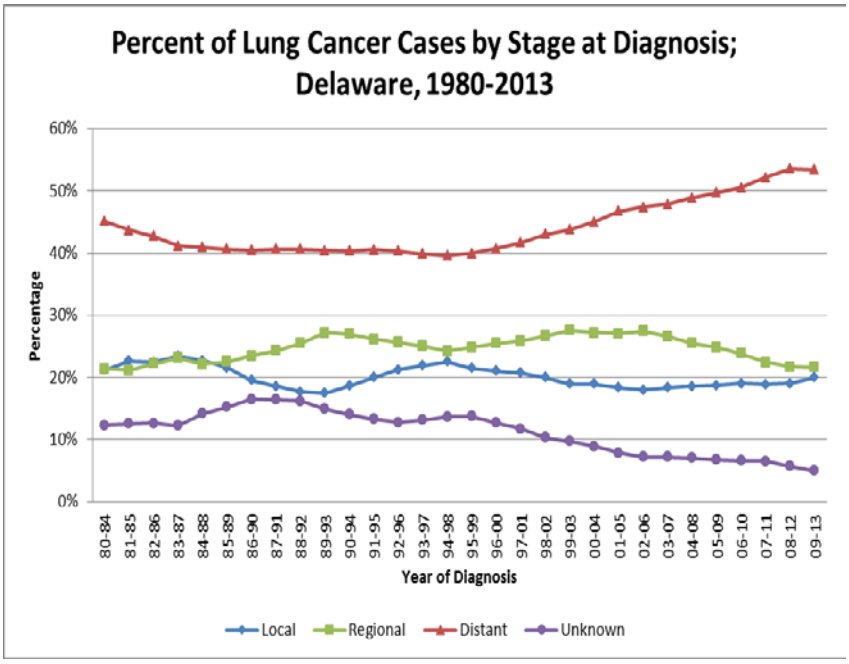
FIGURE 8-5: DISTRIBUTION OF LUNG CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware lung cancer data, the stage of diagnosis is similar.

FIGURE 8-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR LUNG CANCER CASES; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of lung cancer cases diagnosed at the local stage decreased from 21 percent to 20 percent.
  - Lung cancer cases diagnosed at the distant stage increased from 45 percent to 53 percent.

MORTALITY

For 2009-2013, Delaware ranked 13th in the U.S. for lung cancer mortality (12th in 2008-2012); males ranked 16th (16th in 2008-2012) and females ranked 11th (5th in 2008-2012)[11].

2009-2013 DATA

TABLE 8-5: NUMBER OF LUNG CANCER DEATHS, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	2,812	1,529	1,283	2,368	1,281	1,087	404	230	174
Kent	521	298	223	427	243	184	83	50	33
New Castle	1,445	757	688	1,171	605	566	254	142	112
Sussex	846	474	372	770	433	337	67	38	29

Source: Delaware Health Statistics Center, 2016

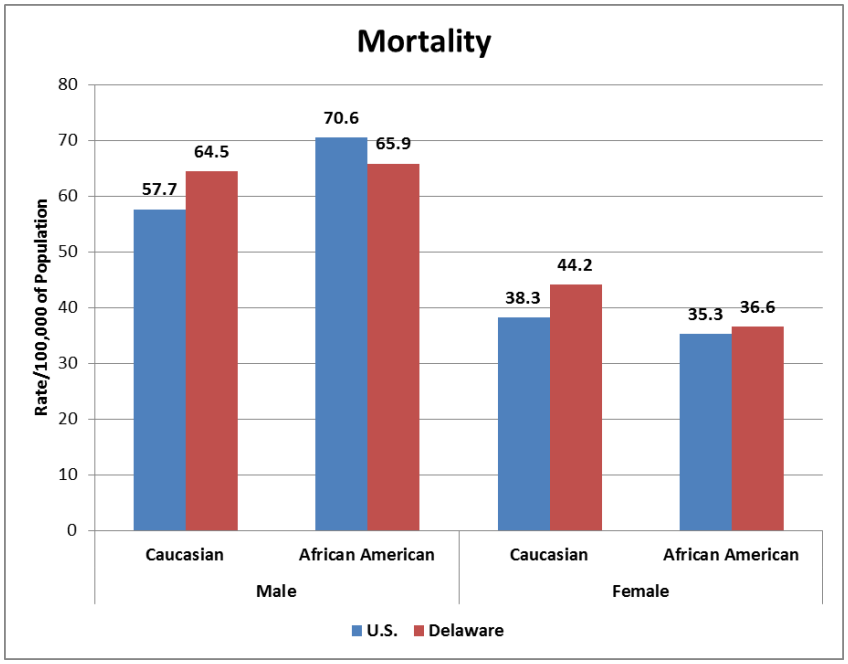
- Lung cancer is the most common cause of cancer death in the U.S. and Delaware.
- In 2009-2013, there were 2,812 deaths (30 percent of all cancer deaths) from lung cancer.
- Caucasians accounted for 84 percent of lung cancer deaths.

TABLE 8-6: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	46.0	57.8	37.0
Delaware	52.0	64.3	42.8
Kent	56.7	73.9	43.9
New Castle	50.3	61.0	42.6
Sussex	52.5	65.0	42.7

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 8-7: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



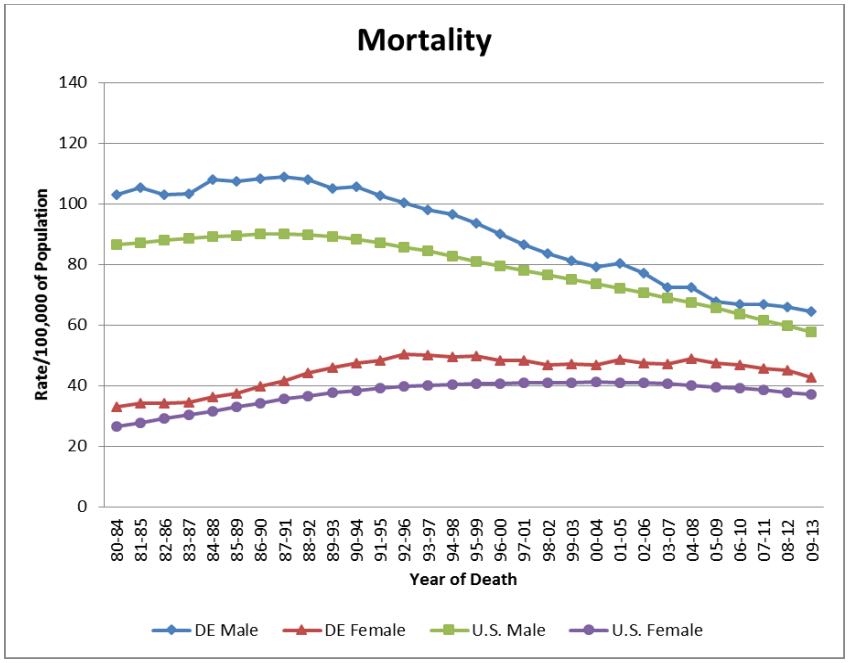
Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Males had a statistically significantly higher lung cancer mortality rate (64.3 per 100,000), compared to females (42.8 per 100,000).
  - The difference in lung cancer mortality rates between Caucasian females (44.2 per 100,000) and African American females (36.6 per 100,000) was not statistically significant.
  - The difference in lung cancer mortality rates between Caucasian males (64.5 per 100,000) and African American males (65.9 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware had a statistically significantly higher lung cancer mortality rate (52.0 per 100,000) than the U.S. (46.0 per 100,000).

- Both males (57.8 per 100,000) and females (37.0 per 100,000) in the U.S. had statistically significantly lower lung cancer mortality rates than their counterparts in Delaware (male: 64.3 per 100,000; female: 42.8 per 100,000).
- Caucasians had a statistically significantly higher lung cancer mortality rate in Delaware (52.9 per 100,000), compared to Caucasians in the U.S (46.7 per 100,000).
- The difference in lung cancer mortality rates between African Americans in Delaware (48.5 per 100,000) and the U.S. (49.4 per 100,000) was not statistically significant.

TRENDS OVER TIME – DELAWARE AND U.S.

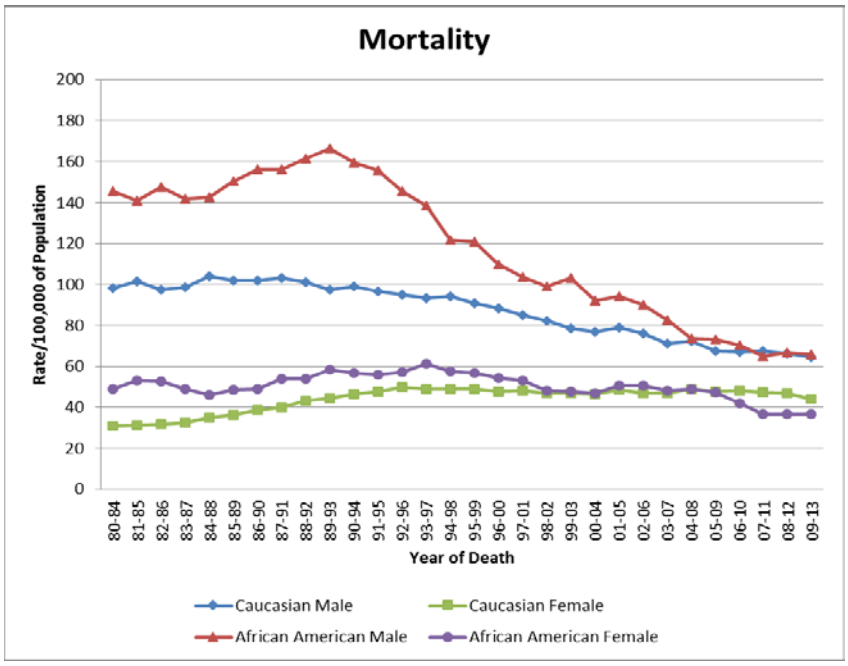
FIGURE 8-8: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for lung cancer declined 15 percent in Delaware and 17 percent in the U.S.
  - Delaware males saw big declines in lung cancer mortality (21 percent) with U.S. male lung cancer mortality having a similar decline of 23 percent.
  - U.S. female lung cancer mortality decreased 10 percent and the Delaware female lung cancer mortality rate declined 9 percent.

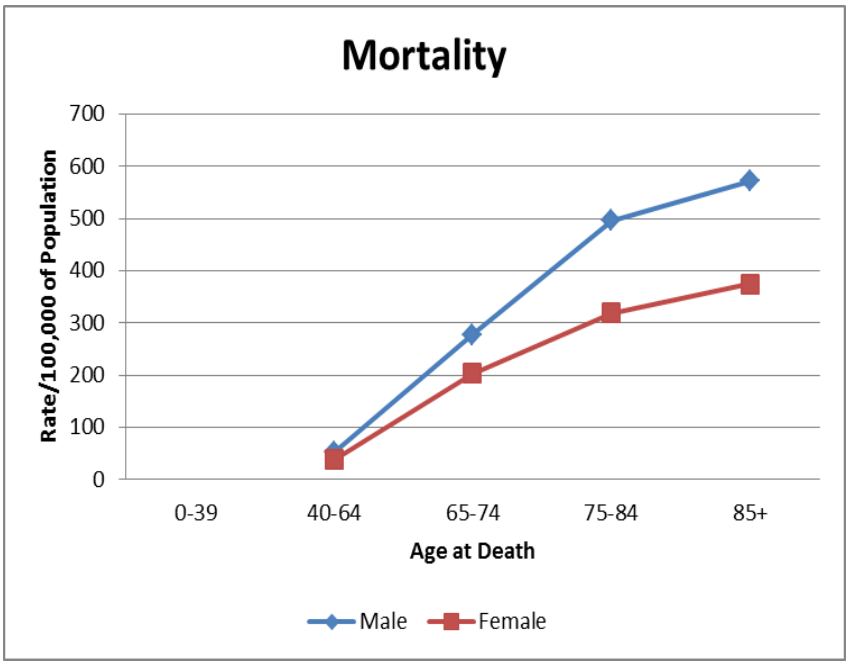
FIGURE 8-9: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African American males in Delaware saw the sharpest decline in lung cancer mortality: a decrease of 36 percent.
  - Among African American females, their lung cancer mortality rate declined by 23 percent.
  - Caucasian males saw an 18 percent decline in lung cancer mortality rate.
  - Among Caucasian females, lung cancer mortality declined 6 percent in the same time period.

FIGURE 8-10: AGE-SPECIFIC LUNG CANCER MORTALITY RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for lung cancer mortality is 85 and older for males and females. Due to low numbers, mortality rates were not able to be computed for the 0-39 age group.

TABLE 8-7: AGE-SPECIFIC LUNG CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	49.0	67.4	37.0	38.6
65-74	275.1	283.2	214.2	129.3
75-84	497.8	429.6	318.7	297.1
85+	577.9	---	379.2	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- After stratifying by race, Caucasian males had peak lung cancer mortality at age 85 years and older while African American males have peak lung cancer mortality at 75-84 years of age. This is similar to Caucasian and African American females.
- Due to low numbers, the mortality rates could not be calculated for some age groups.

CHAPTER 9: MALIGNANT MELANOMA OF THE SKIN

RISK FACTORS

The following are *lifestyle risk factors* which a person can modify to reduce their risk of getting malignant melanoma:

- Excessive ultraviolet (UV) light from the sun, tanning lamps, or tanning beds.
- History of frequent sunburns, especially before age 20.

The following are *environmental and medically-related* causes of malignant melanoma:

- A weakened immune system (e.g. organ transplant patients).

The following are *non-modifiable* risk factors (these cannot be changed):

- Having many moles, especially abnormal moles.
- Light-colored skin, freckles, light hair, and/or blue/green eyes.
- Caucasians are 10 times more likely to get melanoma than African Americans.
- A family or personal history of melanoma.
- Increasing age.
- Females have a higher risk of melanoma before age 40 and males have a higher risk after age 40.
- Having xeroderma pigmentosum (a rare, inherited condition).

To protect against malignant melanoma, individuals should limit exposure to the sun, avoid tanning beds and sun lamps, protect children from exposure to the sun, and remove any abnormal moles.

EARLY DETECTION

Early detection for malignant melanoma includes self-examination of the skin monthly. High-risk individuals should have their skin thoroughly examined by a health care professional.

INCIDENCE

For 2009-2013, Delaware ranked 3rd in the U.S. for malignant melanoma incidence (3rd in 2008-2012); males ranked 2nd (2nd in 2008-2012) and females ranked 5th (7th in 2008-2012)[10].

2009-2013 DATA

TABLE 9-1: NUMBER OF MALIGNANT MELANOMA CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	1,575	930	645	1,546	921	625	13	---	---
Kent	224	124	100	222	124	98	---	---	---
New Castle	841	483	358	823	479	344	11	---	---
Sussex	510	323	187	501	318	183	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 1,575 malignant melanoma cases (6 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 59 percent of malignant melanoma cases.

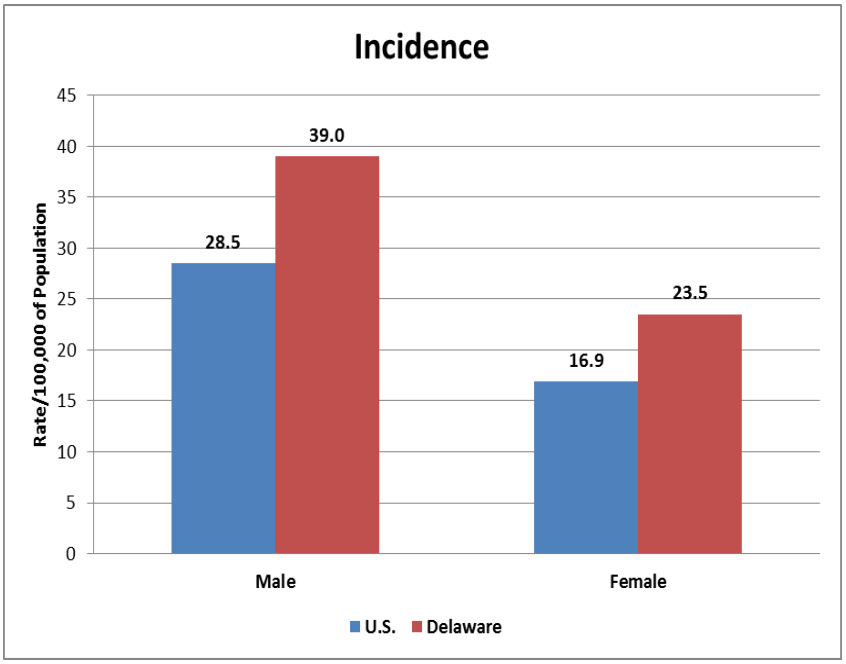
- Caucasians accounted for 98 percent of malignant melanoma cases.

TABLE 9-2: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	21.8	28.5	16.9
Delaware	30.1	39.0	23.5
Kent	25.2	30.4	21.0
New Castle	28.9	37.4	22.9
Sussex	35.4	46.5	26.7

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

FIGURE 9-1: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 2009-2013



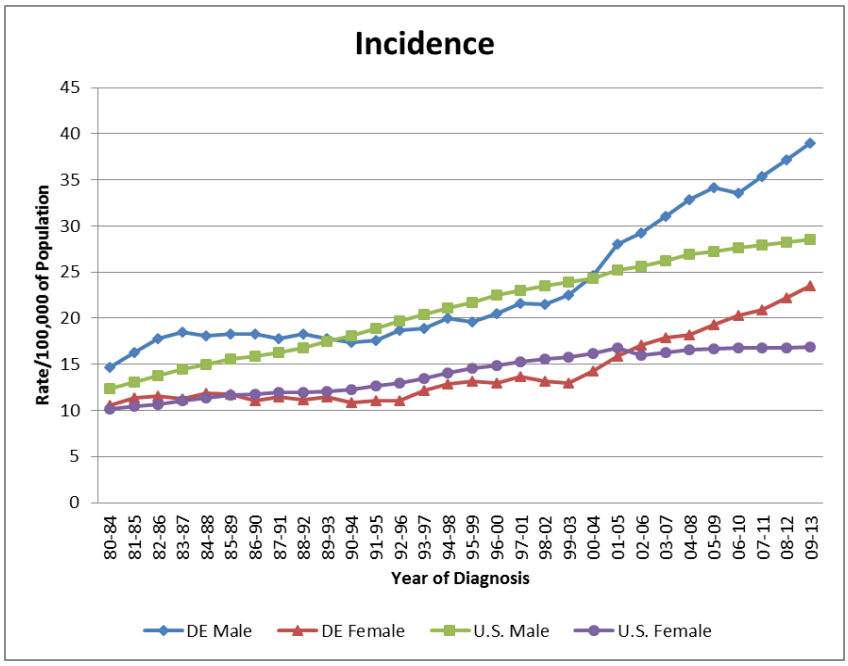
Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Males (39.0 per 100,000) had a statistically significantly higher malignant melanoma incidence rate compared to females (23.5 per 100,000).
  - The difference in malignant melanoma incidence rates by race could not be calculated because of the low numbers of cases in African Americans.
- Comparing Delaware and the U.S.
  - Delaware (30.1 per 100,000) had a statistically significantly higher malignant melanoma incidence rate than the U.S. (21.8 per 100,000).

- Delaware males (39.0 per 100,000) and females (23.5 per 100,000) had statistically significantly higher malignant melanoma incidence rates than U.S. males (28.5 per 100,000) and females (16.9 per 100,000).
- Caucasians in Delaware (37.4 per 100,000) had a statistically significantly higher malignant melanoma incidence rate than Caucasians in the U.S. (25.9 per 100,000).

TRENDS OVER TIME - DELAWARE AND U.S.

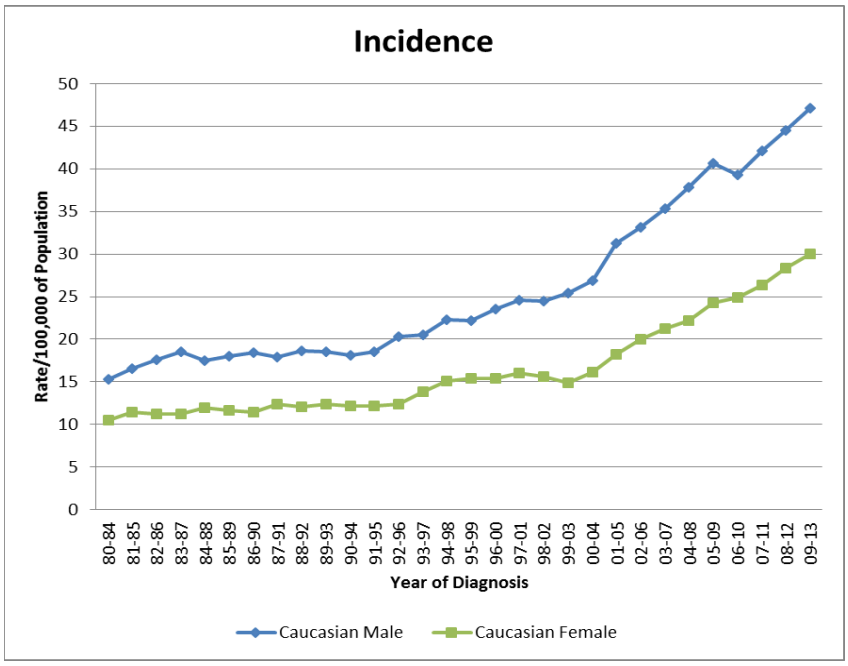
FIGURE 9-2: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for malignant melanoma increased 78 percent in Delaware and 14 percent in the U.S.
  - Delaware males saw a 73 percent increase in the malignant melanoma incidence rate while U.S. males saw a 19 percent increase.
  - Delaware females saw an 81 percent increase in the malignant melanoma incidence rate while U.S. females saw a 7 percent increase.

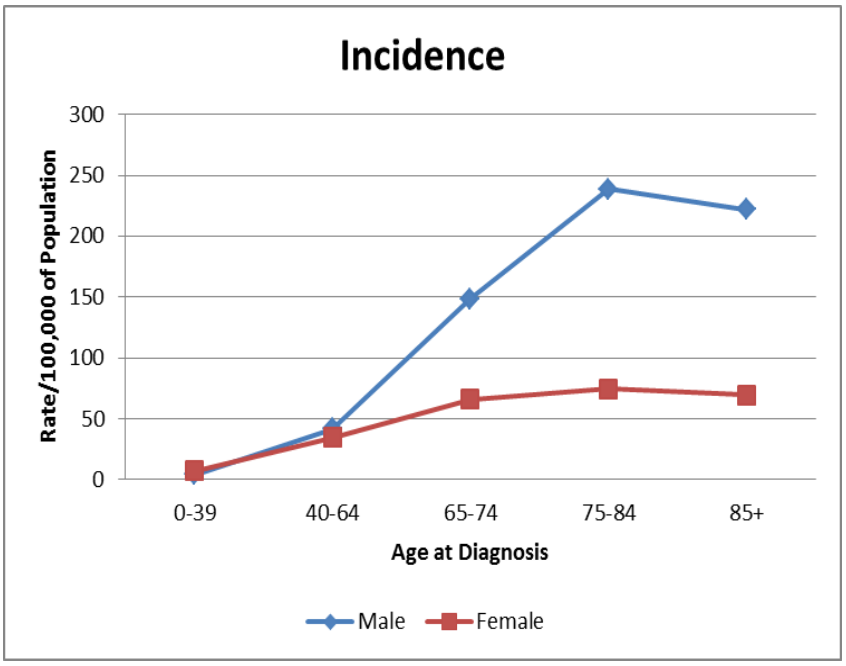
FIGURE 9-3: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA INCIDENCE RATES BY SEX; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Malignant melanoma incidence in Delaware increased 101 percent among Caucasian females and 85 percent among Caucasian males.
  - Due to low numbers, malignant melanoma incidence rates for African American males and females could not be computed.

FIGURE 9-4: AGE-SPECIFIC MALIGNANT MELANOMA INCIDENCE RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for malignant melanoma incidence is 75-84 years for both males and females.

TABLE 9-3: AGE-SPECIFIC MALIGNANT MELANOMA INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	5.9	---	108	---
40-64	53.1	---	44.8	---
65-74	175.3	---	78.4	---
75-84	272.0	---	87.5	---
85+	251.3	---	73.5	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- After stratifying by race, Caucasian males and females have peak malignant melanoma incidence at 75-84 years of age.
- Due to low numbers, malignant melanoma incidence rates could not be calculated for African American males and females.

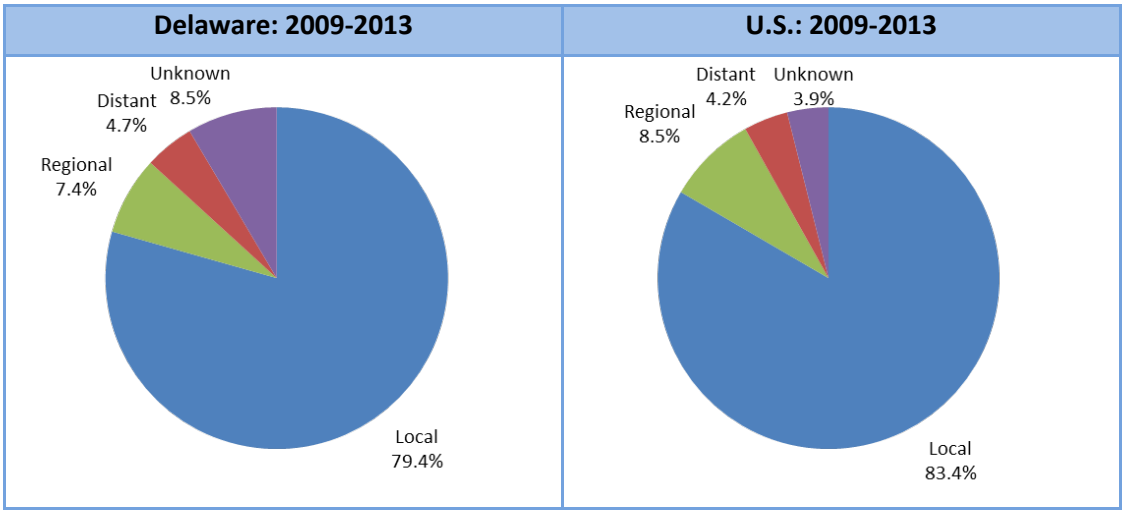
TABLE 9-4: MALIGNANT MELANOMA CASES BY STAGE AT DIAGNOSIS BY SEX AND RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Local	1,250 (79)	725 (78)	525 (81)	1,230 (80)	720 (78)	510 (82)	9 (69)	---	---
Regional	117 (7)	84 (9)	33 (5)	114 (7)	82 (9)	32 (5)	---	---	---
Distant	74 (5)	44 (5)	30 (5)	71 (5)	44 (5)	27 (4)	---	---	---
Unknown	134 (9)	77 (8)	57 (9)	131 (9)	75 (8)	56 (9)	---	---	---
Total	1,575	930	645	1,546	921	625	13	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 1,250 (79 percent) malignant melanomas diagnosed at the local stage; 117 (7 percent) at the regional stage; 74 (5 percent) at the distant stage; and 134 (9 percent) had an unknown stage.
- Males also had fewer malignant melanomas diagnosed at the local stage (78 percent) than females (81 percent).

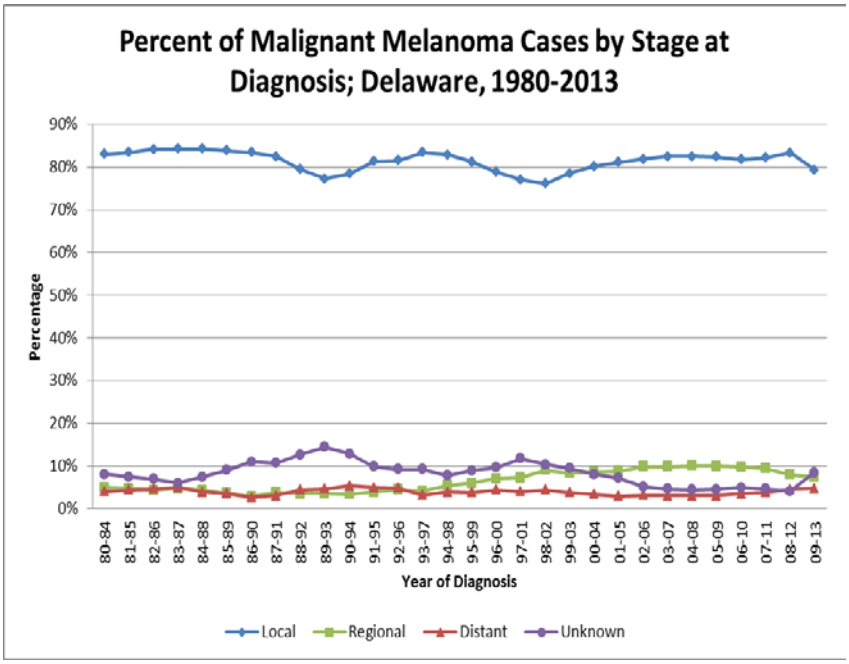
FIGURE 9-5: DISTRIBUTION OF MALIGNANT MELANOMA CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware malignant melanoma data, the U.S. has more malignant melanoma diagnosed at the local stage compared to Delaware.

FIGURE 9-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR MALIGNANT MELANOMA CASES; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of malignant melanoma cases diagnosed at the local stage decreased from 83 percent to 79 percent.
  - Malignant melanoma cases diagnosed at the distant stage increased slightly from 4 percent to 5 percent.

MORTALITY

For 2009-2013, Delaware ranked 24th in the U.S. for malignant melanoma mortality (30th in 2008-2012); males ranked 33rd (32nd in 2008-2012) and females ranked 8th (10th in 2008-2012)[11].

2009-2013 DATA

TABLE 9-5: NUMBER OF MALIGNANT MELANOMA DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	153	92	61	147	90	57	---	---	---
Kent	26	15	11	25	15	10	---	---	---
New Castle	87	55	32	84	54	30	---	---	---
Sussex	40	22	18	38	21	17	---	---	---

Source: Delaware Health Statistics Center, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 153 deaths (2 percent of all cancer deaths) from malignant melanoma.

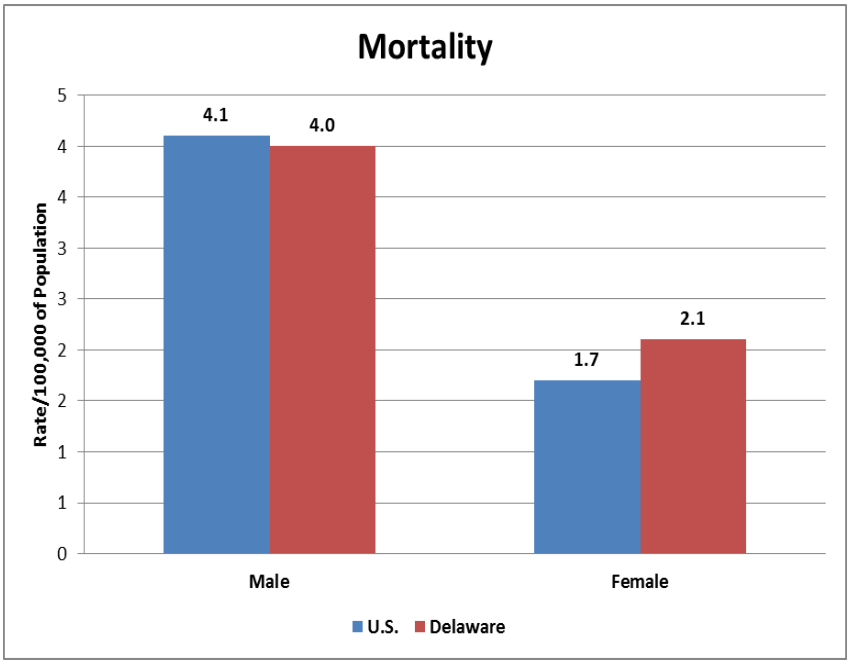
- Caucasians accounted for 96 percent of malignant melanoma deaths.

TABLE 9-6: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	2.7	4.1	1.7
Delaware	2.9	4.0	2.1
Kent	2.8	---	---
New Castle	3.1	4.4	2.1
Sussex	2.6	---	---

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

FIGURE 9-7: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA MORTALITY RATES BY SEX; U.S. AND DELAWARE, 2009-2013



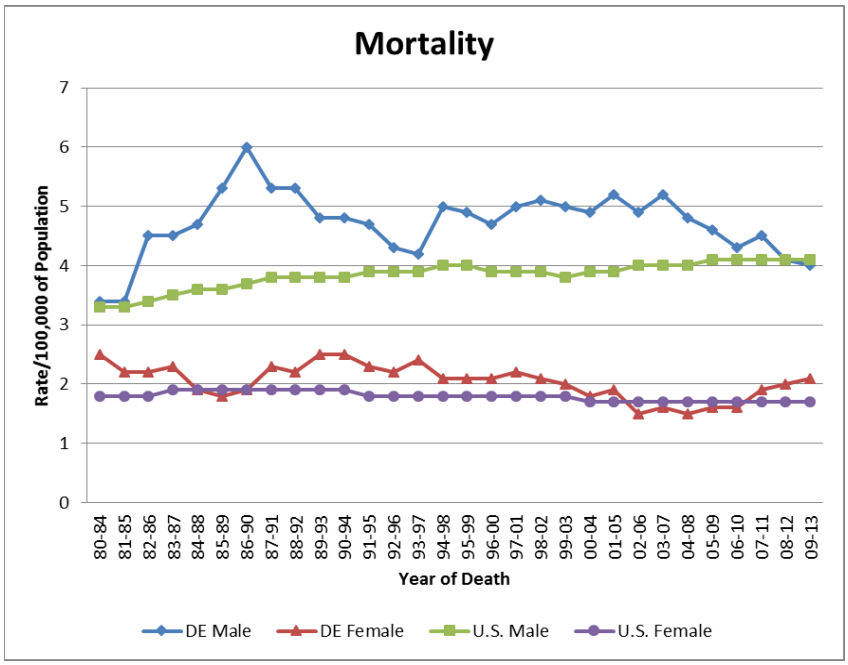
Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Males had a statistically significantly higher malignant melanoma mortality rate (4.0 per 100,000) compared to females (2.1 per 100,000).
  - The difference in malignant melanoma mortality rates by race could not be calculated because of the low numbers of deaths in African Americans.
- Comparing Delaware and the U.S.
  - The difference in melanoma mortality rates between Delaware (2.9 per 100,000) and the U.S. (2.7 per 100,000) was not statistically significant.

- The difference in melanoma mortality rates between Delaware males (4.0 per 100,000) and U.S. males (4.1 per 100,000) was not statistically significant.
- The difference in melanoma mortality rates between Delaware females (2.1 per 100,000) and U.S. females (1.7 per 100,000) was not statistically significant.

TRENDS OVER TIME – DELAWARE AND U.S.

FIGURE 9-8: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2013

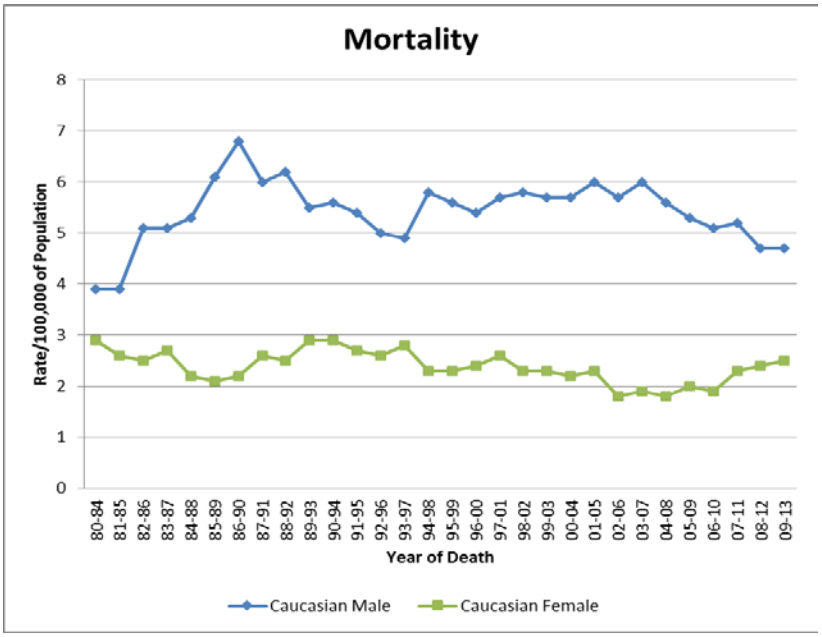


Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for malignant melanoma declined 9 percent in Delaware and increased by 4 percent in the U.S.
  - Delaware males saw big declines in malignant melanoma mortality (20 percent) while U.S. male malignant melanoma mortality rates increased by 8 percent.
  - U.S. female malignant melanoma mortality decreased 6 percent and the Delaware female malignant melanoma mortality rate increased by 5 percent.

TRENDS OVER TIME - DELAWARE

FIGURE 9-9: FIVE-YEAR AVERAGE AGE-ADJUSTED MALIGNANT MELANOMA MORTALITY RATES BY RACE AND SEX; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Caucasian males saw an 18 percent decline in malignant melanoma mortality while Caucasian females saw a 9 percent increase.
  - Due to low numbers, malignant melanoma mortality rates for African American males and females could not be computed.

AGE-SPECIFIC MORTALITY RATES - DELAWARE

TABLE 9-7: AGE-SPECIFIC MALIGNANT MELANOMA MORTALITY RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	4.1	---	---	---
65-74	---	---	---	---
75-84	33.7	---	---	---
85+	---	---	---	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for malignant melanoma mortality in males is 75-84 years of age. Due to low numbers, mortality rates were not able to be computed for the other age groups.
- After stratifying by race, Caucasian males had peak malignant melanoma mortality at 75-84 years of age.
- Due to low numbers, the mortality rates could not be calculated for some age groups.

CHAPTER 10: ORAL CAVITY AND PHARYNX CANCER[18]

RISK FACTORS

The following are *lifestyle risk factors* which a person can modify to reduce their risk of getting oral cancer:

- Smoking cigarettes, cigars, or pipes
- Use of snuff or chewing tobacco
- Alcohol abuse – Seventy percent of people with oral cancer abuse alcohol.
- Heavy drinking and smoking – The risk may be as much as 100 times more compared to those who do not drink or smoke.
- Chewing betel quid and gutka (mostly in South and southeast Asia)
- Infection with human papillomavirus (HPV) – HPV DNA (particularly HPV 16) is found in about two-thirds of oral cancers.
- Exposure to ultraviolet light (cancer of the lip)
- Diet low in fruits and vegetables
- Use of mouthwash (suspected risk factor)

The following are *environmental and medically-related* causes of oral cancer:

- Improperly fitted dentures (suspected)

The following are *non-modifiable* risk factors (these cannot be changed):

- Oral cancer is twice as common in males than females.
- Most oral cancers occur at age 55 and older.
- Genetic syndromes – Fanconi anemia, Dyskeratosis congenita
- Having a weakened immune system

To protect against oral cancer, individuals should avoid tobacco, limit alcohol use and exposure to ultraviolet light, consume a diet rich in fruits and vegetables, and have precancerous growths treated.

EARLY DETECTION

Most pre-cancers of the oral cavity and pharynx can be found early during routine screening exams by a dentist, doctor, dental hygienist, or by self-exam.

[18] "Oral cancer" is used instead of "oral cavity and pharynx cancer" throughout this chapter.

INCIDENCE

For 2009-2013, Delaware ranked 14th in the U.S. for oral cancer incidence (21st in 2008-2012); males ranked 12th (15th in 2008-2012) and females ranked 19th (25th in 2008-2012)[10].

2009-2013 DATA

TABLE 10-1: NUMBER OF ORAL CANCER CASES, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	667	471	196	567	408	159	80	54	26
Kent	122	85	37	108	77	31	12	---	---
New Castle	356	247	109	286	203	83	53	37	16
Sussex	189	139	50	173	128	45	15	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

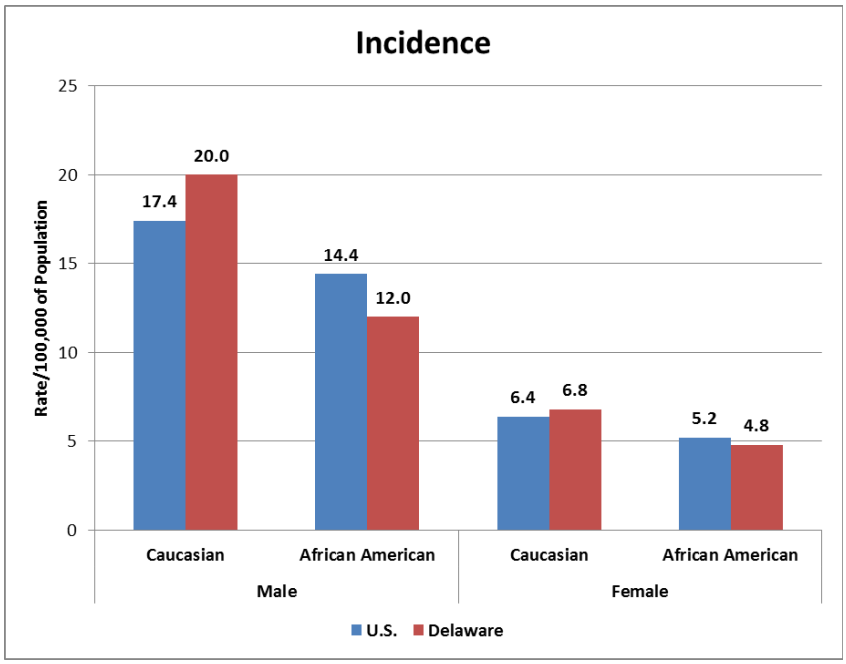
- In 2009-2013, there were 667 oral cancer cases (2 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 71 percent of oral cancer cases.
- Caucasians accounted for 85 percent of oral cancer cases.

TABLE 10-2: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	11.1	16.7	6.2
Delaware	12.2	18.7	6.8
Kent	12.8	19.2	7.3
New Castle	11.8	17.9	6.7
Sussex	12.4	19.5	6.3

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

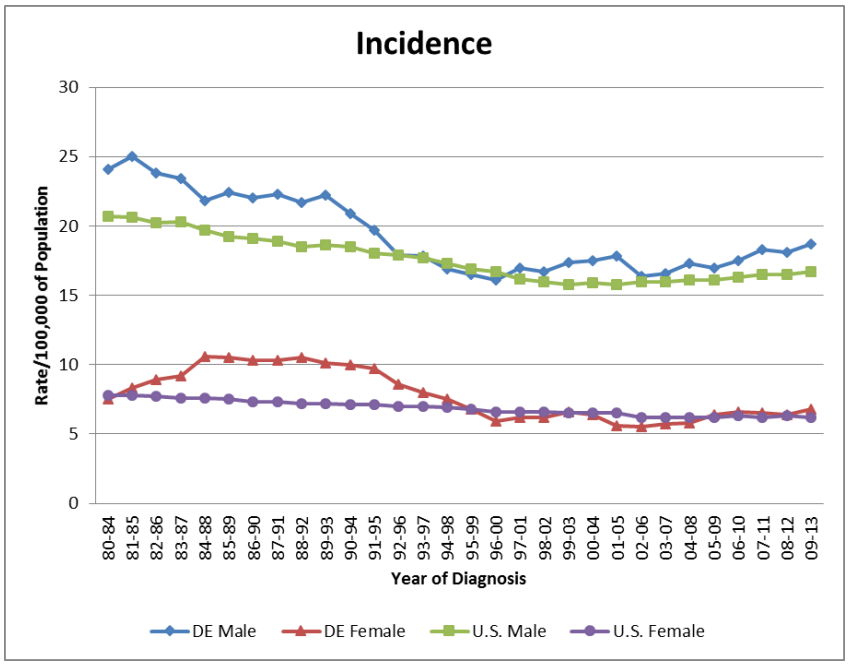
FIGURE 10-1: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER INCIDENCE RATES BY SEX AND RACE; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Caucasians (12.9 per 100,000) had a statistically significantly higher oral cancer incidence rate compared to African Americans (7.9 per 100,000).
  - The difference in oral cancer incidence rates between Caucasian females (6.8 per 100,000) and African American females (4.8 per 100,000) was not statistically significant.
  - Caucasian males (20.0 per 100,000) had a statistically significantly higher oral cancer incidence rate compared to African American males (12.0 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware (12.2 per 100,000) had a statistically significantly higher oral cancer incidence rate than the U.S. (11.1 per 100,000).
  - Delaware males (18.7 per 100,000) had statistically significantly higher oral cancer incidence rates than U.S. males (16.7 per 100,000).
  - The difference in oral cancer incidence rates between Delaware females (6.8 per 100,000) and U.S. females (6.2 per 100,000) was not statistically significant.
  - Caucasians in Delaware (12.9 per 100,000) had a statistically significantly higher oral cancer incidence rate than Caucasians in the U.S. (11.6 per 100,000).
  - The difference in oral cancer incidence between African Americans in Delaware (7.9 per 100,000) and the U.S. (9.2 per 100,000) was not statistically significant.

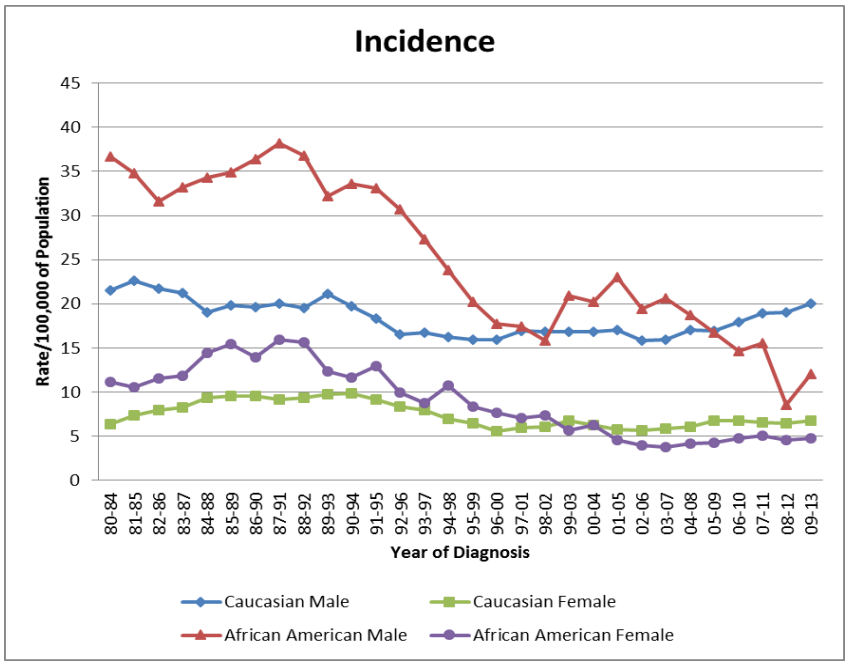
FIGURE 10-2: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for oral cancer increased 5 percent in Delaware and 4 percent in the U.S.
  - Delaware males saw increases in incidence (7 percent), along with the U.S. male oral cancer incidence rate which increased 6 percent.
  - U.S. female oral cancer incidence rates decreased 5 percent and Delaware female oral cancer incidence rates saw an increase of 3 percent.

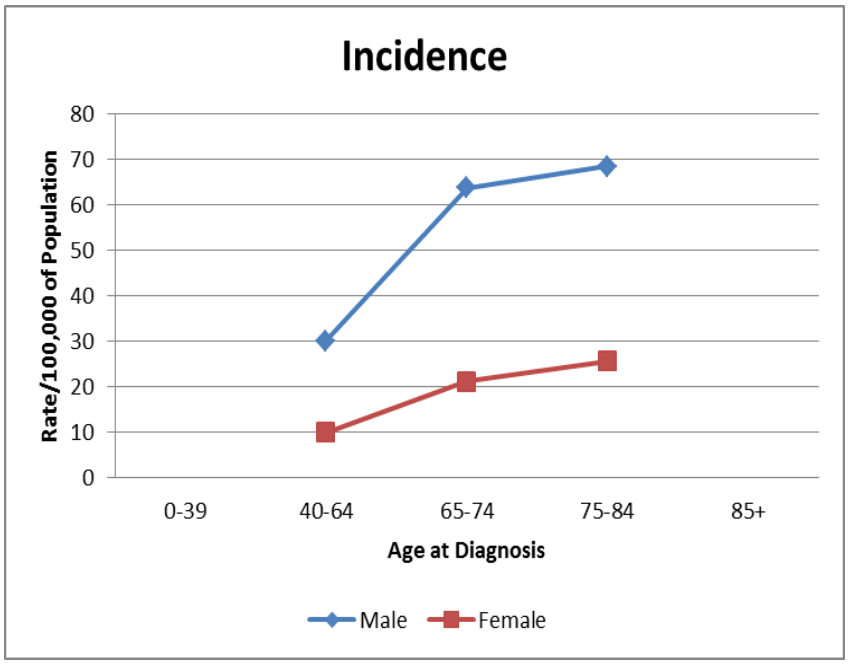
FIGURE 10-3: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African American males in Delaware saw a 43 percent decline in oral cancer incidence; African American females saw a 16 percent decline in oral cancer incidence.
  - Caucasian males saw a 19 percent increase in oral cancer incidence; Caucasian females had different outcomes with no change in oral cancer incidence in the same time period.

FIGURE 10-4: AGE-SPECIFIC ORAL CANCER INCIDENCE RATES BY SEX; DELAWARE, 2009-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- The peak age for oral cancer incidence is 75-84 years for both males and females. Due to low numbers, incidence rates were not able to be computed for the youngest and oldest age groups.

TABLE 10-3: AGE-SPECIFIC ORAL CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2009-2013

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	32.3	10.0	24.5	---
65-74	69.7	22.8	---	---
75-84	76.5	26.2	---	---
85+	---	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- After stratifying by race, Caucasians have peak oral cancer incidence at 85 years of age and older.
- Due to low numbers, the incidence rates could not be calculated for some African American age groups.

STAGE OF DIAGNOSIS - DELAWARE

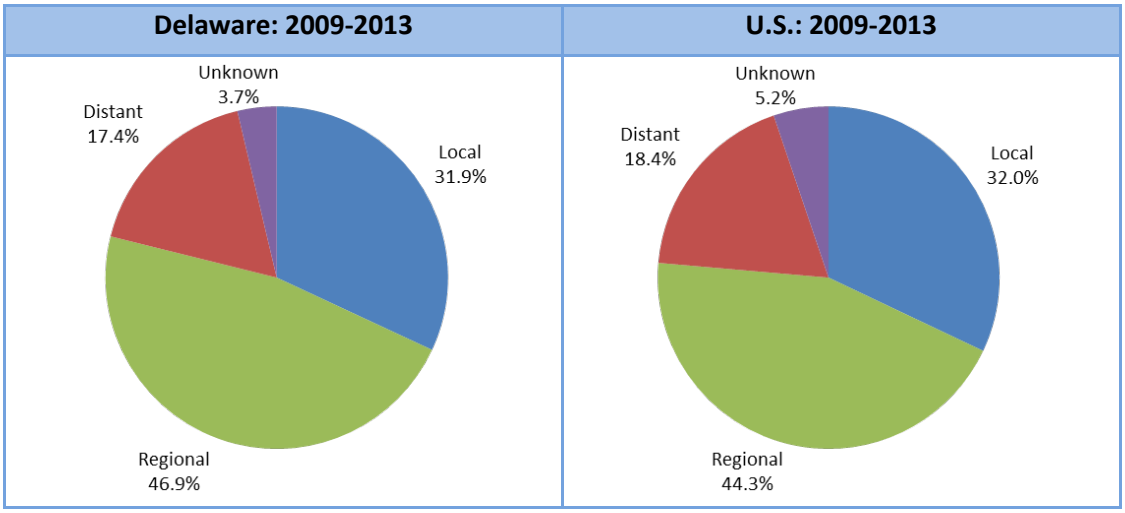
TABLE 10-4: ORAL CANCER CASES BY STAGE AT DIAGNOSIS BY SEX AND RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Local	213 (32)	126 (27)	87 (44)	183 (32)	112 (28)	71 (45)	23 (29)	12 (22)	11 (42)
Regional	313 (47)	243 (52)	70 (36)	271 (48)	213 (52)	58 (37)	34 (43)	25 (46)	9 (35)
Distant	116 (17)	85 (18)	31 (16)	91 (16)	68 (17)	23 (15)	---	---	---
Unknown	25 (4)	17 (4)	8 (4)	22 (4)	15 (4)	7 (4)	---	---	---
Total	667	471	196	567	408	159	80	54	26

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Counts less than 6 are not shown to protect patient privacy

- In 2009-2013, there were 213 (32 percent) oral cancers diagnosed at the local stage; 313 (47 percent) at the regional stage; 116 (17 percent) at the distant stage; and 25 (4 percent) had an unknown stage.
- Males had less oral cancers diagnosed at the local stage (27 percent) than females (44 percent).

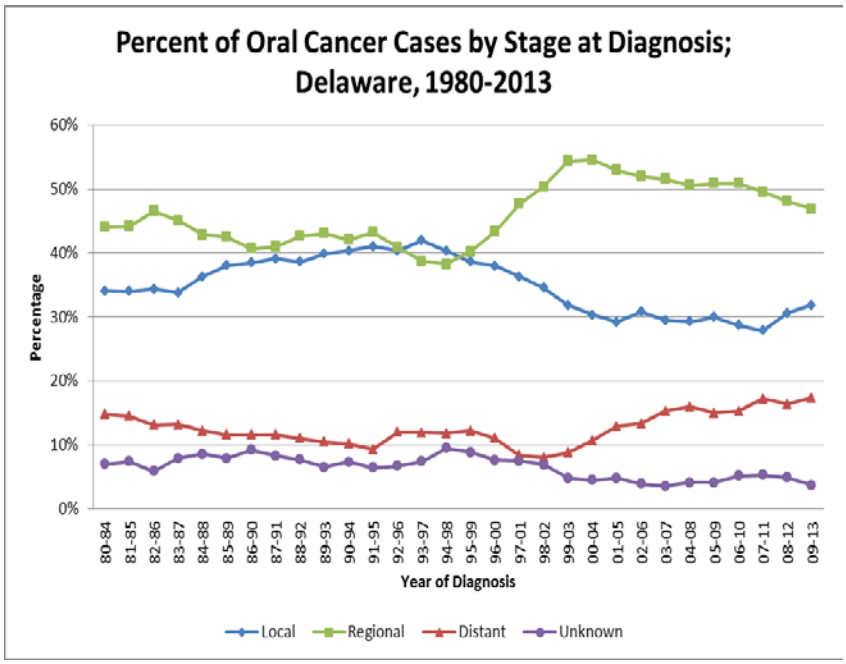
FIGURE 10-5: DISTRIBUTION OF ORAL CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware oral cancer data, more oral cancer was diagnosed at the regional stage in Delaware than the U.S.

FIGURE 10-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR ORAL CANCER CASES; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of oral cancer cases diagnosed at the local stage decreased from 34 percent to 32 percent.
  - Oral cancer cases diagnosed at the distant stage increased from 15 percent to 17 percent.

MORTALITY

For 2009-2013, Delaware ranked 14th in the U.S. for oral cancer mortality (10th in 2008-2012); males ranked 10th (7th in 2008-2012) and females ranked 38th (38th in 2008-2012)[11].

2009-2013 DATA

TABLE 10-5: NUMBER OF ORAL CANCER DEATHS, BY SEX AND RACE; DELAWARE AND COUNTIES, 2009-2013

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
Delaware	143	106	37	110	79	31	28	---	---
Kent	37	28	9	28	21	7	---	---	---
New Castle	64	46	18	45	31	14	16	---	---
Sussex	42	32	10	37	27	10	---	---	---

Source: Delaware Health Statistics Center, 2016
Counts less than 6 are not shown to protect patient privacy

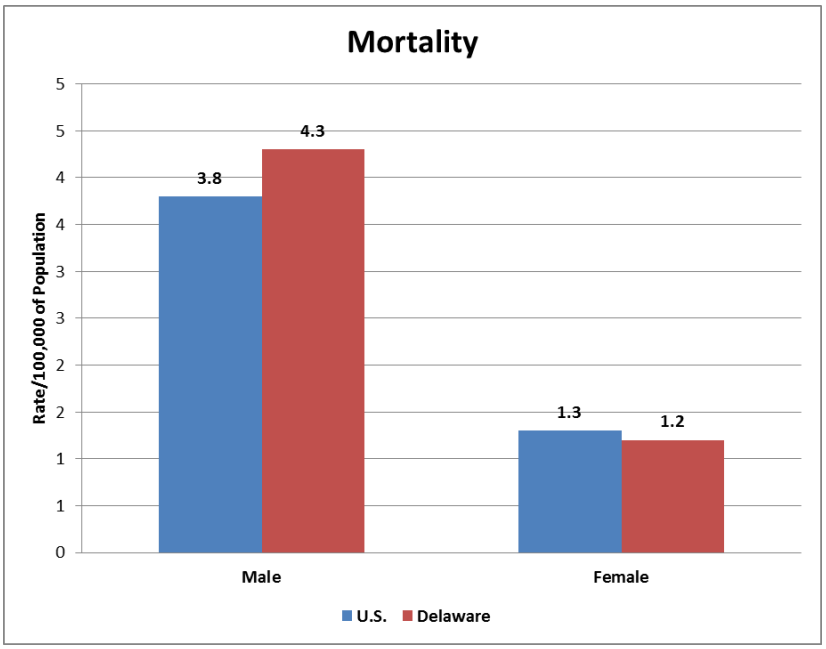
- In Delaware in 2009-2013, there were 143 deaths (2 percent of all cancer deaths) from oral cancer.
- Caucasians in Delaware accounted for 84 percent of oral cancer deaths.

TABLE 10-6: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2009-2013

	Overall	Male	Female
U.S.	2.4	3.8	1.3
Delaware	2.6	4.3	1.2
Kent	3.9	6.7	---
New Castle	2.2	3.6	---
Sussex	2.7	4.6	---

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

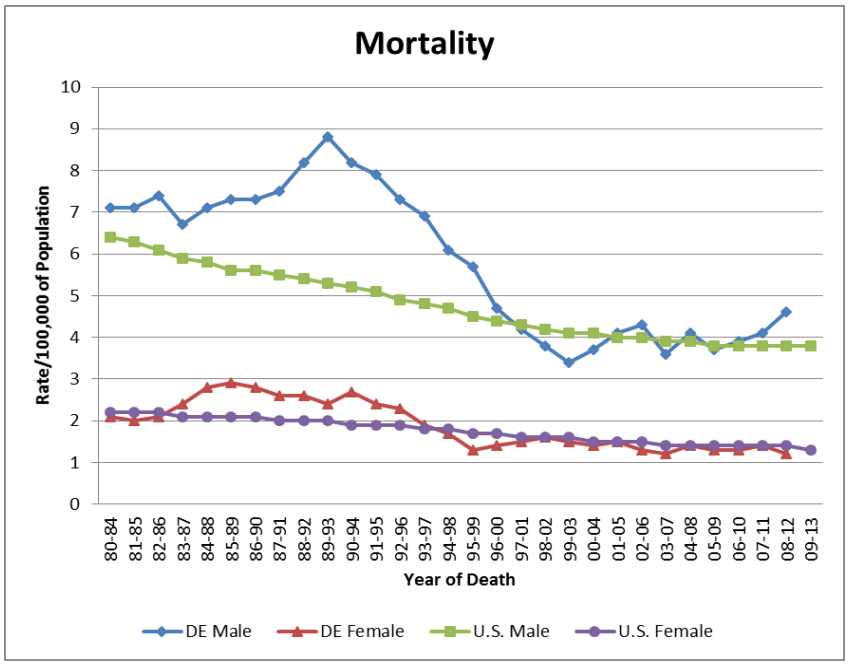
FIGURE 10-7: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - Males had a statistically significantly higher oral cancer mortality rate (4.3 per 100,000) compared to females (1.2 per 100,000)
- Comparing Delaware and the U.S.
  - The difference in oral cancer mortality rates between Delaware (2.6 per 100,000) and the U.S. (2.4 per 100,000) was not statistically significant.
  - The difference in oral cancer mortality rates between males (3.8 per 100,000) and females (1.3 per 100,000) in the U.S. and Delaware (male: 4.3 per 100,000; female: 1.2 per 100,000) was not statistically significant.
  - The difference in oral cancer mortality rates between Caucasians in Delaware (2.5 per 100,000) and the U.S (2.4 per 100,000) was not statistically significant.
  - The difference in oral cancer mortality rates between African Americans in Delaware (3.1 per 100,000) and the U.S. (2.9 per 100,000) was not statistically significant.

FIGURE 10-8: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2013

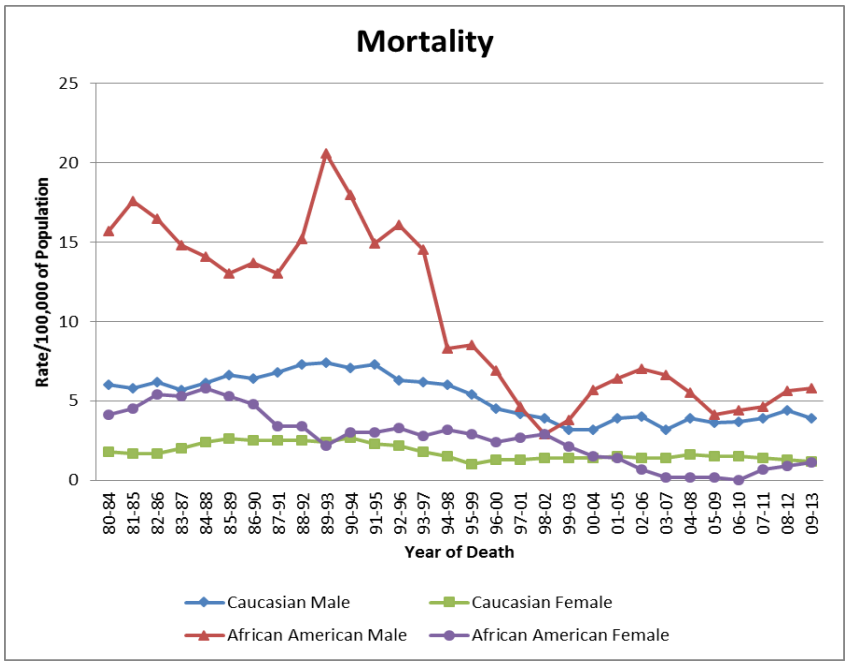


Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Oral cancer mortality increased 13 percent in Delaware and declined 11 percent in the U.S.
  - Delaware males saw increases in oral cancer mortality (26 percent) with U.S. male oral cancer mortality declined 7 percent.
  - U.S. female oral cancer mortality decreased 19 percent and the Delaware female oral cancer mortality rate declined 20 percent.

TRENDS OVER TIME - DELAWARE

FIGURE 10-9: FIVE-YEAR AVERAGE AGE-ADJUSTED ORAL CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - African American males in Delaware saw an increase in oral cancer mortality by 53 percent.
  - Among African American females, their oral cancer mortality rate declined by 48 percent.
  - Caucasian males saw a 22 percent increase in the oral cancer mortality rate.
  - Among Caucasian females, oral cancer mortality declined 14 percent in the same time period.

AGE-SPECIFIC MORTALITY RATES - DELAWARE

- Due to low numbers, age-specific oral cancer mortality rates were not able to be computed.

CHAPTER 11: PROSTATE CANCER

RISK FACTORS

The following are *lifestyle risk factors* which a man can modify to reduce his risk of getting prostate cancer:

- A diet high in red meat and/or high-fat dairy products
- A diet low in fruits and vegetables
- Obesity
- Tobacco and heavy alcohol use

The following are *environmental and medically-related* causes of prostate cancer:

- Employment involving following industries: welders, battery manufacturers, rubber workers, and workers exposed to cadmium

The following are *non-modifiable* risk factors (these cannot be changed):

- Age (risk increases after age 50)
- Race (African Americans are at higher risk) and ethnicity (Hispanics are at lower risk)
- Nationality (higher risk in males from North America and northwestern Europe)
- Family history of prostate cancer or inherited DNA changes (heredity prostate cancer gene 1)
- Gene mutations that occur during a man's life
- Higher levels of certain male hormones, e.g. testosterone
- Infection and inflammation of the prostate gland (prostatitis)
- Certain genes like the BRCA1 and BRCA2 genes

To protect against prostate cancer, individuals should maintain a healthy weight, consume a diet high in fruits, vegetables and whole grains, limit calcium intake, and engage in regular physical activity.

EARLY DETECTION

The American Cancer Society (ACS) recommends that males make an informed decision with their health care provider about whether to be screened for prostate cancer. Males should receive information from their doctors about the risks and possible benefits of prostate cancer screening. Males should not be screened unless they receive this information[19].

The Delaware Cancer Consortium (DCC) recommends the following prostate cancer screening guidelines for Delaware males:

- No mass prostate cancer screening efforts
- Promote education for informed prostate cancer screening decision-making
- Screening in males older than 75 years is less desirable; however, screening decisions should be made on an individual basis.
- Screening is not recommended for males with a life expectancy of less than 10 years.
- Offer average-risk individuals screening beginning at age 50 and using an informed decision-making process.
- High-risk individuals should be encouraged to be screened at age 40 if they:
  - Have first degree relatives with prostate cancer
  - Are African American males

[19] American Cancer Society; Prostate Cancer: Early Detection.
http://www.cancer.org/cancer/prostatecancer/moreinformation/prostatecancerearlydetection/prostate-cancer-early-detection-acs-recommendations

- Have family or personal history of BRCA1 or BRCA2 gene
- Screening at one-to-two year intervals via prostate specific antigen (PSA) test, with or without digital rectal exam (DRE)

PROSTATE CANCER SCREENING IN DELAWARE

Data from the 2014 BRFS provides information on the prevalence of prostate cancer screening among Delaware males:

- 45 percent of Delaware males age 40 and older reported having had a PSA blood test in the past two years, compared to the national median prevalence of 43 percent.
- The proportion of Delaware males who received a PSA test within the past two years increased with age: 33 percent of males ages 45-54 were tested compared to 68 percent of males ages 65 and older.
- In Delaware, Caucasian males were more likely to have had a PSA test (47 percent) than African American males (45 percent). The difference in screening prevalence rates between Caucasians and African Americans did not reach a level of statistical significance.
- As the level of education increased, the proportion of Delaware males who had had a PSA test increased. Among Delaware males with less than a high school education, the prostate cancer screening prevalence rate was 25 percent. Among Delaware males who graduated from college, the comparable screening prevalence rate was 51 percent. This difference was statistically significant.
- According to the 2015 BRFS report, 28 percent of Delaware males reported making the decision together with their health care provider to have the PSA test done.

INCIDENCE

For 2009-2013, Delaware ranked 3rd in the U.S. for prostate cancer incidence (5th in 2008-2012)[10].

2009-2013 DATA

TABLE 11-1: NUMBER OF PROSTATE CANCER CASES, BY RACE; DELAWARE AND COUNTIES, 2009-2013

	All Males	Caucasian	African American
Delaware	3,961	2,951	936
Kent	762	515	233
New Castle	2,111	1,501	578
Sussex	1,088	935	125

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

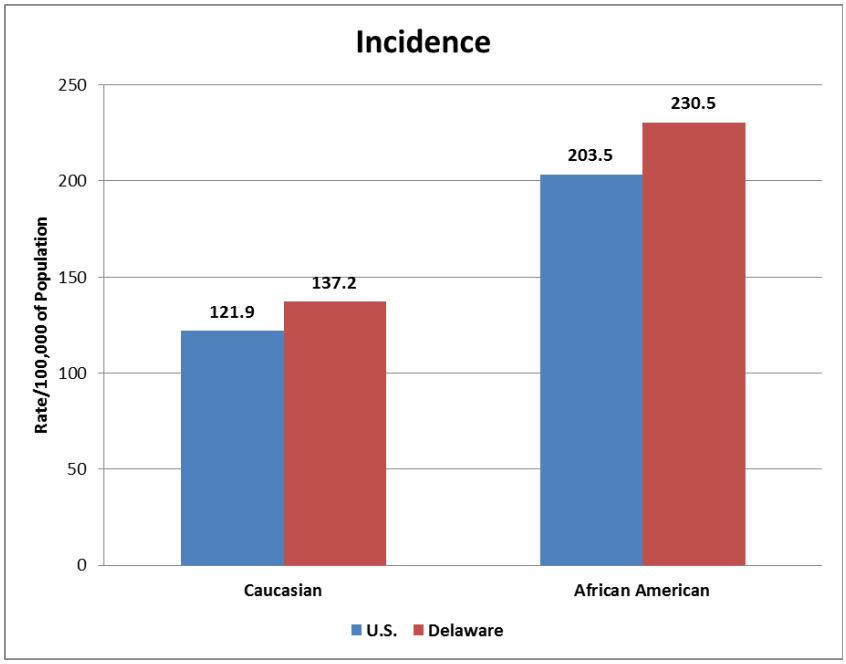
- Prostate cancer is the most commonly diagnosed cancer among males in the U.S. and Delaware.
- In 2009-2013, there were 3,961 prostate cancer cases (28 percent of all cancer cases in males) diagnosed in Delaware.
- Caucasians accounted for 75 percent of prostate cancer cases in Delaware.

TABLE 11-2: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2009-2013

	All Males	Caucasian	African American
U.S.	129.4	121.9	203.5
Delaware	151.4	137.2	230.5
Kent	170.0	146.1	270.8
New Castle	152.4	139.3	222.6
Sussex	138.1	128.9	208.2

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

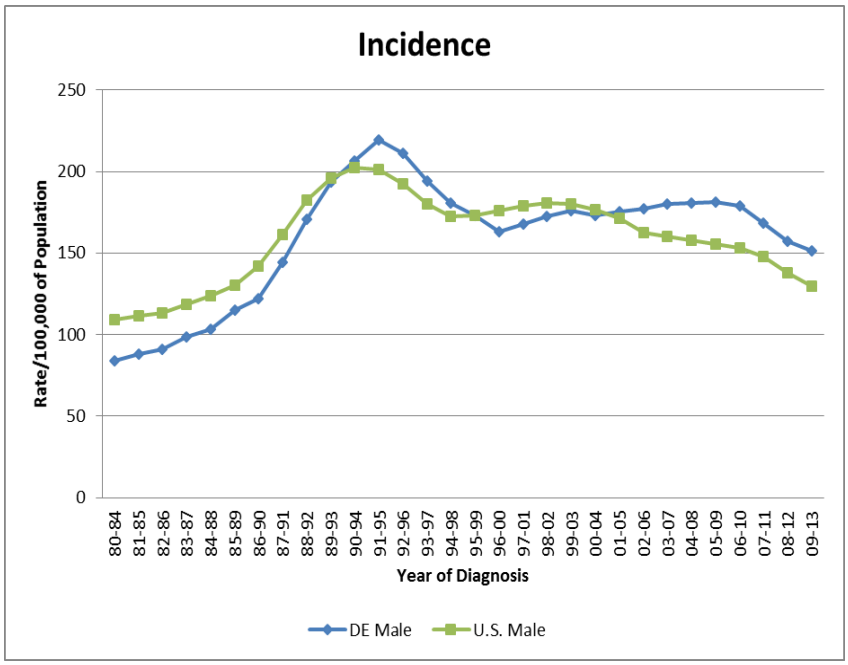
FIGURE 11-1: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES BY RACE; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - African Americans (230.5 per 100,000) had a statistically significantly higher prostate cancer incidence rate compared to Caucasians (137.2 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware (151.4 per 100,000) had a statistically significantly higher prostate cancer incidence rate than the U.S. (129.4 per 100,000).
  - Caucasians in Delaware (137.2 per 100,000) had a statistically significantly higher prostate cancer incidence rate than Caucasians in the U.S. (121.9 per 100,000).
  - African Americans in Delaware (230.5 per 100,000) had a statistically significantly higher prostate cancer incidence rate than African Americans in the U.S. (203.5 per 100,000).

FIGURE 11-2: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES; U.S. AND DELAWARE, 1980-2013

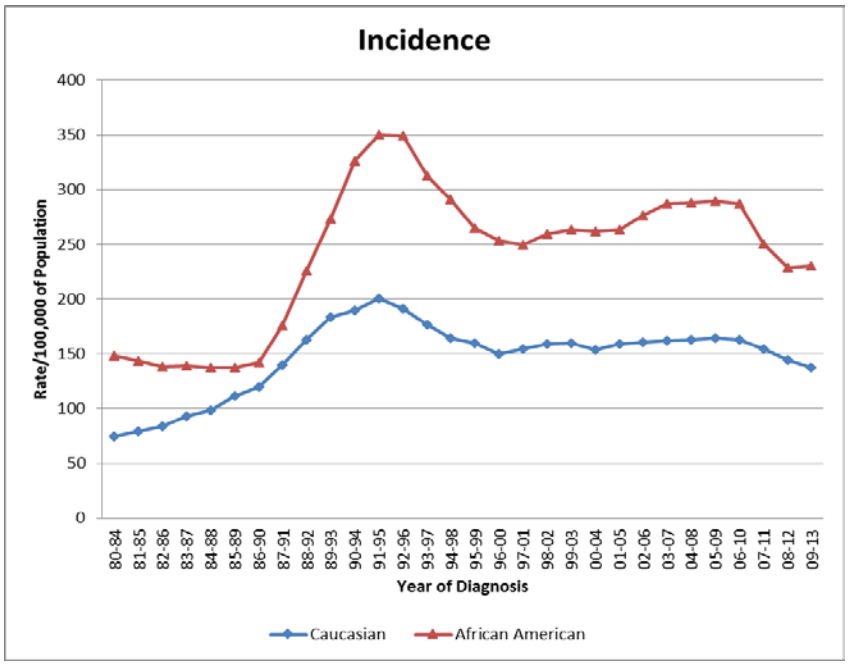


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Incidence rates for prostate cancer declined in Delaware by 14 percent and the U.S. by 28 percent.

TRENDS OVER TIME - DELAWARE

FIGURE 11-3: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Prostate cancer incidence in Delaware decreased by 14 percent among Caucasian males and declined by 12 percent among African Americans.

AGE-SPECIFIC INCIDENCE RATES - DELAWARE

TABLE 11-3: AGE-SPECIFIC PROSTATE CANCER INCIDENCE RATES BY RACE; DELAWARE, 2009-2013

Age at Diagnosis	All Males	Caucasian	African American
0-39	---	---	---
40-64	196.0	164.0	347.7
65-74	849.5	806.3	1,158.5
75-84	635.8	606.8	858.8
85+	458.7	443.9	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for prostate cancer incidence is 65-74 years of age.
- Due to low numbers, incidence rates were not able to be computed for some age categories when stratifying by race.

STAGE OF DIAGNOSIS - DELAWARE

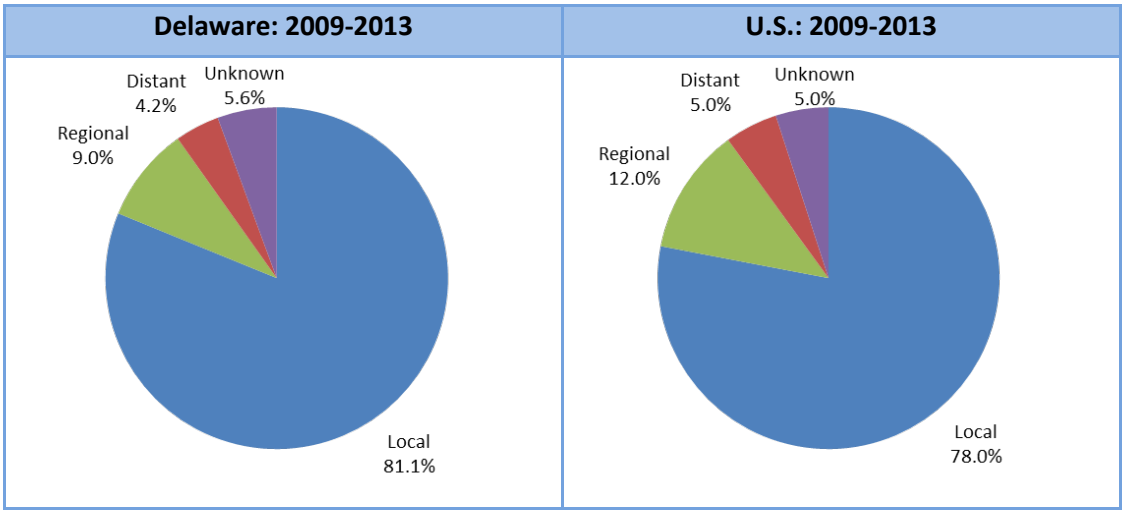
TABLE 11-4: PROSTATE CANCER CASES BY STAGE AT DIAGNOSIS BY RACE; DELAWARE, 2009-2013

Stage at Diagnosis	All Males	Caucasian	African American
Local	3,212 (81)	2,397 (81)	755 (81)
Regional	358 (9)	265 (9)	86 (9)
Distant	168 (4)	130 (4)	37 (4)
Unknown	223 (6)	159 (5)	58 (6)
Total	3,961	2,951	936

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- In 2009-2013, there were 3,212 (81 percent) prostate cancers diagnosed at the local stage; 358 (9 percent) at the regional stage; 168 (4 percent) at the distant stage; and 223 (6 percent) had an unknown stage.
- The proportion of prostate cancers diagnosed at each stage was similar between the racial groups.

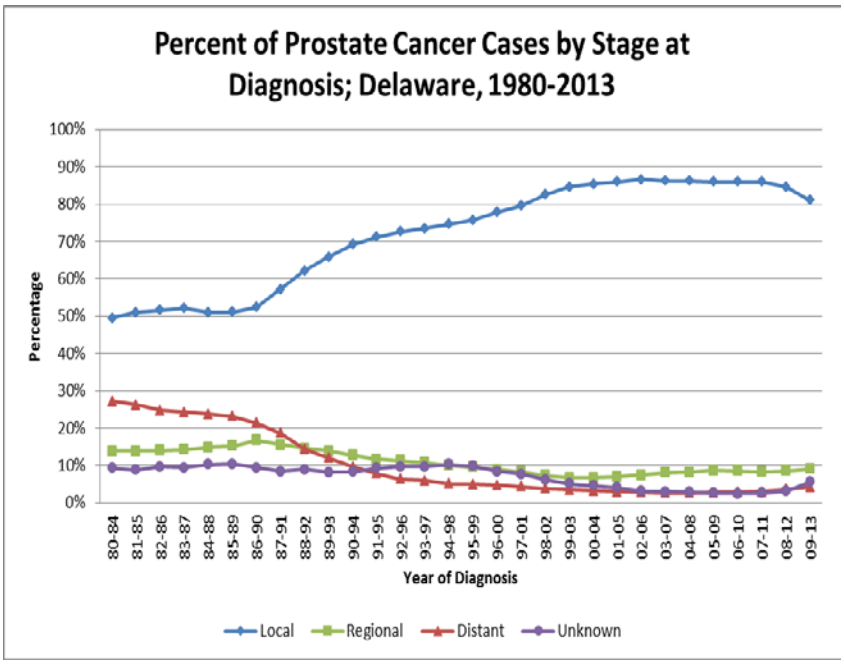
FIGURE 11-4: DISTRIBUTION OF PROSTATE CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016

- In comparing U.S. and Delaware data, the proportion of prostate cancer diagnosed at local stage is higher in Delaware (81 percent) than the U.S. (78 percent).

FIGURE 11-5: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR PROSTATE CANCER CASES; DELAWARE, 1980-2013



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

- From 1980-1984 to 2009-2013 in Delaware
  - The percent of prostate cancer cases diagnosed at the local stage increased from 50 percent to 81 percent.
  - Cases diagnosed at the distant stage decreased from 27 percent to 4 percent.

MORTALITY

For 2009-2013, Delaware ranked 35th in the U.S. for prostate cancer mortality (18th in 2008-2012)[11].

2009-2013 DATA

TABLE 11-5: NUMBER OF PROSTATE CANCER DEATHS, BY RACE; DELAWARE AND COUNTIES, 2009-2013

	All Males	Caucasian	African American
Delaware	426	318	102
Kent	62	41	19
New Castle	232	167	63
Sussex	132	110	20

Source: Delaware Health Statistics Center, 2016

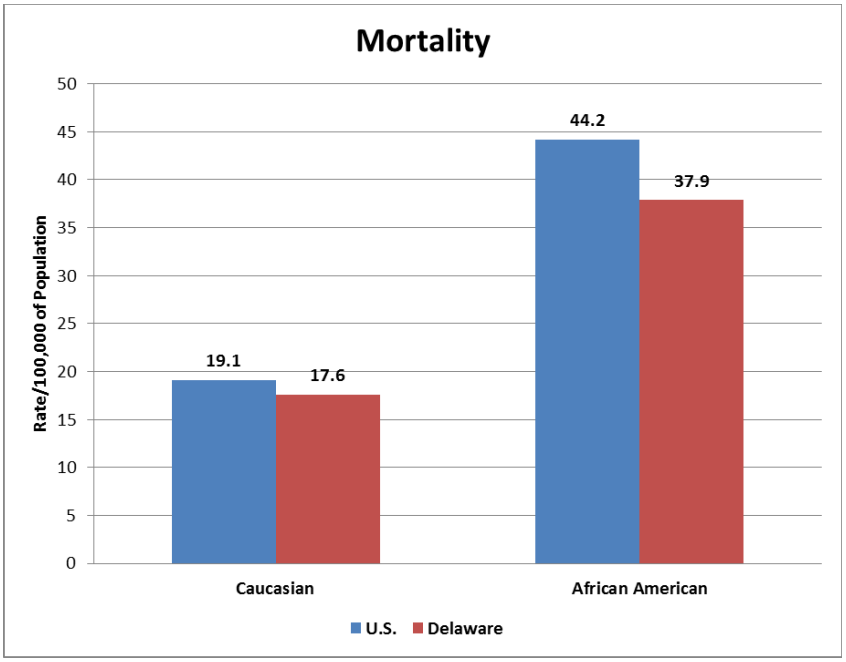
- Prostate cancer is the second most common cause of cancer deaths among males in the U.S. and Delaware.
- In 2009-2013, there were 426 male deaths (9 percent of all male cancer deaths) from prostate cancer.
- Caucasian males accounted for 75 percent of prostate cancer deaths in Delaware.

TABLE 11-6: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2009-2013

	All Males	Caucasian	African American
U.S.	20.7	19.1	44.2
Delaware	19.9	17.6	37.9
Kent	16.8	13.8	---
New Castle	20.6	18.0	36.1
Sussex	21.2	19.1	---

Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

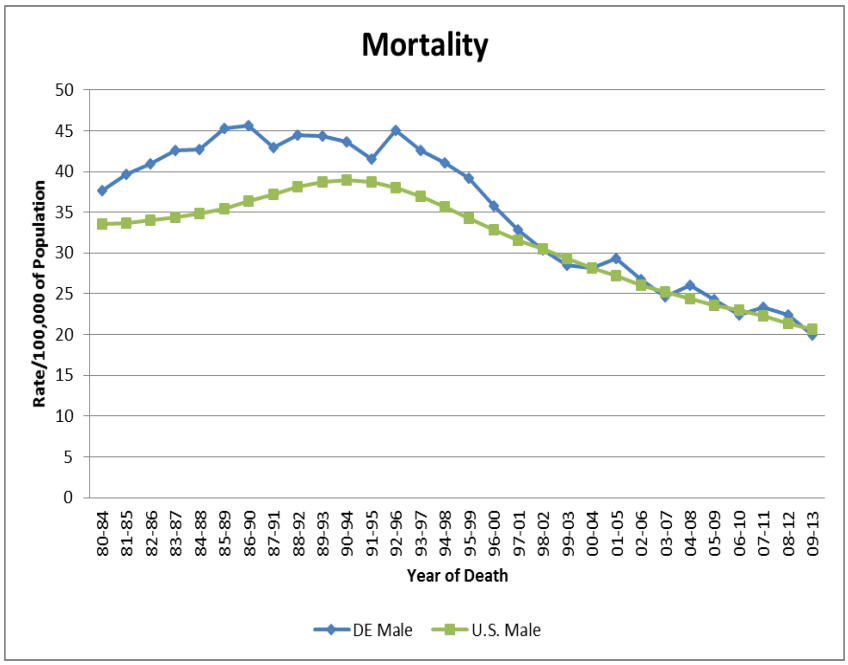
FIGURE 11-6: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES BY RACE; U.S. AND DELAWARE, 2009-2013



Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- In Delaware
  - African Americans (37.9 per 100,000) had a statistically significantly higher prostate cancer mortality rate compared to Caucasians (17.6 per 100,000).
- Comparing Delaware and the U.S.
  - The difference in the prostate cancer mortality rates between Delaware (19.9 per 100,000) and the U.S. (20.7 per 100,000) was not statistically significant.
  - The difference in the prostate cancer mortality rates between Caucasians in Delaware (17.6 per 100,000) and the U.S (19.1 per 100,000) was not statistically significant.
  - The difference in the prostate cancer mortality rates between African Americans in Delaware (37.9 per 100,000) and the U.S (44.2 per 100,000) was not statistically significant.

FIGURE 11-7: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES; U.S. AND DELAWARE, 1980-2013

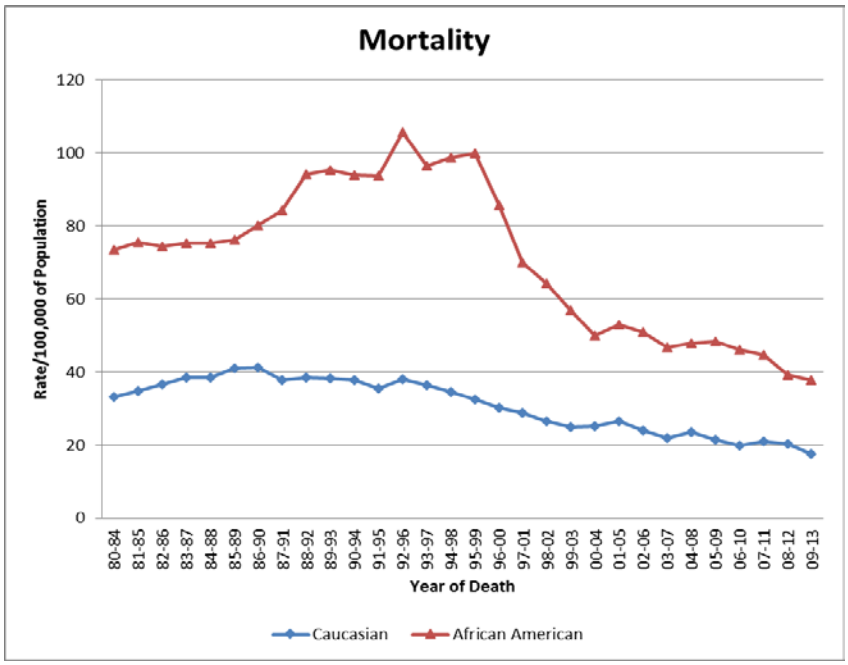


Source (Delaware): Delaware Health Statistics Center, 2016
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Mortality rates for prostate cancer declined 30 percent in Delaware and 29 percent in the U.S.

TRENDS OVER TIME - DELAWARE

FIGURE 11-8: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2013



Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- From 1999-2003 to 2009-2013
  - Prostate cancer mortality in Delaware declined 34 percent among African American males and 30 percent among Caucasians.

AGE-SPECIFIC MORTALITY RATES - DELAWARE

TABLE 11-7: AGE-SPECIFIC PROSTATE CANCER MORTALITY RATES BY RACE; DELAWARE, 2009-2013

Age at Death	All Males	Caucasian	African American
0-39	---	---	---
40-64	6.0	4.6	---
65-74	58.2	49.3	115.8
75-84	162.5	131.9	425.3
85+	447.7	448.1	---

Source: Delaware Health Statistics Center, 2016
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population
Rates based on less than 25 cases are not shown

- The peak age for prostate cancer mortality is age 85 and older. Due to low numbers, prostate cancer mortality rates were not able to be computed for some of the age groups.
- After stratifying by race, Caucasian males had peak prostate cancer mortality at 85 years and over and African American males had peak mortality at 75-84 years of age. Due to low numbers, the mortality rates could not be calculated for most of the African American age groups.

CHAPTER 12: THE DELAWARE CANCER TREATMENT PROGRAM

The Delaware Cancer Treatment Program (DCTP) is a program of the Delaware Department of Health and Social Services (DHSS), Division of Public Health (DPH), established to provide medical insurance coverage to uninsured Delawareans for treatment of cancer. Treatment is covered for a maximum of 24 months after the date cancer treatment is initiated for each primary cancer diagnosis. Treatment does not include routine monitoring for pre-cancerous conditions or monitoring for recurrence during or after remission.

To qualify for the DCTP, applicants must[20]:

- Need treatment for cancer in the opinion of the applicant's licensed physician of record
- Be a Delaware resident over the age of 18
- Have been a Delaware resident at the time their cancer was diagnosed
- Have no comprehensive health insurance, or maximum out of pocket expenses for cancer treatment is no more than 15 percent of income (This does not include premiums.)
- Household income less than 650 percent of the federal poverty level
- Diagnosed with any cancer on or after July 1, 2004

The following disqualify an applicant from the DCTP[20]:

- Out-of-pocket expenses less than 15 percent of income
- Enrollment in Medicaid
- Receives benefits through the Medicaid Breast and Cervical Cancer Treatment Program
- Was not a Delaware resident when diagnosed with cancer

Covered services for the DCTP include:

- Provider reimbursement
- Prescriptions
- Chemotherapy
- Radiation
- Hospitalization
- Surgery
- Nutritional support
- Medical equipment
- Hospice

To characterize the clients in Delaware who access the DCTP, a study was conducted to determine utilization of the DCTP for 2009-2013. Only claims data from clients who had their first occurrence of cancer in 2009-2013 and their claims data was analyzed. Client demographic data includes age at enrollment, race/ethnicity, marital status, federal poverty level, citizenship status, and cancer site. Claims data includes information on charges for inpatient, outpatient, pharmacy, and other[21] services while undergoing cancer treatment. Finally, claims data for the top four cancers (female breast, colorectal, lung, and prostate) are also presented.

For the time period 2009-2013, of the 921 people enrolled in the DCTP, 907 (98 percent) had claims data. The clients were equally divided between male and female at 50 percent each, while 66 percent identified as Caucasian; and 37 (4 percent) of clients in the DCTP were not U.S. citizens. Most people lived in a two-person

[20] http://dhss.delaware.gov/dhss/dph/dpc/catreatment.html

[21] Other services include hospice, Health Care Financing Administration (HCFA)/Centers for Medicare and Medicaid Services, nursing home, and home health.

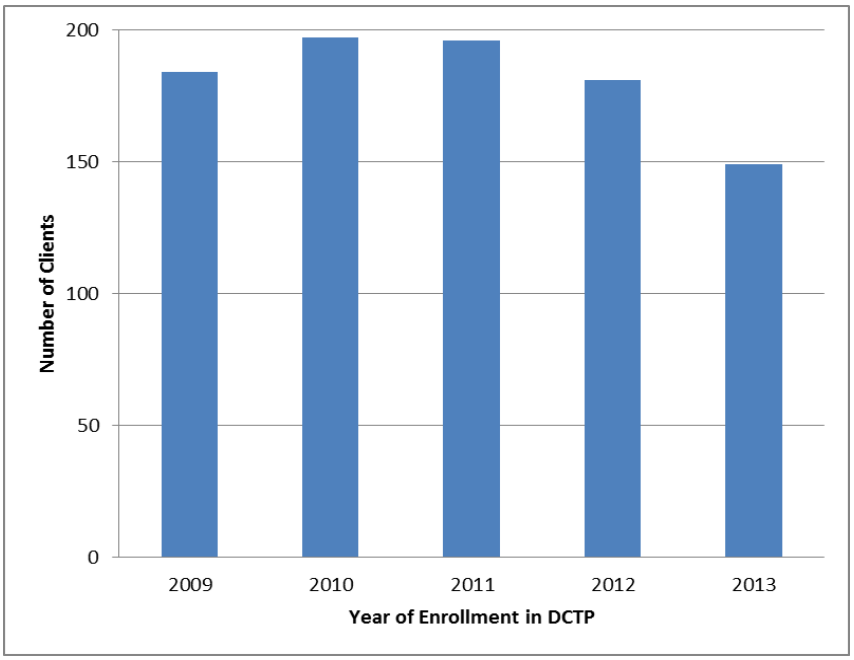
household (39 percent) and 43 percent of clients were married. There were 475 clients (52 percent) who lived under 138 percent of the federal poverty level. The average client age was 52.6 years.

Table 12-1: Delaware Cancer Treatment Program client demographics, 2009-2013

VARIABLE	N (%)
Race/Ethnicity	
Caucasian	602 (66)
African American	187 (21)
Hispanic	74 (8)
Other	44 (5)
Sex	
Male	454 (50)
Female	453 (50)
Household size (median, IQR)	2 (1-3)
Household size (mean ± sd)	2.2 ± 1.4
Household size	
1	309 (34)
2	352 (39)
3	111 (12)
4 or more	135 (15)
Marital status	
Single	178 (20)
Married	387 (43)
Divorced	314 (35)
Missing	28 (3)
Citizenship	
Citizen	870 (96)
Not a citizen	37 (4)
Federal poverty level	
0% - 138%	475 (52)
More than 138% - 400%	393 (43)
More than 400%	39 (4)
Age (median, IQR)	54 (47-60)
Age (mean ± sd)	52.6 ± 10.3
Age group	
0-34 years	67 (7)
35-44 years	97 (11)
45-54 years	298 (33)
55-64 years	412 (45)
65 and older	33 (4)

Source: Delaware Cancer Treatment Program, 2016

FIGURE 12-1: YEAR OF ENROLLMENT IN THE DELAWARE CANCER TREATMENT PROGRAM FOR THE FIRST OCCURRENCE OF CANCER, 2009-2013



Source: Delaware Cancer Treatment Program, 2016

Figure 12-1 depicts the year of enrollment in the DCTP for the first occurrence of cancer. The highest enrollment was in 2010 (197 clients) compared to lowest enrollment in 2013 (149 clients).

There were 14 clients (2 percent) who had two cancers at the time they were enrolled in the DCTP. The five most common cancers were other cancers (169 clients), breast cancer (117 clients), lung cancer (109 clients), prostate cancer (65 clients), and colorectal cancer (60 clients). Other cancers were composed of cancers defined as "other", "ill-defined" and "unknown" per the Surveillance, Epidemiology, and End Results (SEER) program definition[22].

[22] https://seer.cancer.gov/tools/ssm/other.pdf

TABLE 12-2: BREAKDOWN OF CANCER TYPES FOR CLIENTS ENROLLED IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

VARIABLE	N (%)
Number of cancers diagnosed	
One cancer diagnosed	893 (98)
Two cancers diagnosed	14 (2)
Only one cancer site	
Brains and other nervous system	12 (1)
Breast	117 (13)
Cervix	18 (2)
Colorectal	60 (7)
Esophagus	9 (1)
Hodgkin Lymphoma	14 (2)
Kidney and renal pelvis	25 (3)
Larynx	15 (2)
Leukemia	18 (2)
Liver	15 (2)
Lung	109 (12)
Melanoma	17 (2)
Multiple Myeloma	16 (2)
Non-Hodgkin Lymphoma	35 (4)
Oral and pharynx	30 (3)
Other[23]	169 (19)
Ovary	20 (2)
Pancreas	29 (3)
Prostate	65 (7)
Stomach	15 (2)
Testis	20 (2)
Thyroid	16 (2)
Urinary Bladder	17 (2)
Uterine	32 (4)
Two cancer sites	
Breast and Uterine	1 (0.11)
Colorectal and Melanoma	1 (0.11)
Colorectal and Other	1 (0.11)
Hodgkin Lymphoma and Other	1 (0.11)
Kidney and renal pelvis and Other	1 (0.11)
Lung and Other	2 (0.22)
Lung and Prostate	1 (0.11)
Melanoma and Other	1 (0.11)
Non-Hodgkin Lymphoma and Other	1 (0.11)
Prostate and Other	1 (0.11)
Ovary and Other	1 (0.11)
Ovary and Stomach	1 (0.11)
Uterine and Other	1 (0.11)

Source: Delaware Cancer Treatment Program, 2016

[23] This category includes cancers which were defined as "other", "ill-defined" and "unknown" per the SEER Site groups for cancer classifications

TABLE 12-3: CLAIMS ASSOCIATED WITH CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

Variable	All Years	2009	2010	2011	2012	2013
Total number of claims	54,776	5,907	11,613	13,022	13,159	11,075
Number of claims by type of service						
Inpatient	879 (2)	142 (2)	203 (2)	184 (1)	187 (1)	163 (1)
Other	29,695 (54)	3,574 (61)	6,846 (59)	7,245 (56)	6,838 (52)	5,192 (47)
Outpatient	11,473 (21)	1,048 (18)	2,135 (18)	2,447 (19)	2,803 (21)	3,040 (27)
Pharmacy	12,729 (23)	1,143 (19)	2,429 (21)	3,146 (24)	3,331 (25)	2,680 (24)
Average amount paid	$709	$739	$650	$704	$706	$763
Total amount paid	$38,832,663	$4,367,169	$7,548,835	$9,171,070	$9,294,114	$8,451,475

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 54,776 claims were submitted to the DCTP and these totaled over $38 million. The most claims paid, over $15 million, was for outpatient services. The lowest category of claims paid was just over $3 million for pharmacy claims. The average amount paid per claim was $709.00.

TABLE 12-4: DEMOGRAPHICS FOR BREAST CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

VARIABLE	N (%)
Race/Ethnicity	
Caucasian	59 (50)
African American	35 (30)
Hispanic	16 (14)
Other	7 (6)
Household size (median, IQR)	2 (1-3)
Household size (mean ± sd)	2.4 ± 1.4
Household size	
1	35 (30)
2	45 (38)
3	13 (11)
4 or more	24 (21)
Marital status	
Single	26 (22)
Married	47 (40)
Divorced	39 (33)
Unknown	5 (4)
Citizenship	
Citizen	109 (93)
Not a citizen	8 (7)
Federal poverty level	
0% - 138%	68 (58)
More than 138% - 400%	43 (37)
More than 400%	6 (5)
Age (median, IQR)	55 (45-60)
Age (mean ± sd)	51.8 ± 10.1
Age group	
0-34 years	8 (7)
35-44 years	19 (16)
45-54 years	31 (27)
55-64 years	54 (46)
65 and older	5 (4)

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 117 females filed claims for only breast cancer. Most were Caucasian (50 percent) and married (40 percent). Most lived under 138 percent of the federal poverty level (58 percent).

TABLE 12-5: CLAIMS ASSOCIATED WITH BREAST CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

Variable	All Years	2009	2010	2011	2012	2013
Total number of claims	6,926	837	1,210	1,464	1,910	1,505
Number of claims by type of service						
Inpatient	59 (1)	13 (2)	9 (1)	16 (1)	15 (1)	6 (0)
Other	3,453 (50)	426 (51)	699 (58)	764 (52)	941 (49)	623 (41)
Outpatient	1,931 (28)	198 (24)	297 (25)	353 (24)	548 (29)	535 (36)
Pharmacy	1,483 (21)	200 (24)	205 (17)	331 (23)	406 (21)	341 (23)
Average amount paid	$682	$808	$667	$704	$624	$676
Total amount paid	$4,723,953	$676,522	$806,764	$1,031,468	$1,191,529	$1,017,670

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 6,926 claims for those with breast cancer were submitted to the DCTP. Most of the claims (50 percent) were from other services, while the least (1 percent) were from inpatient services. The total amount paid in claims was $4.7 million and the average amount paid per claim was $682.

TABLE 12-6: DEMOGRAPHICS FOR COLORECTAL CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

VARIABLE	N (%)
Race/Ethnicity	
Caucasian	40 (67)
African American	15 (25)
Hispanic	4 (7)
Other	1 (2)
Sex	
Male	36 (60)
Female	24 (40)
Household size (median, IQR)	2 (1-3)
Household size (mean ± sd)	2.2 ± 1.6
Household size	
1	28 (47)
2	12 (20)
3	9 (15)
4 or more	11 (18)
Marital status	
Single	14 (23)
Married	24 (40)
Divorced	22 (37)
Citizenship	
Citizen	59 (98)
Not a citizen	1 (2)
Federal poverty level	
0% - 138%	35 (58)
More than 138% - 400%	23 (38)
More than 400%	2 (3)
Age (median, IQR)	54 (48-61)
Age (mean ± sd)	52.9 ± 9.8
Age group	
0-34 years	4 (7)
35-44 years	6 (10)
45-54 years	21 (35)
55-64 years	27 (45)
65 and older	2 (3)

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 60 people filed claims for only colorectal cancer. Most were Caucasian (67 percent) and married

TABLE 12-7: CLAIMS ASSOCIATED WITH COLORECTAL CANCER TREAMTENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

Variable	All Years	2009	2010	2011	2012	2013
Total number of claims	4,737	590	781	1,282	1,193	891
Number of claims by type of service						
Inpatient	79 (2)	12 (2)	19 (2)	20 (20	15 (1)	13 (1)
Other	2,532 (53)	372 (63)	447 (57)	760 (59)	585 (49)	368 (41)
Outpatient	903 (19)	92 (16)	136 (17)	180 (14)	269 (23)	226 (25)
Pharmacy	1,223 (26)	114 (19)	179 (23)	322 (25)	324 (27)	284 (32)
Average amount paid	$830	$840	$730	$703	$763	$1,183
Total amount paid	$3,931,753	$495,523	$569,937	$901,776	$910,115	$1,054,403

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 4,737 claims for those with colorectal cancer were submitted to the DCTP. Most of the claims (53 percent) were from other services while the least (2 percent) were from inpatient services. The total amount paid in claims was $3.9 million and the average amount paid per claim was $830.

TABLE 12-8: DEMOGRAPHICS FOR LUNG CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

VARIABLE	N (%)
Race/Ethnicity	
Caucasian	82 (75)
African American	21 (19)
Hispanic	2 (2)
Other	4 (4)
Sex	
Male	57 (52)
Female	52 (48)
Household size (median, IQR)	2 (1-2)
Household size (mean ± sd)	2.1 ± 1.1
Household size	
1	30 (28)
2	56 (51)
3	11 (10)
4 or more	12 (11)
Marital status	
Single	14 (13)
Married	53 (49)
Divorced	40 (37)
Unknown	2 (2)
Citizenship	
Citizen	108 (99)
Not a citizen	1 (1)
Federal poverty level	
0% - 138%	53 (49)
More than 138% - 400%	55 (50)
More than 400%	1 (1)
Age (median, IQR)	57 (51-62)
Age (mean ± sd)	56.0 ± 6.4
Age group	
0-34 years	1 (1)
35-44 years	4 (4)
45-54 years	33 (30)
55-64 years	70 (64)
65 and older	1 (1)

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 109 people filed claims for only lung cancer. Most were Caucasian (75 percent) and married (49 percent). Most lived under 138 percent of the federal poverty level (49 percent).

TABLE 12-9: CLAIMS ASSOCIATED WITH LUNG CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

Variable	All Years	2009	2010	2011	2012	2013
Total number of claims	6,998	619	1,649	1,359	1,743	1,628
Number of claims by type of service						
Inpatient	129 (2)	7 (1)	35 (2)	23 (2)	31 (2)	33 (2)
Other	3,751 (54)	379 (61)	879 (53)	733 (54)	957 (55)	803 (49)
Outpatient	1,447 (21)	102 (16)	319 (19)	253 (19)	374 (21)	399 (25)
Pharmacy	1,671 (24)	131 (21)	416 (25)	350 (26)	381 (22)	393 (24)
Average amount paid	$616	$553	$632	$679	$566	$623
Total amount paid	$4,307,279	$342,251	$1,041,819	$922,553	$986,417	$1,014,239

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 6,998 claims for those with lung cancer were submitted to the DCTP. Most of the claims (54 percent) were from other services while the least (2 percent) were from inpatient services. The total amount paid in claims was $4.3 million and the average amount paid per claim was $616.

TABLE 12-10: DEMOGRAPHICS FOR PROSTATE CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

VARIABLE	N (%)
Race/Ethnicity	
Caucasian	33 (51)
African American	28 (43)
Hispanic	4 (6)
Household size (median, IQR)	2 (1-2)
Household size (mean ± sd)	2.0 ± 1.0
Household size	
1	18 (28)
2	35 (54)
3	8 (12)
4 or more	4 (6)
Marital status	
Single	6 (9)
Married	39 (60)
Divorced	18 (28)
Unknown	2 (3)
Citizenship	
Citizen	65 (100)
Not a citizen	0 (0)
Federal poverty level	
0% - 138%	31 (48)
More than 138% - 400%	30 (46)
More than 400%	4 (6)
Age (median, IQR)	59 (56-63)
Age (mean ± sd)	58.8 ± 8.4
Age group	
0-34 years	1 (2)
35-44 years	1 (2)
45-54 years	14 (22)
55-64 years	41 (63)
65 and older	8 (12)

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 65 males filed claims for only prostate cancer. Most were Caucasian (51 percent) and married (60 percent). Most lived under 138 percent of the federal poverty level (48 percent).

TABLE 12-11: CLAIMS ASSOCIATED WITH PROSTATE CANCER TREATMENT IN THE DELAWARE CANCER TREATMENT PROGRAM, 2009-2013

Variable	All Years	2009	2010	2011	2012	2013
Total number of claims	2,323	169	538	667	599	350
Number of claims by type of service						
Inpatient	24 (1)	2 (1)	9 (2)	8 (1)	3 (1)	2 (1)
Other	1,350 (58)	131 (78)	367 (68)	359 (54)	286 (48)	207 (59)
Outpatient	400 (17)	24 (14)	79 (15)	103 (15)	112 (19)	82 (23)
Pharmacy	549 (24)	12 (7)	83 (15)	197 (30)	198 (33)	59 (17)
Average amount paid	$476	$734	$584	$398	$378	$501
Total amount paid	$1,105,439	$124,118	$314,026	$265,490	$226,292	$175,513

Source: Delaware Cancer Treatment Program, 2016

In 2009-2013, 2,323 claims for those with prostate cancer were submitted to the DCTP. Most of the claims (58 percent) were from other services while the least (1 percent) were from inpatient services. The total amount paid in claims was $1.1 million and the average amount paid per claim was $476.

SUMMARY

From 2009-2013, there were a total of 921 Delawareans enrolled in the DCTP; 602 (66 percent) were Caucasian, 454 (50 percent) were male, and 412 (45 percent) were ages 55-64. There were 14 (2 percent) clients who were diagnosed with more than one cancer at the time of their DCTP enrollment.

Overall, the number of clients enrolled in the DCTP decreased between 2009 and 2013. Most of the 54,776 claims submitted to the DCTP were classified as “other” – defined as hospice, Health Care Financing Administration (HCFA)/Centers for Medicare and Medicaid Services, nursing home, and home health. In terms of the amount paid, outpatient services were the highest at over $15 million for 2009-2013.

After excluding cancers classified as “other,” breast cancer had the highest amount of claims paid for treatment through the DCTP, followed by lung, colorectal, and prostate cancer. These four cancers accounted for 50 percent of all new cancers diagnosed in Delaware during 2009-2013; and $14,068,425 (36 percent) of the total amount of claims paid by the DCTP. While the amount of claims paid has declined since 2011, the fact that there are still many people being covered by the program for essential services demonstrates the need and importance of the program.

CHAPTER 13: CANCER INCIDENCE BY CENSUS TRACT

BACKGROUND

As required by Title 16, Chapter 292 of the *Delaware Code* (Appendix E), the Delaware Department of Health and Social Services, Division of Public Health (DPH) publishes cancer rates by census tract annually. Specifically:

> *"The agency [DPH] shall create a detailed map of each county in Delaware that graphically illustrates the overall incidence of cancer in each census tract. The census tracts will be identified on the maps and shall be color-coded to designate the degree of cancer incidence in each tract. These maps shall be created within 90 days of the agency receiving the cancer incidence data. The agency shall post the maps created … on their website in a format that can be easily accessed and read by the public."*

METHODS

Census tract analysis methods are described in detail in Appendix F.

As of the 2010 Census, Delaware is divided into 214 census tracts.

- For 2009-2013, the least populated census tract (511.01 in Sussex County) had an annual average of 675 residents. The most populous census tract (402.02 in Kent County) had an annual average population of 12,256 residents. The average annual number of residents per census tract was 4,193.
- For 2009-2013 census tract analyses, 27,194 Delaware cancer cases diagnosed during the time period were included in the analyses.

RESULTS OF CENSUS TRACT ANALYSES

Cancer incidence rates by census tract (with confidence intervals) are shown in Appendix H for the 2009-2013 time period. Census tracts shaded in yellow have statistically significantly higher incidence rates and those shaded in blue have statistically significantly lower incidence rates (when compared to the overall state incidence rate).

Results for 2009-2013 show that:

- In 30 of Delaware's 214 census tracts, the all-site cancer incidence rate was statistically significantly higher than Delaware's average 2009-2013 incidence rate (507.5 per 100,000)[24].
- In 20 of Delaware's 214 census tracts, the all-site cancer incidence rate was statistically significantly lower than Delaware's average 2009-2013 incidence rate (507.5 per 100,000).
- All-site cancer incidence rates for the remaining 164 census tracts were not significantly different from the state's average rate for the 2009-2013 time period.

Appendix I shows maps of Delaware census tracts grouped by 2009-2013 all-site cancer incidence quintile. Appendix J shows maps of Delaware census tracts in which census tracts with 2009-2013 all-site cancer incidence rates are significantly different from the state average. These are shaded for ease of identification.

DISCUSSION OF RESULTS OF CENSUS TRACT ANALYSES

When assessing cancer incidence data by census tract, it should be kept in mind that the occurrence of cancer may differ across census tracts for a variety of reasons. For example, lifestyle behaviors may cluster in a homogeneous community. In addition, the presence or absence of exposure to environmental or occupational carcinogens is often limited to a defined geographic area. In addition, residents in certain geographic areas

[24] 507.5 is average 2009-2013 Delaware incidence rate calculated by Excel rather than SEER*Stat (507.3).

may be more impoverished than other residents, which will affect their availability of health insurance coverage as well as their level of access to health care, particularly cancer screening services. Finally, chance or random variation can play a role, since approximately 5 percent of all comparisons will be significantly different due to chance alone.

Additional caution is needed when comparing results from the 2009-2013 census tract analysis to results for 2003–2007 and earlier time periods. Because of the change in the configuration of census tracts in Delaware (i.e., shifting from 197 census tracts defined by the 2000 Census to 214 census tracts defined by the 2010 Census), results derived using the two different census tract configurations would be expected to differ due to various reasons. Despite population growth in the intervening decade, the average population size of each census tract decreased when census tracts were redrawn for the 2010 Census. Using the 2000 Census configuration of 197 census tracts, each census tract had an average of 4,257 residents. Using the 2010 Census configuration of 214 census tracts, each census tract had an average of 4,118 residents.

Furthermore, there is an inherent instability in calculating cancer incidence rates at the census tract level. In a small group, such as a census tract, the relative number of cancer diagnoses can change considerably from year to year. If one case of cancer is diagnosed in a census tract one year, and three cases of cancer are diagnosed in the same census tract the next year, the cancer rate for that census tract will change dramatically from one year to the next. These relatively large fluctuations do not typically occur in larger populations. If a census tract has an all-site cancer incidence rate that is significantly different from the state rate for one time period, it is not unusual to find a non-significant difference in rates for the following time period (and vice versa).

The all-site cancer incidence fluctuations in census tract 513.02 illustrate this key point. During 2003-2007, 134 all-site cancer cases were diagnosed in census tract 513.02 and its all-site cancer incidence rate (823.3 per 100,000) was significantly elevated, compared to the all-site cancer incidence rate for Delaware (510.6 per 100,000). In 2004-2008, 123 all-site cancer cases were diagnosed in census tract 513.02 – 11 fewer than the previous time period. However, despite the decrease in the number of cases, the all-site cancer incidence rate (649.2 per 100,000) for 2004-2008 remained significantly elevated, compared to the all-site cancer incidence rate for Delaware (515.1 per 100,000). For the most recent time period, 2009-2013, 104 all-site cancer cases were diagnosed in census tract 513.02, yielding an all-site cancer incidence rate (524.3 per 100,000) which was not statistically significantly different from the all-site cancer incidence rate for Delaware (507.3 per 100,000).

Inaccurate data on the population at risk in small geographic areas continues to complicate epidemiologic studies in community settings. Census data are known to be less accurate for cities or counties than for states. In addition: *"The uncertainty is greatest for demographic subgroups of the population during the 10-year interval between national census counts*"[25]. Because population estimates for census tracts in analyses during the three initial time periods (2001-2005, 2002-2006, and 2003-2007) relied solely on 2000 Census population data, there was the potential for major fluctuations in the rate when comparing that data with data using the 2010 Census population projections. A further complication is that before 2004-2008, geocoding was not yet available, further reducing the accuracy of geographic data.

[25] Thun M. Sinks T. Understanding Cancer Clusters. Cancer: A Cancer Journal for Clinicians, 54(5), 273-280 (2004)

APPENDIX A: DATA SOURCES AND METHODOLOGY

CANCER INCIDENCE DATA

DELAWARE CANCER REGISTRY

This report covers data on cancer cases diagnosed among Delawareans from January 1, 2009 to December 31, 2013 and that were reported to the Delaware Cancer Registry (DCR) by May 2015. Trends in incidence rates are based on cancers diagnosed from January 1, 1980 to December 31, 2013.

During 2009-2013, there were 27,194 cancer cases diagnosed among Delawareans, which includes individuals with cancers diagnosed at more than one site (known as multiple primaries). With the exception of urinary bladder cancer, only malignant tumors are included in the analyses. *In situ* urinary bladder cancer cases are included because, based on language used by pathologists, it is difficult to distinguish them from malignant cancers.

The International Classification of Diseases for Oncology, Second Edition (ICD-O-2), describes the topography (primary anatomic site) and morphology (histology) for cancers reported from 1988 through 2000. Cancers diagnosed from 2001 through the present are coded using the International Classification of Diseases for Oncology, Third Edition (ICD-O-3)[26]. Relevant codes for this report are in Appendix B. The topography code defines both the site of the tumor and the type of cancer. The first four digits of the morphology code define the histology of the cancer and the fifth digit indicates whether or not the cancer is malignant, benign, *in situ*, or uncertain. Consistent with publication of the Centers for Disease Control and Prevention's (CDC) *U.S. Cancer Statistics*, Kaposi's sarcoma and mesothelioma are considered separate sites based on distinct histology codes.

SEER PROGRAM OF THE NATIONAL CANCER INSTITUTE

U.S. incidence and mortality data obtained from the Surveillance, Epidemiology and End Results (SEER) program of the National Cancer Institute were used as the comparison for Delaware's cancer incidence and mortality rates. These data were accessed using SEER*Stat. Since 1973, the SEER program collects, analyzes, and disseminates cancer incidence data for cancer control, diagnosis, treatment, and research from population-based registries throughout the United States. The initial SEER reporting areas were Connecticut, Iowa, New Mexico, Utah, and Hawaii; the metropolitan areas of Detroit, Michigan, and San Francisco-Oakland, California; and the Commonwealth of Puerto Rico (through 1989). Additional geographic areas were selected for inclusion in the SEER Program based on their ability to operate and maintain a high quality population-based cancer reporting system and for their epidemiologically-relevant population subgroups[27].

Historically, Delaware's cancer incidence rates have been compared to cancer incidence rates calculated using data from the original nine registries (SEER-9) that provided data to SEER beginning in 1974-1975. In 2009, the Division of Public Health (DPH) and the Delaware Cancer Consortium elected to begin using cancer incidence rates based on 17 population-based registries as a comparison for Delaware's cancer incidence rates. Currently SEER incidence rates are based on data from 18 population-based registries (SEER-18) that represent 28 percent of the U.S. population. The primary benefit of using U.S. comparison rates derived from SEER-18 is that these rates are based on a larger and more representative sub-sample of the U.S. population. Also, comparing Delaware's incidence rates with rates derived from the SEER-18 registries provides a comparison of cancer surveillance statistics that is consistent with those of other population-based registries throughout the U.S.

[26] Fritz A, Jack A, Parkin DM, Percy C, Shanmugarathan, Sobin L, Whelan S (eds). International Classification of Diseases for Oncology, Third Edition (ICD-O-3). World Health Organization, Geneva.

[27] Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute. http://seer.cancer.gov/about/

CANCER MORTALITY DATA

DELAWARE HEALTH STATISTICS CENTER

Mortality data are provided by the Delaware Health Statistics Center for all death certificates filed in Delaware from 2009 through 2013. Five-year average annual age-adjusted cancer mortality rates are based on deaths that occurred in the five-year time period from January 1, 2009 to December 31, 2013. Trends in cancer mortality are presented for deaths that occurred from 1980 through 2013.

Underlying cause-of-death codes are based on the International Classification of Diseases, Ninth Edition (ICD-9) for deaths that occurred between 1980 and 1998. For deaths that occurred from 1999 to the present, the International Classification of Diseases, Tenth Edition (ICD-10) is used to code cause of death. To determine the underlying cause of death, the sequence of events leading to the individual's death are recorded on the death certificate and run through the Automated Classification of Medical Entities (ACME) software used by the National Center for Health Statistics. This program uses a series of rules and hierarchies of events to select the most appropriate underlying cause of death.

NATIONAL CENTER FOR HEALTH STATISTICS

U.S. mortality data were obtained from the National Center for Health Statistics (NCHS). U.S. mortality data are compiled from all death certificates filed in the 50 states and the District of Columbia from 1980 through 2013. Cause of death was coded by NCHS in accordance with World Health Organization regulations that stipulate that cancer deaths be coded using the most current revision of the International Classification of Diseases. As in Delaware, deaths that occurred prior to 1999 in the U.S. are coded using ICD-9 and beginning with 1999 deaths are coded using ICD-10. These U.S. mortality data were accessed through SEER*Stat[28].

POPULATION ESTIMATES, 2009-2013

Cancer incidence and mortality rates for the U.S. are calculated using population totals estimated by the U.S. Census. Delaware rates are based on population estimates released by the Delaware Population Consortium (DPC) and the U.S. Census Bureau.

RISK FACTORS AND EARLY DETECTION

Data on known and suspected cancer risk factors, prevention options, and screening recommendations are located at the beginning of each site-specific chapter of this report. Primary resources for this information are: (1) American Cancer Society (www.cancer.org) and (2) National Cancer Institute (www.cancer.gov).

The Behavioral Risk Factor Survey (BRFS) provides estimates of the prevalence of risk factors across Delaware and nationally. The most recently available risk factor data from BRFS are from 2014. Risk factor data are included in appropriate chapters for site-specific cancers. Supplemental data on cervical cancer screening, overweight and obesity, physical inactivity, and nutrition are presented in Appendix D.

STATISTICAL METHODOLOGY AND TECHNICAL TERMS

AGE-ADJUSTMENT OF INCIDENCE AND MORTALITY RATES

The age distribution of a population is an important determinant of the burden of cancer. Because cancer incidence and mortality increase with age, crude rates cannot be used for comparisons of cancer statistics between sexes, racial or ethnic groups, or geographic entities across different time spans.

Age adjustment is useful when comparing two or more populations with different age distributions at one

[28] SEER*Stat Software, Surveillance, Epidemiology and End Results (SEER) program, National Cancer Institute. http://seer.cancer.gov/seerstat/index.html

point in time or one population at two or more points in time[29]. To calculate an age-adjusted incidence rate, the crude incidence rate for each of 18 five-year age groups is multiplied by a fixed population weight for that specific age group using the appropriate 2000 U.S. Standard Population (Table A-1)[30]. Individual age-specific rates are then summed to obtain the overall age-adjusted rate.

TABLE A-1: U.S. STANDARD YEAR 2000 POPULATION WEIGHTS, BY AGE GROUP

Age Group	Population Weight	Age Group	Population Weight
0-4	0.0691	**45-49**	0.0721
5-9	0.0725	**50-54**	0.0627
10-14	0.0730	**55-59**	0.0485
15-19	0.0722	**60-64**	0.0388
20-24	0.0665	**65-69**	0.0343
25-29	0.0645	**70-74**	0.0318
30-34	0.0710	**75-79**	0.0270
35-39	0.0808	**80-84**	0.0178
40-44	0.0819	**85+**	0.0155

Source: http://seer.cancer.gov/stdpopulations/19ages.proportions.html

The formula for an age-adjusted rate can be presented as follows:

$$\textit{Age-Adjusted Rate} = \textit{sum}\ (w_i \times ((c_i/n_i) \times 100{,}000))$$

- c_i is the number of new cases or deaths in the *i* age group
- n_i is the population estimate for the *i* age group
- w_i is the proportion of the standard population in the *i* age group

All rates were expressed per 100,000 of the population.

RACE- AND SEX-SPECIFIC INCIDENCE AND MORTALITY RATES

Race- and sex-specific incidence and mortality rates are calculated to assess how cancer patterns differed across subgroups within the state. These rates are calculated by dividing the number of cases or deaths that occurred in each race and/or sex group by the total population in the corresponding race and/or sex group over the same time period. As with other rates, these rates were adjusted to the U.S. standard population and expressed per 100,000 of the population.

CONFIDENCE INTERVALS

Age-adjusted incidence and mortality rates are subject to chance variation, particularly when they are based on a small number of cancer cases or deaths occurring over a limited time period or in a limited geographic area. Aggregating several years of data provides more reliable estimates of incidence and mortality in these situations. The level of uncertainty associated with incidence and mortality rates is estimated by the 95 percent confidence interval.

[29] Anderson RN, Rosenberg HM. Report of the second workshop on age adjustment. National Center for Health Statistics. Vital Health Stat 4(30). 1998.
[30] Klein RJ, Schoenborn CA. Age Adjustment Using the 2000 Projected U.S. Population. Healthy People statistical notes, no. 20. http://www.cdc.gov/nchs/data/statnt/statnt20.pdf

When incidence rates are based on more than 100 cases, lower and upper limits of the 95 percent confidence intervals for an age-adjusted (AA) incidence or mortality rate are calculated using SEER*Stat[31] by methodology shown here:[32]

$$\text{Lower Confidence Limit} = \text{AA Rate} - 1.96\left[\frac{\text{AA Rate}}{\sqrt{\#\text{ Cases}}}\right]$$

$$\text{Upper Confidence Limit} = \text{AA Rate} + 1.96\left[\frac{\text{AA Rate}}{\sqrt{\#\text{ Cases}}}\right]$$

where AA Rate is the age-adjusted incidence or mortality rate.

When an incidence or mortality rate is based on fewer than 100 cases or deaths, the 95 percent confidence intervals are calculated using the following formulas:

$$\text{Lower Confidence Limit (LCL)} = \text{AA Rate} \times L$$

$$\text{Upper Confidence Limit (LCL)} = \text{AA Rate} \times U$$

where L and U are values published by the National Center for Health Statistics for the specific purpose of calculating 95 percent confidence intervals for rates based on fewer than 100 cases[33].

STAGE AT DIAGNOSIS

Stage at diagnosis describes the extent to which a cancer has spread from the site of origin at the time of diagnosis. SEER summary staging is used to define the stage at diagnosis for all incident cancer cases. Cancer cases diagnosed between 1980 and 2000 are coded according to Summary Stage 1977. Cases diagnosed from 2001 through 2003 are coded according to Summary Stage 2000. Beginning in 2004, SEER Summary Stage 2000, derived using the Collaborative Staging Algorithm, is used.

Three categories define the stage at diagnosis for a particular cancer site:

1. **Local -** Tumor is invasive but confined to the organ of origin.
2. **Regional -** Tumor has extended beyond limits of the organ of origin with no evidence of distant metastasis.
3. **Distant -** Cancer cells have detached from the tumor at the primary site and are growing at a new site in the body.

DATA RELEASE STANDARDS

For this report, cancer frequencies and rates are released according to DPH Policy Memorandum 49 (Data and Data Release Standards). Incidence and mortality frequencies of fewer than six are not presented and age-adjusted incidence and mortality rates based on fewer than 25 cases or deaths are not calculated. This DPH policy helps protect patient privacy and confidentiality[34,35]. Furthermore, a cancer rate based on a very small number of cases is inherently unstable and cannot be reliably interpreted.

DEFINITION OF RACE

Incidence and mortality rates for the total population include residents of all race categories or unknown race, regardless of Hispanic ethnicity status.

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[31] Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute. SEER*Stat Software, Latest Release: Version 7.1.0 - July 17, 2012. http://seer.cancer.gov/seerstat/index.html

[32] Tiwari RC, Clegg LX, Zou Z. Efficient interval estimation for age-adjusted cancer rates. Stat Methods Med Res 2006;15(6):547-69.

[33] Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM, Sutton PD. Births: Final data for 2001. National vital statistics reports; vol. 51 no. 2. Hyattsville, Maryland: National Center for Health Statistics, 2002.

[34] Coughlin SS, Clutter GG, Hutton M. Ethics in Cancer Registries. *Journal of Cancer Registry Management, 2:* 5-10, 1999.

[35] McLaughlin CC. Confidentiality protection in publicly released central registry data. *Journal of Cancer Registry Management, 2:* 84-88, 2002.

APPENDIX B: PRIMARY CANCER SITE DEFINITIONS

TABLE B-1: PRIMARY CANCER SITE DEFINITIONS

Cancer Site Group	ICD-O-3 Site (Topography)	ICD-O-3 Histology (Morphology
Brain and Other Nervous System	C710–C719	excludes 9050-9055, 9140, 9530-9539, 9590-9992
Female Breast	C500–C509	excludes 9050–9055, 9140 and 9590–9992
Colon and Rectum	C180–C189, C260, C199, C209	excludes 9050–9055, 9140 and 9590–9992
Cervical	C530-C539	excludes 9050-9055, 9140, 9590-9992
Lung and Bronchus	C340–C349	excludes 9050–9055, 9140 and 9590–9992
Melanoma of the Skin	C440-C449	8720-8790
Oral Cavity and Pharynx	C000-C009, C019-C029, C030-C039, C040-C049, C050-C059, C060-C069, C079-C089, C090-C099, C100-C109, C110-C119, C129, C130-C139, C140, C142, C148	excludes 9050-9055, 9140, 9590-9992
Prostate	C619	excludes 9050–9055, 9140 and 9590–9992

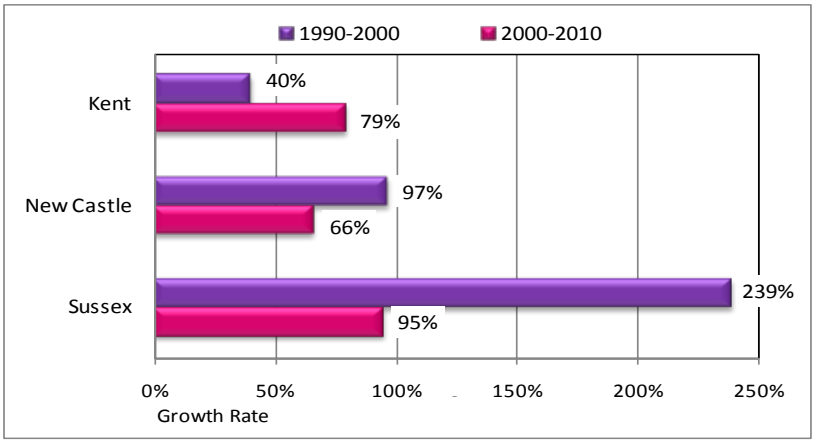
Source: Site Recode ICD-O-3/WHO 2008 Definition http://seer.cancer.gov/siterecode/icdo3_dwhoheme/index.html

APPENDIX C: CANCER INCIDENCE AND MORTALITY AMONG PERSONS OF HISPANIC ETHNICITY

The Census Bureau defines "Hispanic or Latino" as "a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race."[36] In 1990, persons of Hispanic ethnicity comprised 2.4 percent of Delaware's population. By 2000, Delaware's Hispanic population doubled to 4.8 percent. As of the 2010 U.S. Census, persons of Hispanic origin comprise 8.4 percent of Delaware's population.

The largest growth in the Hispanic population occurred in Sussex County, where the Hispanic prevalence grew from 1.3 percent in 1990 to 4.4 percent in 2000, and again to 8.6 in 2010. Historically, since 1990 when Hispanic prevalence data began to be collected, New Castle County had the largest percentage of persons of Hispanic ethnicity. The Hispanic population in New Castle County grew from 2.7 percent in 1990, to 5.3 percent in 2000, and to 8.7 percent in 2010. Among Kent County residents, the Hispanic population grew from 2.3 percent in 1990, to 3.2 percent in 2000, and to 5.8 percent in 2010.

FIGURE C-1: CHANGES IN DELAWARE'S HISPANIC POPULATION BY COUNTY AND DECADE, 1990-2000 AND 2000-2010



Source: U.S. Census Bureau 2010, American FactFinder http://factfinder2.census.gov/

Hispanic cancer rates were calculated for 2009-2013. Incidence and mortality frequencies of fewer than six cases and incidence and mortality rates based on fewer than 25 cases are not shown according to the Division of Public Health's Policy Memorandum 49. Cancer rates are heavily influenced by changes or uncertainties in the number of cancer cases and the size of the population. Specific issues that suggest that Hispanic cancer rates would be subject to misinterpretation are discussed below:

- **Uncertain estimate of Delaware's Hispanic population —** Estimates of Delaware's population are derived from the census performed every 10 years by the U.S. Census Bureau. The Delaware Population Consortium (DPC) uses census data to estimate the Delaware population between census years. In preparation for the post-2010 Census benchmarking when the race categories will shift to white non-Hispanic, black non-Hispanic, other non-Hispanic, and Hispanic, a separate projection for Hispanics is provided by the DPC. This projection is made by using the overall age structure of the total population and applying the current percentage of a given age-sex category measured in the American Community Survey for years 2009-2013 combined. A final adjustment was made based on projections from the U.S. Census Bureau as to the overall rate of growth for the Hispanic population in both the state and the nation.

[36] Grieco, EM, Cassidy RC. (2001-03). "Overview of Race and Hispanic Origin: Census 2000 Brief" U.S. Census Bureau. Accessed May 26, 2011.

- **Inaccurate recording of Hispanic ethnicity on death certificates —** Race and Hispanic origin are treated as distinct categories and reported separately on death certificates and to the Delaware Cancer Registry, in accordance with guidelines from the federal Office of Management and Budget. However, it is possible that Hispanic race is under-reported both in the cancer registry and on death certificates.
- **Hispanic Identification in the Delaware Cancer Registry data —** NAACCR convened an Expert Panel in 2001 to develop a best practices approach to Hispanic identification. In the resulting approach to enhance Hispanic identification, the NAACCR Hispanic Identification Algorithm (NHIA) was computerized and released for use by central cancer registries in 2003. In this report, NHIA is used for identifying Delawareans of Hispanic origin. To minimize misclassification, the expert panel continues to evaluate NHIA while considering the possibility of under- or over-estimation of Hispanic cancer incidence.
- **Small number of cases or deaths and small population sizes —** An incidence or mortality rate is an estimate, and the reliability of estimates can be measured by calculating a confidence interval. A narrow confidence interval suggests that the rate is a good estimate; a wide confidence interval suggests that the rate should be interpreted with caution. If the confidence intervals of two rates do not overlap, the rates are considered to be statistically different. Both the size of the numerator (the number of cases or deaths) and the size of the denominator (the population) determine the width of the confidence interval. Typically, researchers report 95 percent confidence intervals. When constructed properly, a 95 percent confidence interval includes the true cancer rate 95 percent of the time.

CANCER INCIDENCE AMONG PERSONS OF HISPANIC ETHNICITY

- During 2009-2013, 691 cases of cancer were reported among Delawareans known to be of Hispanic ethnicity: 338 were male (49 percent) and 353 were female (51 percent).
- The 2009-2013 all-site cancer incidence rate for Hispanic Delawareans was 405.8 per 100,000 and this incidence rate is statistically significantly lower than the rate for the state of Delaware (507.3 per 100,000).
- The all-site cancer incidence rate among Hispanic males in Delaware (441.1 per 100,000) is statistically significantly lower than the comparable rate for Delaware males (582.8 per 100,000). Among Hispanic females in Delaware, the all-site cancer incidence rate (381.6 per 100,000) is statistically significantly lower than the comparable rate for Delaware females (451.8 per 100,000).

TABLE C-1: CANCER CASES, POPULATION SIZE AND AGE-ADJUSTED CANCER INCIDENCE RATES; DELAWARE HISPANIC POPULATION, 2009-2013

Cancer Site and Sex	Number of Cases	Five-Year Population	Age-Adjusted Incidence Rate and 95% Confidence Interval
All-Site: Both Sexes	691	380,478	405.8 (372.2, 441.3)
All-Site: Males Only	338	196,197	441.1 (388.8, 497.7)
All-Site: Females Only	353	184,281	381.6 (338.2, 428.4)
Breast (Female)	98	184,281	105.0 (83.1, 130.4)
Colorectal: Both Sexes	42	380,478	26.0 (18.1, 35.9)
Colorectal: Males Only	26	196,197	33.0 (20.2, 50.1)
Colorectal: Females Only	16	184,281	---
Lung: Both Sexes	56	380,478	40.9 (30.2, 53.8)
Lung: Males Only	26	196,197	36.4 (22.5, 55.0)
Lung: Females Only	30	184,281	44.7 (29.4, 64.1)
Prostate (Male)	96	196,197	141.0 (111.7, 174.7)

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

* = Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population
--- = Rate not shown when fewer than 25 cases

CANCER MORTALITY AMONG PERSONS OF HISPANIC ETHNICITY

- During 2009-2013, 157 deaths from cancer occurred among Delawareans known to be of Hispanic ethnicity: 88 were male (56 percent) and 69 were female (44 percent).
- The 2009-2013 all-site cancer mortality rate for Hispanic Delawareans was 110.7 per 100,000 and this mortality rate is statistically significantly lower than the rate for the state of Delaware (176.1 per 100,000).
- The all-site mortality rate among Hispanic males in Delaware (134.4 per 100,000) is statistically significantly lower than the comparable rate for Delaware males (211.4 per 100,000). The all-site mortality rate for Hispanic females in Delaware (90.7 per 100,000) is statistically significantly lower than the comparable rate for Delaware females (151.0 per 100,000).

TABLE C-2: CANCER DEATHS, POPULATION SIZE AND AGE-ADJUSTED CANCER MORTALITY RATES; DELAWARE HISPANIC POPULATION, 2009-2013

Cancer Site and Sex	Number of Deaths	Five-Year Population	Age-Adjusted Mortality Rate and 95% Confidence Interval
All-Site: Both Sexes	157	380,478	110.7 (92.3, 131.2)
All-Site: Males Only	88	196,197	134.4 (104.4, 169.2)
All-Site: Females Only	69	184,281	90.7 (68.6, 116.7)
Breast (Female)	11	184,281	---
Colorectal: Both Sexes	16	380,478	---
Colorectal: Males Only	13	196,197	---
Colorectal: Females Only	3	184,281	---
Lung: Both Sexes	30	380,478	21.8 (14.3, 31.4)
Lung: Males Only	16	196,197	---
Lung: Females Only	14	184,281	---
Prostate (Male)	8	196,197	---

Source: Delaware Health Statistics Center, 2016
* = Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population
--- = Rate not shown when fewer than 25 deaths

APPENDIX D: **BEHAVIORAL RISK FACTORS**

The Behavioral Risk Factor Survey (BRFS) is the world's largest ongoing telephone health survey tracking health conditions and risk behaviors in the United States yearly since 1984. Currently, data are collected in all 50 states and four territories. The survey was developed to monitor the statewide prevalence of behavioral risk factors influencing premature morbidity and mortality. The BRFS includes a core set of questions developed by the Centers for Disease Control and Prevention (CDC) and is administered to adults ages 18 and older. Delaware's BRFS is a collaborative effort between the Division of Public Health (DPH) and the CDC. BRFS questions target lifestyle behaviors (including tobacco use, fruit and vegetable consumption, exercise, and weight control); cancer screening practices; health status; and health care access and use[37].

Technological and cultural changes are posing challenges to survey research. One of the most significant challenges has been the rapid increase in households where telephone service is provided primarily or only via cell phone service. These "cell phone" households are, at least currently, more common among young adults and minority populations.

Originally, the BRFS survey was administered by a random-digit-dial telephone survey. Starting with reporting 2011 data, the BRFS became a "multi-mode survey," using several modes of data collection—including landline telephone interviews, cell phone interviews, and online follow-up surveys for some respondents who did not want to respond by phone. Also, the BRFS uses a new method for weighting data, called "raking," which more accurately reflects the actual population of each state[38].

Because cell phones are quickly replacing landline phones, it was difficult to obtain a true representative sample of some population subgroups during the late 2000s. The response rate problems likely resulted in less accurate prevalence estimates for some behaviors or conditions more prevalent in populations who primarily use cell phones. For example, the prevalence of cigarette smoking, known to be more prevalent among young adults, may have been under-estimated for several years.

The data below relate to cancer screening and risk factor prevalence among Delawareans for 2014. Data on breast, colorectal, and prostate cancer screening patterns among Delawareans are provided in relevant cancer site chapters earlier in this document. Cervical cancer screening data are provided below[39].

CERVICAL CANCER SCREENING

The BRFS has collected data on cervical cancer screening in Delaware annually from 1995 to 2000, and biennially since then. As mentioned above, the BRFS 2014 prevalence data are not directly comparable to years of data prior to 2011 because of changes in weighting methodology and the addition of the cell phone sampling frame.

- In 2014, Delaware females age 18 and older (80 percent) were second only to Tennessee females (80 percent) for the highest prevalence nationally of having had a Pap test within the previous three years. This difference was not statistically significant. In the U.S., the national median was 75 percent of U.S. females age 18 and older reported having had a Pap test within the previous three years.
- In Delaware, Caucasian females were more likely to have had a Pap test within the previous three years (81 percent) than African American females (78 percent). However, this difference in prevalence rates did not meet the threshold of statistical significance.
- In 2014, fewer Delaware females ages 18-24 reported having had a Pap test in the last three years (64

[37] Behavioral Risk Factor Surveillance System http://www.cdc.gov/BRFS/
[38] Behavioral Risk Factor Surveillance System (BRFS) Fact Sheet: Raking– Changing Weighting Methodology http://www.dhss.delaware.gov/dph/dpc/files/rakingweights_info.pdf
[39] Delaware Behavioral Risk Factor Survey – Measuring Behaviors that Affect Health. http://www.dhss.delaware.gov/dph/dpc/brfsurveys.html

percent) than females in all other age groups, with the exception of females age 65 and older. Delaware females ages 35-44 and ages 45-54 had the highest cervical cancer screening prevalence of all age groups (both at 92 percent); this prevalence was statistically significantly higher than ages 18-24 and age 65 and older.

- In Delaware, the prevalence of having had a Pap test within the previous three years was statistically significantly lower among females in the $15,000 - $24,999 income bracket (70 percent), compared to those in all other higher income brackets.
- In Delaware, there was a direct relationship between the level of education and the prevalence of having had a Pap test within the previous three years. Only 73 percent of females with less than a high school education had a Pap test, compared to 87 percent of females who completed college (a statistically significant difference).

OVERWEIGHT/OBESITY

Being overweight or obese is a risk factor for numerous cancers, including female breast, colorectal, kidney, and uterine cancers. In addition, being overweight or obese is a major risk factor for other chronic diseases, including coronary heart disease, type 2 diabetes, and stroke.

The CDC defines overweight as a body mass index (BMI) from 25 to less than 30; and obese as a BMI equal to or greater than 30. BMI is calculated using an individual's height and weight[40]. The following data are specific to the 2014 Delaware BRFS:

- In Delaware, 68 percent of adults ages 18 and over were overweight or obese in 2014, compared to the national median of 65 percent.
- In 2014, the prevalence of overweight in Delaware differed significantly by sex: 42 percent of males and 31 percent of females were overweight.
- The prevalence of obesity among adult Delawareans did not differ by sex: 29 percent of males and 32 percent of females were obese in 2014.
- The prevalence of overweight did not differ significantly between Caucasian (38 percent) and African American (32 percent) Delawareans.
- In Delaware, significantly more African Americans (38 percent) than Caucasians (30 percent) were obese. African Americans females were more likely to be obese (41 percent), compared to 35 percent of African American males.
- The prevalence of being overweight was highest among Delaware college graduates (38 percent) but did not differ significantly from those with any other educational attainment level.
- The prevalence of obesity was statistically significantly higher among Delaware adults with some education after high school (33 percent) than among college graduates (25 percent).
- The prevalence of obesity was lowest among Delaware adults with an income level of more than $75,000 (25 percent) but only barely statistically significantly lower than the obesity prevalence rate among those earning $35,000-$49,000 (36 percent). No other significant differences were observed.
- Among Delawareans, the prevalence of obesity was highest among those ages 45-54 (37 percent) and was significantly different compared to those who were under the age of 25 (17 percent).
- Delawareans ages 55-64 had the highest prevalence of overweight (40 percent) but did not significantly differ from any other age group.

[40] About BMI for Adults http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

PHYSICAL ACTIVITY

Lack of physical activity is a substantiated risk factor for colorectal cancer and a suspected risk factor for other cancers (e.g., prostate cancer). The benefits of regular, sustained physical activity also include reduction in risk for other chronic diseases, including coronary heart disease, stroke, type 2 diabetes, and improved overall well-being.

Respondents in the 2015 Delaware BRFS survey answer a series of questions to determine what percentage of respondents met aerobic guidelines, strengthening guidelines, both, or neither[41].

- In Delaware, 42 percent of adults ages 18 and older did not meet either aerobic or strengthening guidelines, similar to the national median of 39 percent.
- In Delaware, the prevalence of adults who reported they did not meet aerobic or strengthening guidelines was statistically significantly higher among females (45 percent) than males (38 percent).
- African American Delawareans (44 percent) were less likely to meet aerobic or strengthening guidelines than Caucasians (40 percent). This difference was not statistically significant.
- Delawareans ages 55-64 (43 percent) were less likely to meet either aerobic or strengthening guidelines. However, this was not statistically significant compared to any other age group.
- Delawareans in lower income categories reported statistically significantly lower prevalence of physical activity which meets guidelines (56 percent of those earning less than $15,000 did not meet the guidelines; 49 percent of those earning $15,000-$24,999 did not meet the guidelines). This compares to Delawareans in the highest income category, where 36 percent of those earning $50,000 or more per year did not meet the guidelines.
- Delawareans in lower education levels reported statistically significantly lower prevalence of meeting the physical activity guidelines. In Delaware, 62 percent of adults with less than a high school diploma and 47 percent of adults with a high school education or GED did not meet the physical activity guidelines compared to 38 percent of adults with some post high school education or 30 percent of adults who were college graduates.

DIETARY FRUITS AND VEGETABLES

A diet high in fruits and vegetables is a protective factor against numerous cancers, including cancers of the breast, cervix, colon/rectum, uterus, esophagus, oral cavity, ovary, pancreas, prostate, and stomach.

The following data are from the 2015 Delaware BRFS:

- In Delaware, 15 percent of adults consumed five or more servings of fruits and/or vegetables a day, compared to the national median of 16 percent of adults.
- Significantly fewer Delaware males (10 percent) consumed five or more servings of fruits and vegetables daily than females (15 percent).
- In Delaware, 13 percent of Caucasians, 14 percent of African Americans, and 12 percent of Hispanics consumed five or more servings of fruits and vegetables daily. This difference was not statistically significant.

[41]U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans. Hyattsville, MD: U.S. Department of Health and Human Services;2008. https://health.gov/paguidelines/

APPENDIX E: TITLE 16, CHAPTER 20 OF THE DELAWARE CODE (76 DEL. LAWS., C 292 §1)

CHAPTER 292 FORMERLY
SENATE BILL NO. 235
AS AMENDED BY
SENATE AMENDMENT NO. 2
AND
HOUSE AMENDMENT NO. 1

AN ACT TO AMEND TITLE 16 OF THE DELAWARE CODE RELATING TO UNIFORM HEALTH DATA REPORTING.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF DELAWARE:

WHEREAS, the State of Delaware traditionally has one of the highest rates of cancer incidence and mortality in the United States;

WHEREAS, identification of clusters of certain types of cancers in specific locations can help public health agencies develop intervention strategies leading to early detection when cancer is more easily cured;

WHEREAS, providing such data to medical researchers outside state government may assist in the process of both identifying cancer clusters and developing intervention strategies;

WHEREAS, the public good is served by allowing citizens to know of potential hazards in their communities so they can take actions to preserve their health;

WHEREAS, it is equally important to preserve the privacy and dignity of people afflicted with cancer, and

WHEREAS, the Department of Health and Social Services, Division of Public Health has opted to err on the side of cancer patient privacy by withholding even generic data on cancer clusters from other researchers and the public;

NOW THEREFORE:

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF DELAWARE:

Section 1. Amend Chapter 20, Title 16 of the Delaware Code by renumbering §2005 through 2008 as §2006 through 2009, respectively.

Section 2. Amend Chapter 20, Title 16 of the Delaware Code by inserting a new §2005 to read as follows:

"§2005(a). Cancer incidence data.

Notwithstanding any provisions in this Title to the contrary, the agency shall make available as public records cancer incidence by census tract and by type of cancer. Such released data shall be assigned consensus tract geography from the most recent decennial census. If release of such information by census tract will explicitly or implicitly identify any individual, the agency may combine data among contiguous census tracts, but only insofar as is necessary to protect patient confidentiality.

(b) The agency shall create a detailed map of each county in Delaware that graphically illustrates the overall incidence of cancer in each census tract. The census tracts will be identified on the maps and shall be color-coded to designate the degree of cancer incidence in each tract. These maps shall be created within 90 days of the agency receiving the cancer incidence data.

(c) The agency shall post the maps created under the subsection above on their website in a format that can be easily accessed and read by the public."

Section 3. Amend §1232(d) Title 16 of the Delaware Code by deleting the word "or" at the end of paragraph (6) and by inserting the word "or" at the end of paragraph 7 and by adding a new paragraph "(8)" to read as follows:

"(8) Pursuant to Title 16 §2005."

Section 4. Amend Subchapter III of Chapter 12 of Title 16 of the Delaware Code by inserting a new section §1233 to read as follows:

"§1233. Regulations.

The Department of Health and Social Services shall enforce this subchapter and shall from time to time promulgate any additional forms and regulations that are necessary for this purpose."

Approved July 3, 2008

APPENDIX F: CANCER INCIDENCE BY CENSUS TRACT

GEOCODING VALIDATION PROCESS

Accurate census tract assignment is necessary for valid rate calculation at the census tract level. The accuracy of census tract assignment is entirely dependent on the accuracy and quality of patient address data. To assure accuracy and quality, cancer cases submitted to the Delaware Cancer Registry (DCR) undergo quality assurance review of the data fields for each patient's address. The case-level quality review of street address data includes correction of misspellings, incomplete addresses, and address formats. Accurint®, a Lexis Nexis® service, is used to assign a valid physical street address to P.O. Box addresses where possible. DCR staff also use Accurint® to assign a valid physical street address to rural addresses where possible.

Geocoding software is then used to assign cases to a census tract based on the patient's address at time of diagnosis. Some cases may not be coded to the street address level in this step, due to recently created streets that are not yet embedded within the geocoding software. For these cases, further manual review and census tract assignment is conducted using the American Factfinder® and Google Maps® online databases.

PRELIMINARY ANALYSES

Cancer case files created for DPH by the DCR include all eligible[42] cancer cases diagnosed among Delawareans from January 1, 2009 through December 31, 2013. Within this time period, 100 percent of the cases were successfully geocoded (all but one case); i.e. the residential census tract of the individual was identified. The table below shows the percentage level of certainty of the census tract assignments. The level of certainty shown in the table below indicates the basis of the assignment of census tract for each individual. More that 99 percent of cases were assigned a census tract based on a complete and valid address of residence.

TABLE F-1: CENSUS TRACT CERTAINTY FOR DELAWARE CANCER INCIDENCE DATA, 2009-2013

Census Tract Based on Level of Certainty	2009-2013
Complete & valid street address of residence	26,995 (99.3)
Residence ZIP + 4	5 (0.02)
Residence ZIP + 2	59 (0.22)
Residence ZIP code only	89 (0.33)
ZIP code of P.O. Box	45 (0.17)
Address missing	1 (0.00)
Total Number of Cases	**27,194**

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

FIVE-YEAR POPULATION ESTIMATES BY CENSUS TRACT

As of the 2000 U.S. Census, Delaware was comprised of 197 census tracts. Census tract analyses through 2003-2007 used the 2000 Census tract designations. As of the 2010 Census, however, Delaware was realigned into 214 census tracts. These new census tract subdivisions became available beginning with the 2004-2008 analyses. Approximately half of the 2010 Census tracts remained the same as in the 2000 Census and the rest have either combined with others or split into two or more new census tracts.

Note that census tracts do not follow a consecutive numbering scheme. New Castle County contains 129 census tracts numbered 2.00 through 169.04. Kent County is comprised of 32 tracts numbered 401.00 through 434.00. Sussex County includes 53 tracts numbered 501.01 through 519.00.

[42] Excludes benign tumors, non-urinary bladder in situ tumors, and basal and squamous cell cancers per reporting guidelines mandated by the Surveillance, Epidemiology, and End Results Program of the National Cancer Institute.

Census tract populations for 2009-2013 were calculated using estimates from the Delaware Population Consortium (2009 and 2010), the U.S. Census Bureau (2011-2013) and both the 2000 Census and the 2010 Census. Population data specific for each five-year age category and census tract from both the 2000 Census and the 2010 Census were used to calculate the proportion that each of the 18 age groups contributed to the overall census tract population. For intervening years, age-specific population estimates were obtained by extrapolating between the 2000 and 2010 Census population data.

For each census tract, denominators for each year within the five-year study period were summed to obtain the total population for the five-year study period. Five-year population estimates for the 2009-2013 study period range from 3,255 for census tract 512.05 in Sussex County to 63,939 for census tract 402.02 in Kent County.

AGE-ADJUSTED AND CRUDE INCIDENCE RATES, BY CENSUS TRACT

For each census tract, cross-tabulations (age group x census tract) were created to determine the number of cancer cases diagnosed by census tract and age group. These frequencies were used to calculate crude incidence rates at the census tract level.

Crude incidence rates represent the total number of new cancer diagnoses divided by the total population at risk, without consideration of any age-related characteristics of the population. To calculate a crude incidence rate by census tract, the number of cancer cases diagnosed in each age group is divided by the population size for that specific age group. These values were then multiplied by 100,000 (Equation F-1).

EQUATION F-1: 2008-2012 CRUDE ALL-SITE CANCER INCIDENCE RATE, 45-49 YEAR OLDS, DELAWARE CENSUS TRACT 999.99

$$\frac{(\text{No. cancer cases (2006 - 2010) among 45 – 49 year olds in CT999.99})}{(\text{2006 – 2010 population, 45 – 49 year olds in CT999.99})} = \frac{(5)}{(929)} \times 100{,}000 = 538.2 \text{ per } 100{,}000$$

Age-adjusted incidence rates were then calculated to take into account the different age distributions for the populations at risk. To calculate age-adjusted incidence rates, crude incidence rates for each age group were multiplied by the appropriate 2000 U.S. Standard Population weight for that age group (Appendix A). Age-adjusted incidence rates for each of the 18 age groups were then summed to yield the age-adjusted incidence rate for an entire census tract.

95 PERCENT CONFIDENCE INTERVALS

Confidence intervals represent the range of values in which the cancer rate could reasonably fall. Our best estimate of the cancer rate in a particular census tract is the incidence rate itself. However, the rate could reasonably lie anywhere between the lower confidence limit (LCL) and the upper confidence limit (UCL). Because of this, a confidence interval is sometimes called the “margin of error.”

When incidence rates are based on more than 100 cases, 95 percent confidence intervals are calculated using equation F-2.

EQUATION F-2: CONFIDENCE LIMIT EQUATIONS FOR 100 OR MORE CASES

$$\text{Lower Confidence Limit} = \text{AA Rate} - 1.96\left[\frac{\text{AA Rate}}{\sqrt{\#\text{ Cases}}}\right]$$

$$\text{Upper Confidence Limit} = \text{AA Rate} + 1.96\left[\frac{\text{AA Rate}}{\sqrt{\#\text{ Cases}}}\right]$$

where AA Rate is the age-adjusted incidence rate for a particular census tract.

When incidence rates are based on fewer than 100 cases, 95 percent confidence intervals are calculated using equation F-3.

EQUATION F-3: CONFIDENCE LIMIT EQUATIONS FOR FEWER THAN 100 CASES

Lower Confidence Limit (LCL) = AA Rate x L

Upper Confidence Limit (LCL) = AA Rate x U

Where:

- AA Rate is the age-adjusted incidence rate for a particular census tract, and
- L and U are values published by the National Center for Health Statistics for the specific purpose of calculating 95 percent confidence intervals for rates based on fewer than 100 cases[43].

COMPARING CENSUS TRACT RATES TO THE STATE RATE

The level of uncertainty associated with an incidence rate is reflected in the width of its confidence interval. Very wide confidence intervals mean that the incidence rate is estimated with a small degree of certainty. Smaller intervals indicate an incidence rate estimate with a greater level of certainty.

The width of a confidence interval is influenced by two factors: (a) the number of cancer cases in the population and (b) the size of the population under consideration. When a cancer rate is calculated for a small population in which only a handful of cases were diagnosed, we would expect the confidence interval for the rate to be very wide. On the other hand, when a cancer rate is calculated for a large population in which many cases were diagnosed, we expect the confidence interval for the rate to be narrower.

The width of a confidence interval is important because it is used to determine if the amount by which two incidence rates differ is statistically significant. If the confidence interval for an incidence rate in one area overlaps with the confidence interval for a rate in another area, the rates are said to be "not statistically significantly different from one another." Even though the two rates may look very different, if the cancer rate for one area is NOT statistically significantly different from the cancer rate for another area, researchers cannot say that one rate is truly different from the other rate.

On the other hand, if the confidence interval for the incidence rate in one area does NOT overlap with the confidence interval for an incidence rate in another area, the two rates are statistically significantly different. When the rate for one area is significantly different from the rate for another area, the difference between the rates is greater than would be expected by chance alone.

For each census tract, the all-site cancer incidence rate is compared to the all-site cancer incidence rate for the state of Delaware. This allows DPH to identify any census tracts that have a cancer incidence rate that is statistically significantly higher or lower than the incidence rate for Delaware. If the confidence interval for an incidence rate overlaps with the confidence interval for the state incidence rate, the census tract rate is not statistically significantly different from the state rate. If the confidence interval for a census tract rate does not overlap with the confidence interval for the state rate, the census tract rate is said to be statistically significantly different from the state rate. Census tracts with statistically significantly higher or lower cancer rates compared to the state are denoted in the rate table in Appendix H and in all color-coded maps in Appendices I and J.

[43] Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM, Sutton PD. Births: Final data for 2001. National vital statistics reports; vol 51 no. 2. Hyattsville, Maryland: National Center for Health Statistics. 2002.

SUPPLEMENTAL INFORMATION

For 2009-2013, there were two census tracts with less than 25 cancer cases: census tracts 145.01 and 411.00 (denoted by the symbol "*" in Appendix H). When incidence rates are computed for an entire geographic area based on a very small number of cases, rates are estimated with a larger degree of uncertainty. This uncertainty is represented by a wide confidence interval which is more likely to overlap with the confidence intervals of incidence rates from other areas. This means that it is more difficult to establish a significant difference between incidence rates. For this reason, rates based on fewer than 25 cases are denoted in both the rate table and color-coded maps since they should be interpreted with caution.

APPENDIX G: **CANCER INCIDENCE RATES BY CENSUS TRACT – INTERPRETATION**

In brief:

- A cancer rate in a census tract will change year to year because of the relatively small population in each of the census tracts. For this reason, the incidence rates are uncertain, subject to wide variation, and difficult to interpret.
- To help understand how much confidence we should have in a cancer rate for a census tract, we calculated a confidence interval. A confidence interval represents the range of values in which the cancer incidence rate could reasonably fall. It is sometimes referred to as the "margin of error."
- If the confidence interval of a cancer incidence rate in a census tract does not overlap with the confidence interval for the state, we say that there is enough confidence to call the incidence rate in the census tract "significantly different" from the state rate.
- Appendix H shows the confidence intervals for the cancer rates in each census tract and for the state. These data will help you determine if the incidence rate in a particular census tract is significantly different from the state rate.

Analysis of disease rates for small areas, such as census tracts, is difficult to interpret and can be misleading if not considered carefully. The following information is presented to help interpret the information on "Cancer Rates by Census Tract."

To understand cancer in Delaware, researchers need to track the number of all newly diagnosed cancer cases each year. Researchers use different types of information to calculate cancer rates. This information includes estimates of the number of people living in Delaware and data on the cancer cases diagnosed in our state.

Even though researchers calculate cancer rates using the best possible information, cancer rates still have some amount of uncertainty. The rate of any disease in a population provides a snapshot of the impact of that disease for a specific time period. Because Delaware is a small state, researchers must interpret this snapshot carefully.

In a small group, such as a census tract, the snapshot changes much from year to year. If one case of cancer is diagnosed in a census tract one year, and three cases of cancer are diagnosed in the same census tract the next year, the cancer rate for that census tract will change dramatically from one year to the next. These big fluctuations do not typically occur in larger populations. If we compare the cancer rate for a census tract to the cancer rate for the whole state of Delaware for a given time period, it would not be unusual to find the comparison different (perhaps even reversed) the following year. In Delaware, we publish five-year cancer incidence rates to allow for better understanding cancer patterns among small populations. Cancer rates for five-year time periods are less vulnerable to the yearly fluctuations of cancer cases diagnosed in small populations.

We can tell how much uncertainty there is in a cancer rate by looking at its confidence interval. A confidence interval is a range of values that shows where the cancer rate could reasonably be. This means that the cancer rate could be anywhere between the lower confidence limit and the upper confidence limit.

If the difference between the upper confidence limit and the lower confidence limit is wide, there is greater uncertainty in the reliability of the cancer incidence rate. If the difference between the upper confidence limit and the lower confidence limit is very narrow, there is much less uncertainty in the cancer rate.

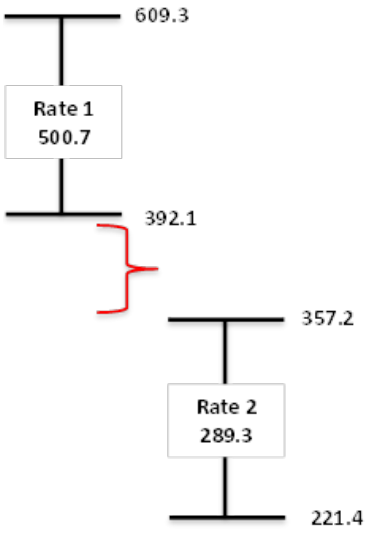
The width of a confidence interval depends on two things: (a) the number of people living in that area and (b) the number of cancer cases diagnosed in that area.

When a cancer rate is calculated for a small area (like a census tract or a neighborhood block), usually a small number of people live in that area. A much smaller number of people in that area will have been diagnosed with cancer. When a cancer rate is calculated for a small area, the cancer rate has a lot of uncertainty because researchers do not have very much information. Cancer rates based on small numbers of cases or deaths will typically have very wide confidence intervals.

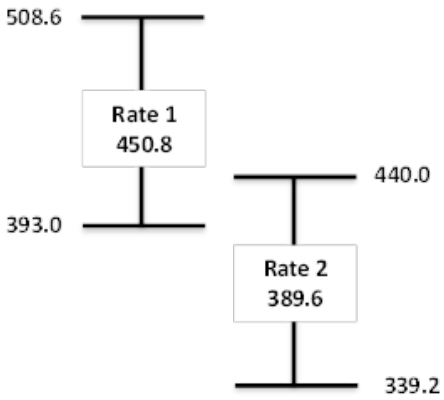
On the other hand, when a cancer rate is calculated for a large area (like a state or a country) with a large population, the odds are that more people will have been diagnosed with cancer compared to a smaller area. When a cancer rate is calculated based on a large number of cases or deaths, researchers are more certain of the level of cancer in that area. This means that cancer rates for large areas will usually have narrow confidence intervals.

Confidence intervals are important for another reason, too. They help researchers determine if differences in cancer rates for two different areas are statistically significant. If the confidence interval for the incidence rate in one area does NOT overlap with the confidence interval for an incidence rate in another area, the two rates are significantly different. The figure below shows what non-overlapping confidence intervals look like.

If "Rate 1" is statistically significantly higher than "Rate 2," the lower confidence limit for "Rate 1" is greater than the upper confidence limit for "Rate 2." When one rate is significantly different from another rate, the difference between the two rates is larger than we would expect by chance alone.



If the confidence interval for the incidence rate in one area overlaps with the confidence interval for an incidence rate in another area, the two rates are NOT significantly different. The figure below shows how the confidence intervals look when the cancer rates for two areas are NOT significantly different from one another.



If “Rate 1” is NOT significantly greater than “Rate 2”, the lower confidence limit for “Rate 1” is less than the upper confidence limit for “Rate 2.” Even though the numbers may look very different, if the cancer rate for one area is not significantly different from the cancer rate for another area, researchers cannot say that one rate is truly different from the other rate.

DPH compared cancer incidence rates for each census tract to the cancer rate for the state of Delaware. This means that we were able to tell if any census tracts had a statistically significantly higher-than-expected or lower-than-expected overall cancer rate compared to the whole state.

When interpreting the cancer rates for any census tract, review the maps, plus the table in Appendix H that lists the actual rate and the confidence intervals for both the state and for each census tract. When viewing the cancer rate in a census tract, it is important to look at the confidence interval. If a cancer rate has a relatively wide confidence interval, the cancer rate has a lot of uncertainty. When cancer rates have a lot of uncertainty, conclusions should be drawn cautiously. Even our best guess may overestimate or underestimate the actual rate of cancer in a census tract.

APPENDIX H: AGE-ADJUSTED 2009-2013 ALL-SITE CANCER INCIDENCE RATES BY CENSUS TRACT, DELAWARE

TABLE H-1: AGE-ADJUSTED 2009-2013 ALL-SITE CANCER INCIDENCE RATES BY CENSUS TRACT; DELAWARE, 2009-2013

Blue = Incidence rate is statistically significantly lower than the state rate.
Yellow = Incidence rate is statistically significantly higher than the state rate.

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
2.00	435.0 (363.2 , 506.8)
3.00	518.2 (413.4 , 641.6)
4.00	553.9 (445.8 , 661.9)
5.00	481.8 (382.6 , 598.8)
6.01	647.8 (510.4 , 810.8)
6.02	543.5 (432.3 , 674.6)
9.00	565.2 (419.5 , 745.1)
11.00	403.3 (332.1 , 474.6)
12.00	587.9 (430.4 , 784.2)
13.00	455.2 (375.1 , 535.3)
14.00	442.5 (336.0 , 572.1)
15.00	383.3 (294.6 , 490.4)
16.00	444.6 (326.7 , 591.2)
19.02	731.9 (525.2 , 992.9)
21.00	458.1 (334.2 , 613.0)
22.00	582.9 (448.0 , 745.8)
23.00	671.3 (525.2 , 845.3)
24.00	522.3 (428.5 , 616.2)
25.00	517.6 (409.8 , 645.1)
26.00	599.4 (482.6 , 736.0)
27.00	611.7 (432.9 , 839.7)
28.00	512.0 (358.6 , 708.8)
29.00	693.4 (562.6 , 824.2)
30.02	607.3 (420.5 , 848.6)
101.01	530.2 (431.5 , 628.8)
101.04	526.8 (419.0 , 653.9)
102.00	552.2 (425.3 , 705.2)
103.00	543.1 (434.4 , 670.7)
104.00	573.5 (482.9 , 664.1)
105.02	483.8 (409.6 , 558.1)
107.02	429.6 (348.2 , 511.0)
108.00	423.2 (356.6 , 489.8)

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
109.00	543.5 (445.0 , 641.9)
110.00	485.1 (393.1 , 577.0)
111.00	444.2 (359.8 , 542.4)
112.01	576.4 (445.8 , 733.3)
112.02	512.0 (427.5 , 596.6)
112.03	441.4 (362.4 , 520.4)
112.04	444.4 (362.5 , 526.4)
112.05	422.7 (321.0 , 546.4)
112.06	445.5 (372.0 , 519.0)
113.00	460.8 (368.1 , 569.8)
114.00	448.5 (369.9 , 527.1)
115.00	498.1 (404.8 , 606.4)
116.00	353.3 (281.0 , 438.5)
117.00	428.9 (362.9 , 495.0)
118.00	445.4 (375.3 , 515.5)
119.00	527.2 (434.8 , 619.7)
120.00	507.3 (425.8 , 588.7)
121.00	474.9 (380.4 , 585.8)
122.00	549.5 (448.2 , 650.9)
123.00	560.2 (442.8 , 699.1)
124.00	553.6 (456.1 , 651.0)
125.00	581.8 (493.0 , 670.5)
126.00	474.2 (375.5 , 591.0)
127.00	534.5 (452.0 , 617.1)
129.00	539.7 (444.3 , 635.1)
130.00	536.0 (411.0 , 687.2)
131.00	493.0 (379.7 , 629.6)
132.00	428.6 (329.4 , 548.4)
133.00	483.3 (374.6 , 613.8)
134.00	571.3 (466.9 , 675.7)
135.01	442.6 (389.5 , 495.6)
135.03	476.6 (411.8 , 541.3)

* Age-adjusted incidence rate is based on fewer than 25 cases
Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population
SourceE: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

TABLE H-2: AGE-ADJUSTED 2009-2013 ALL-SITE CANCER INCIDENCE RATES BY CENSUS TRACT; DELAWARE, 2009-2013 (CONTINUED)

Blue = Incidence rate is statistically significantly lower than the state rate.
Yellow = Incidence rate is statistically significantly higher than the state rate.

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
135.05	505.6 (411.0 , 615.6)
135.06	524.1 (438.2 , 610.0)
136.04	539.0 (449.4 , 628.6)
136.07	373.7 (311.8 , 435.5)
136.08	536.2 (409.2 , 690.2)
136.10	446.6 (373.9 , 519.3)
136.11	419.1 (347.0 , 491.1)
136.12	378.3 (318.0 , 438.7)
136.13	520.5 (438.6 , 602.5)
136.14	647.3 (516.3 , 801.4)
136.15	593.2 (505.3 , 681.1)
137.00	528.2 (424.2 , 650.0)
138.00	522.3 (438.7 , 605.9)
139.01	487.7 (384.2 , 610.4)
139.03	667.1 (537.6 , 796.5)
139.04	615.0 (520.0 , 710.1)
140.00	489.7 (400.9 , 578.4)
141.00	671.6 (560.4 , 782.9)
142.00	587.0 (447.9 , 755.5)
143.00	413.6 (345.1 , 482.2)
144.02	428.5 (332.1 , 544.1)
144.03	347.7 (267.2 , 444.8)
144.04	442.5 (356.6 , 528.4)
145.01*	302.1 (181.9 , 471.7)
145.02	581.0 (386.1 , 839.8)
147.02	573.1 (441.4 , 731.8)
147.03	506.0 (425.0 , 587.0)
147.05	542.8 (457.9 , 627.7)
147.06	603.3 (458.1 , 780.0)
148.03	527.6 (436.2 , 619.0)
148.05	535.5 (464.2 , 606.7)
148.07	577.7 (487.4 , 668.1)

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
148.08	621.0 (519.6 , 722.4)
148.09	620.2 (535.1 , 705.3)
148.10	605.5 (517.8 , 693.2)
149.03	752.0 (620.2 , 883.9)
149.04	584.1 (485.2 , 683.0)
149.06	505.7 (399.1 , 632.1)
149.07	568.3 (467.4 , 669.1)
149.08	498.9 (367.8 , 661.4)
149.09	486.5 (391.1 , 581.8)
150.00	520.6 (439.7 , 601.6)
151.00	594.7 (494.4 , 695.0)
152.00	472.4 (394.4 , 550.4)
154.00	540.0 (436.4 , 660.8)
155.02	581.1 (466.6 , 715.1)
156.00	553.6 (432.3 , 698.2)
158.02	637.0 (485.0 , 821.7)
159.00	653.5 (539.4 , 767.6)
160.00	619.7 (497.0 , 763.4)
161.00	509.0 (405.4 , 630.9)
162.00	598.3 (480.5 , 736.2)
163.01	601.9 (511.7 , 692.1)
163.02	590.2 (503.2 , 677.1)
163.05	551.4 (470.2 , 632.7)
164.01	630.0 (525.6 , 734.3)
164.04	571.2 (460.3 , 682.0)
166.01	585.8 (522.2 , 649.3)
166.02	566.5 (480.3 , 652.7)
166.04	596.6 (521.0 , 672.3)
166.08	696.5 (575.8 , 817.1)
168.01	527.3 (435.6 , 619.0)
168.04	548.6 (463.6 , 633.6)
169.01	629.3 (499.7 , 782.1)

* Age-adjusted incidence rate is based on fewer than 25 cases
Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population
Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

TABLE H-3: AGE-ADJUSTED 2009-2013 ALL-SITE CANCER INCIDENCE RATES BY CENSUS TRACT; DELAWARE, 2009-2013 (CONTINUED)

Blue = Incidence rate is statistically significantly lower than the state rate.

Yellow = Incidence rate is statistically significantly higher than the state rate.

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
169.04	544.9 (435.8 , 672.9)
401.00	704.3 (616.4 , 792.1)
402.01	573.2 (473.1 , 673.3)
402.02	486.9 (437.1 , 536.7)
402.03	671.1 (566.1 , 776.1)
405.01	478.8 (398.0 , 559.6)
405.02	462.9 (370.7 , 570.9)
407.00	526.4 (446.3 , 606.5)
409.00	665.6 (537.7 , 793.5)
410.00	456.5 (380.1 , 532.9)
411.00*	908.9 (392.4 , 1791.0)
412.00	537.9 (444.0 , 631.8)
413.00	539.8 (401.9 , 709.7)
414.00	543.8 (441.0 , 663.4)
415.00	559.0 (463.2 , 654.7)
416.00	553.9 (447.0 , 678.5)
417.01	649.8 (566.7 , 732.9)
417.02	658.2 (553.9 , 762.5)
418.01	614.0 (546.7 , 681.2)
418.02	500.1 (408.7 , 591.5)
419.00	580.5 (495.9 , 665.1)
420.00	550.5 (443.1 , 657.8)
421.00	564.3 (467.0 , 661.7)
422.01	496.3 (430.5 , 562.0)
422.02	578.7 (511.1 , 646.2)
425.00	494.4 (401.8 , 601.9)
428.00	621.0 (544.8 , 697.2)
429.00	550.1 (464.6 , 635.6)
430.00	638.8 (546.8 , 730.9)
431.00	534.5 (420.4 , 670.0)
432.02	703.1 (590.9 , 815.2)
433.00	474.4 (388.8 , 560.0)
434.00	518.7 (438.3 , 599.1)
501.01	556.0 (463.5 , 648.4)
501.03	616.5 (530.0 , 703.0)
501.04	501.4 (413.9 , 589.0)
501.05	559.6 (471.8 , 647.4)
502.00	505.8 (402.8 , 627.0)
503.01	585.3 (515.3 , 655.2)
503.02	595.3 (499.1 , 691.5)
504.01	551.7 (454.2 , 649.2)
504.03	502.3 (398.9 , 624.4)
504.05	642.2 (541.4 , 743.0)
504.06	376.5 (308.2 , 444.7)
504.07	557.0 (471.7 , 642.2)
504.08	596.3 (506.9 , 685.6)
505.01	565.0 (466.8 , 663.3)
505.03	543.9 (439.4 , 648.5)
505.04	459.7 (384.9 , 534.5)
506.01	521.2 (438.9 , 603.5)
506.02	520.9 (448.5 , 593.2)
507.01	475.0 (397.1 , 552.8)
507.03	466.0 (374.2 , 573.4)
507.04	656.9 (571.1 , 742.7)
507.05	511.5 (448.3 , 574.7)
507.06	392.2 (313.3 , 485.0)
508.01	601.6 (494.4 , 708.8)
508.02	624.6 (534.1 , 715.1)
508.03	573.3 (512.3 , 634.2)
509.01	557.4 (449.9 , 682.8)
509.02	574.6 (507.6 , 641.5)
510.03	498.5 (428.2 , 568.9)

* Age-adjusted incidence rate is based on fewer than 25 cases

Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

TABLE H-4: AGE-ADJUSTED 2009-2013 ALL-SITE CANCER INCIDENCE RATES BY CENSUS TRACT; DELAWARE, 2009-2013 (CONTINUED)

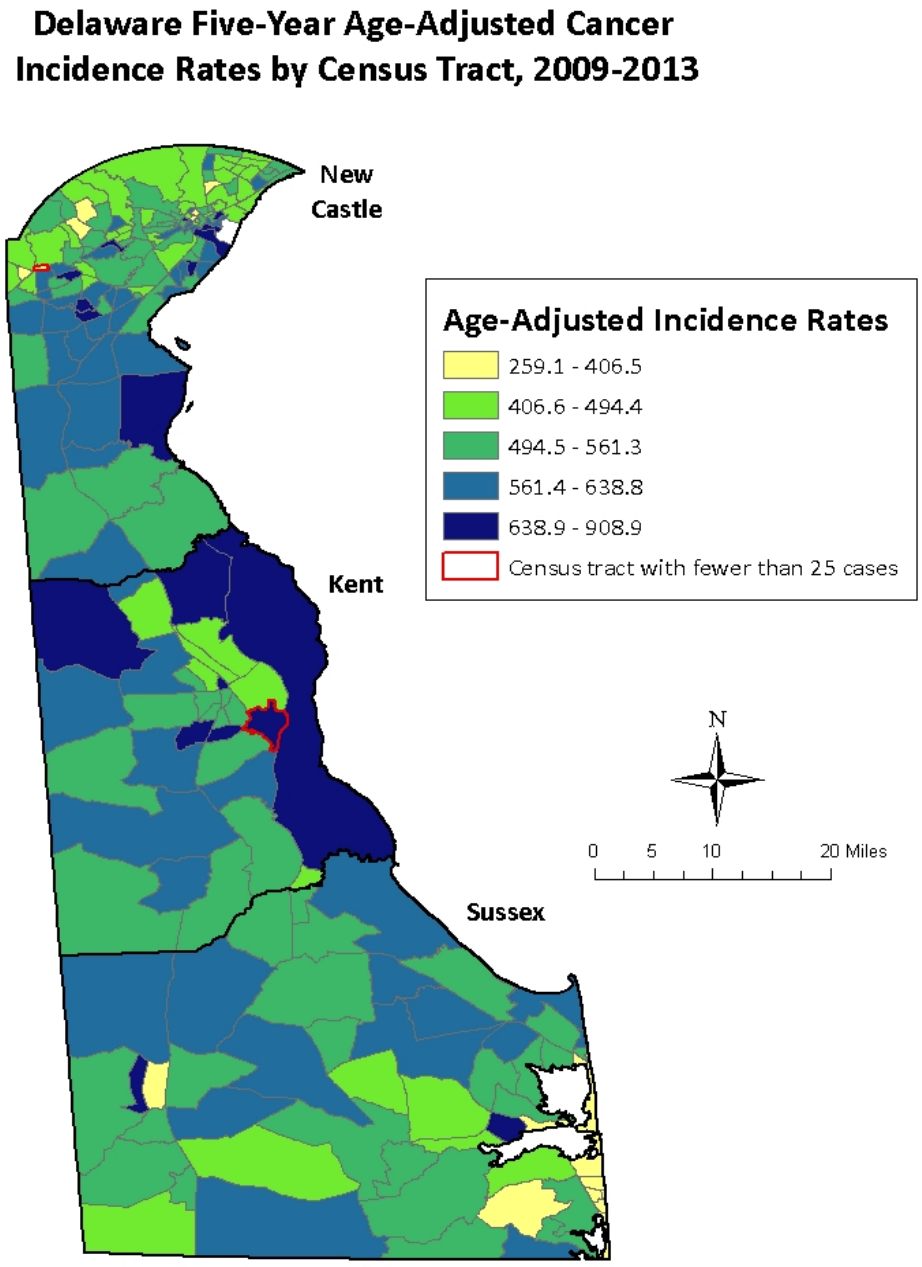
Blue = Incidence rate is statistically significantly lower than the state rate.
Yellow = Incidence rate is statistically significantly higher than the state rate.

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
510.04	563.6 (487.4 , 639.9)
510.05	504.8 (437.4 , 572.1)
510.06	545.7 (458.9 , 632.4)
510.07	528.7 (459.1 , 598.2)
511.01	617.4 (444.9 , 834.5)
511.02	520.9 (402.9 , 662.7)
511.03	389.3 (274.1 , 536.6)
512.01	328.6 (252.0 , 421.3)
512.02	318.9 (228.9 , 432.6)
512.03	326.4 (228.6 , 451.8)
512.04	367.4 (263.7 , 498.4)
512.05	259.1 (170.8 , 377.0)

2010 Census Tract ID	Delaware: 507.3 (501.2, 513.5) Age-Adjusted Rate (95% confidence Interval)
513.01	493.7 (436.2 , 551.2)
513.02	406.5 (329.8 , 483.1)
513.03	561.3 (491.6 , 631.0)
513.05	568.8 (481.2 , 656.4)
513.06	506.8 (421.0 , 592.6)
514.00	525.7 (432.8 , 618.7)
515.00	506.9 (431.6 , 582.2)
517.01	483.4 (400.9 , 565.9)
517.02	575.5 (493.0 , 658.0)
518.01	550.3 (461.3 , 639.2)
518.02	535.3 (439.1 , 631.5)
519.00	489.1 (406.3 , 571.9)

* Age-adjusted incidence rate is based on fewer than 25 cases
Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population
Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2016

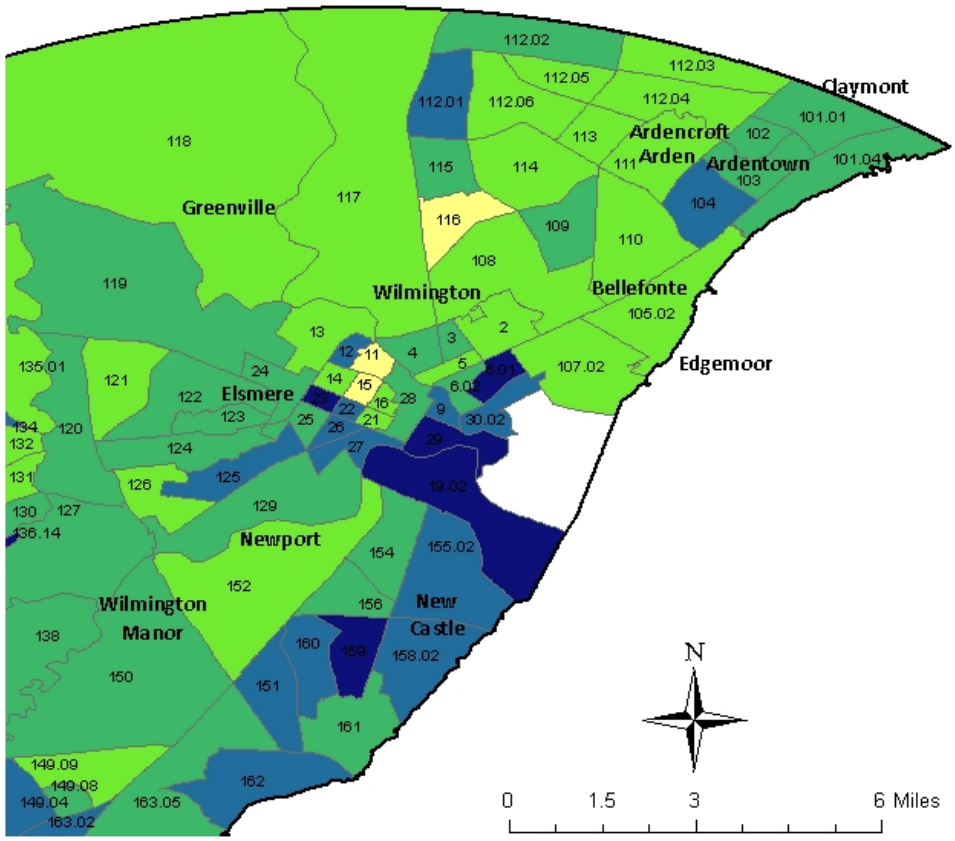
APPENDIX I: MAPS OF DELAWARE CENSUS TRACTS BY 2009-2013 CANCER INCIDENCE RATE QUINTILES



Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Wilmington and Northeastern New Castle County



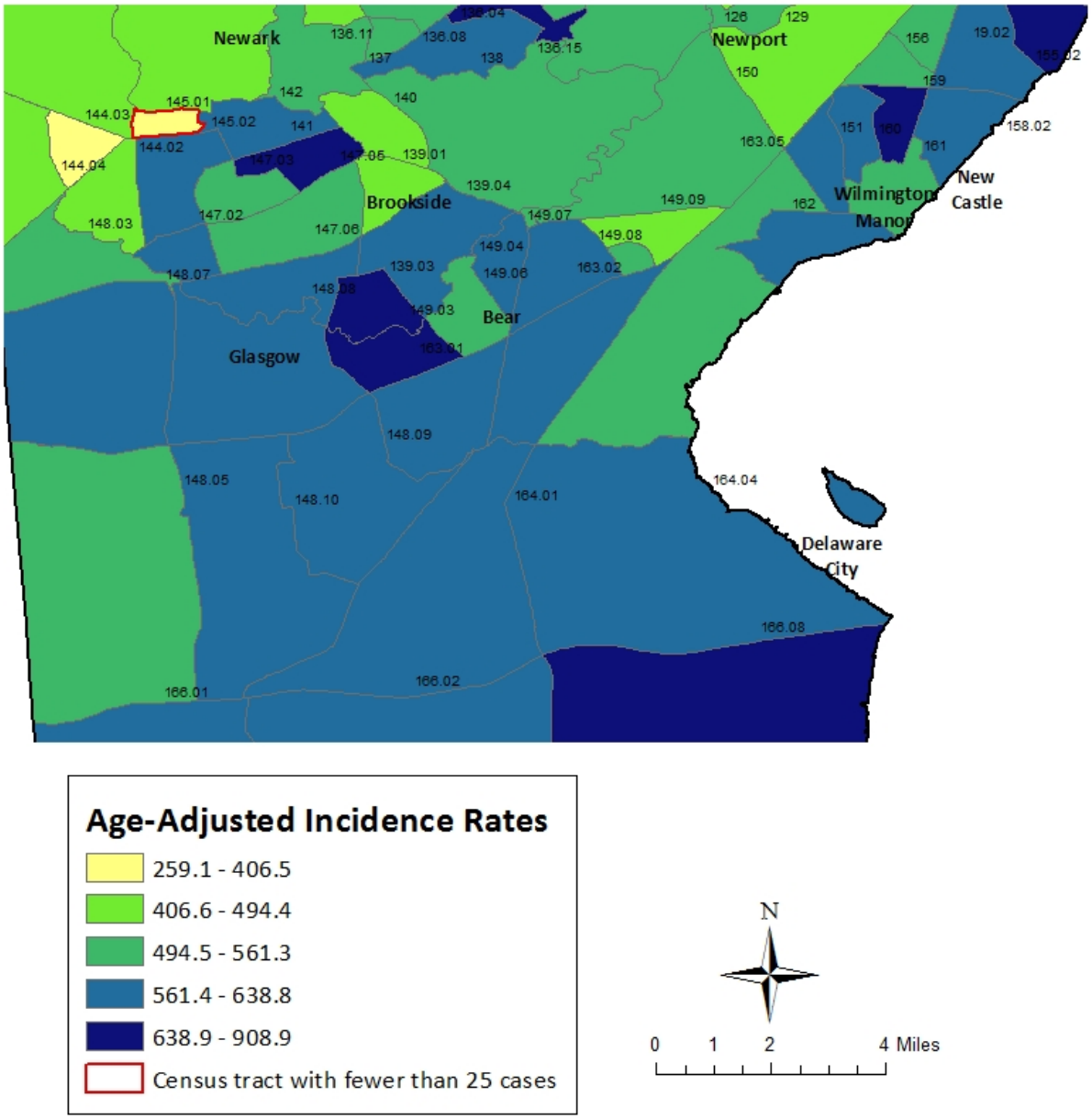
Age-Adjusted Incidence Rates

- 259.1 - 406.5
- 406.6 - 494.4
- 494.5 - 561.3
- 561.4 - 638.8
- 638.9 - 908.9

Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

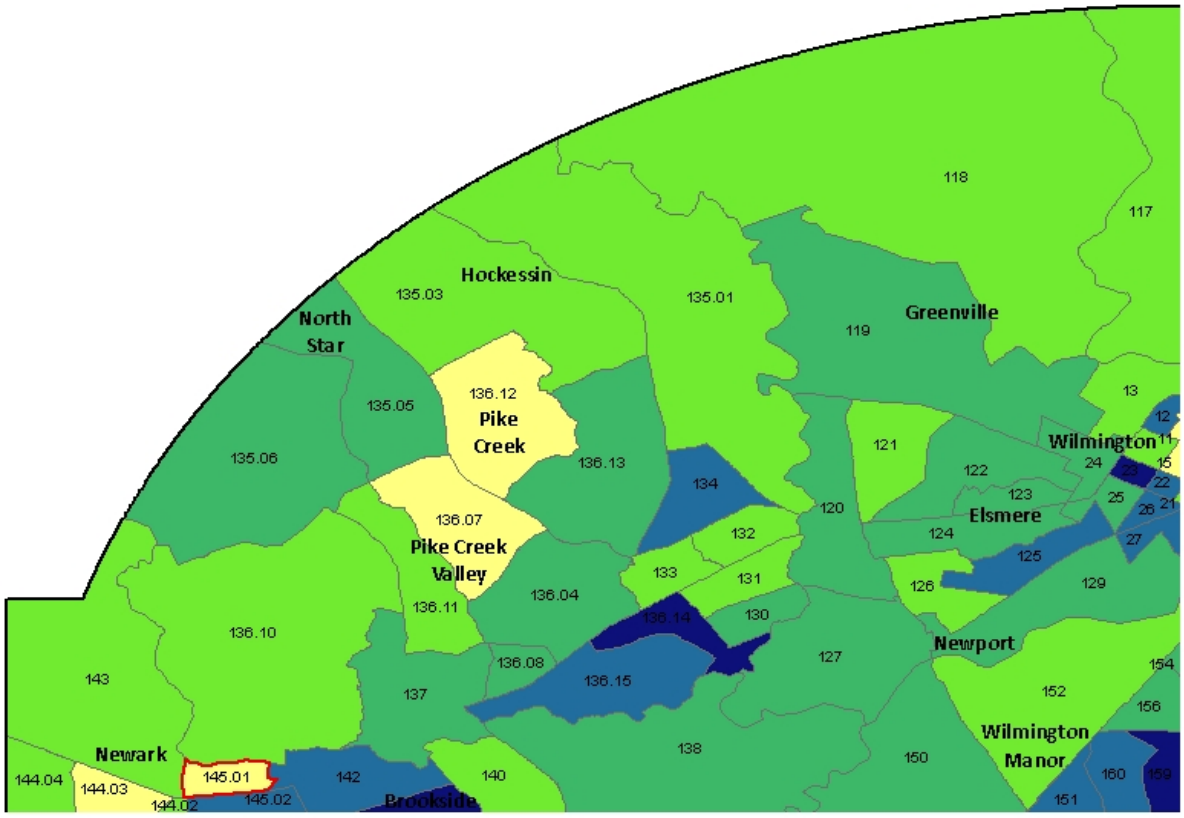
Newark, New Castle, and Central New Castle County



Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Hockessin and Northwestern New Castle County



Age-Adjusted Incidence Rates

- 259.1 - 406.5
- 406.6 - 494.4
- 494.5 - 561.3
- 561.4 - 638.8
- 638.9 - 908.9
- Census tract with fewer than 25 cases

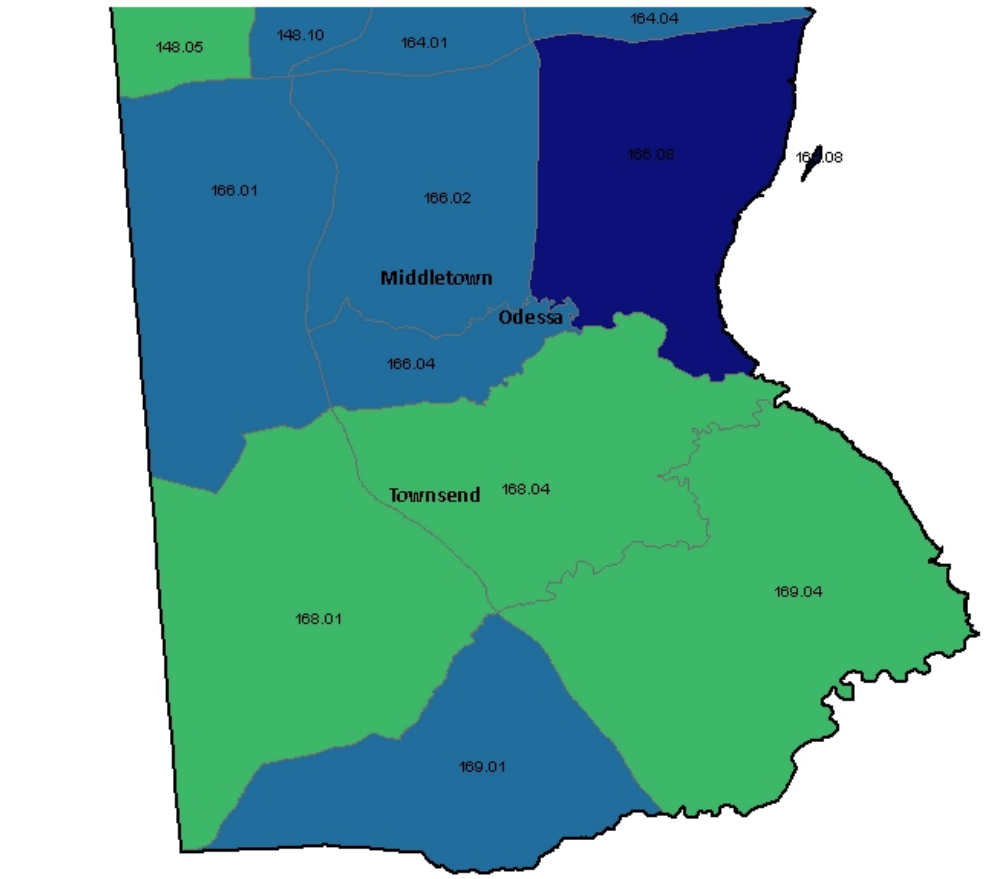
N

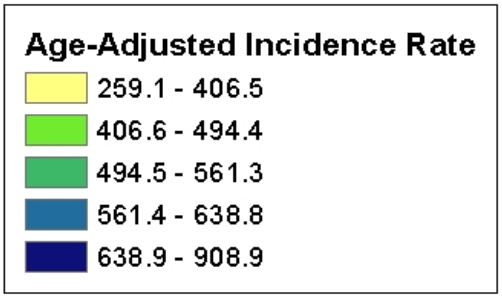
0 1 2 4 Miles

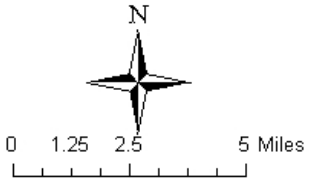
Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Southern New Castle County



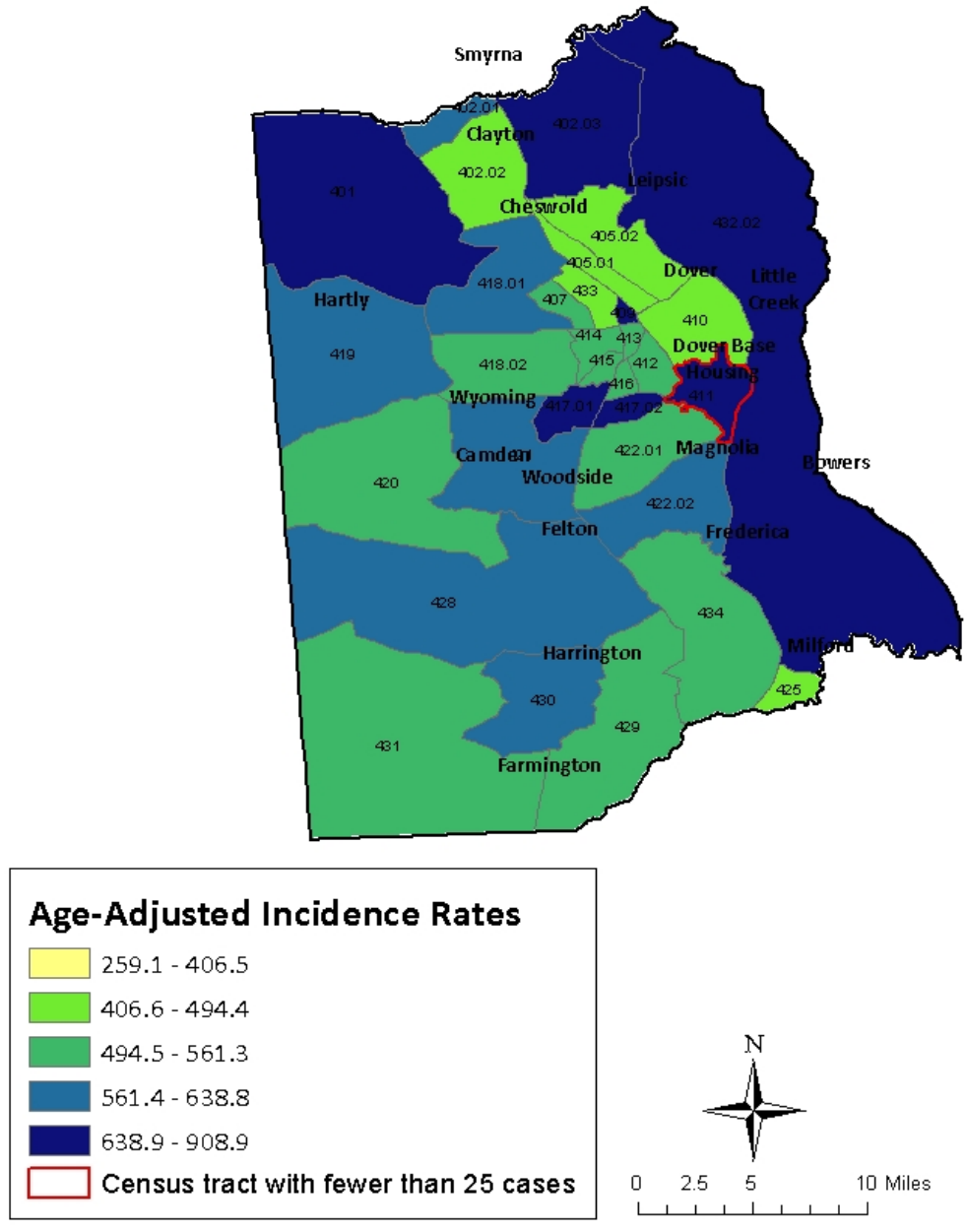




Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

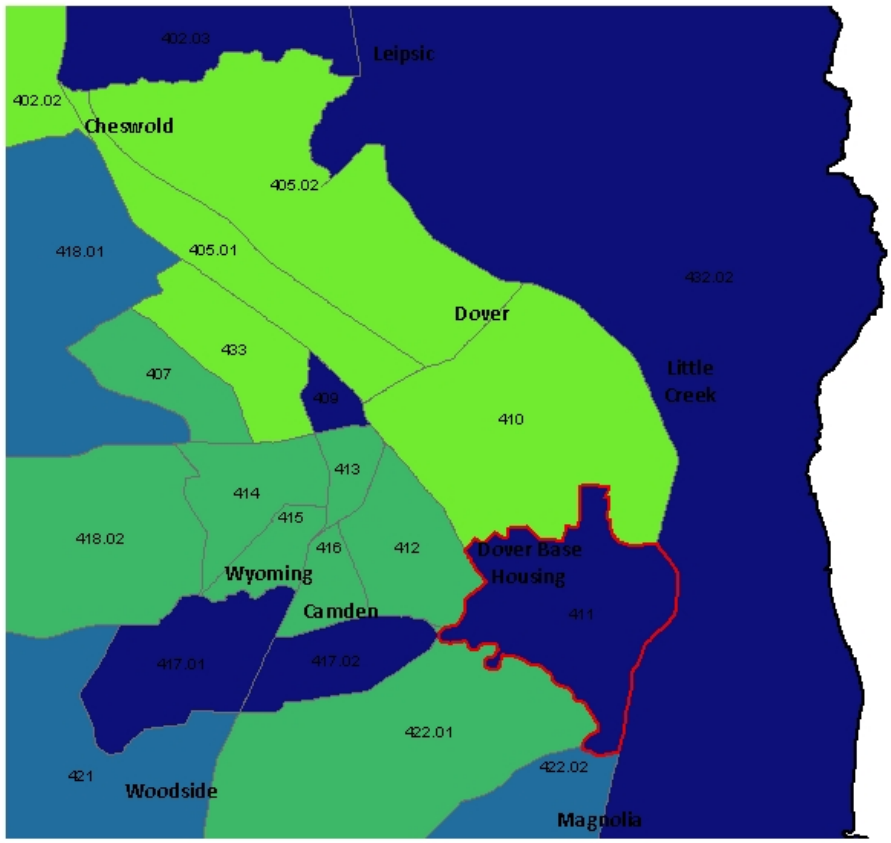
Kent County



Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Greater Dover



Age-Adjusted Incidence Rates

- 259.1 - 406.5
- 406.6 - 494.4
- 494.5 - 561.3
- 561.4 - 638.8
- 638.9 - 908.9
- Census tract with fewer than 25 cases

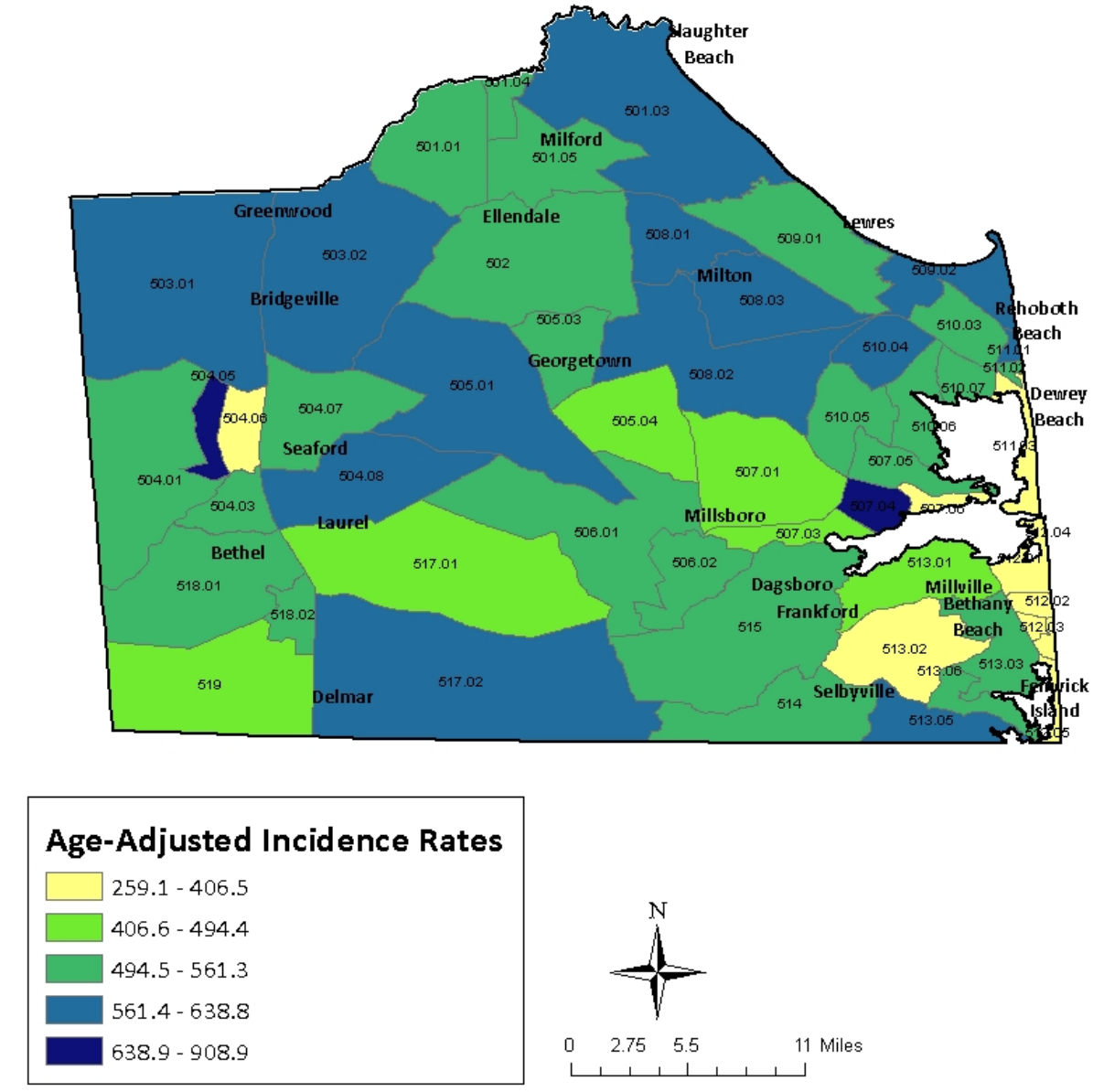
N

0 1 2 4 Miles

Source: Delaware Cancer Registry

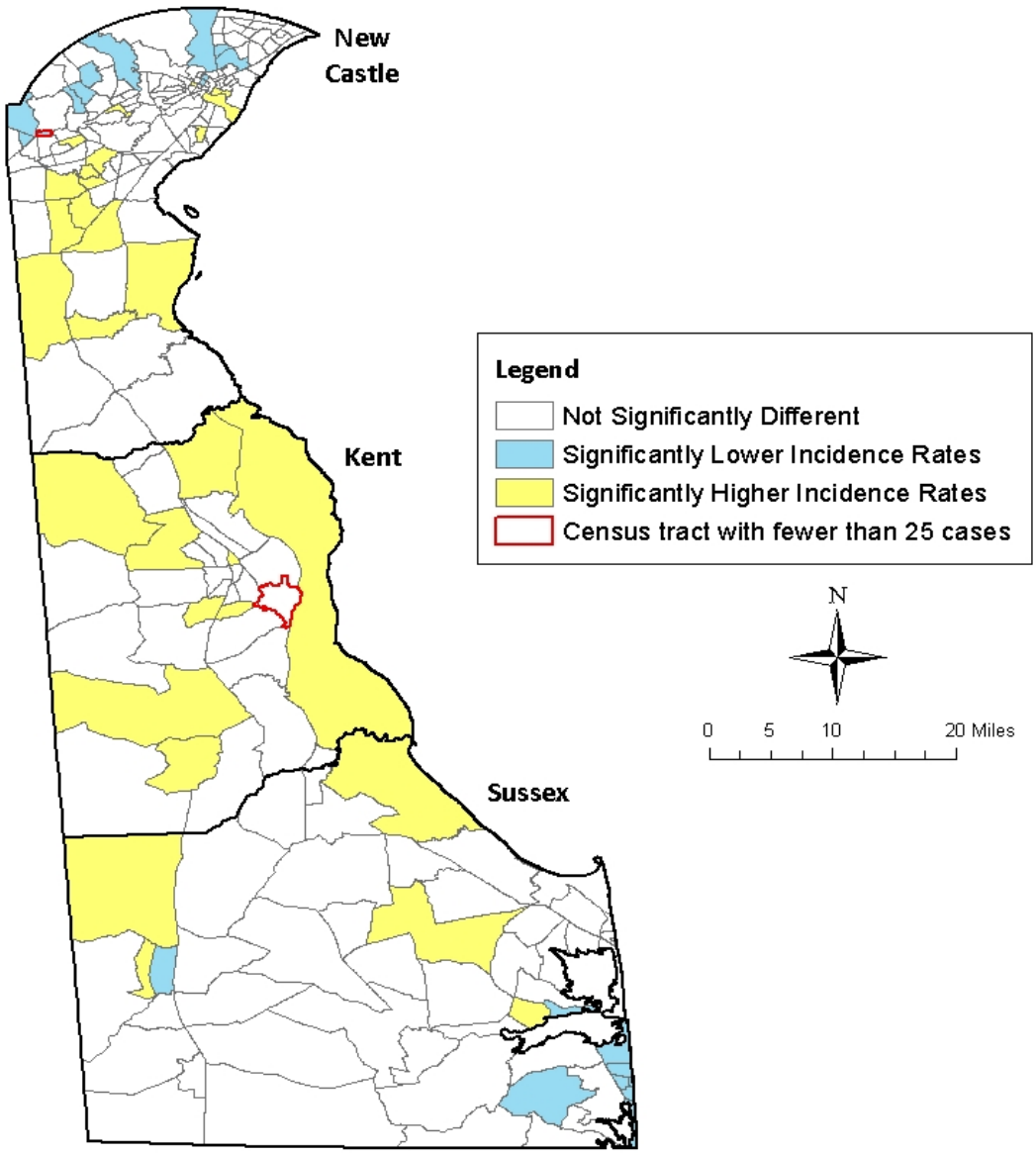
Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Sussex County



Source: Delaware Cancer Registry

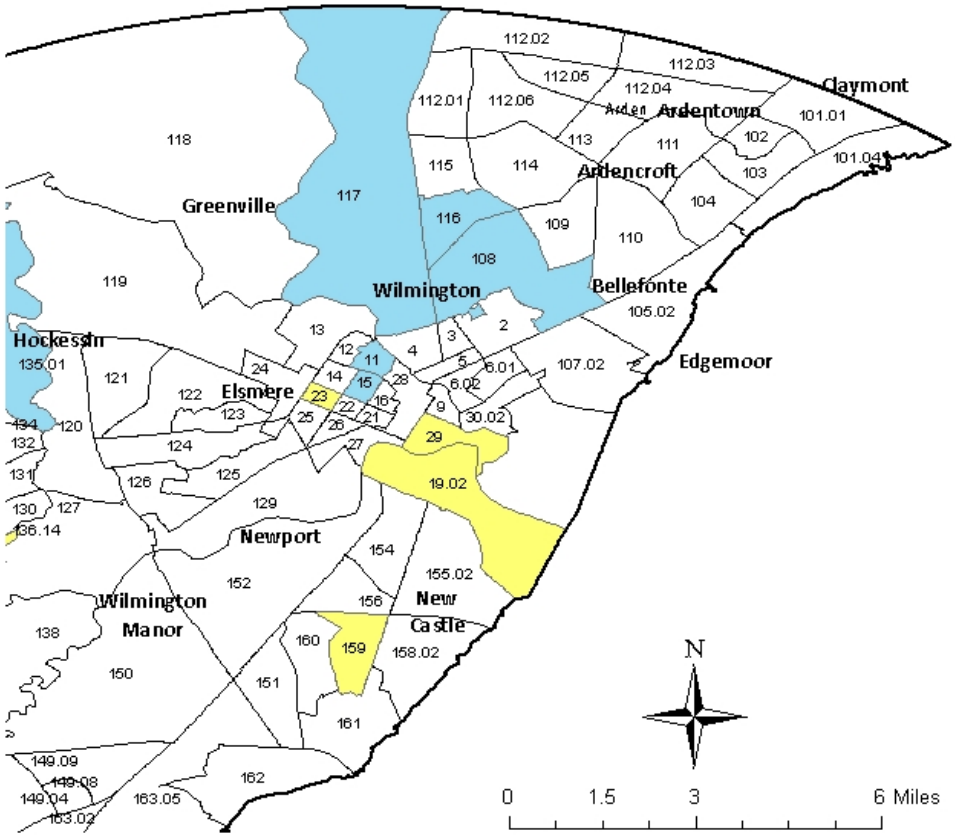
APPENDIX J: MAPS OF DELAWARE CENSUS TRACTS BY 2009-2013 HIGH/LOW CANCER INCIDENCE RATES



Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Wilmington and Northeastern New Castle County



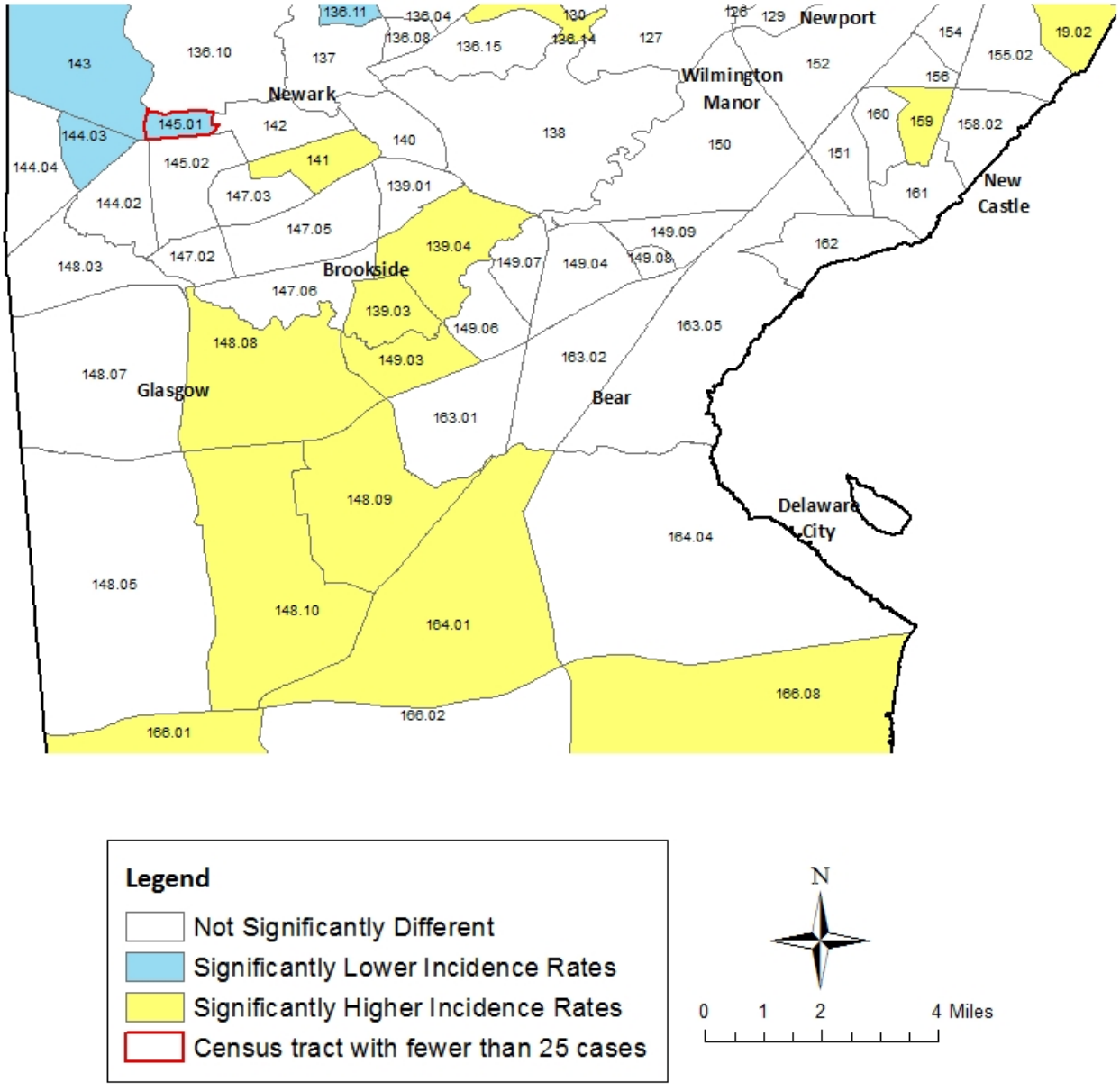
Legend

- Not Significantly Different
- Significantly Lower Incidence Rates
- Significantly Higher Incidence Rates

Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Newark, New Castle, and Central New Castle County



Legend

- Not Significantly Different
- Significantly Lower Incidence Rates
- Significantly Higher Incidence Rates
- Census tract with fewer than 25 cases

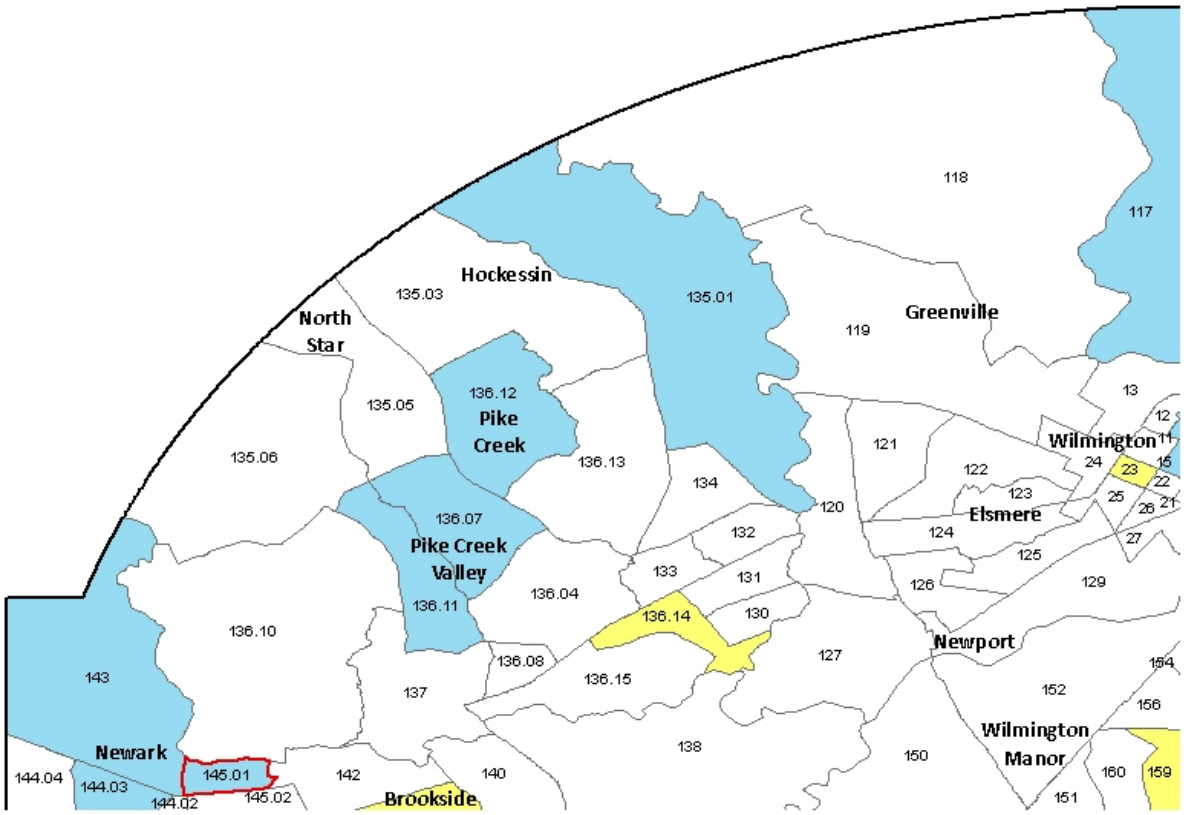
N

0 1 2 4 Miles

Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Hockessin and Northwestern New Castle County



Legend

- Not Significantly Different
- Significantly Lower Incidence Rates
- Significantly Higher Incidence Rates
- Census tract with fewer than 25 cases

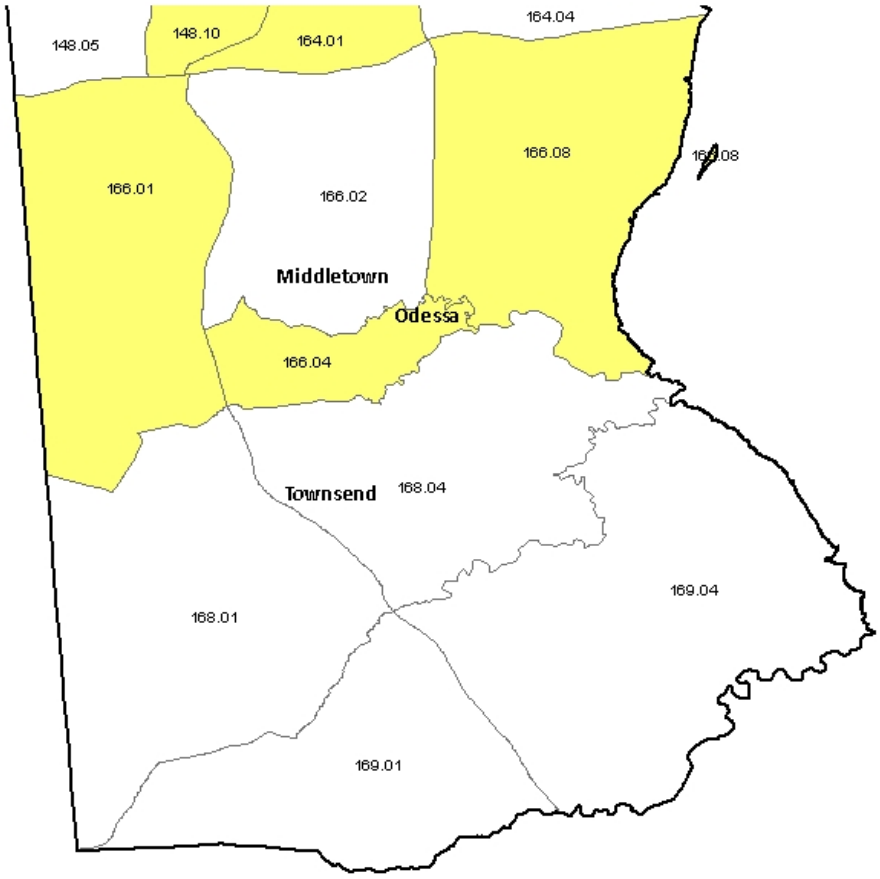
N

0 1 2 4 Miles

Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

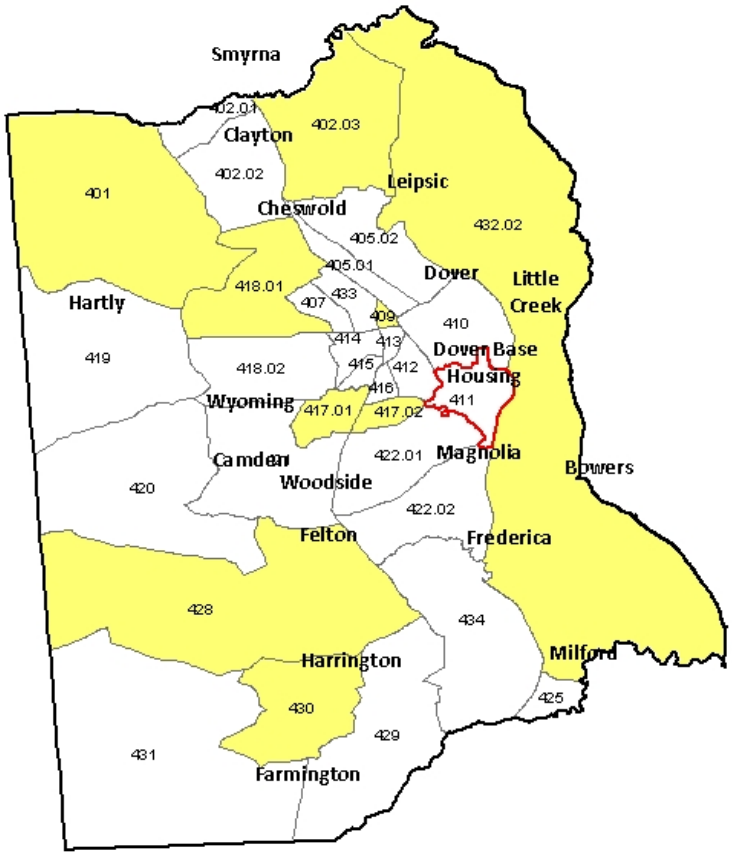
Southern New Castle County

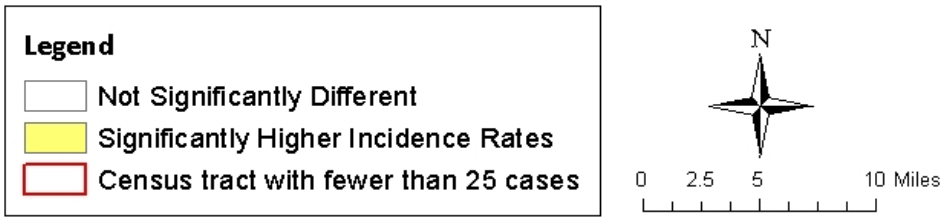


Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Kent County

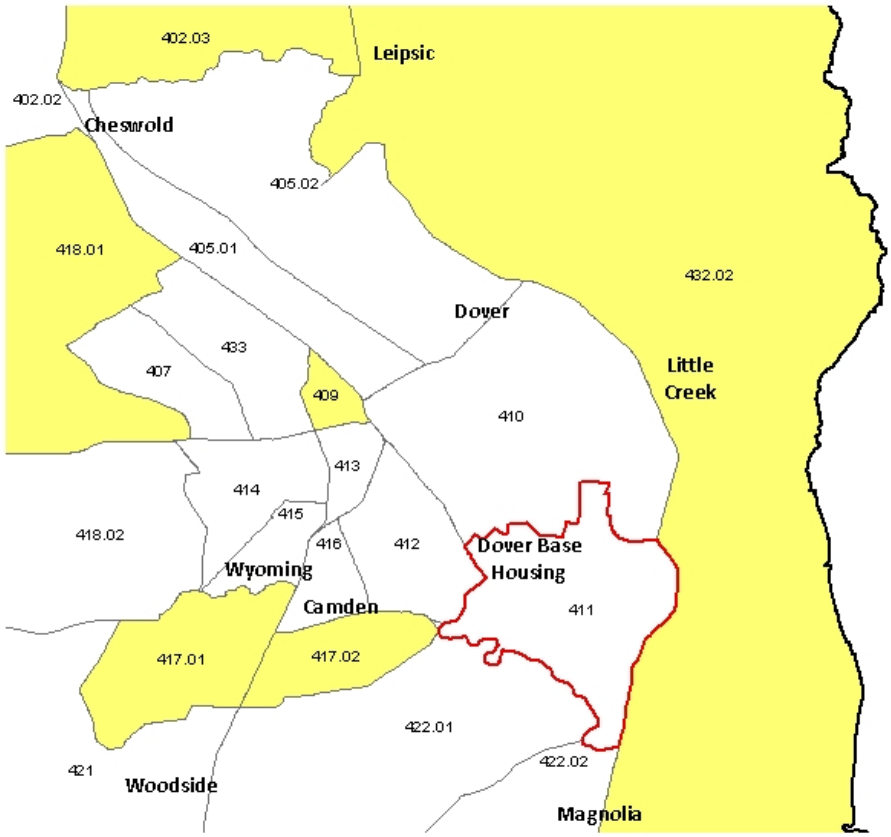


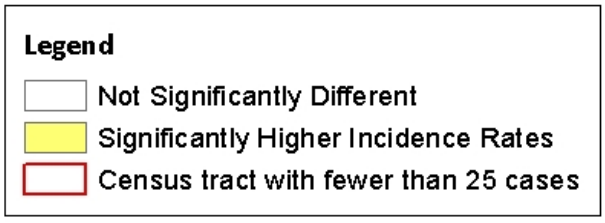


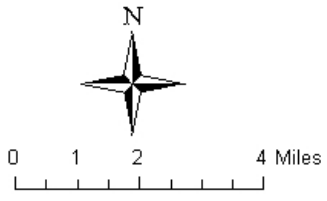
Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Greater Dover



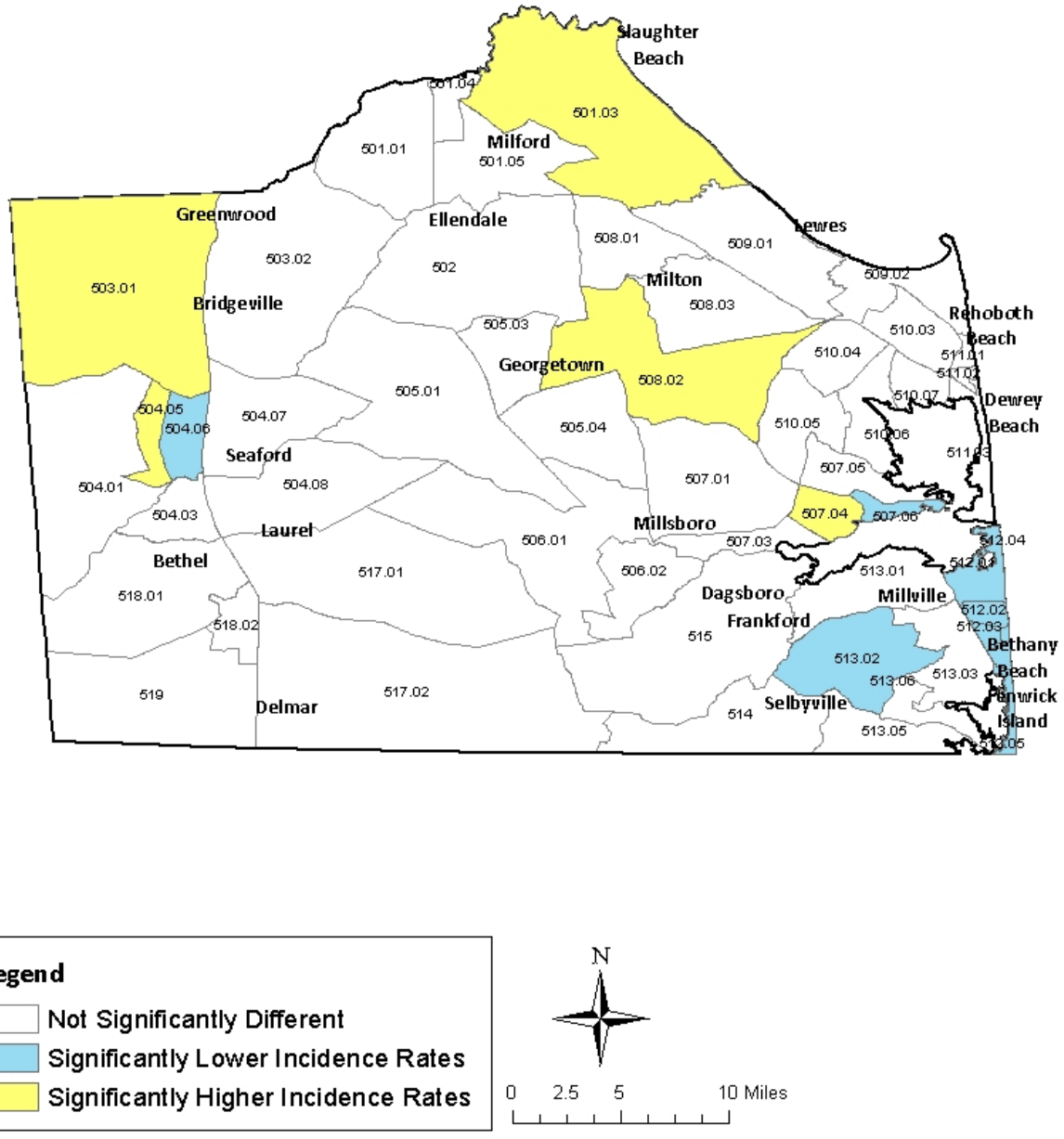




Source: Delaware Cancer Registry

Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2009-2013

Sussex County



Source: Delaware Cancer Registry