

# **CANCER INCIDENCE AND MORTALITY IN DELAWARE, 2008-2012**

DELAWARE HEALTH AND SOCIAL SERVICES  
DIVISION OF PUBLIC HEALTH  
2016



*DELAWARE HEALTH AND SOCIAL SERVICES*  

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*Division of Public Health*



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## CHAPTER 1: EXECUTIVE SUMMARY

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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 2008-2012. The Division of Public Health (DPH) compares Delaware's cancer incidence and mortality trends for 2008-2012 to those of the U.S. over the same time period. DPH also summarizes how Delaware and U.S. cancer rates have changed from 1998-2002 to 2008-2012.

Despite fluctuations in all-site cancer incidence from 1998-2002 to 2008-2012, Delaware's 2008-2012 all-site cancer incidence rate was only 2.0 percent less than in 1998-2002. During the same time period, the comparable U.S. all-site cancer incidence rate fell 7.0 percent. While progress continues to be made, Delaware's 2008-2012 all-site cancer incidence rate (503.9 per 100,000) remains 10.8 percent higher than the comparable U.S. rate (454.8 per 100,000).

From 1998-2002 to 2008-2012, all-site cancer incidence decreased 4.0 percent among both Delaware males and females. African American Delawareans have experienced especially noteworthy declines in all-site cancer incidence. From 1998-2002 to 2008-2012, the all-site cancer incidence rate fell 9.5 percent among African Americans in Delaware; among Caucasian Delawareans, the all-site cancer incidence rate decreased 0.6 percent during the same time period.

Delaware's 2008-2012 all-site cancer mortality rate of 181.0 per 100,000 was 5.8 percent higher than the U.S. rate of 171.2 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 its cancer mortality rates.

In the early 1990s, Delaware ranked second highest among U.S. states in terms of all-site cancer mortality; for the 2008-2012 time period, Delaware ranked 14<sup>th</sup> highest among U.S. states. **From 1998-2002 to 2008-2012, Delaware's cancer death rate decreased 14.0 percent, an improvement that was identical to the decline seen nationally (14.0 percent).**

Male Delawareans experienced a slightly greater rate of decline in cancer mortality than females (17.0 percent vs. 13.0 percent, respectively). **The all-site cancer mortality rate among African American Delawareans declined 21.9 percent, compared to 13.9 percent among Caucasian Delawareans.**

**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.

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### LUNG CANCER

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- **Lung cancer continues to account for an enormous share of Delaware's overall cancer burden.** From 2008-2012, lung cancer accounted for 14.4 percent of all newly-diagnosed cancer cases and 30.0 percent of all cancer deaths in Delaware.
- 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.

- **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 2008-2012, 53.6 percent of Delaware lung cancer cases and 53.4 percent of U.S. lung cancer cases were diagnosed in the distant stage. Additionally, treatment options are not as effective for lung cancer as for some other forms of cancer.
- Despite the grim statistics, Delaware continues to make progress in reducing statewide lung cancer incidence rates; the ranking for 2008-2012 was 12<sup>th</sup> compared to 10<sup>th</sup> in 2007-2011. From 1998-2002 to 2008-2012, lung cancer rates declined 14.1 percent for Delaware males, compared to 15.6 percent for U.S. males. **The lung cancer incidence rate for Delaware females increased 6.5 percent during the same time period, compared to a 3.6 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 1980-1984 male lung cancer mortality rate was 19.2 percent greater than that of the U.S. For 2008-2012, Delaware's male lung cancer mortality rate was 14.4 percent higher than the U.S. rate.
- Between 1998-2002 and 2008-2012, Delaware's lung cancer mortality rate fell 13.0 percent while the U.S. rate dropped 15.3 percent.
- **Delaware's lung cancer mortality rates have declined noticeably among African Americans.** From 1998-2002 to 2008-2012, Delaware's lung cancer mortality rates declined 32.6 percent among African American males and 23.7 percent among African American females.
- Among Caucasian Delawareans, males experienced greater reductions in lung cancer mortality compared to females. From 1998-2002 to 2008-2012, Delaware's lung cancer mortality rate decreased 19.7 percent among male Caucasians and 0.6 percent among Caucasian females.
- **For the 2008-2012 time period, Delaware females ranked fifth highest in the nation in lung cancer mortality while Delaware males ranked 16<sup>th</sup>.**

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## COLORECTAL CANCER

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- From 1998-2002 to 2008-2012, Delaware's colorectal cancer incidence rate decreased 31.8 percent while the comparable U.S. rate fell 22.3 percent. For both males and females, Delaware's colorectal incidence rates declined faster than the U.S. Among males, Delaware's incidence rate declined 33.0 percent while the U.S. rate declined 23.7 percent. Among females, Delaware's incidence rate declined 30.8 percent while the U.S. rate declined 21.6 percent.
- From 1998-2002 to 2008-2012, Delaware's greatest improvements in colorectal cancer rates were observed among African Americans; incidence rates for African American males and females declined 38.3 percent and 39.0 percent, respectively.

- **For 2008-2012, the colorectal cancer incidence rate among African Americans in Delaware (41.4 per 100,000) was lower than the U.S. (52.3 per 100,000).**
- For the 2008-2012 time period, 55.9 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 a 12.5 percent decline since 1998-2002 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 2008-2012, Delaware's colorectal cancer mortality rate was lower than that of the U.S. (14.6 per 100,000 vs 15.5 per 100,000, respectively).**
- From 1998-2002 to 2008-2012, Delaware's colorectal cancer mortality rate decreased 30.5 percent while the national rate decreased 24.4 percent. Delaware ranked 37<sup>th</sup> in 2008-2012 compared to 27<sup>th</sup> in 2007-2011.
- **The reduction in colorectal cancer mortality rates is especially noteworthy among African American Delawareans.** From 1998-2002 to 2008-2012, Delaware's colorectal cancer mortality rates declined 49.7 percent among African American males, compared to 29.3 percent among Caucasian males. During the same time period, colorectal cancer mortality declined 44.6 percent among African American females, compared to 29.0 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 69.4 percent.

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## BREAST CANCER

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- The 2008-2012 breast cancer incidence rate for Delaware (126.7 per 100,000) was higher than the U.S. rate (124.8 per 100,000), but the difference was not statistically significant. Delaware was ranked 17<sup>th</sup> in 2008-2012 compared to 10<sup>th</sup> in 2007-2011.
- From 1998-2002 to 2008-2012, Delaware's breast cancer incidence rate declined 3.4 percent while the comparable U.S. rate fell 8.0 percent. During this time period, Delaware's decline in breast cancer incidence was limited to Caucasian females. While the breast cancer incidence rate declined 4.4 percent among Caucasian females in the state, it increased 6.4 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 42.2 percent in 1980-1984 to 65.1 percent in 2008-2012.
- Although Delaware's 2008-2012 breast cancer mortality rate (21.9 per 100,000) was nearly identical to the U.S. rate (22.0 per 100,000), African American females in Delaware had a lower mortality rate (26.2 per 100,000) than African American females in the U.S. (30.2 per 100,000). These differences were not statistically significant.

- **From 1998-2002 to 2008-2012, Delaware's decline in breast cancer mortality (22.3 percent) was greater than the decline seen nationally (17.4 percent).** Delaware was ranked 23<sup>rd</sup> in 2008-2012 compared to 17<sup>th</sup> in 2007-2011.
- **Delaware's decline in breast cancer mortality rates was especially pronounced among African Americans.** From 1998-2002 to 2008-2012, Delaware's female breast cancer mortality rate decreased 27.2 percent among African Americans and 20.7 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 BRFSS showed that Delaware females ranked third highest nationally in the prevalence of females ages 40 and over who have had a mammogram within the past two years (80.1 percent).

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## PROSTATE CANCER

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- From 1998-2002 to 2008-2012, Delaware's prostate cancer incidence rate decreased 9.0 percent while the U.S. rate fell 23.7 percent. Delaware's 2008-2012 prostate cancer incidence rate (157.0 per 100,000) was significantly higher than the U.S. (137.9 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 BRFSS show that Delaware ranked 12<sup>th</sup> in the nation in the prevalence of males aged 40 and over who have had a PSA (protein-specific antigen) test within the past two years.**
- Delaware's prostate cancer incidence was ranked 5<sup>th</sup> in 2008-2012 compared to 4<sup>th</sup> in 2007-2011.
- 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 2008-2012, Delaware's percentage of prostate cancer cases diagnosed in the local stage increased substantially, from 49.6 percent to 84.7 percent.
- **The prostate cancer incidence rate among African American Delawareans continues to be significantly greater than the comparable rate for Caucasians. Delaware's 2008-2012 prostate cancer incidence rate was 228.8 per 100,000 for African Americans, compared to 144.1 per 100,000 for Caucasians. This same trend is observed in the U.S.**
- Delaware's mortality rate for prostate cancer was ranked 18<sup>th</sup> in 2008-2012, compared to 17<sup>th</sup> in 2007-2011.
- 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 1998-2002 to 2008-2012, prostate cancer mortality declined 39.2 percent among African American Delawareans, compared to 23.3 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 2008-2012, the African American (2000-2004: 49.9 per 100,000; 2008-2012: 39.1 per 100,000) and Caucasian (2000-2004: 25.1 per 100,000; 2008-2012: 20.4 per 100,000) prostate cancer mortality rates were as similar as they had ever been since cancer data surveillance efforts began in 1980.**

## TRENDS IN CANCER INCIDENCE

For 2008-2012, Delaware's all-site cancer incidence was significantly higher than the U.S. and Delaware's incidence rates were also statistically significantly higher than the U.S. for lung and prostate cancers.

Delaware's all-site cancer incidence rate declined just 2.0 percent from 1998-2002 to 2008-2012; however, during the same time period, incidence rates for several cancer sites experienced more substantial fluctuations. In Delaware, urinary bladder cancer incidence increased 9.9 percent from 1998-2002 to 2008-2012, while the comparable U.S. rate decreased 6.0 percent. The percent change in incidence rates for Non-Hodgkin lymphoma was negligible (no change for Delaware and a decrease of 0.5 percent for the U.S.).

Table 1-1 summarizes 2008-2012 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 1998-2002 to 2008-2012.

**TABLE 1-1: AVERAGE ANNUAL AGE-ADJUSTED CANCER INCIDENCE RATES WITH 95 PERCENT CONFIDENCE INTERVALS; DELAWARE VS. U.S., 2008-2012**

Cancer Site	DE Incidence Rate 2008-2012	U.S. Incidence Rate 2008-2012	DE % Change: 98-02 to 08-12	U.S. % Change: 98-02 to 08-12
All-Site*	503.9 (497.8, 510.2)	454.8 (454.1, 455.4)	-2.0	-6.8
Female breast	126.7 (122.5, 131.1)	124.8 (124.4, 125.3)	-3.4	-8.0
Colorectal	39.9 (38.2, 41.7)	42.4 (42.2, 42.6)	-31.8	-22.3
Lung/bronchus*	72.1 (69.8, 74.5)	58.7 (58.5, 58.9)	-4.8	-9.8
Non-Hodgkin lymphoma	19.9 (18.7, 21.2)	19.7 (19.5, 19.8)	0.0	-0.5
Ovarian	10.8 (9.6, 12.1)	12.1 (12.0, 12.3)	-30.8	-16.0
Prostate*	157.0 (152.1, 162.1)	137.9 (137.4, 138.4)	-9.0	-23.7
Stomach	6.3 (5.7, 7.1)	7.4 (7.3, 7.5)	-16.0	-9.8
Urinary bladder*	24.5 (23.2, 25.9)	20.3 (20.2, 20.5)	+9.9	-6.0

\* = Delaware incidence rate is 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, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

## TRENDS IN CANCER MORTALITY

Although Delaware's 2008-2012 all-site cancer mortality rate was significantly greater than the U.S., Delaware's rate has shown a similar rate of decline compared to the U.S. for the 1998-2002 to 2008-2012 time period (14.0 percent decline for both). From 1998-2002 to 2008-2012, Delaware has made great strides in reducing its cancer mortality burden for several cancer types (especially female breast and colorectal). Delaware also had higher rates of decline in mortality rates for ovarian and urinary bladder cancer.

**TABLE 1-2: AVERAGE ANNUAL AGE-ADJUSTED CANCER MORTALITY RATES WITH 95 PERCENT CONFIDENCE INTERVALS; DELAWARE VS. U.S., 2008-2012**

Cancer Site	DE Mortality Rate 2008-2012	U.S. Mortality Rate 2008-2012	DE % Change: 98-02 to 08-12	U.S. % Change: 98-02 to 08-12
All-Site*	181.0 (177.4, 184.8)	171.2 (171.0, 171.4)	-14.0	-14.0
Female breast	22.0 (20.3, 23.8)	21.9 (21.8, 22.0)	-22.3	-17.4
Colorectal	14.6 (13.6, 15.7)	15.5 (15.4, 15.6)	-30.5	-24.4
Lung/bronchus*	54.0 (52.0, 56.0)	47.2 (47.1, 47.3)	-13.0	-15.3
Non-Hodgkin lymphoma	5.7 (5.1, 6.4)	6.2 (6.1, 6.2)	-26.9	-23.5
Ovarian	7.6 (6.6, 8.7)	7.7 (7.6, 7.8)	-17.4	-13.5
Prostate	22.4 (20.4, 24.6)	21.4 (21.3, 21.5)	-26.3	-29.8
Stomach	3.8 (3.3, 4.4)	3.4 (3.3, 3.4)	-17.4	-24.4
Urinary bladder	4.7 (4.1, 5.3)	4.4 (4.4, 4.4)	-14.8	0.0

\* = 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, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

### 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 2008-2012. 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 2008-2012 show that:

- In 14 of Delaware’s 214 census tracts, the all-site cancer incidence rate was statistically significantly higher than Delaware’s average 2008-2012 incidence rate (510.0 per 100,000)<sup>1</sup>.
- In 14 of Delaware’s 214 census tracts, the all-site cancer incidence rate was statistically significantly lower than Delaware’s average 2008-2012 incidence rate (510.0 per 100,000).
- All-site cancer incidence rates for the remaining 186 census tracts were not significantly different from the state’s average rate for the 2008-2012 time period.
- Age-adjusted five-year cancer incidence rates by census tract with 95 percent confidence intervals are presented in Appendix H for 2008-2012. 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

<sup>1</sup> 510.0 is average 2008-2012 Delaware incidence rate calculated by Excel rather than SEER\*Stat (503.9).

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.

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## CHAPTER 2: INTRODUCTION

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### DELAWARE CANCER REGISTRY

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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<sup>2</sup>. 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).<sup>3</sup> The DCR ensures accurate, timely, and routine surveillance of cancer trends among Delawareans.

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### REPORTING FACILITIES

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There are seven Delaware hospitals currently reporting cancer cases to the DCR. Forty-nine non-hospital offices submit data to the DCR; these offices include 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.

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### DATA CONFIDENTIALITY

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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.

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### DATA QUALITY

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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.

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<sup>2</sup> <http://delcode.delaware.gov/title16/c032/index.shtml>

<sup>3</sup> <http://www.cdc.gov/cancer/npcr>

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## NAACCR CERTIFICATION AND NPCR STANDARD STATUS

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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<sup>4</sup>. 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 and 2012 (most recent year for 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 2012 surpassed all standard levels for quality, completeness, and timeliness.

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## USES OF DATA

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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.

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## ORGANIZATION OF THIS REPORT

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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 2008-2012. We compare Delaware's cancer incidence and mortality trends for 2008-2012 to those of the U.S. over the same time period. We also summarize how Delaware and U.S. cancer rates have changed from 1998-2002 to 2008-2012. 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 2008-2012 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<sup>5</sup>.

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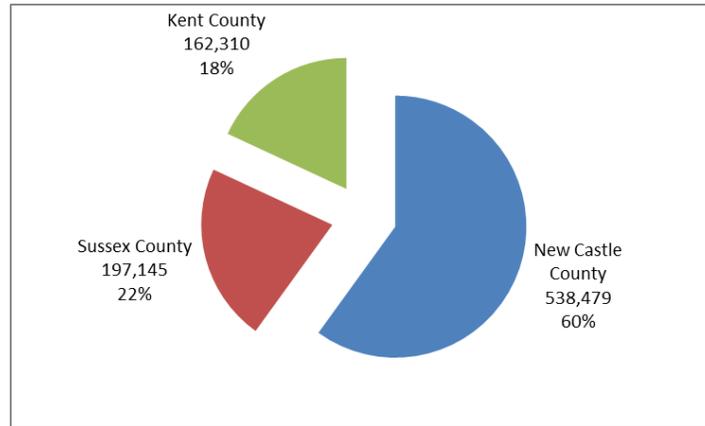
<sup>4</sup> <http://www.naaccr.org/Certification/Criteria.aspx>

<sup>5</sup> 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](http://www.cdc.gov/uscs).

## 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).

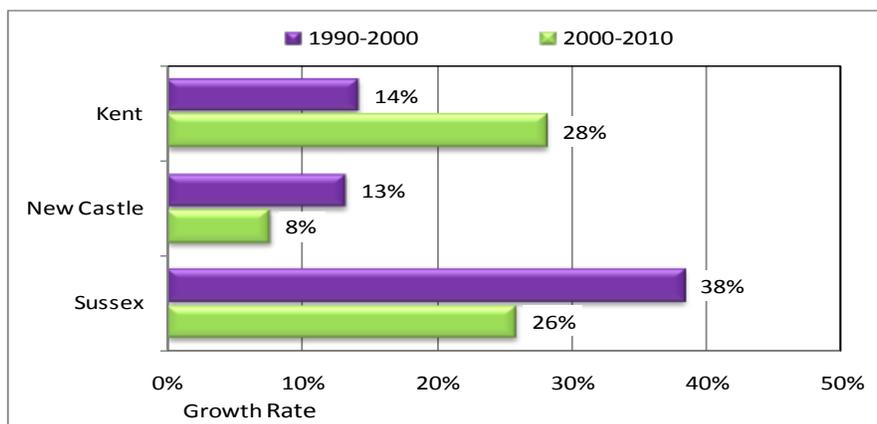
**FIGURE 2-1: DELAWARE POPULATION BY COUNTY, 2010**



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**



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 and 66 percent of Kent and New Castle County residents, respectively, are Caucasian. African Americans comprise roughly 21 percent of Delaware’s population. Approximately 13 percent of Sussex County residents are African American; Kent and New Castle Counties are comparatively more racially diverse with 24.0 percent and 23.7 percent of African American residents, respectively. Three percent of Delawareans are Asian. Another six 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**

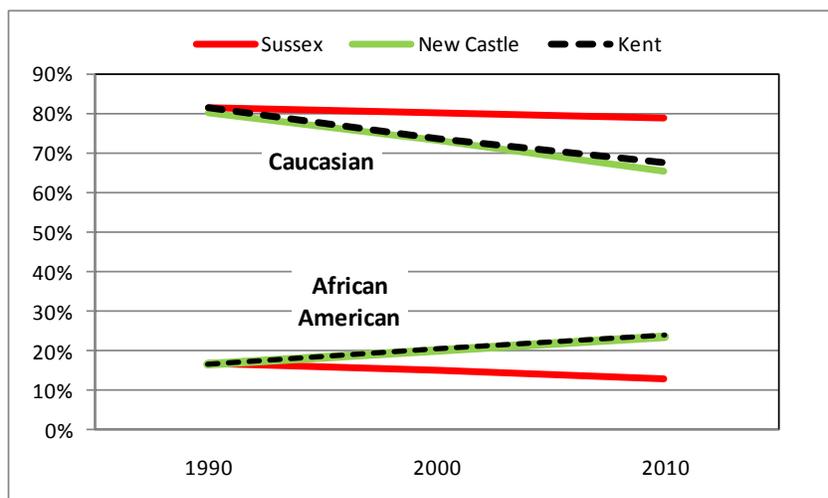
Race	Delaware	Kent	New Castle	Sussex
Caucasian	68.9	67.8	65.5	79.0
African American	21.4	24.0	23.7	12.7
American Indian/Alaska Native	0.5	0.6	0.3	0.8
Asian	3.2	2.0	4.3	1.0
Other or 2 or more races	6.1	5.5	6.1	6.4
<b>TOTAL</b>	100.0	100.0	100.0	100.0
Hispanic ethnicity	8.2	5.8	8.7	8.6

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**



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<sup>6,7</sup>.

- 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.

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<sup>6</sup> Coughlin SS, Clutter GG, Hutton M. Ethics in Cancer Registries. *Journal of Cancer Registry Management*, 2: 5-10, 1999.

<sup>7</sup> 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 2008-2012, Delaware ranked 2<sup>nd</sup> in the U.S. for all-site cancer incidence (2<sup>nd</sup> in 2007-2011); males ranked 4<sup>th</sup> (3<sup>rd</sup> in 2007-2011) and females ranked 10<sup>th</sup> (11<sup>th</sup> in 2007-2011)<sup>8</sup>.

#### 2008-2012 DATA

- In 2008-2012, there were 26,303 all-site cancer cases diagnosed in Delaware; an average of 5,261 per year.
- Delaware males accounted for 52.4 percent of all-site cancer cases.
- Caucasians in Delaware accounted for 81.9 percent of all-site cancer cases.

**TABLE 3-1: NUMBER OF ALL-SITE CANCER CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	26,303	13,795	12,508	21,534	11,312	10,222	4,225	2,227	1,998
Kent	4,796	2,520	2,276	3,806	1,985	1,821	900	496	404
New Castle	14,064	7,195	6,869	11,064	5,666	5,398	2,693	1,389	1,304
Sussex	7,443	4,080	3,363	6,664	3,661	3,003	632	342	290

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

- In Delaware
  - The difference in incidence rates between Caucasians (510.0 per 100,000) and African Americans (491.9 per 100,000) was not statistically significant.
  - Caucasian females (459.0 per 100,000) had a significantly higher incidence rate than African American females (412.1 per 100,000).
  - The difference in incidence rates between Caucasian males (579.8 per 100,000) and African American males (603.8 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware had a significantly higher incidence rate (503.9 per 100,000) than the U.S. (454.8 per 100,000).
  - Delaware males (580.7 per 100,000) and females (447.2 per 100,000) had significantly higher incidence rates than U.S. males (516.6 per 100,000) and females (411.2 per 100,000).
  - Caucasians in Delaware (510.0 per 100,000) had a significantly higher incidence rate than Caucasians in the U.S. (463.3 per 100,000).

<sup>8</sup> 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](http://www.cdc.gov/uscs).

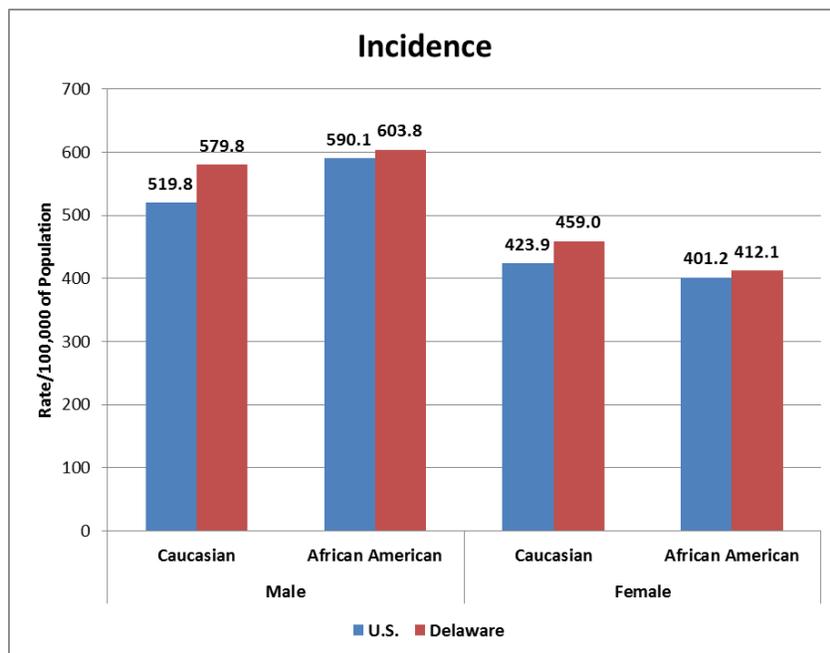
- There was no statistically significant difference between incidence rates for African Americans in Delaware (491.9 per 100,000) and the U.S. (478.0 per 100,000).

**TABLE 3-2: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	454.8	516.6	411.2
<b>Delaware</b>	503.9	580.7	447.2
Kent	538.1	623.6	472.7
New Castle	491.8	564.9	440.6
Sussex	506.8	584.2	445.9

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 3-1: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

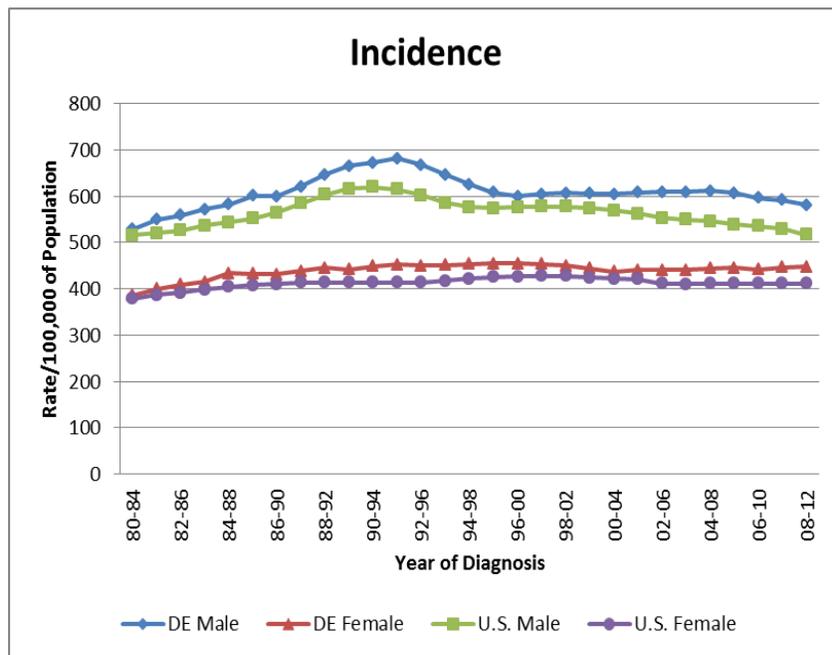


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Incidence rates for all-site cancer declined 2 percent in Delaware and 7 percent in the U.S.
  - U.S. males saw big declines in all-site cancer incidence (10 percent) while Delaware male all-site cancer incidence rates declined by 4 percent.
  - U.S. and Delaware female all-site cancer incidence rates saw a slight decline of 4 percent each.

**FIGURE 3-2: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

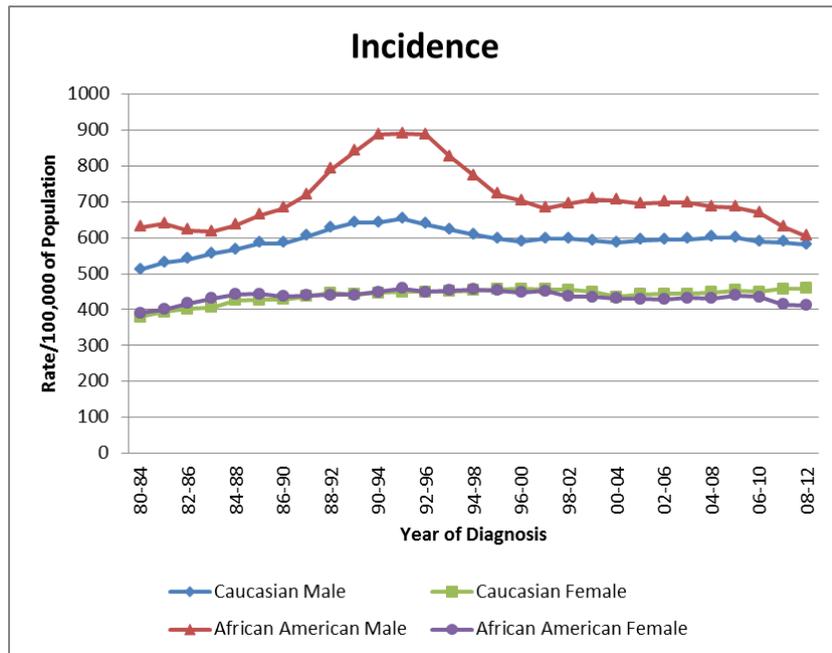


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - 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 6 percent.
  - Caucasian males and females had different outcomes with all-site cancer incidence; among Caucasian males there was a 3 percent decline while Caucasian females experienced a 1 percent increase.

**FIGURE 3-3: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER INCIDENCE RATES BY RACE AND SEX; DELAWARE, 1980-2012**

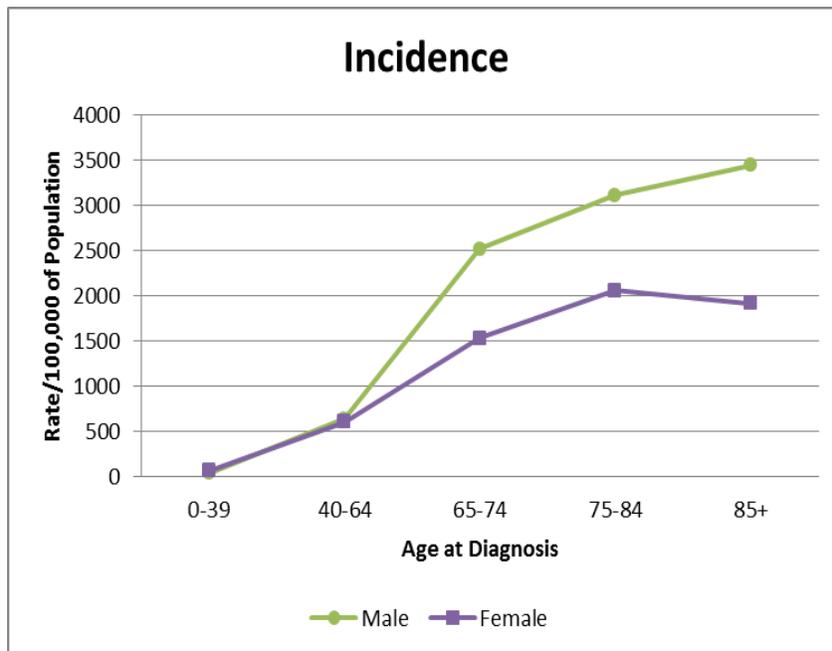


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

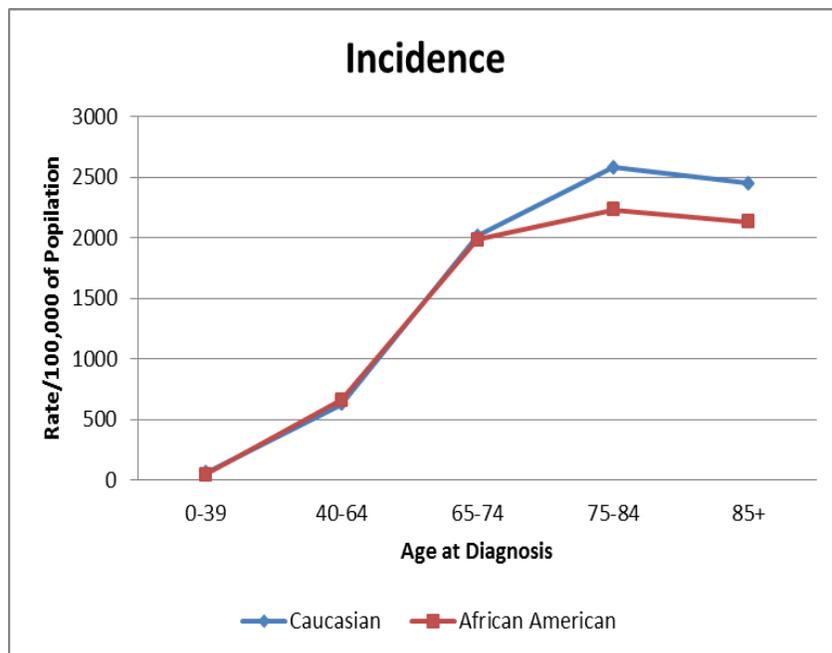
- The peak age for all-site cancer incidence in Delaware is 75-84 years.
- For females the peak age for all-site cancer incidence is 75-84 and for males the peak is age 85 and older.
- Caucasians have a peak age for all-site cancer incidence of 75-84 which is the same for African Americans.

**FIGURE 3-4: AGE-SPECIFIC ALL-SITE CANCER INCIDENCE RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 3-5: AGE-SPECIFIC ALL-SITE CANCER INCIDENCE RATES BY RACE; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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.

**TABLE 3-3: AGE-SPECIFIC ALL-SITE CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	44.9	33.4	72.4	56.5
40-64	628.1	774.9	622.9	575.0
65-74	2506.5	2799.5	1586.4	1352.3
75-84	3198.8	2594.9	2088.5	1996.1
85+	3503.4	3099.9	1935.6	1697.2

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

## MORTALITY

For 2008-2012, Delaware ranked 14<sup>th</sup> in the U.S. for all-site cancer mortality (14<sup>th</sup> in 2007-2011); males ranked 17<sup>th</sup> (17<sup>th</sup> in 2007-2011) and females ranked 9<sup>th</sup> (13<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 9,427 deaths from cancer in Delaware, an average of 1,885 per year.
- Delaware males accounted for 51.9 percent of all-site cancer deaths.
- Caucasians accounted for 82.0 percent of all-site cancer deaths.

**TABLE 3-4: NUMBER OF ALL-SITE CANCER DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	9,427	4,896	4,531	7,733	4,027	3,706	1,536	788	748
Kent	1,746	903	843	1,410	719	691	298	171	127
New Castle	5,129	2,621	2,508	4,060	2,091	1,969	984	483	501
Sussex	2,552	1,372	1,180	2,263	1,217	1,046	254	134	120

Source: Delaware Health Statistics Center, 2015

- In Delaware
  - Males had a significantly lower all-site cancer mortality rate (261.9 per 100,000) compared to females (155.5 per 100,000)

<sup>9</sup> 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/](http://seer.cancer.gov/csr/1975_2012/), based on November 2014 SEER data submission, posted to the SEER web site, April 2015.

- There was no statistically significant difference between the all-site cancer mortality rates for Caucasian (154.6 per 100,000) and African American (165.3 per 100,000) females.
- Caucasian males (213.7 per 100,000) had a significantly lower all-site cancer mortality rate than African American males (243.3 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a significantly higher all-site cancer mortality rate (181.0 per 100,000) than the U.S. (171.2 per 100,000).
  - Both males (207.9 per 100,000) and females (145.4 per 100,000) in the U.S. had significantly lower all-site cancer mortality rates than their counterparts in Delaware (male: 216.9 per 100,000; female: 155.5 per 100,000).
  - Caucasians had a significantly higher all-site cancer mortality rate in Delaware (179.2 per 100,000) compared to Caucasians in the U.S (170.9 per 100,000).
  - African Americans in Delaware (196.7 per 100,000) had a lower all-site cancer mortality rate than African Americans in the U.S. (202.0 per 100,000) but these differences were not statistically significant.

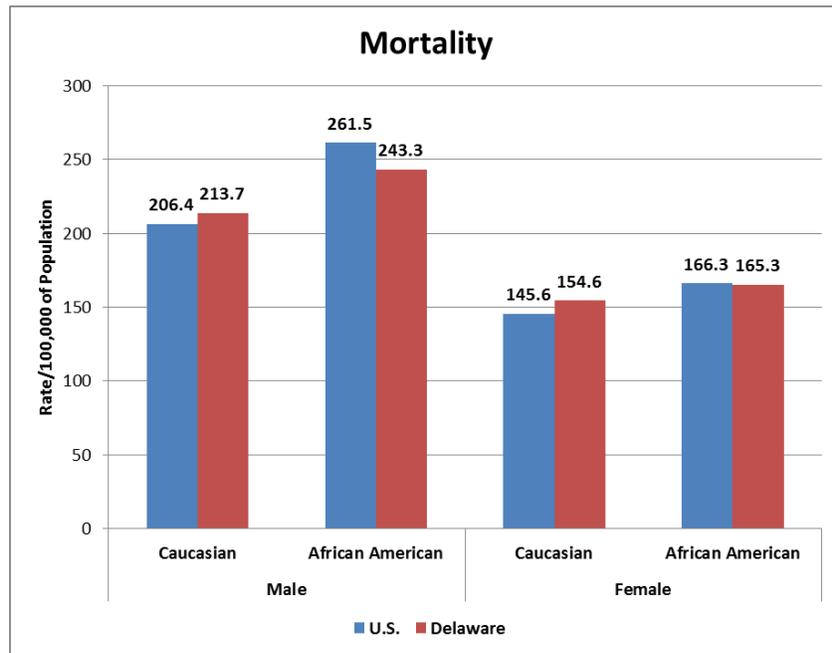
**TABLE 3-5: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	171.2	207.9	145.4
<b>Delaware</b>	181.0	216.9	155.5
Kent	199.0	236.6	172.3
New Castle	182.0	219.0	156.4
Sussex	168.9	203.5	143.5

Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
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 FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

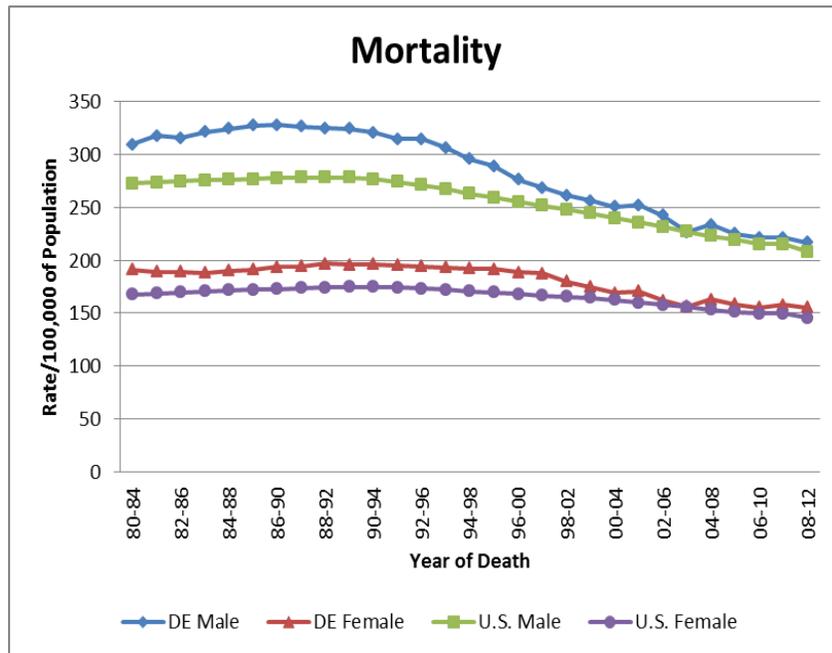


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME – DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Mortality rates for all-site cancer declined by 14 percent in both the U.S. and Delaware.
  - U.S. and Delaware males saw big declines in all-site cancer mortality (16 percent and 17 percent, respectively).
  - U.S. and Delaware females experienced declines in all-site cancer mortality (12 percent and 13 percent, respectively).

**FIGURE 3-7: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

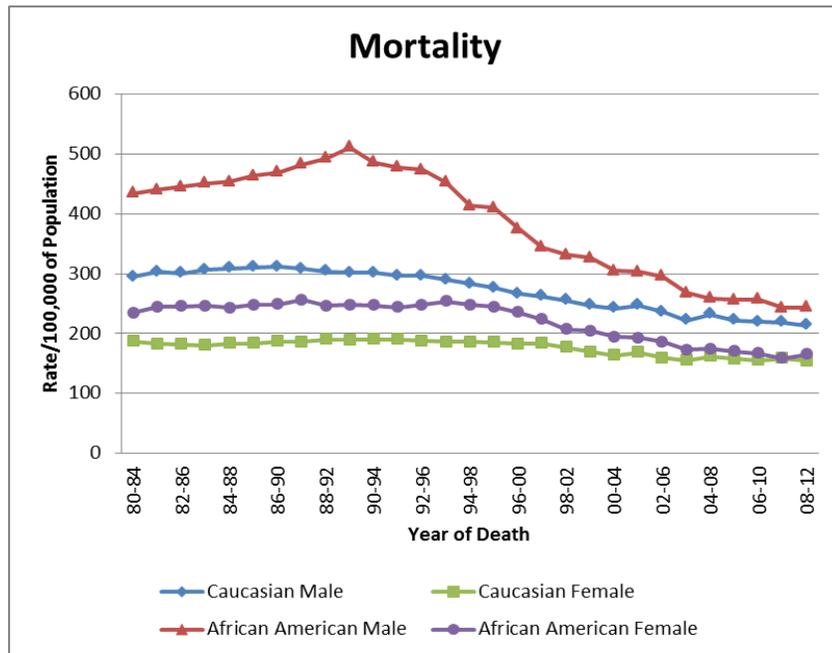


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - 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 20 percent.
  - Caucasian males in Delaware saw a 16 percent decline in the all-site cancer mortality compared to a 13 percent decline among Caucasian females in Delaware.

**FIGURE 3-8: FIVE-YEAR AVERAGE AGE-ADJUSTED ALL-SITE CANCER MORTALITY RATES BY RACE AND SEX; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**AGE-SPECIFIC MORTALITY RATES - DELAWARE**

- 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.

**FIGURE 3-9: AGE-SPECIFIC ALL-SITE CANCER MORTALITY RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

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

**TABLE 3-6: AGE-SPECIFIC ALL-SITE CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	5.2	5.9	7.8	9.1
40-64	165.0	219.1	137.6	163.8
65-74	781.0	1015.3	616.2	563.6
75-84	1553.0	1629.3	1025.6	1144.2
85+	2535.1	2143.1	1400.1	1405.8

Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

## CHAPTER 4: BREAST CANCER (FEMALE)

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### RISK FACTORS

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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 person can modify to reduce their 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 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 one 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 aged 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.

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## EARLY DETECTION

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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 American Cancer Society (ACS) recommends that<sup>10</sup>

- Females age 40-44 should have start annual breast cancer screening if they choose to do so. The risks and potential benefits should be considered.
- Females age 45-54 should get mammograms every year.
- Females age 55 and older should get mammograms every two years or have the choice to continue yearly screening.

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<sup>10</sup>. 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.

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## FEMALE BREAST CANCER SCREENING IN DELAWARE

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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 ACS) 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, 80.1 percent reported having a mammogram within the previous two years, compared to the national median of 73.0 percent of U.S. females age 40 and older. Delaware females ranked third highest nationally for this response.
- In Delaware, the percentage of Caucasian females age 40 and older who reported having a mammogram in the past two years was higher than African American females, but the difference was not significantly different (80.4 percent vs. 78.8 percent, respectively).
- Females age 40 and older in the three highest income categories had the highest percentages of mammography use (82.3 percent for females with an annual income of \$35,000-\$49,999, 81.9

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<sup>10</sup> 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>

percent for females with an annual income of \$50,000-\$74,999, and 86.8 percent for females with an annual income of \$75,000 and over).

- Delaware females (age 40 and older) who were college graduates were more likely to have had a mammogram than those who had some post high school education; this difference was statistically significant.

## INCIDENCE

**For 2008-2012, Delaware ranked 17<sup>th</sup> in the U.S. for female breast cancer incidence (13<sup>th</sup> in 2007-2011)<sup>8</sup>.**

### 2008-2012 DATA

- Female 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; 77 percent were in Caucasian males. While these data are collected only breast cancer in females will be addressed in this section.
- In 2008-2012, there were 3,530 female breast cancer cases (28.2 percent of all cancer cases in females) diagnosed in Delaware.
- Caucasians accounted for 79.6 percent of female breast cancer cases in Delaware.

**TABLE 4-1: NUMBER OF FEMALE BREAST CANCER CASES, BY RACE; DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>Delaware</b>	3,530	2,811	630
Kent	602	463	128
New Castle	2,036	1,556	425
Sussex	892	792	77

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

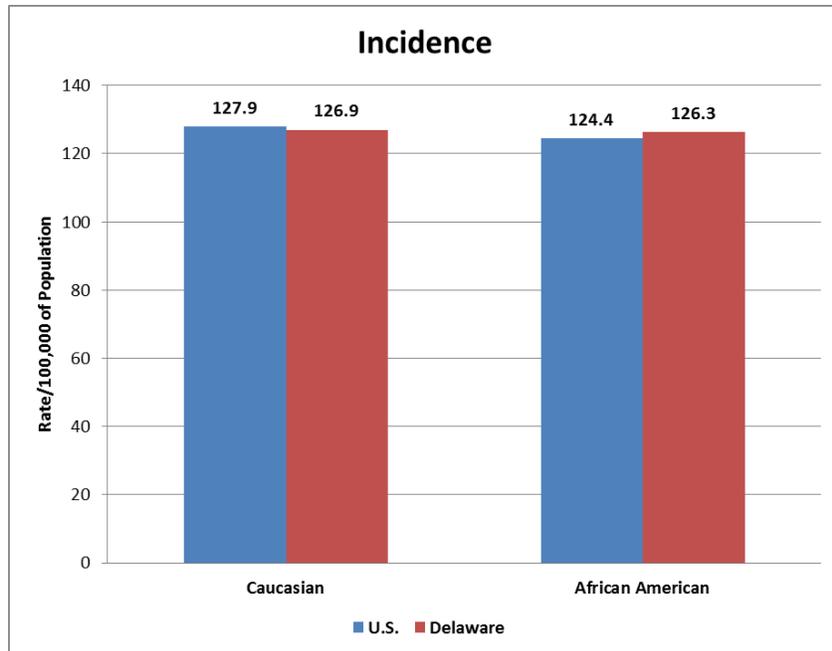
- In Delaware
  - The difference in female breast cancer incidence rates between Caucasians (126.9 per 100,000) and African Americans (126.3 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - The difference in female breast cancer incidence rates between Delaware (126.7 per 100,000) and the U.S. (124.8 per 100,000) was not statistically significant.
  - The difference in female breast cancer incidence rates between Caucasians in Delaware (126.9 per 100,000) the U.S. (127.9 per 100,000) was not statistically significant.
  - There was no statistically significant difference in female breast cancer incidence rates between African Americans in Delaware (126.3 per 100,000) and the U.S. (124.4 per 100,000).

**TABLE 4-2: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>U.S.</b>	124.8	127.9	124.4
<b>Delaware</b>	126.7	126.9	126.3
Kent	125.0	125.6	130.1
New Castle	130.4	132.4	128.6
Sussex	120.2	116.8	115.8

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 4-1: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES BY RACE; U.S. AND DELAWARE, 2008-2012**

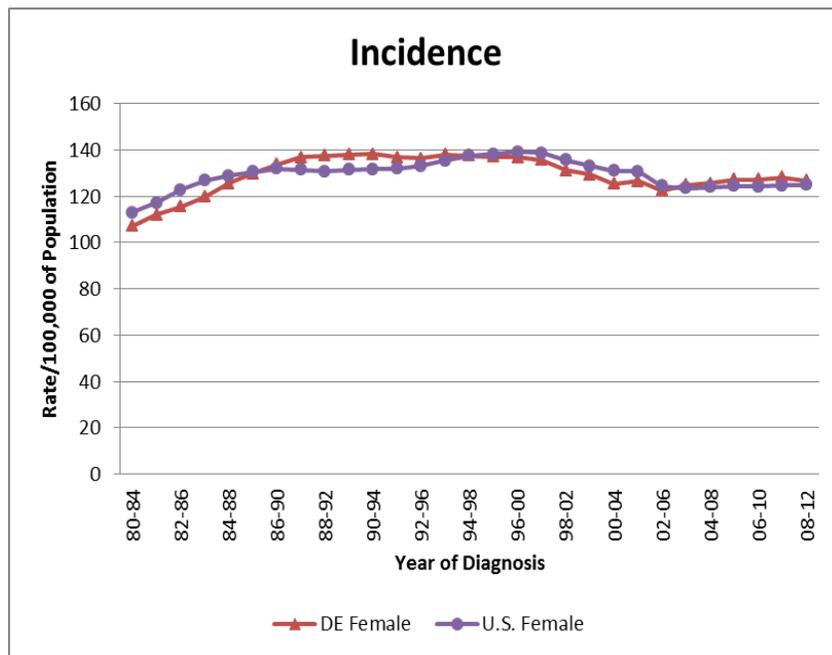


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TRENDS OVER TIME - DELAWARE AND U.S.**

- From 1998-2002 to 2008-2012
  - Incidence rates for female breast cancer declined slightly in both Delaware (3 percent) and the U.S. (8 percent).

**FIGURE 4-2: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES; U.S. AND DELAWARE, 1980-2012**

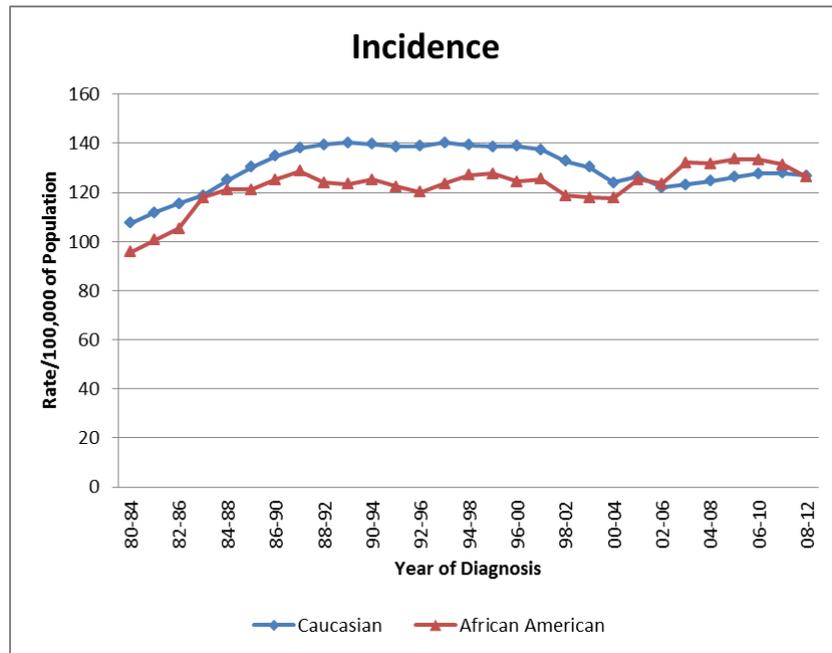


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American females in Delaware saw a 6 percent increase in female breast cancer incidence while Caucasians saw a 4 percent decrease.

**FIGURE 4-3: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2012**

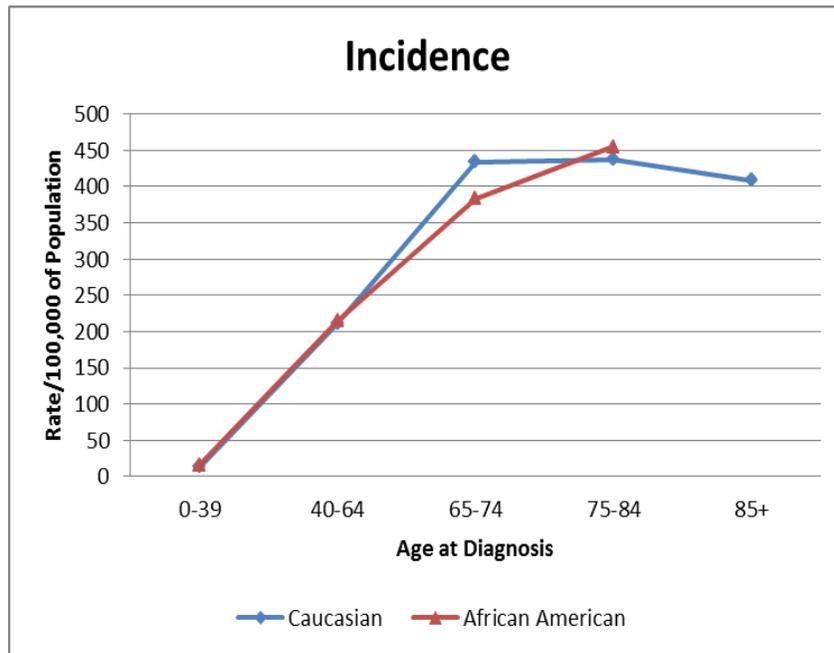


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- 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 who were in the 85 and older age group.

**FIGURE 4-4: AGE-SPECIFIC FEMALE BREAST CANCER INCIDENCE RATES BY RACE; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TABLE 4-3: AGE-SPECIFIC FEMALE BREAST CANCER INCIDENCE RATES BY RACE; DELAWARE, 2008-2012**

Age at Diagnosis	All Females	Caucasian	African American
0-39	15.1	14.2	16.1
40-64	211.9	211.0	214.9
65-74	423.9	434.4	383.8
75-84	433.9	437.3	455.0
85+	403.9	408.6	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

#### STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 2,299 (65.1 percent) breast cancers diagnosed at the local stage; 981 (27.8 percent) at the regional stage; 187 (5.3 percent) at the distant stage; and 63 (1.8 percent) had an unknown stage.
- Caucasians females in Delaware had a higher proportion (66.8 percent) of breast cancer diagnosed at the local stage than African American females in Delaware (58.1 percent).

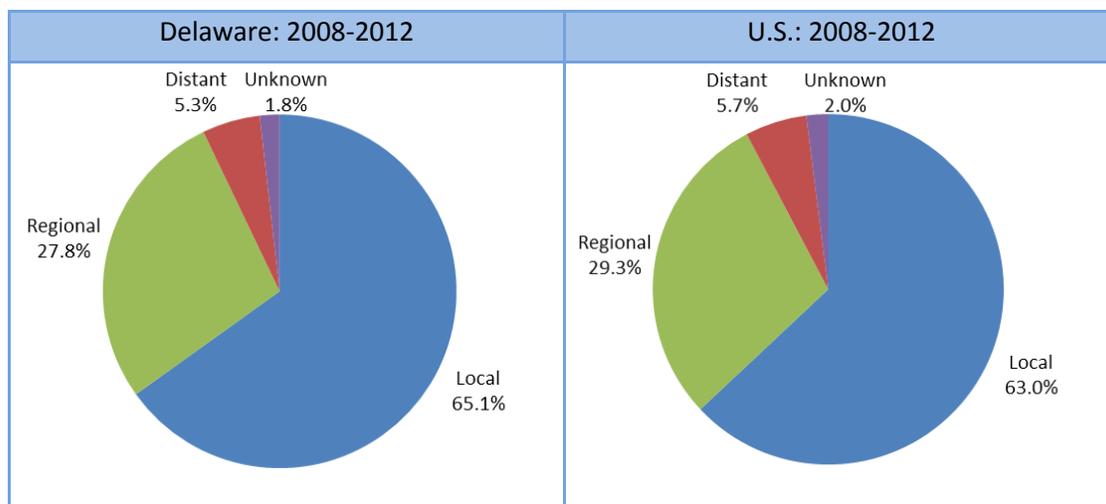
**TABLE 4-4: FEMALE BREAST CANCER CASES BY STAGE AT DIAGNOSIS BY RACE; DELAWARE, 2008-2012**

Stage at Diagnosis	All Females	Caucasian	African American
Local	2,299 (65.1)	1,877 (66.8)	366 (58.1)
Regional	981 (27.8)	745 (26.5)	210 (33.3)
Distant	187 (5.3)	144 (5.1)	38 (6.0)
Unknown	63 (1.8)	45 (1.6)	16 (2.5)
<b>Total</b>	<b>3,530</b>	<b>2,811</b>	<b>630</b>

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

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

**FIGURE 4-5: DISTRIBUTION OF FEMALE BREAST CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**

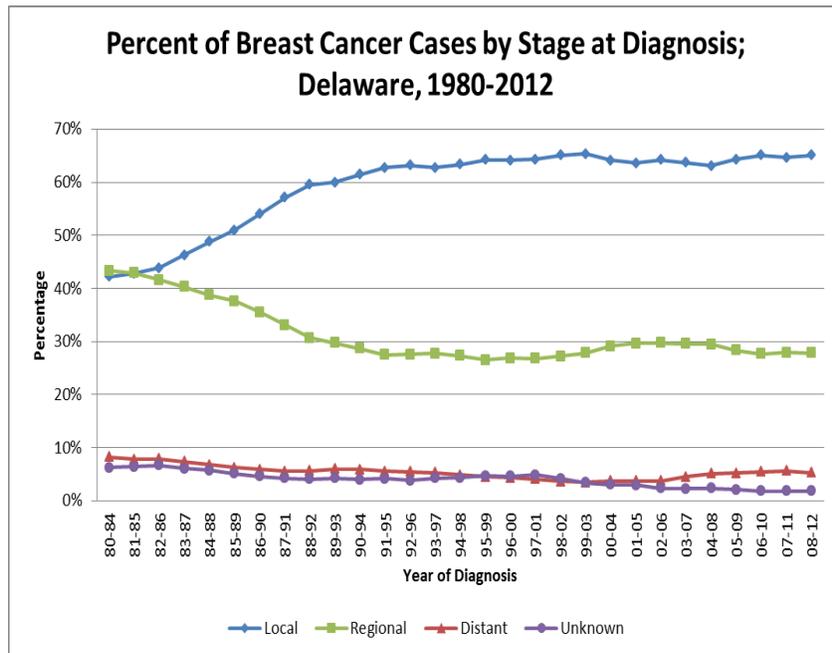


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of female breast cancer cases diagnosed at the local stage increased from 42.2 percent to 65.1 percent.
  - Cases diagnosed at the distant stage decreased from 8.2 percent to 5.3 percent.

**FIGURE 4-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR FEMALE BREAST CANCER CASES; DELAWARE, 1980-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 23<sup>rd</sup> in the U.S. for female breast cancer mortality (17<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- Female 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 2008 through 2012 (5 deaths in Caucasian males; one African American male death). Male deaths due to breast cancer are not included in this section.
- In 2008-2012, there were 635 female deaths (14.0 percent of all female cancer deaths) from breast cancer.
- Caucasian females accounted for 79.1 percent of breast cancer deaths in Delaware.

**TABLE 4-5: NUMBER OF FEMALE BREAST CANCER DEATHS, BY RACE; DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>Delaware</b>	635	502	124
Kent	128	99	26
New Castle	352	267	79
Sussex	155	136	19

Source: Delaware Health Statistics Center, 2015

- In Delaware
  - There was no statistically significant difference between the female breast cancer mortality rates for Caucasians (21.4 per 100,000) and African Americans (26.2 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware’s female breast cancer mortality rate (22.0 per 100,000) was not statistically different from the U.S. rate (21.9 per 100,000).
  - There was no statistically significant difference between the female breast cancer mortality rates for Caucasians in Delaware (21.4 per 100,000) compared to Caucasians in the U.S (21.3 per 100,000).
  - African Americans in Delaware (26.2 per 100,000) had a lower female breast cancer mortality rate than African Americans in the U.S. (30.2 per 100,000) but these differences were not statistically significant.

**TABLE 4-6: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>U.S.</b>	21.9	21.3	30.2
<b>Delaware</b>	22.0	21.4	26.2
Kent	26.5	26.4	27.3
New Castle	21.8	21.2	25.7
Sussex	19.7	19.1	---

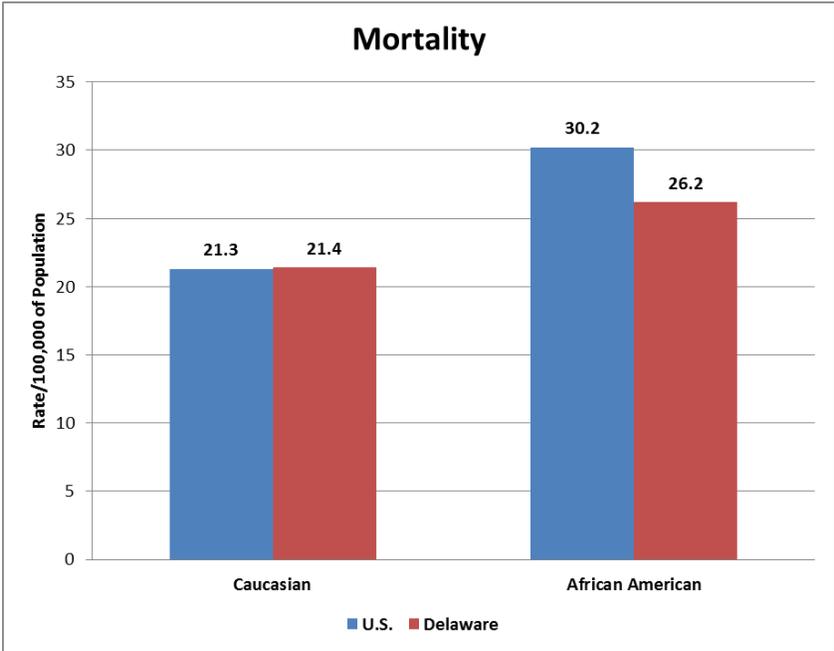
Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

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 4-7: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES BY RACE; U.S. AND DELAWARE, 2008-2012**

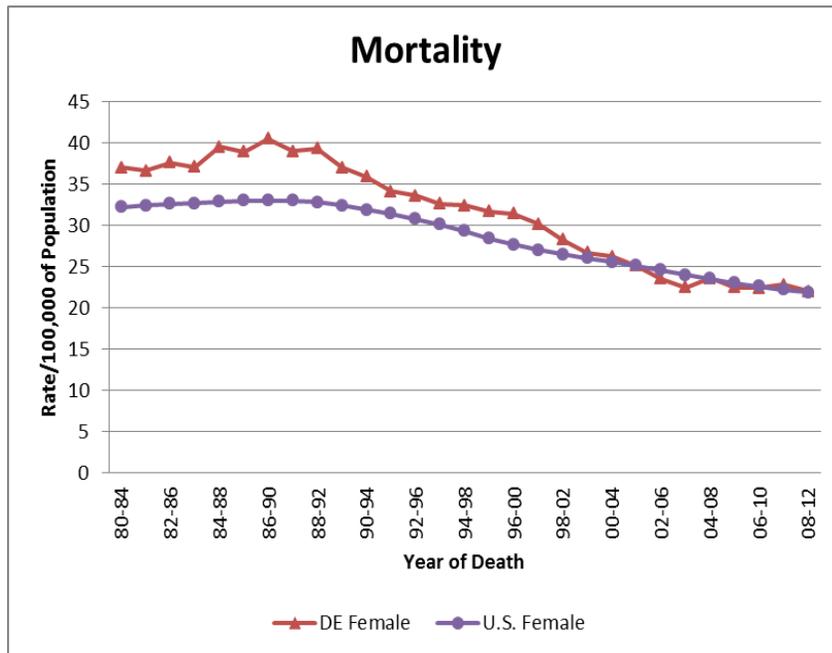


Source (Delaware): Delaware Health Statistics Center, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TRENDS OVER TIME – DELAWARE AND U.S.**

- From 1998-2002 to 2008-2012
  - Mortality rates for female breast cancer declined 22 percent in Delaware and 17 percent in the U.S.

**FIGURE 4-8: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES; U.S. AND DELAWARE, 1980-2012**

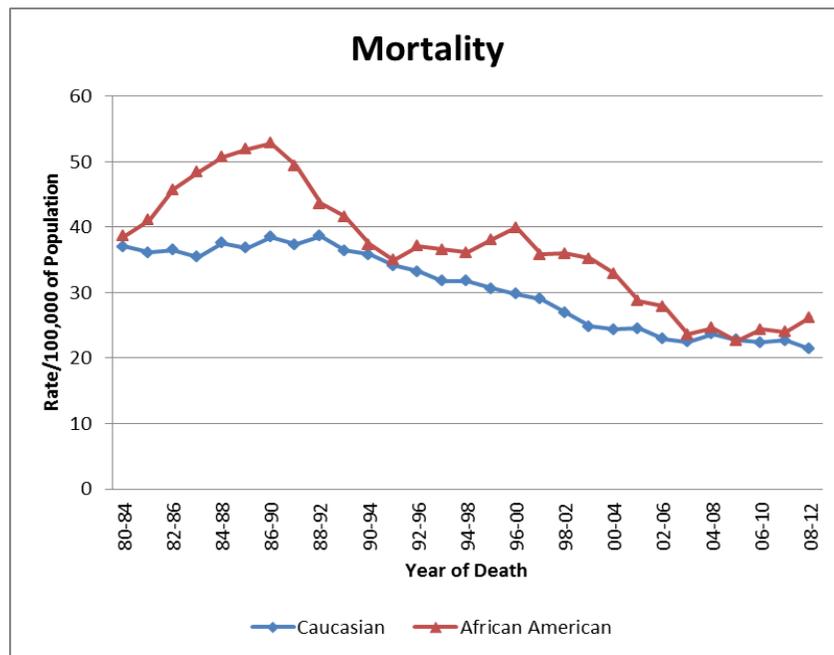


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American females in Delaware saw a 27 percent decline in breast cancer mortality while Caucasians saw a 21 percent decline in mortality.

**FIGURE 4-9: FIVE-YEAR AVERAGE AGE-ADJUSTED FEMALE BREAST CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC MORTALITY RATES - DELAWARE

- 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.

**TABLE 4-7: AGE-SPECIFIC FEMALE BREAST CANCER MORTALITY RATES BY RACE; DELAWARE, 2008-2012**

Age at Death	All Females	Caucasian	African American
0-39	---	---	---
40-64	28.8	27.0	36.6
65-74	70.0	71.7	---
75-84	109.5	105.4	---
85+	177.4	169.9	---

Source: Delaware Health Statistics Center, 2015  
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

## CHAPTER 5: COLORECTAL CANCER

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### RISK FACTORS

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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 1<sup>st</sup>-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, 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

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The American Cancer Society's (ACS) 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<sup>11</sup>:

- 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

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

## COLORECTAL CANCER SCREENING IN DELAWARE

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

- Delaware ranked fifth highest in the prevalence (76.5 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 69.4 percent.
- The percentage of Delawareans who have ever had a colonoscopy or sigmoidoscopy increased with age. Significantly more Delawareans ages 60-64 and 65+ (78.6 percent and 85.5 percent, respectively) reported ever having had a colonoscopy or sigmoidoscopy, compared to those ages 50-59 (55.2 percent).
- The proportion of Caucasians age 50 and older in Delaware who had ever had a colonoscopy or sigmoidoscopy (78.4 percent) was higher than that for African Americans in Delaware (69.5 percent). However, this difference was not statistically significant.
- In Delaware, the proportion of adults ages 50 and over who had ever had a colonoscopy or sigmoidoscopy increased by level of education.
- 27.0 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 (73.0 percent for Delaware vs. 55.2 percent for the U.S.).

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<sup>11</sup> Detailed screening guidelines for colorectal cancer:

<http://www.cancer.org/Cancer/ColonandRectumCancer/MoreInformation/ColonandRectumCancerEarlyDetection/colorectal-cancer-early-detection-acs-recommendations>

## INCIDENCE

For 2008-2012, Delaware ranked 36<sup>th</sup> in the U.S. for colorectal cancer incidence (28<sup>th</sup> in 2007-2011); males ranked 36<sup>th</sup> (27<sup>th</sup> in 2007-2011) and females ranked 37<sup>th</sup> (31<sup>st</sup> in 2007-2011)<sup>8</sup>.

### 2008-2012 DATA

- Colorectal cancer is the third most commonly diagnosed cancer in the U.S. and Delaware.
- In 2008-2012, there were 2,074 colorectal cancer cases (7.9 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 51.4 percent of colorectal cancer cases.
- Delaware Caucasians accounted for 81.5 percent of colorectal cancer cases.

**TABLE 5-1: NUMBER OF COLORECTAL CANCER CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	2,074	1,065	1,009	1,691	877	814	344	167	177
Kent	378	186	192	192	149	149	73	34	39
New Castle	1,111	572	539	539	448	414	226	111	115
Sussex	585	307	278	278	280	251	45	22	23

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

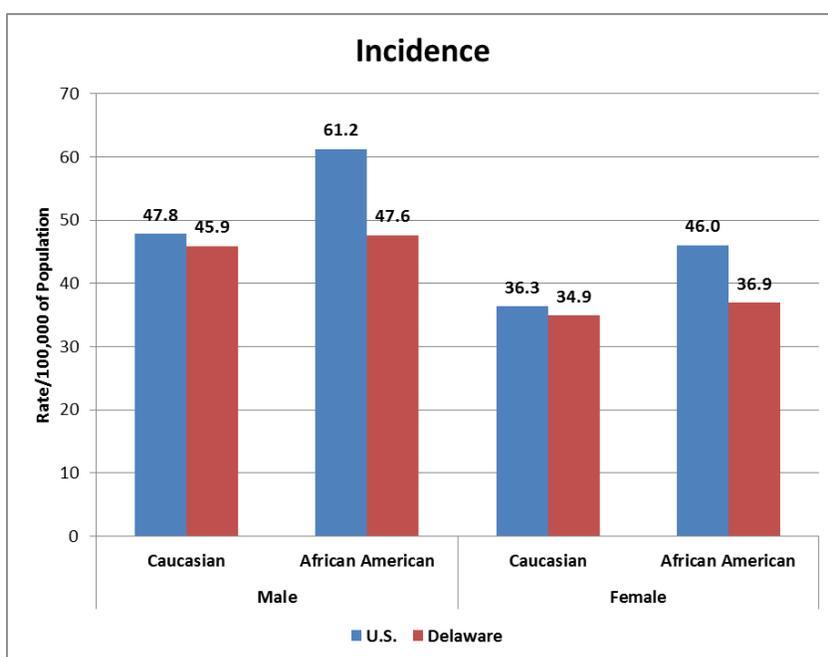
- In Delaware
  - The difference in incidence rates between Caucasians (39.9 per 100,000) and African Americans (41.4 per 100,000) was not statistically significant.
  - The difference in incidence rates between Caucasian females (34.9 per 100,000) and African American females (36.9 per 100,000) was not statistically significant.
  - The difference in incidence rates between Caucasian males (45.9 per 100,000) and African American males (47.6 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware had a significantly lower incidence rate (39.9 per 100,000) than the U.S. (42.4 per 100,000).
  - Delaware males (45.8 per 100,000) and females (35.1 per 100,000) did not have incidence rates that were statistically different from U.S. males (48.9 per 100,000) and females (37.1 per 100,000).
  - The incidence rate for Caucasians in Delaware (39.9 per 100,000) was not statistically different from the incidence rate for Caucasians in the U.S. (41.5 per 100,000).
  - African Americans in Delaware (41.4 per 100,000) had a significantly lower incidence rate than African Americans in the U.S. (52.3 per 100,000).

**TABLE 5-2: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	42.4	48.9	37.1
<b>Delaware</b>	39.9	45.8	35.1
Kent	43.4	48.0	39.8
New Castle	39.3	45.6	34.1
Sussex	39.8	46.0	34.4

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 5-1: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

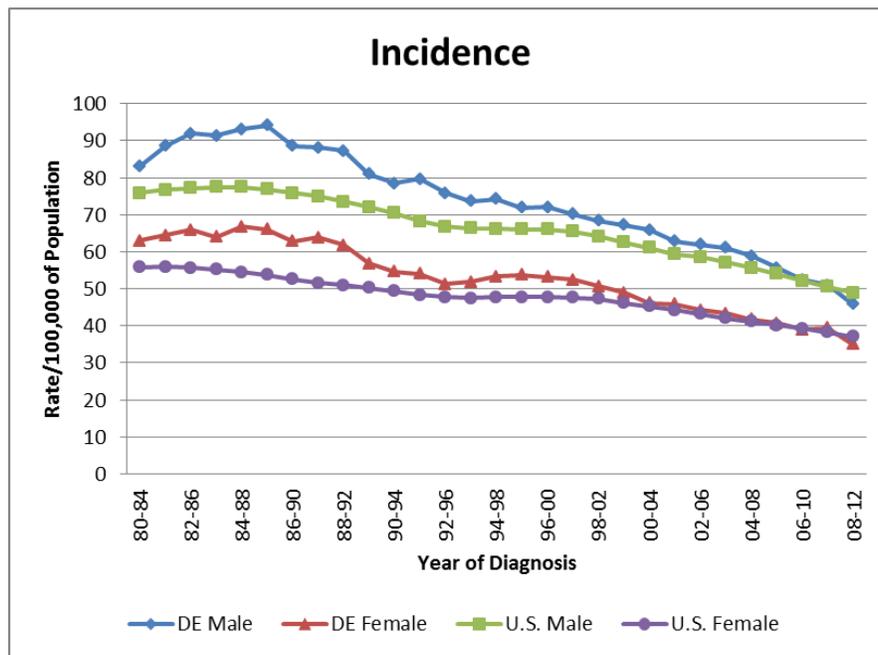


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Incidence rates for colorectal cancer declined 32 percent in Delaware and 22 percent in the U.S.
  - Delaware and U.S. males saw big declines in colorectal cancer incidence (33 percent and 24 percent, respectively).
  - Delaware and U.S. females saw big declines in colorectal cancer incidence (31 percent and 22 percent, respectively).

**FIGURE 5-2: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

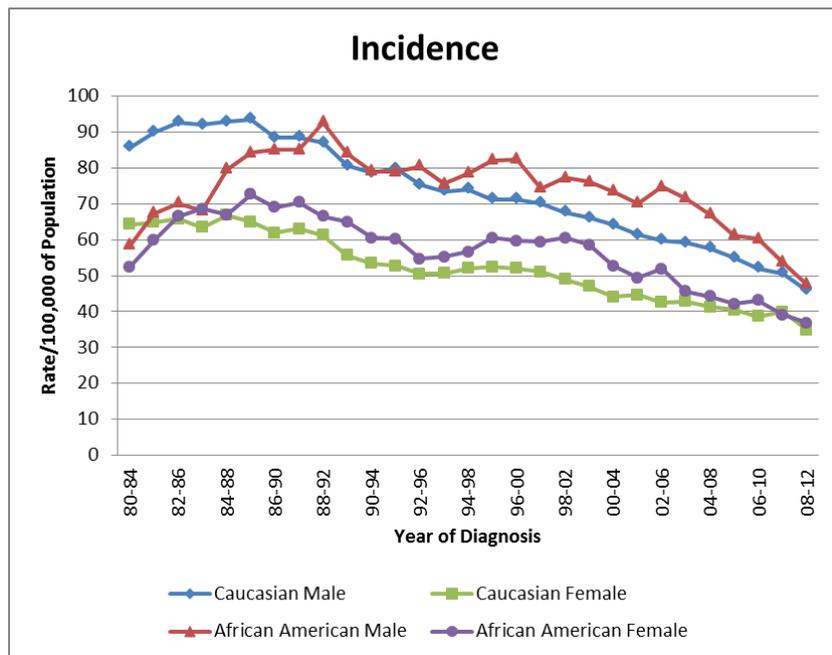


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American males and females in Delaware saw a sharp decline in colorectal cancer incidence (38 percent and 39 percent, respectively).
  - Caucasian males saw a 32 percent decline in colorectal cancer incidence and Caucasian females saw a decline of 29 percent in the same time period.

**FIGURE 5-3: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER INCIDENCE RATES BY RACE AND SEX; DELAWARE, 1980-2012**

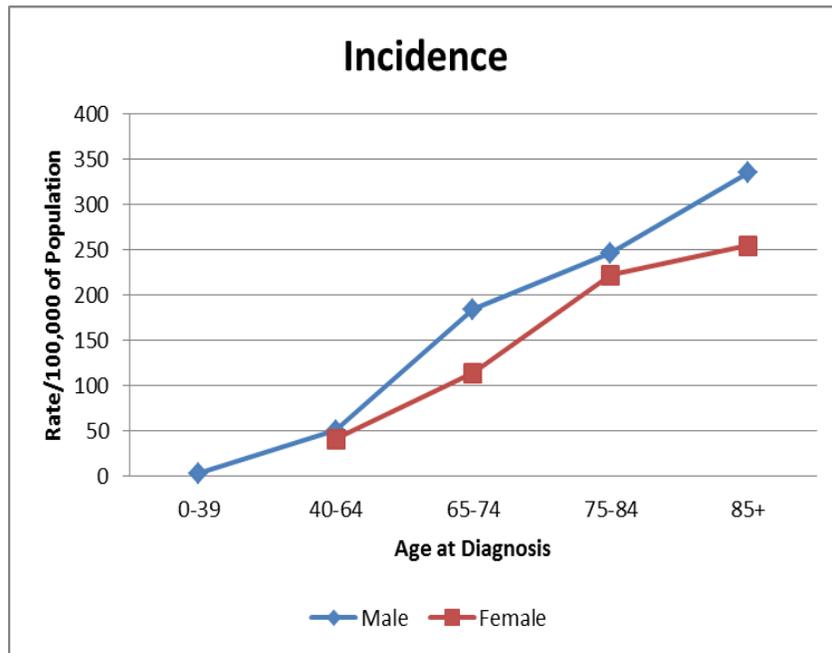


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- 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.

**FIGURE 5-4: AGE-SPECIFIC COLORECTAL CANCER INCIDENCE RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- 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 for African American males and females and for Caucasian females aged 0-39.

**TABLE 5-3: AGE-SPECIFIC COLORECTAL CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	3.6	---	---	---
40-64	50.6	52.8	40.1	49.3
65-74	183.0	207.4	113.7	132.9
75-84	249.3	---	229.3	183.6
85+	334.5	---	258.1	----

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

### STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 797 (38.4 percent) colorectal cancers diagnosed at the local stage; 727 (35.1 percent) at the regional stage; 432 (20.8 percent) at the distant stage; and 118 (5.7 percent) had an unknown stage.

- African Americans had a higher proportion of colorectal cancers (41.2 percent) diagnosed at the local stage than Caucasians (37.7 percent).
- Males also had more colorectal cancers diagnosed at the local stage (39.6 percent) than females (37.2 percent). African American males had the highest proportion diagnosed at the local stage (46.1 percent), compared to African American females (36.7 percent).

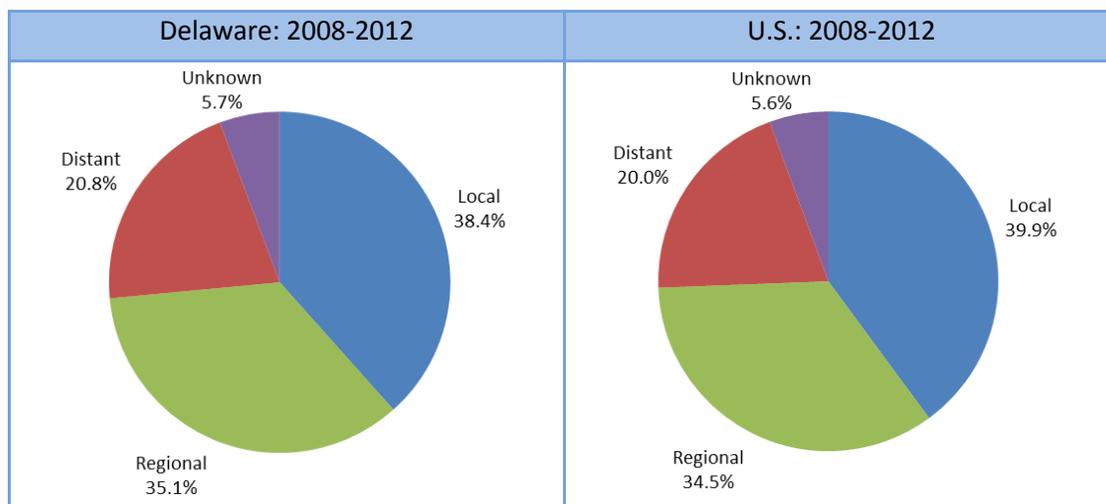
**TABLE 5-4: COLORECTAL CANCER CASES BY STAGE AT DIAGNOSIS BY RACE AND SEX; DELAWARE, 2008-2012**

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Local</b>	797 (38.4)	422 (39.6)	375 (37.2)	638 (37.7)	334 (38.1)	304 (37.3)	142 (41.2)	77 (46.1)	65 (36.7)
<b>Regional</b>	727 (35.1)	365 (34.3)	362 (35.9)	600 (35.5)	307 (35.0)	293 (36.0)	114 (33.1)	52 (31.1)	62 (35.0)
<b>Distant</b>	432 (20.8)	224 (21.0)	208 (20.6)	360 (21.3)	192 (21.9)	168 (20.6)	64 (18.6)	29 (17.4)	35 (19.8)
<b>Unknown</b>	118 (5.7)	54 (5.1)	64 (6.3)	93 (5.5)	44 (5.0)	49 (6.0)	24 (7.0)	9 (5.4)	15 (8.5)
<b>Total</b>	2,074	1,065	1,009	1,691	877	814	344	167	177

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

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

**FIGURE 5-5: DISTRIBUTION OF COLORECTAL CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**



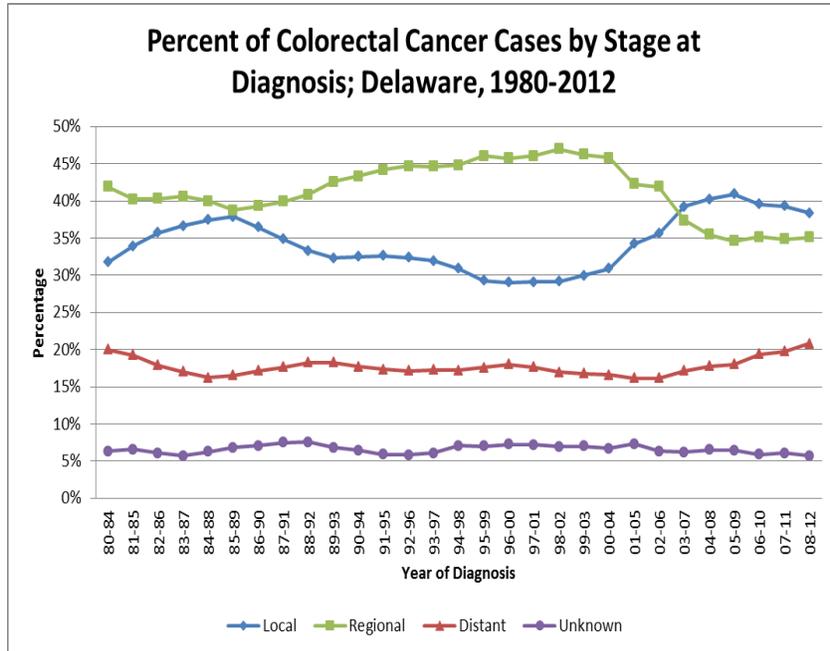
Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of colorectal cancer cases diagnosed at the local stage increased from 31.7 percent to 38.4 percent.

- Colorectal cancer cases diagnosed at the distant stage increased slightly, from 20.0 percent to 20.8 percent.

**FIGURE 5-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR COLORECTAL CANCER CASES; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 37<sup>th</sup> in the U.S. for colorectal cancer mortality (27<sup>th</sup> in 2007-2011); males ranked 35<sup>th</sup> (29<sup>th</sup> in 2007-2011) and females ranked 39<sup>th</sup> (27<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- Colorectal cancer is the third most common cause of cancer death in the U.S. and Delaware.
- In 2008-2012, there were 785 deaths (8.3 percent of all cancer deaths) from colorectal cancer.
- Delaware Caucasians accounted for 79.4 percent of colorectal cancer deaths.

**TABLE 5-5: NUMBER OF COLORECTAL CANCER DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	785	395	363	623	326	297	120	58	62
Kent	142	80	62	114	62	52	26	17	9
New Castle	420	210	210	332	170	162	78	33	45
Sussex	196	105	91	177	94	83	16	8	8

Source: Delaware Health Statistics Center, 2015

- In Delaware
  - Males had a significantly higher colorectal cancer mortality rate (17.5 per 100,000) compared to females (12.2 per 100,000)
  - There was no statistically significant difference between the colorectal cancer mortality rates for Caucasian females (16.8 per 100,000) and African American females (14.4 per 100,000) females.
  - There was no significant difference between mortality rates for Caucasian males (17.4 per 100,000) and African American males (16.8 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a lower colorectal cancer mortality rate (14.6 per 100,000) than the U.S. (15.5 per 100,000); this difference was not statistically significant.
  - Both males (18.6 per 100,000) and females (13.1 per 100,000) in the U.S. had higher colorectal cancer mortality rates than their counterparts in Delaware (male: 17.5 per 100,000; female: 12.2 per 100,000); the differences were not statistically significant.
  - Caucasians had a lower colorectal cancer mortality rate in Delaware (14.5 per 100,000) compared to Caucasians in the U.S. (15.0 per 100,000); this difference was not statistically significant.
  - African Americans in Delaware (15.6 per 100,000) had a significantly lower colorectal cancer mortality rate than African Americans in the U.S. (21.4 per 100,000).

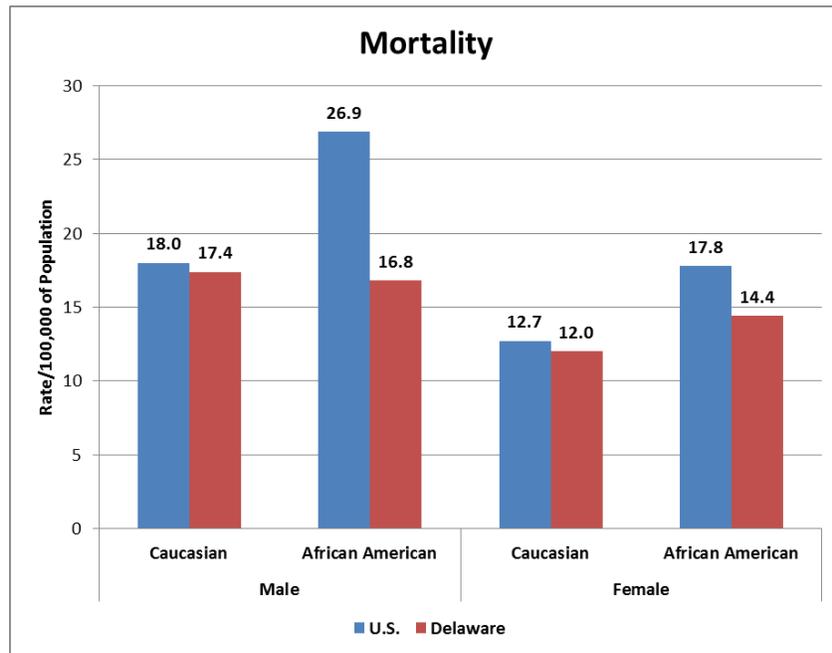
**TABLE 5-6: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	15.5	18.6	13.1
<b>Delaware</b>	14.6	17.5	12.2
Kent	16.2	20.4	12.6
New Castle	14.9	17.5	12.8
Sussex	13.2	15.9	10.8

Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 5-7: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

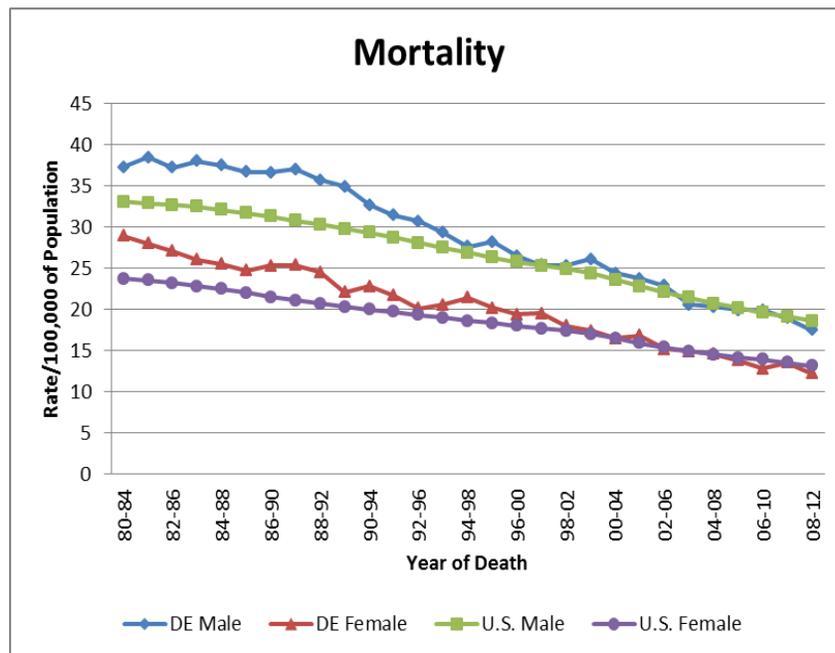


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME – DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Mortality rates for colorectal cancer declined 30 percent in Delaware and 24 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 25 percent.
  - U.S. female colorectal cancer decreased by 25 percent and the Delaware female colorectal cancer mortality rate declined by 32 percent.

**FIGURE 5-8: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

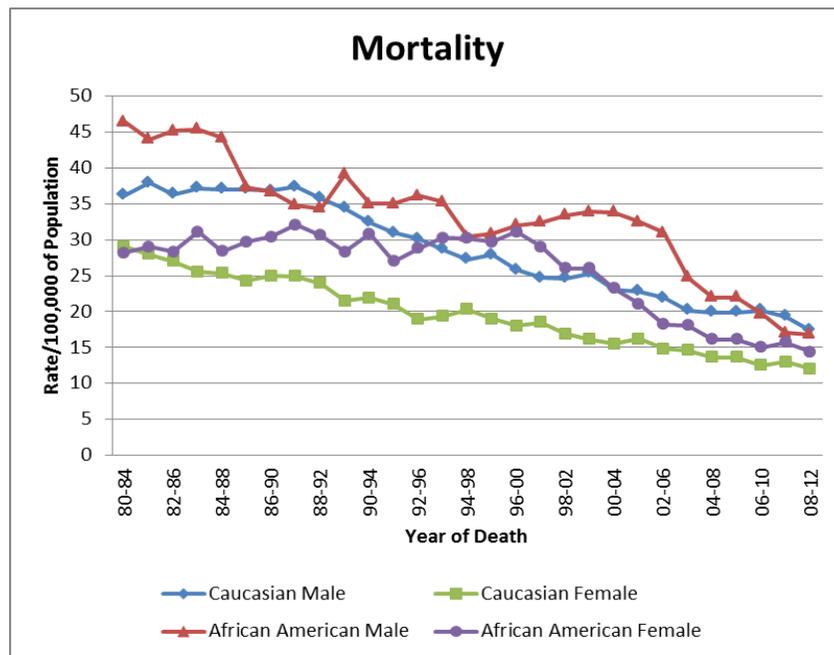


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American males and females in Delaware saw huge declines in colorectal cancer mortality (50 percent and 45 percent, respectively).
  - Caucasian males and females both saw a 29 percent decline in the colorectal cancer mortality rate during the same time period.

**FIGURE 5-9: FIVE-YEAR AVERAGE AGE-ADJUSTED COLORECTAL CANCER MORTALITY RATES BY RACE AND SEX; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC MORTALITY RATES - DELAWARE

- 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.

**FIGURE 5-10: AGE-SPECIFIC COLORECTAL CANCER MORTALITY RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- 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.

**TABLE 5-7: AGE-SPECIFIC COLORECTAL CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	15.9	18.0	8.1	---
65-74	58.6	---	42.4	---
75-84	113.6	---	82.0	---
85+	211.3	---	189.3	---

Source: Delaware Health Statistics Center, 2015  
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

## CHAPTER 6: LUNG AND BRONCHUS CANCER<sup>12</sup>

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### RISK FACTORS

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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, 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

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In January 2013, the American Cancer Society (ACS) published new lung cancer screening guidelines<sup>13</sup> 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 aged 55 to 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.

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<sup>12</sup> "Lung cancer" is used instead of "lung and bronchus cancer" throughout this chapter.

<sup>13</sup> Wender R, et al. American Cancer Society Lung Cancer Screening Guidelines. Published early online January 11, 2013 in *CA: A Cancer Journal for Clinicians*

## CURRENT TRENDS IN SMOKING IN DELAWARE

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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 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, 19.9 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 (19.9 percent) is close to the 2014 U.S. median prevalence of 18.2 percent.
- Delaware males are more likely to report being current smokers (23.5 percent) than females. This prevalence rate is significantly higher than the rate among females in Delaware (16.6 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 (28.9 percent). This rate was significantly higher than that for Delawareans ages 55-64 and 65 and older.
- Current smoking prevalence decreased with education level. In Delaware, 40.3 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 24.4 percent for those with a high school diploma or equivalent, 15.3 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, 40.4 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 (12.6 percent).

## INCIDENCE

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**For 2008-2012, Delaware ranked 12<sup>th</sup> in the U.S. for lung cancer incidence (12<sup>th</sup> in 2007-2011); males ranked 16<sup>th</sup> (16<sup>th</sup> in 2007-2011) and females ranked 7<sup>th</sup> (7<sup>th</sup> in 2007-2011)<sup>8</sup>.**

## 2008-2012 DATA

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- Lung cancer is the most frequently diagnosed cancer in the U.S. and Delaware.
- In 2008-2012, there were 3,789 lung cancer cases (14.4 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 51.6 percent of lung cancer cases.
- Caucasians accounted for 84.5 percent of lung cancer cases.

**TABLE 6-1: NUMBER OF LUNG CANCER CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	3,789	1,956	1,833	3,201	1,635	1,566	542	298	244
Kent	721	376	345	593	304	289	115	65	50
New Castle	1,890	967	923	1,533	771	762	342	188	154
Sussex	1,178	613	565	1,075	560	515	85	45	45

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

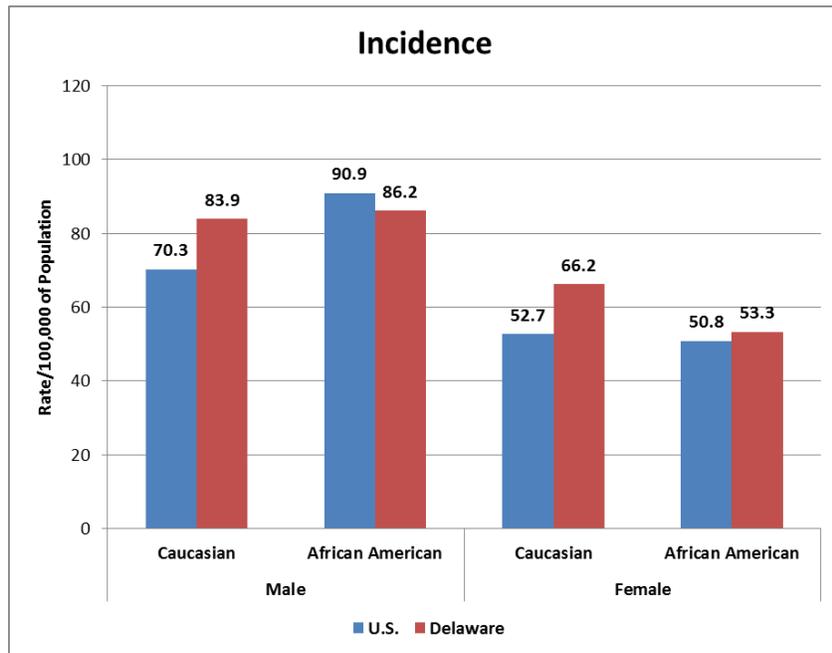
- In Delaware
  - The difference in lung cancer incidence rates between Caucasians (73.7 per 100,000) and African Americans (66.9 per 100,000) was not statistically significant.
  - Caucasian females (66.2 per 100,000) had a significantly higher lung cancer incidence rate than African American females (53.3 per 100,000).
  - The difference in lung cancer incidence rates between Caucasian males (83.9 per 100,000) and African American males (86.2 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware (72.1 per 100,000) had a significantly higher lung cancer incidence rate than the U.S. (58.7 per 100,000).
  - Delaware males (83.8 per 100,000) and females (63.5 per 100,000) had significantly higher lung cancer incidence rates than U.S. males (70.1 per 100,000) and females (50.2 per 100,000), respectively.
  - Caucasians in Delaware (73.7 per 100,000) had a significantly higher lung cancer incidence rate than Caucasians in the U.S. (60.2 per 100,000).
  - There was no statistically significant difference in lung cancer incidence between African Americans in Delaware (66.9 per 100,000) and the U.S. (67.0 per 100,000).

**TABLE 6-2: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	58.7	70.1	50.2
<b>Delaware</b>	72.1	83.8	63.5
<b>Kent</b>	81.0	95.8	70.3
<b>New Castle</b>	67.4	79.1	58.9
<b>Sussex</b>	75.5	85.0	68.3

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 6-1: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

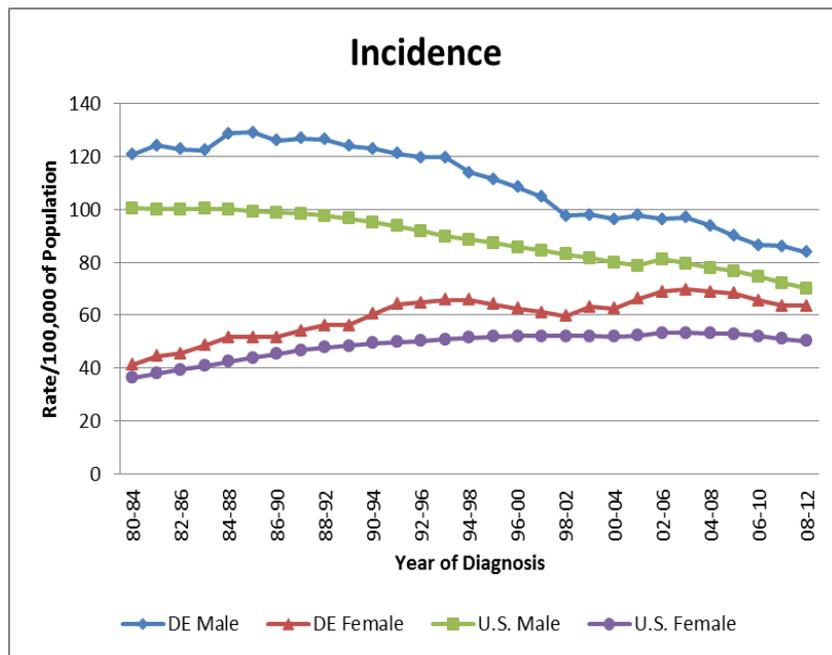


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Incidence rates for lung cancer declined 5 percent in Delaware and 10 percent in the U.S.
  - Delaware males saw big declines in incidence (14 percent), along with the U.S. male lung incidence rate which declined 16 percent.
  - U.S. female lung cancer incidence rates saw a slight decline of 4 percent and Delaware female lung cancer incidence rates saw an increase of 7 percent.

**FIGURE 6-2: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

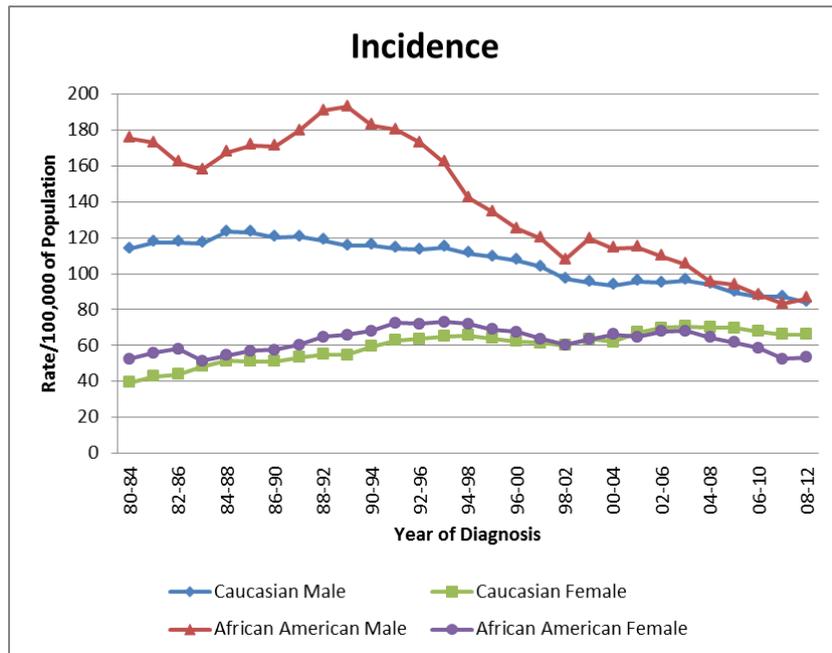


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American males in Delaware saw the sharpest decline in lung cancer incidence (20 percent); African American females had similar results with the lung cancer incidence rate declining 11 percent.
  - Caucasian males saw a 14 percent decline in lung cancer incidence; Caucasian females had different outcomes with lung cancer incidence increasing by 10 percent in the same time period.

**FIGURE 6-3: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER INCIDENCE RATES BY RACE AND SEX; DELAWARE, 1980-2012**

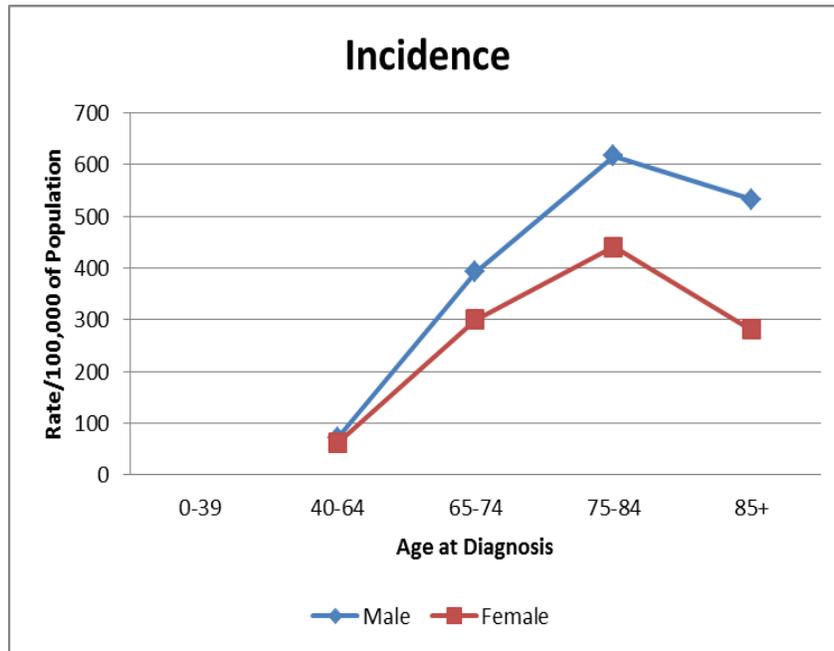


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- 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.

**FIGURE 6-4: AGE-SPECIFIC LUNG CANCER INCIDENCE RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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 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.

**TABLE 6-3: AGE-SPECIFIC LUNG CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	67.3	94.2	64.5	60.6
65-74	397.6	402.8	328.4	177.9
75-84	634.1	530.2	443.4	435.1
85+	545.8	---	298.9	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

## STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 719 (19.0 percent) lung cancers diagnosed at the local stage; 824 (21.7 percent) at the regional stage; 2,030 (53.6 percent) at the distant stage; and 216 (5.7 percent) had an unknown stage.
- African Americans had a higher proportion (56.8 percent) diagnosed at the distant stage than Caucasians (53.2 percent).
- Males also had more diagnosed at the distant stage (56.2 percent) than females (50.7 percent).

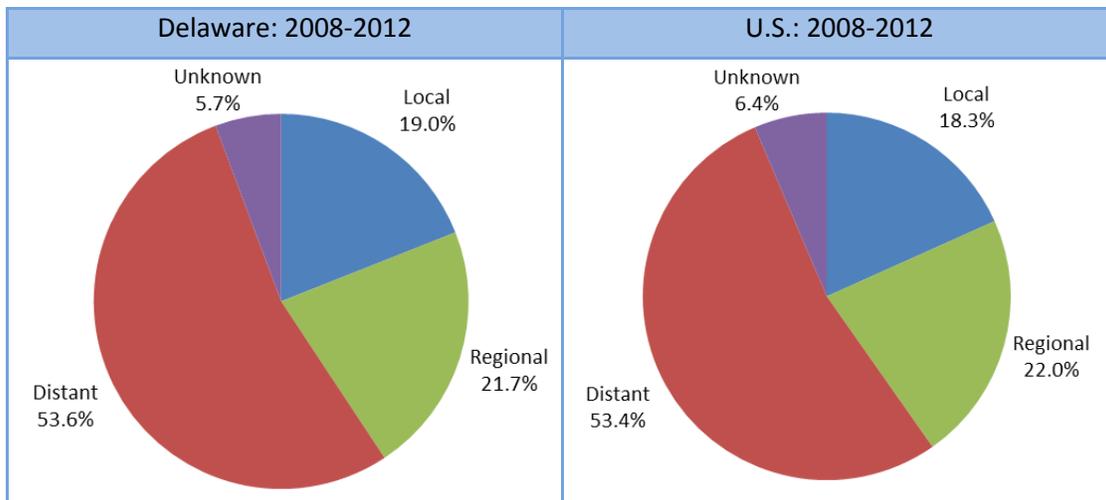
**TABLE 6-4: LUNG CANCER CASES BY STAGE AT DIAGNOSIS BY RACE AND SEX; DELAWARE, 2008-2012**

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Local</b>	719 (19.0)	329 (16.8)	390 (21.3)	627 (19.6)	281 (17.2)	346 (22.1)	76 (14.0)	---	---
<b>Regional</b>	824 (21.7)	400 (20.5)	424 (23.1)	687 (21.5)	334 (20.4)	353 (22.5)	129 (23.8)	61 (20.5)	68 (27.9)
<b>Distant</b>	2,030 (53.6)	1,100 (56.2)	930 (50.7)	1,703 (53.2)	919 (56.2)	784 (50.1)	308 (56.8)	170 (57.0)	138 (56.6)
<b>Unknown</b>	216 (5.7)	127 (6.5)	89 (4.8)	184 (5.7)	101 (6.2)	83 (5.3)	29 (5.4)	---	---
<b>Total</b>	3,789	1,956	1,833	3,201	1,635	1,566	542	273	240

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Counts less than 6 are not shown to protect patient privacy

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

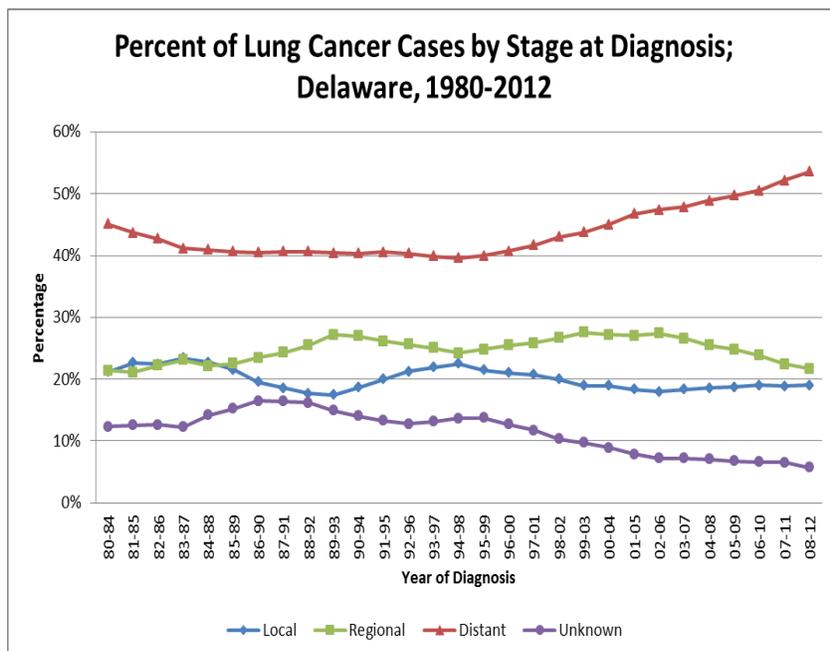
**FIGURE 6-5: DISTRIBUTION OF LUNG CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of lung cancer cases diagnosed at the local stage decreased from 21.2 percent to 19.0 percent.
  - Lung cancer cases diagnosed at the distant stage increased from 45.1 percent to 53.6 percent.

**FIGURE 6-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR LUNG CANCER CASES; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 12<sup>th</sup> in the U.S. for lung cancer mortality (12<sup>th</sup> in 2007-2011); males ranked 16<sup>th</sup> (12<sup>th</sup> in 2007-2011) and females ranked 5<sup>th</sup> (4<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- Lung cancer is the most common cause of cancer death in the U.S. and Delaware.
- In 2008-2012, there were 2,830 deaths (30.0 percent of all cancer deaths) from lung cancer.
- Caucasians accounted for 84.8 percent of lung cancer deaths.

**TABLE 6-5: NUMBER OF LUNG CANCER DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	2,830	1,515	1,315	2,400	1,274	1,126	394	225	169
Kent	528	294	234	442	244	198	75	47	28
New Castle	1,466	768	698	1,193	614	579	256	145	111
Sussex	836	453	383	765	416	349	63	33	30

Source: Delaware Health Statistics Center, 2015

- In Delaware
  - Males had a significantly higher lung cancer mortality rate (65.9 per 100,000) compared to females (45.1 per 100,000)
  - Caucasian females had a significantly higher lung cancer mortality rate (46.8 per 100,000) compared to African American females (36.7 per 100,000).
  - Caucasian males (66.2 per 100,000) had a lower lung cancer mortality rate than African American males (66.8 per 100,000) but these differences were not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware had a significantly higher lung cancer mortality rate (54.0 per 100,000) than the U.S. (47.2 per 100,000).
  - Both males (59.8 per 100,000) and females (37.8 per 100,000) in the U.S. had significantly lower lung cancer mortality rates than their counterparts in Delaware (male: 65.9 per 100,000; female: 45.1 per 100,000).
  - Caucasians had a significantly higher lung cancer mortality rate in Delaware (55.1 per 100,000) compared to Caucasians in the U.S (47.9 per 100,000).
  - African Americans in Delaware (49.1 per 100,000) had a lower lung cancer mortality rate than African Americans in the U.S. (50.6 per 100,000) but these differences were not statistically significant.

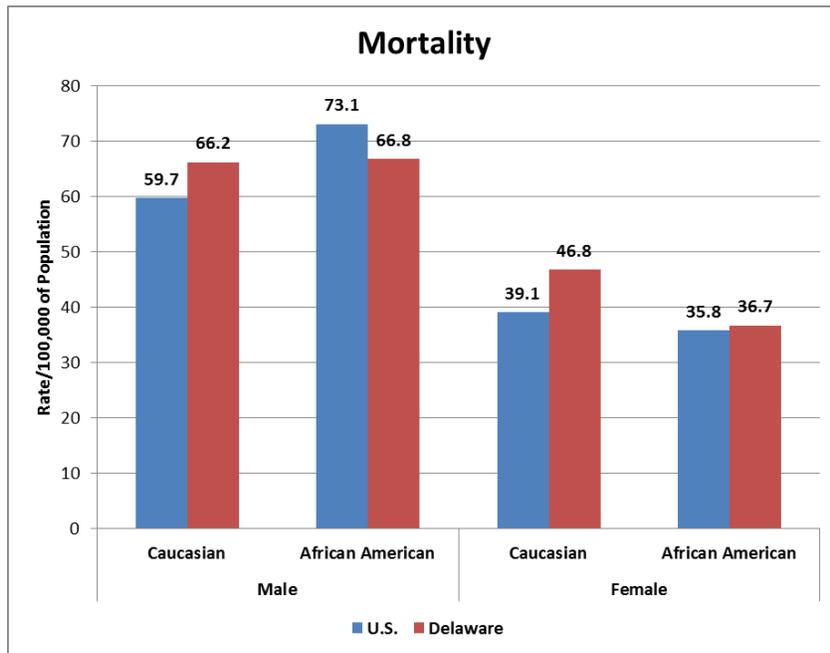
**TABLE 6-6: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	47.2	59.8	37.8
<b>Delaware</b>	54.0	65.9	45.1
Kent	59.7	76.3	47.6
New Castle	52.3	63.5	44.1
Sussex	53.6	64.2	45.5

Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 6-7: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

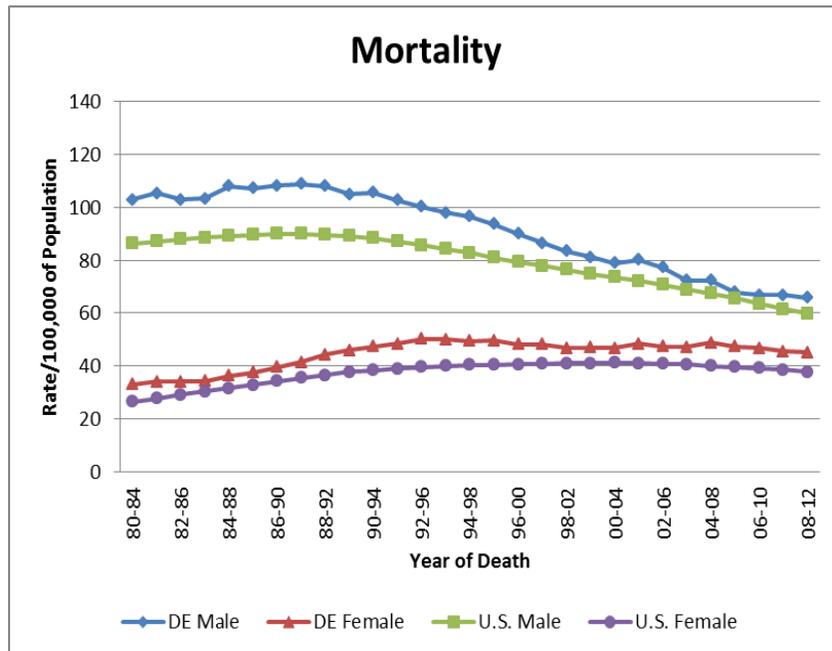


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME – DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Mortality rates for lung cancer declined 13 percent in Delaware and 15 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 22 percent.
  - U.S. female lung cancer mortality decreased 8 percent and the Delaware female lung cancer mortality rate showed a decline of 3 percent.

**FIGURE 6-8: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

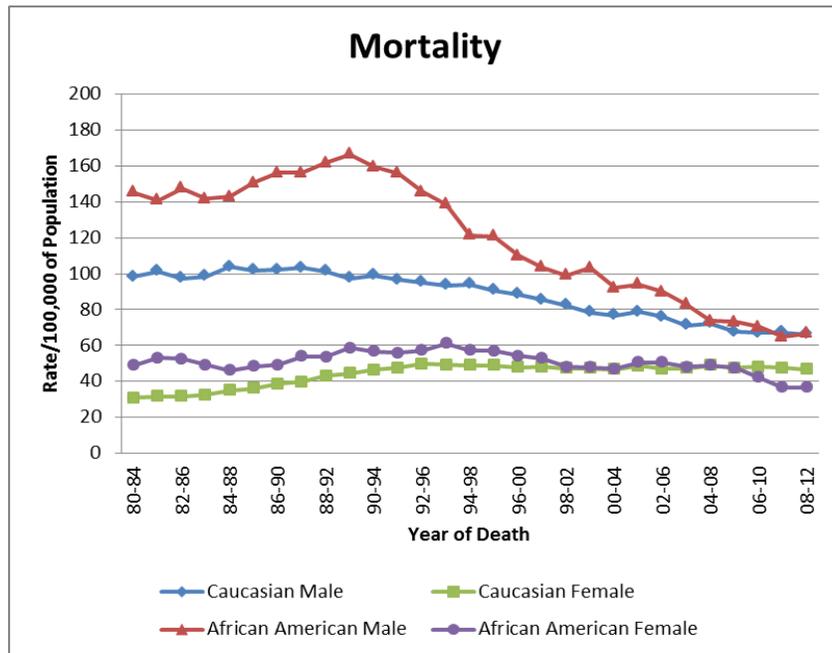


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TRENDS OVER TIME - DELAWARE**

- From 1998-2002 to 2008-2012
  - African American males in Delaware saw the sharpest decline in lung cancer mortality: a decrease of 33 percent.
  - Among African American females, their lung cancer mortality rate declined by 24 percent.
  - Caucasian males saw a 20 percent decline in lung cancer mortality rate.
  - Among Caucasian females, lung cancer mortality declined only 1 percent in the same time period.

**FIGURE 6-9: FIVE-YEAR AVERAGE AGE-ADJUSTED LUNG CANCER MORTALITY RATES BY RACE AND SEX; DELAWARE, 1980-2012**

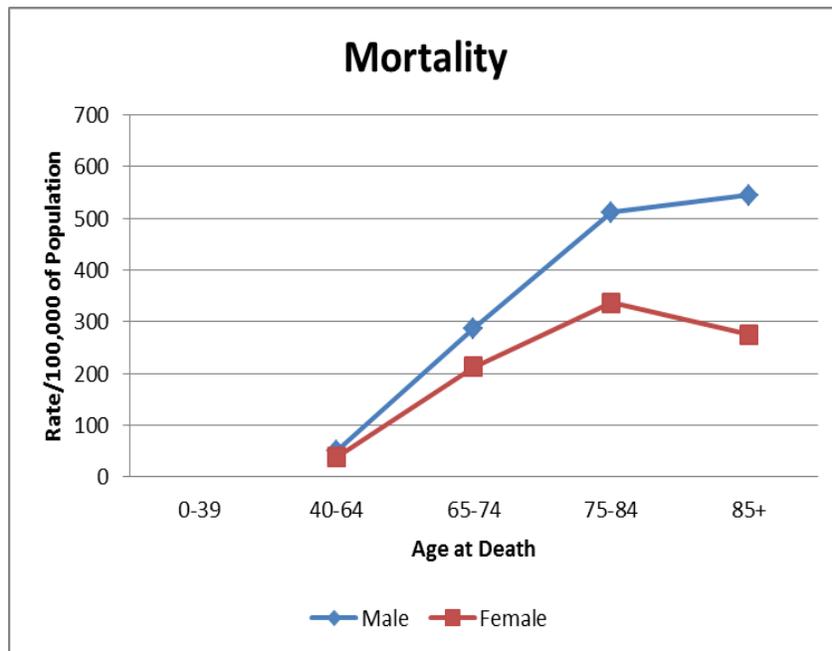


Source: Delaware Health Statistics Center, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**AGE-SPECIFIC MORTALITY RATES - DELAWARE**

- The peak age for lung cancer mortality is 75-84 years for females, while the peak age for lung cancer mortality in males is 85 and older. Due to low numbers, mortality rates were not able to be computed for the 0-39 age group.

**FIGURE 6-10: AGE-SPECIFIC LUNG CANCER MORTALITY RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Health Statistics Center, 2015  
 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 lung cancer mortality at 85 years and over.
- Caucasian and African American females have peak lung cancer mortality at 75-84 years of age. Due to low numbers, the mortality 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.

**TABLE 6-7: AGE-SPECIFIC LUNG CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	48.1	66.4	38.5	40.3
65-74	286.1	328.3	227.1	138.2
75-84	525.5	407.3	345.5	289.4
85+	567.8	421.0	288.2	154.3

Source: Delaware Health Statistics Center, 2015  
 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

## CHAPTER 7: NON-HODGKIN LYMPHOMA

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### RISK FACTORS

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The following are *lifestyle risk factors* which a person can modify to reduce their risk of getting non-Hodgkin lymphoma:

- Diet high in meat and fats
- Overweight or obesity
- Smoking

The following are *environmental and medically-related* causes of non-Hodgkin lymphoma:

- Exposure to benzene, ethylene oxide, environmental or medical radiation, electromagnetic fields, and certain weed or insect killers
- Chemotherapy (alkylating agents)

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

- Increasing age – most cases occur at age 60 or older (although some types are common in young people)
- Risk is higher in males than females although some types are more common in females
- Caucasians are at higher risk than African Americans
- A weakened immune system (due to organ transplants, HIV infection); autoimmune diseases
- Infection with *Helicobacter pylori*
- History of other infections (e.g. human T-cell leukemia virus, Epstein-Barr virus, hepatitis C virus)

To protect against non-Hodgkin lymphoma, individuals should maintain a healthy weight, eat a healthy diet, avoid behaviors which may spread HIV infection, and get treatment for HIV infection and *Helicobacter pylori*.

### EARLY DETECTION

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There are currently no tests recommended for detection for non-Hodgkin lymphoma in the general population. Individuals with known risk factors should have regular check-ups.

### INCIDENCE

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**For 2008-2012, Delaware ranked 19<sup>th</sup> in the U.S. for non-Hodgkin lymphoma incidence (19<sup>th</sup> in 2007-2011); males ranked 22<sup>nd</sup> (18<sup>th</sup> in 2007-2011) and females ranked 17<sup>th</sup> (17<sup>th</sup> in 2007-2011)<sup>8</sup>.**

### 2008-2012 DATA

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- In 2008-2012, there were 1,025 non-Hodgkin lymphoma cases (3.9 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 53.1 percent of non-Hodgkin lymphoma cases.
- Caucasians accounted for 84.0 percent of non-Hodgkin lymphoma cases.
- Table 7-1 presents the 2008-2012 frequencies for non-Hodgkin lymphoma incidence in Delaware by state and county stratified by race and sex.

**TABLE 7-1: NUMBER OF NON-HODGKIN LYMPHOMA CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	1,025	544	481	861	456	405	146	75	71
Kent	176	91	85	154	79	75	19	11	8
New Castle	547	285	262	427	220	207	110	56	54
Sussex	302	168	134	280	157	123	17	8	9

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

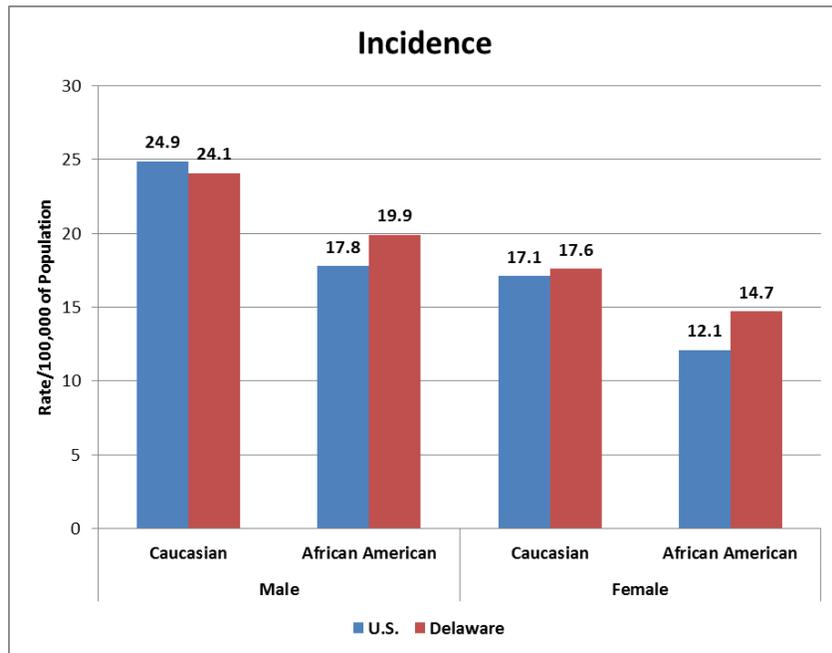
- In Delaware
  - The difference in non-Hodgkin lymphoma incidence rates between Caucasians (20.5 per 100,000) and African Americans (16.9 per 100,000) was not statistically significant.
  - The difference in non-Hodgkin lymphoma incidence rates for Caucasian females (17.6 per 100,000) and African American females (14.7 per 100,000) was not statistically significant.
  - The difference in non-Hodgkin lymphoma incidence rates between Caucasian males (24.1 per 100,000) and African American males (19.9 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware (19.9 per 100,000) had a higher non-Hodgkin lymphoma incidence rate than the U.S. (19.7 per 100,000) but the difference was not statistically significant.
  - Delaware males (23.5 per 100,000) and females (17.0 per 100,000) had non-Hodgkin lymphoma incidence rates that were not statistically different from U.S. males (23.9 per 100,000) and females (16.3 per 100,000).
  - Caucasians in Delaware (20.5 per 100,000) had a similar non-Hodgkin lymphoma incidence rate to Caucasians in the U.S. (20.6 per 100,000).
  - There was no statistically significant difference in non-Hodgkin lymphoma incidence rates when comparing African Americans in Delaware (16.9 per 100,000) and the U.S. (14.6 per 100,000).

**TABLE 7-2: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	19.7	23.9	16.3
<b>Delaware</b>	19.9	23.5	17.0
Kent	20.3	23.0	18.3
New Castle	19.2	22.4	16.6
Sussex	21.0	26.0	16.6

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 7-1: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA INCIDENCE RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

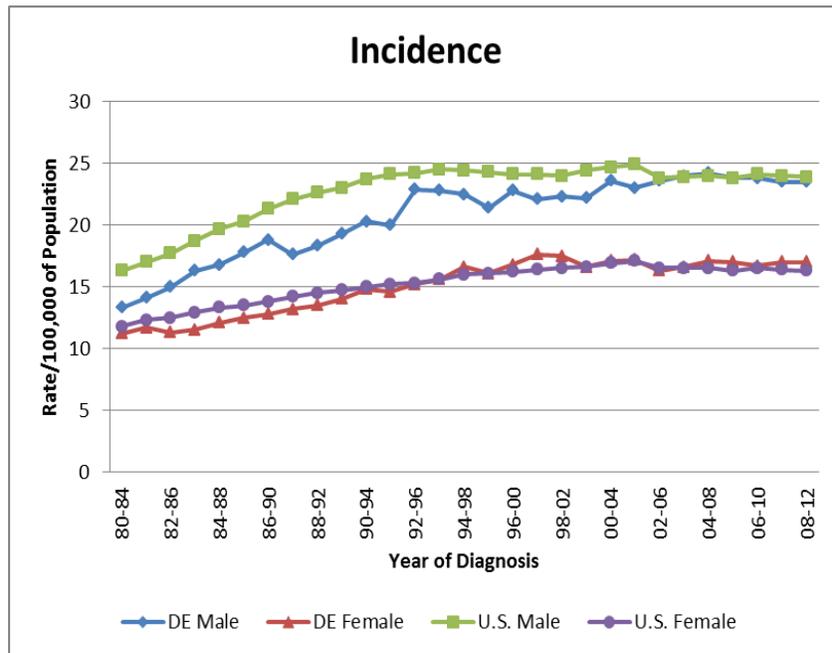


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Incidence rates for non-Hodgkin lymphoma remained the same in Delaware and decreased by 1 percent in the U.S.
  - Delaware males saw a 5 percent increase in non-Hodgkin lymphoma incidence.
  - The non-Hodgkin lymphoma incidence rate for Delaware and U.S. females declined by 3 percent and 1 percent, respectively.

**FIGURE 7-2: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

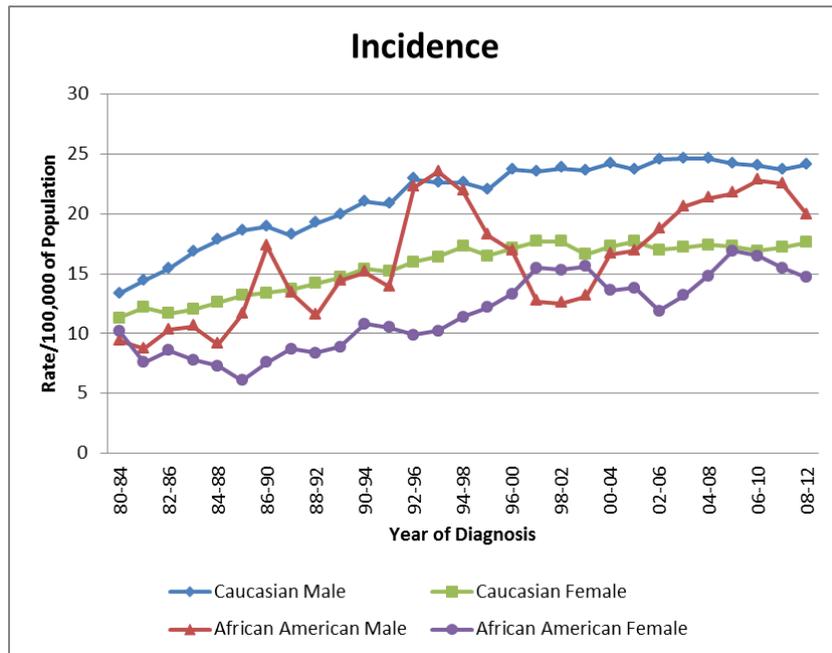


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American males in Delaware saw a 59 percent increase in non-Hodgkin lymphoma incidence while Caucasian males saw a 1 percent increase.
  - Caucasian and African American females saw small decreases of non-Hodgkin lymphoma incidence (1 percent and 4 percent, respectively).

**FIGURE 7-3: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA INCIDENCE RATES BY RACE AND SEX; DELAWARE, 1980-2012**

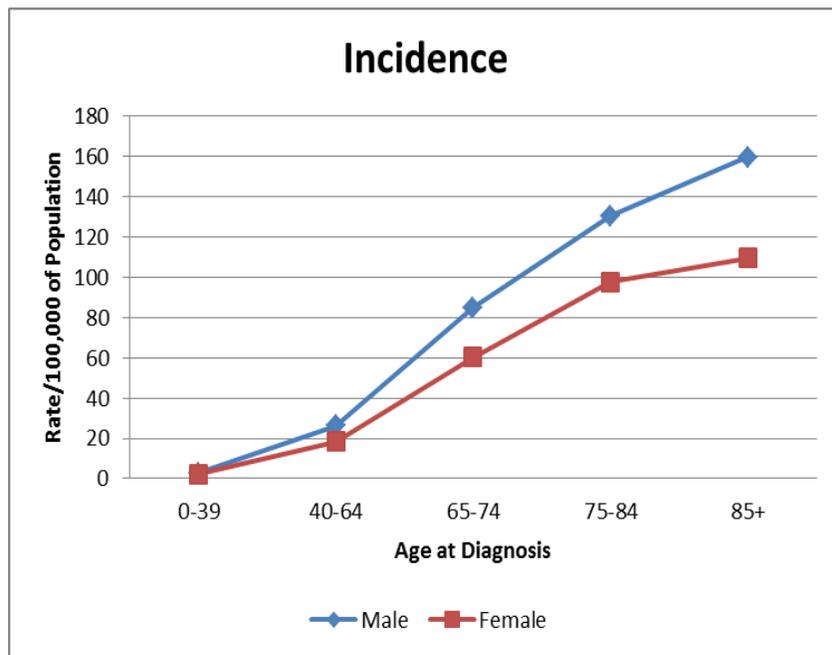


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- The peak age for non-Hodgkin lymphoma incidence is age 85 and older for both males and females.

**FIGURE 7-4: AGE-SPECIFIC NON-HODGKIN LYMPHOMA INCIDENCE RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- After stratifying by race, Caucasians have peak non-Hodgkin lymphoma incidence at age 85 and older which is the same for Caucasian males and females. Due to low numbers, most of the incidence rates could not be calculated for the African American age groups.

**TABLE 7-3: AGE-SPECIFIC NON-HODGKIN LYMPHOMA INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	26.5	28.7	19.1	18.2
65-74	87.0	---	64.4	---
75-84	135.0	---	103.8	---
85+	167.2	---	114.0	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

## STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 264 (25.8 percent) non-Hodgkin lymphomas diagnosed at the local stage; 195 (19.0 percent) at the regional stage; 508 (49.6 percent) at the distant stage; and 58 (5.7 percent) had an unknown stage.
- African Americans had a higher proportion of non-Hodgkin lymphoma (26.7 percent) diagnosed at the local stage than Caucasians (25.2 percent).
- Males also had fewer non-Hodgkin lymphomas diagnosed at the local stage (23.2 percent) than females (28.7 percent).
- African American females had the highest proportion of non-Hodgkin lymphomas diagnosed at the local stage (31.0 percent), compared to the lowest in African American males (22.7 percent).

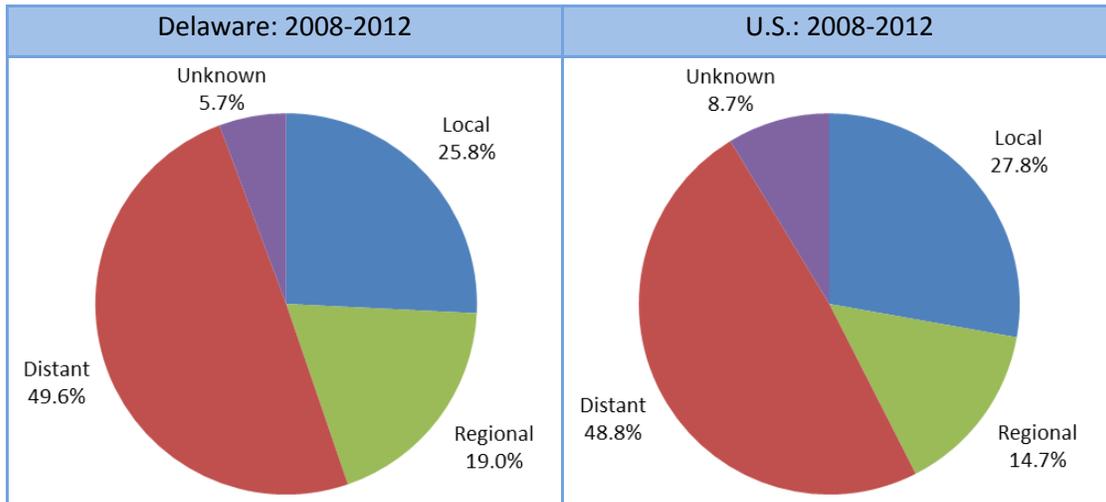
**TABLE 7-4: NON-HODGKIN LYMPHOMA CASES BY STAGE AT DIAGNOSIS BY RACE AND SEX;  
DELAWARE, 2008-2012**

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Local</b>	264 (25.8)	126 (23.2)	138 (28.7)	217 (25.2)	104 (22.8)	113 (27.9)	39 (26.7)	17 (22.7)	22 (31.0)
<b>Regional</b>	195 (19.0)	110 (20.2)	85 (17.7)	165 (19.2)	91 (20.0)	74 (18.3)	27 (18.5)	---	---
<b>Distant</b>	508 (49.6)	276 (50.7)	232 (48.2)	431 (50.1)	234 (51.3)	197 (48.6)	72 (49.3)	37 (49.3)	35 (49.3)
<b>Unknown</b>	58 (5.7)	32 (5.9)	26 (5.4)	48 (5.6)	27 (5.9)	21 (5.2)	8 (5.5)	---	---
<b>Total</b>	1,025	544	481	861	456	405	146	75	71

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Counts less than 6 are not shown to protect patient privacy

- In comparing U.S. and Delaware data, more non-Hodgkin lymphoma cases are diagnosed at the local stage in the U.S. when compared to Delaware.
- More non-Hodgkin lymphoma cases are diagnosed at regional stage in Delaware than in the U.S.

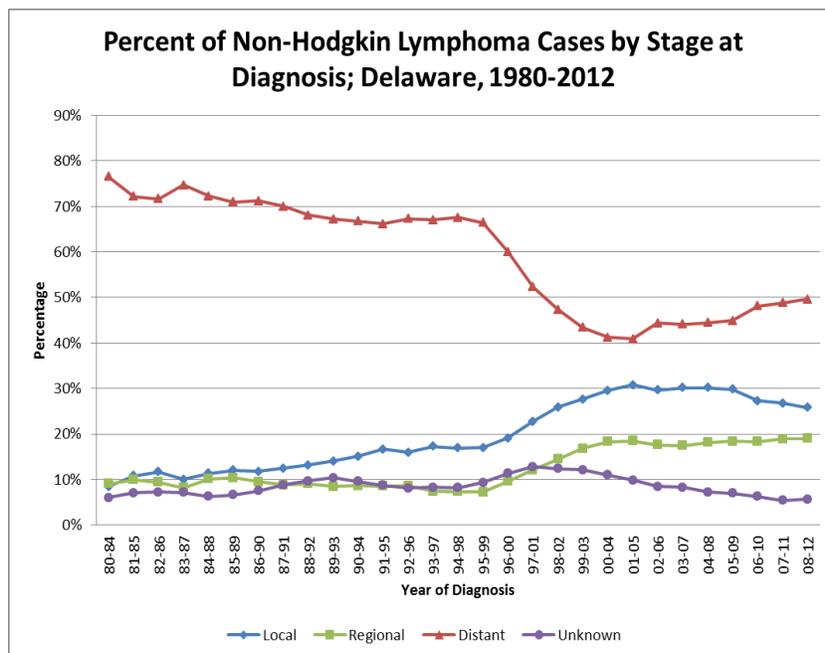
**FIGURE 7-5: DISTRIBUTION OF NON-HODGKIN LYMPHOMA CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of non-Hodgkin lymphoma cases diagnosed at the local stage increased from 8.4 percent to 25.8 percent.
  - Non-Hodgkin lymphoma cases diagnosed at the distant stage decreased from 76.5 percent to 49.6 percent.

**FIGURE 7-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR NON-HODGKIN LYMPHOMA CASES; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 38<sup>th</sup> in the U.S. for non-Hodgkin lymphoma mortality (30<sup>th</sup> in 2007-2011); males ranked 47<sup>th</sup> (40<sup>th</sup> in 2007-2011) and females ranked 25<sup>th</sup> (28<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 292 deaths (3.1 percent of all cancer deaths) from non-Hodgkin lymphoma.
- Caucasians accounted for 85.6 percent of non-Hodgkin lymphoma deaths.

**TABLE 7-5: NUMBER OF NON-HODGKIN LYMPHOMA DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	292	155	137	250	132	118	40	22	18
Kent	60	33	27	51	27	24	9	---	---
New Castle	146	73	71	119	59	60	25	15	10
Sussex	86	47	39	80	46	34	6	---	---

Source: Delaware Health Statistics Center, 2015  
 Counts less than 6 are not shown to protect patient privacy

- In Delaware
  - Males had a significantly higher non-Hodgkin lymphoma mortality rate (6.9 per 100,000) compared to females (4.8 per 100,000)
  - There was no statistically significant difference between the non-Hodgkin lymphoma mortality rates for Caucasians (5.9 per 100,000) and African Americans (5.2 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a lower non-Hodgkin lymphoma mortality rate (5.7 per 100,000) than the U.S. (6.2 per 100,000); this difference was not statistically significant.
  - Males in the U.S. (7.9 per 100,000) had a higher non-Hodgkin lymphoma mortality rate than males in Delaware (6.9 per 100,000) while females in Delaware and the U.S. had the same mortality rate (4.8 per 100,000); the differences were not statistically significant.
  - Caucasians had a lower non-Hodgkin lymphoma mortality rate in Delaware (5.9 per 100,000) compared to Caucasians in the U.S. (6.4 per 100,000); the difference was not statistically significant.
  - African Americans in Delaware (5.2 per 100,000) had a higher non-Hodgkin lymphoma mortality rate than African Americans in the U.S. (4.4 per 100,000) but these differences were not statistically significant.

**TABLE 7-6: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	6.2	7.9	4.8
<b>Delaware</b>	5.7	6.9	4.8
Kent	7.1	9.4	5.6
New Castle	5.2	6.0	4.5
Sussex	5.9	7.1	4.8

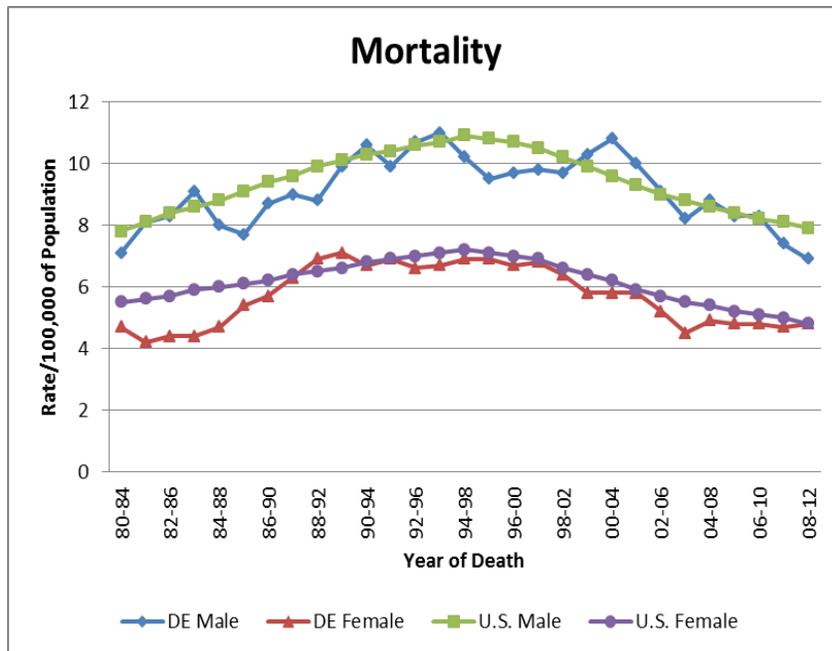
Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TRENDS OVER TIME – DELAWARE AND U.S.**

- From 1998-2002 to 2008-2012
  - Mortality rates for non-Hodgkin lymphoma declined 27 percent in Delaware and 23 percent in the U.S.
  - Delaware males saw big declines in non-Hodgkin lymphoma mortality (29 percent) with U.S. male non-Hodgkin lymphoma mortality having a similar decline of 23 percent.
  - U.S. female non-Hodgkin lymphoma decreased 27 percent and the Delaware female non-Hodgkin lymphoma mortality rate showed a decline of 25 percent.

**FIGURE 7-7: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2012**



Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

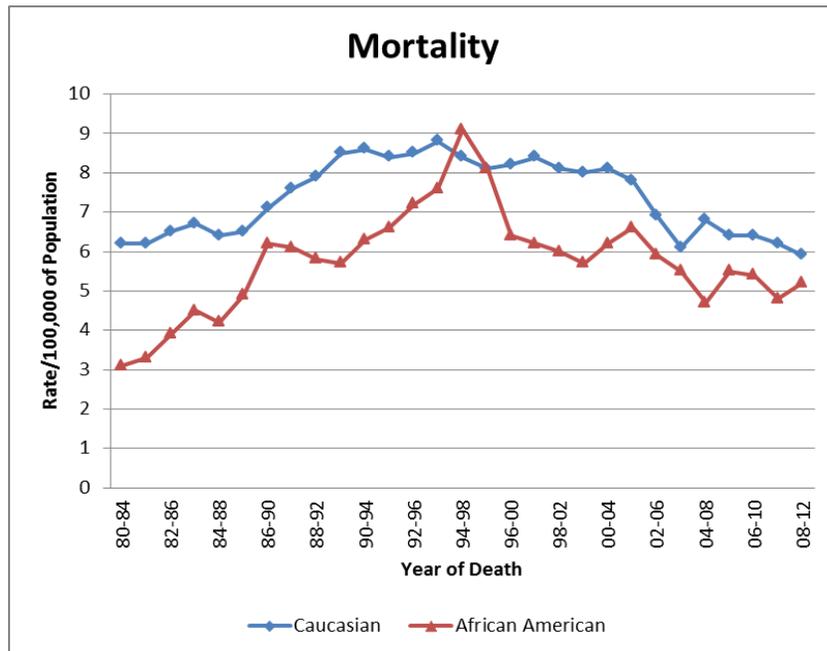
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## TRENDS OVER TIME - DELAWARE

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- From 1998-2002 to 2008-2012
  - Caucasians in Delaware saw a decrease in non-Hodgkin lymphoma mortality rates of 27 percent and African Americans saw a decline of 13 percent.

**FIGURE 7-8: FIVE-YEAR AVERAGE AGE-ADJUSTED NON-HODGKIN LYMPHOMA MORTALITY RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

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## AGE-SPECIFIC MORTALITY RATES - DELAWARE

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

**TABLE 7-7: AGE-SPECIFIC NON-HODGKIN LYMPHOMA MORTALITY RATES BY SEX AND RACE;  
DELAWARE, 2008-2012**

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
<b>0-39</b>	---	---	---	---
<b>40-64</b>	5.2	---	---	---
<b>65-74</b>	25.4	---	---	---
<b>75-84</b>	50.3	---	45.1	---
<b>85+</b>	---	---	73.1	---

Source: Delaware Health Statistics Center, 2015  
 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

## CHAPTER 8: OVARIAN CANCER

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### RISK FACTORS

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

- Obesity
- Never giving birth (risk decreases as number of children increases)
- High-fat diet
- Smoking and alcohol use
- Exposure to talcum powder

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

- Estrogen therapy after menopause (risk is higher for females who took estrogen alone for at least five or 10 years)

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

- Older females are at higher risk (half are found in females over age 63)
- Family history of ovarian, breast, or colorectal cancer
- Personal history of breast cancer
- Inherited mutation of BRCA1 or BRCA2 genes
- Other genetic changes or syndromes
- Early menses or late menopause
- Polycystic ovary syndrome (PCOS)

Factors that are protective against ovarian cancer include having a hysterectomy or tubal ligation, low-fat diet for a long period of time, taking birth control pills for five or more years, and genetic counseling. Genetic counseling (and subsequent genetic testing) should be considered for females who have a first degree relative with the disease, family members with more than one type of cancer, or multiple generations of close family with any cancer. If it is determined that a woman has a genetic predisposition of ovarian cancer, the following should be considered:

- More frequent ovarian cancer screenings
- Surgery to reduce risk
- Medications to reduce risk

### EARLY DETECTION

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There is currently no screening test that is reliable enough to screen for ovarian cancer in the general population. Females at high risk can be screened with ultrasound and blood tests.

## INCIDENCE

For 2008-2012, Delaware ranked 38<sup>th</sup> in the U.S. for ovarian cancer incidence (30<sup>th</sup> in 2007-2011)<sup>8</sup>.

### 2008-2012 DATA

- Ovarian cancer is the fifth most commonly diagnosed cancer among females<sup>14</sup>.
- In 2008-2012, there were 303 ovarian cancer cases (2.42 percent of all cancer cases in females) diagnosed in Delaware.
- Caucasians accounted for 81.8 percent of ovarian cancer cases.

**TABLE 8-1: NUMBER OF OVARIAN CANCER CASES, BY RACE; DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>Delaware</b>	303	248	42
Kent	53	42	11
New Castle	157	124	24
Sussex	93	82	7

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

- In Delaware
  - The difference in ovarian cancer incidence rates between Caucasians (11.1 per 100,000) and African Americans (8.4 per 100,000) was not statistically significant.
- Comparing Delaware and the U.S.
  - Delaware (10.8 per 100,000) had a lower ovarian cancer incidence rate than the U.S. (12.1 per 100,000); this difference was not statistically significant.
  - There was no statistically significant difference in ovarian cancer incidence rates between Caucasians in Delaware (11.1 per 100,000) and the U.S. (12.8 per 100,000).
  - There was no statistically significant difference in ovarian cancer incidence rates between African Americans in Delaware (8.4 per 100,000) and the U.S. (9.8 per 100,000).

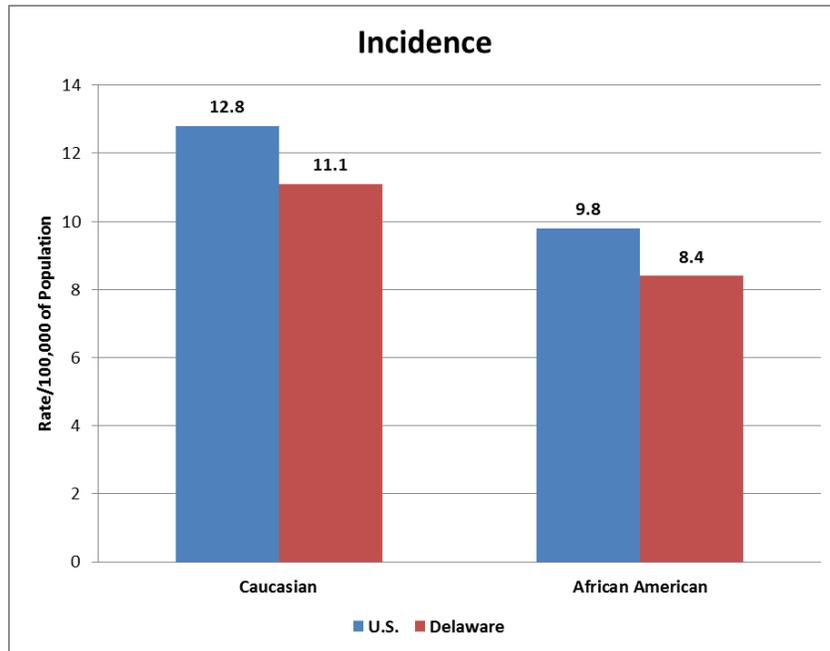
<sup>14</sup> American Cancer Society, March 12, 2015. Available at <http://www.cancer.org/cancer/ovariancancer/detailedguide/ovarian-cancer-key-statistics>

**TABLE 8-2: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER INCIDENCE RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>U.S.</b>	12.1	12.8	9.8
<b>Delaware</b>	10.8	11.1	8.4
Kent	10.9	11.1	---
New Castle	10.0	10.4	---
Sussex	12.8	13.2	---

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 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 8-1: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER INCIDENCE RATES BY RACE; U.S. AND DELAWARE, 2008-2012**

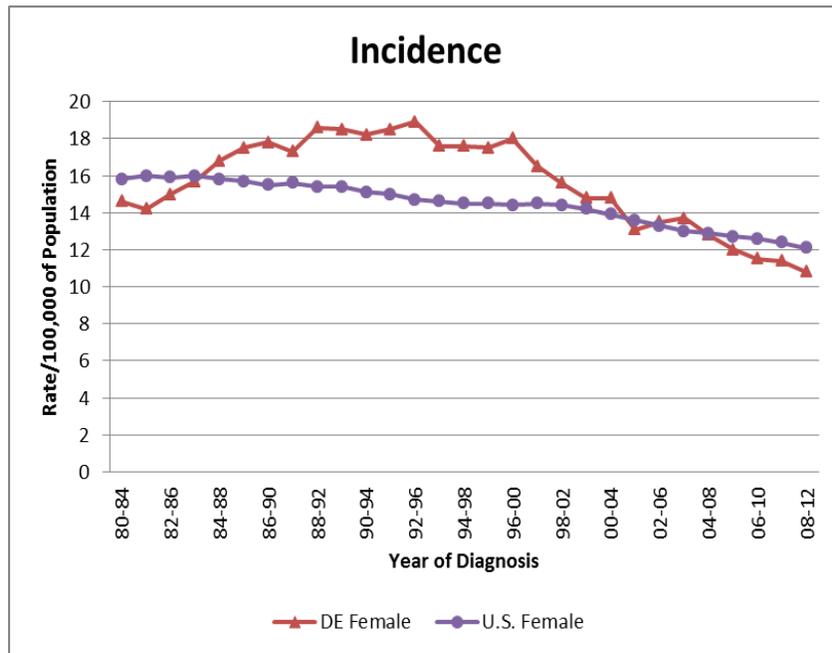


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TRENDS OVER TIME - DELAWARE AND U.S.**

- For the time period of 1998-2002 to 2008-2012
  - Incidence rates for ovarian cancer declined in both Delaware (31 percent) and the U.S. (16 percent).

**FIGURE 8-2: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER INCIDENCE RATES; U.S. AND DELAWARE, 1980-2012**

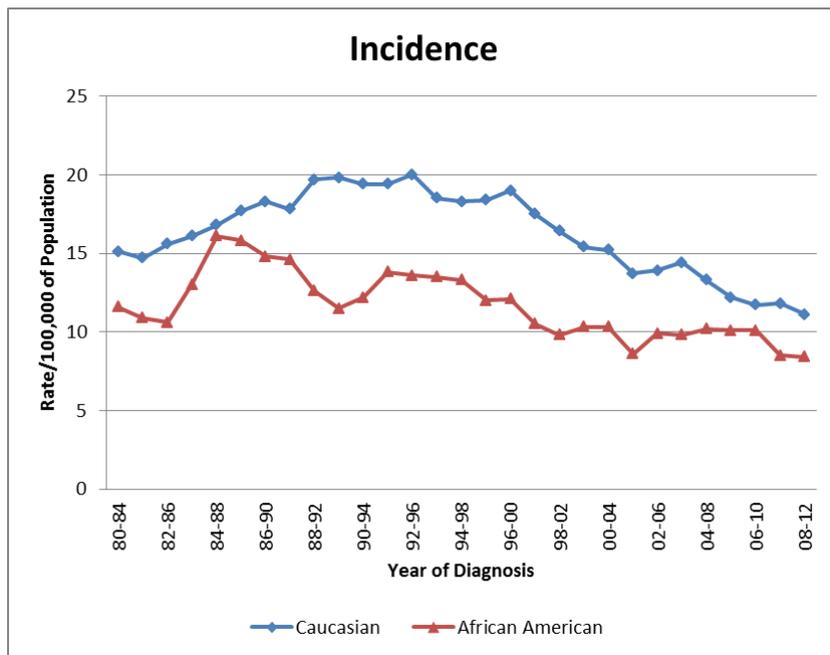


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American females in Delaware saw a smaller decrease in ovarian cancer incidence (14 percent) compared to Caucasians (32 percent).

**FIGURE 8-3: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- The peak age for ovarian cancer incidence is 75-84 years of age for all females and Caucasians.
- Due to low numbers, ovarian cancer incidence rates were not able to be computed for African Americans in Delaware.

**TABLE 8-3: AGE-SPECIFIC OVARIAN CANCER INCIDENCE RATES BY RACE; DELAWARE, 2008-2012**

Age at Diagnosis	All Females	Caucasian	African American
0-39	---	---	---
40-64	16.0	17.6	---
65-74	34.6	35.4	---
75-84	48.2	50.5	---
85+	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

## STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 36 (11.9 percent) ovarian cancers diagnosed at the local stage; 45 (14.9 percent) at the regional stage; 204 (67.3 percent) at the distant stage; and 18 (5.9 percent) had an unknown stage.
- Caucasians had a higher proportion of ovarian cancers diagnosed at the distant stage (69.4 percent) than African Americans (57.1 percent).

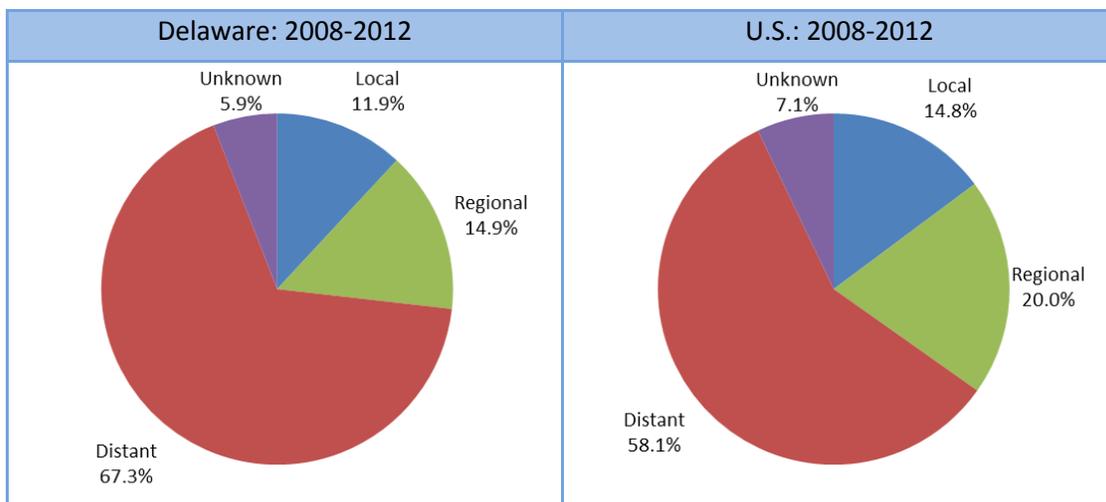
**TABLE 8-4: OVARIAN CANCER CASES BY STAGE AT DIAGNOSIS BY RACE; DELAWARE, 2008-2012**

Stage at Diagnosis	All Females	Caucasian	African American
Local	36 (11.9)	---	---
Regional	45 (14.9)	33 (13.3)	9 (21.4)
Distant	204 (67.3)	172 (69.4)	24 (57.1)
Unknown	18 (5.9)	---	---
<b>Total</b>	<b>303</b>	<b>248</b>	<b>42</b>

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Counts less than 6 are not shown to protect patient privacy

- In comparing U.S. and Delaware data, more ovarian cancer is diagnosed at the distant stage in Delaware than the U.S. Also, the U.S. has more diagnosed at the local stage than Delaware.

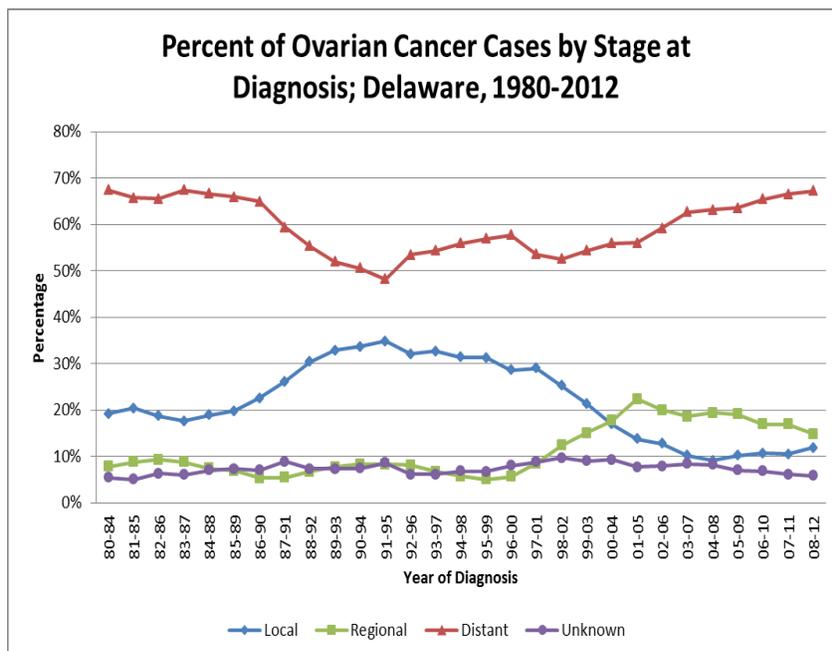
**FIGURE 8-4: DISTRIBUTION OF OVARIAN CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of ovarian cancer cases diagnosed at the local stage decreased from 19.3 percent to 11.9 percent.
  - Ovarian cancer cases diagnosed at the distant stage stayed the same.

**FIGURE 8-5: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR OVARIAN CANCER CASES; DELAWARE, 1980-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 26<sup>th</sup> in the U.S. for ovarian cancer mortality (14<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 224 deaths (4.9 percent of all female cancer deaths) from ovarian cancer.
- Caucasians accounted for 82.1 percent of ovarian cancer deaths.

**TABLE 8-5: NUMBER OF OVARIAN CANCER DEATHS, BY RACE; DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>Delaware</b>	224	184	36
Kent	44	35	9
New Castle	111	88	21
Sussex	69	61	6

Source: Delaware Health Statistics Center, 2015

- In Delaware
  - There was no statistically significant difference between the ovarian cancer mortality rates for Caucasians (7.6 per 100,000) and African Americans (8.0 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware and the U.S. had similar ovarian cancer mortality rates (7.6 per 100,000 vs 7.7 per 100,000).
  - Caucasians in Delaware (7.6 per 100,000) had a lower ovarian cancer mortality rate than Caucasians in the U.S. (8.0 per 100,000) but these differences were not statistically significant.
  - African Americans in Delaware (8.0 per 100,000) had a higher ovarian cancer mortality rate than African Americans in the U.S. (6.7 per 100,000) but these differences were not statistically significant.

**TABLE 8-6: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER MORTALITY RATES; U.S., DELAWARE AND COUNTIES, 2008-2012**

	All Females	Caucasian	African American
<b>U.S.</b>	7.7	8.0	6.7
<b>Delaware</b>	7.6	7.6	8.0
Kent	9.0	9.1	---
New Castle	6.8	6.9	---
Sussex	8.2	8.0	---

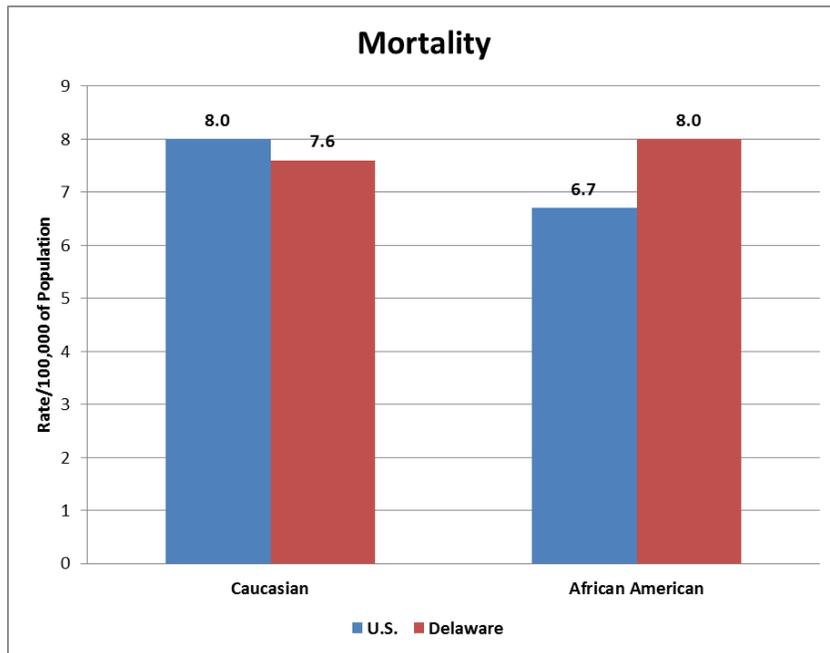
Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

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 8-6: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER MORTALITY RATES BY RACE; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Health Statistics Center, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

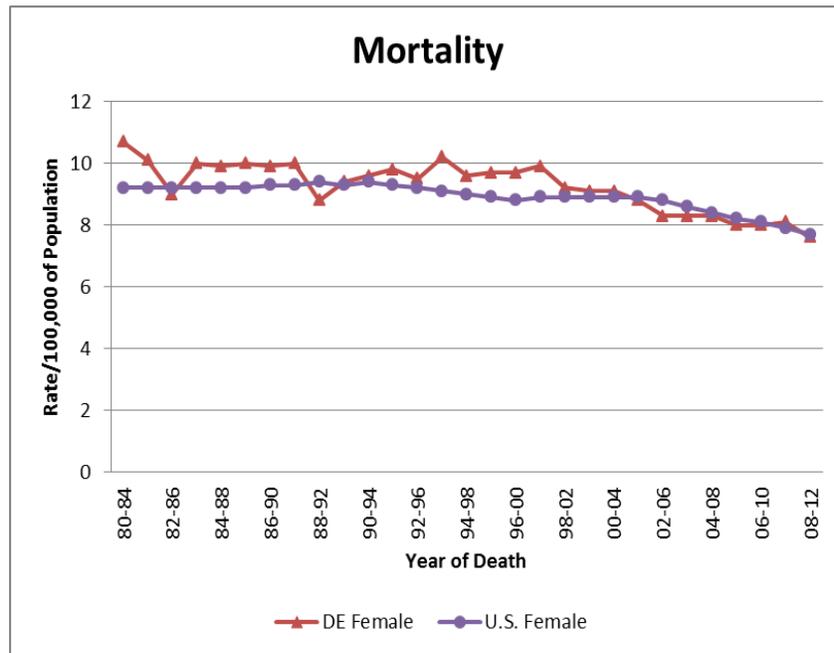
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### TRENDS OVER TIME – DELAWARE AND U.S.

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- From 1998-2002 to 2008-2012
  - Mortality rates for ovarian cancer declined by 17 percent in Delaware and 13 percent in the U.S.

**FIGURE 8-7: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER MORTALITY RATES; U.S. AND DELAWARE, 1980-2012**

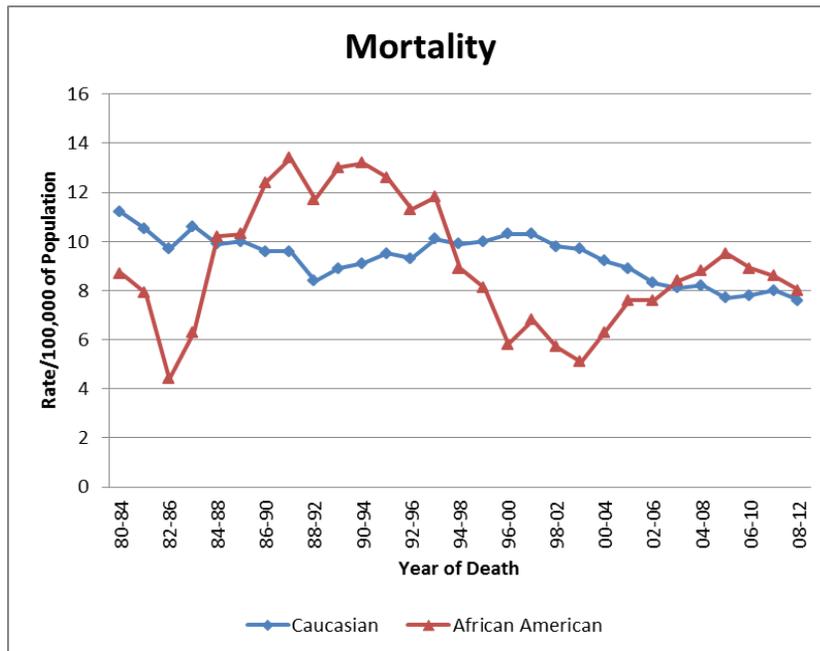


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African Americans in Delaware saw an increase in ovarian cancer mortality of 40 percent while Caucasians saw a decline of 22 percent.

**FIGURE 8-8: FIVE-YEAR AVERAGE AGE-ADJUSTED OVARIAN CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**AGE-SPECIFIC MORTALITY RATES - DELAWARE**

- The peak age for ovarian cancer mortality is age 75-84.
- 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 the African American age groups.
- These numbers are presented in Table 8-7.

**TABLE 8-7: AGE-SPECIFIC OVARIAN CANCER MORTALITY RATES BY RACE; DELAWARE, 2008-2012**

Age at Death	All Females	Caucasian	African American
0-39	---	---	---
40-64	8.2	8.6	---
65-74	25.4	25.1	---
75-84	56.1	55.7	---
85+	54.7	55.9	---

Source: Delaware Health Statistics Center, 2015  
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

## CHAPTER 9: PROSTATE CANCER

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### RISK FACTORS

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The following are *lifestyle risk factors* which a person can modify to reduce their 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

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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<sup>15</sup>.

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

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<sup>15</sup> American Cancer Society; Prostate Cancer: Early Detection.  
<http://www.cancer.org/cancer/prostatecancer/moreinformation/prostatecancerearlydetection/prostate-cancer-early-detection-acs-recommendations>

- 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 beginning at the following ages:
  - 40 years of age for those with several first degree relatives with the disease
  - 40 years of age for those who are African American, have a first degree relative with the disease, family or personal history of BRCA1 or BRCA2 gene, and/or younger than 65 years of age
- 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**

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

- 45.1 percent of Delaware males ages 40 and older reported having had a PSA blood test in the past two years, compared to the national median prevalence of 42.8 percent.
- The proportion of Delaware males who received a PSA test within the past two years increased with age: 33.1 percent of males ages 45-54 were tested, compared to 68.0 percent of males ages 65 and older.
- In Delaware, Caucasian males were more likely to have had a PSA test (46.8 percent) than African American males (45.4 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 25.1 percent. Among Delaware males who graduated from college, the comparable screening prevalence rate was 51.0 percent. This difference was statistically significant.
- According to the 2013 BRFSS report, 3.15 percent of Delaware males reported making the decision together with their health care provider to have the PSA test done.

## **INCIDENCE**

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**For 2008-2012, Delaware ranked 5<sup>th</sup> in the U.S. for prostate cancer incidence (4<sup>th</sup> in 2007-2011)<sup>8</sup>.**

## **2008-2012 DATA**

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- Prostate cancer is the most commonly diagnosed cancer among males in the U.S. and Delaware.
- In 2008-2012, there were 3,975 prostate cancer cases (28.8 percent of all cancer cases in males) diagnosed in Delaware.
- Caucasians accounted for 75.6 percent of prostate cancer cases.

**TABLE 9-1: NUMBER OF PROSTATE CANCER CASES, BY RACE; DELAWARE AND COUNTIES, 2008-2012**

	All Males	Caucasian	African American
<b>Delaware</b>	3,975	3,007	886
Kent	776	538	227
New Castle	2,085	1,509	534
Sussex	1,114	960	125

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

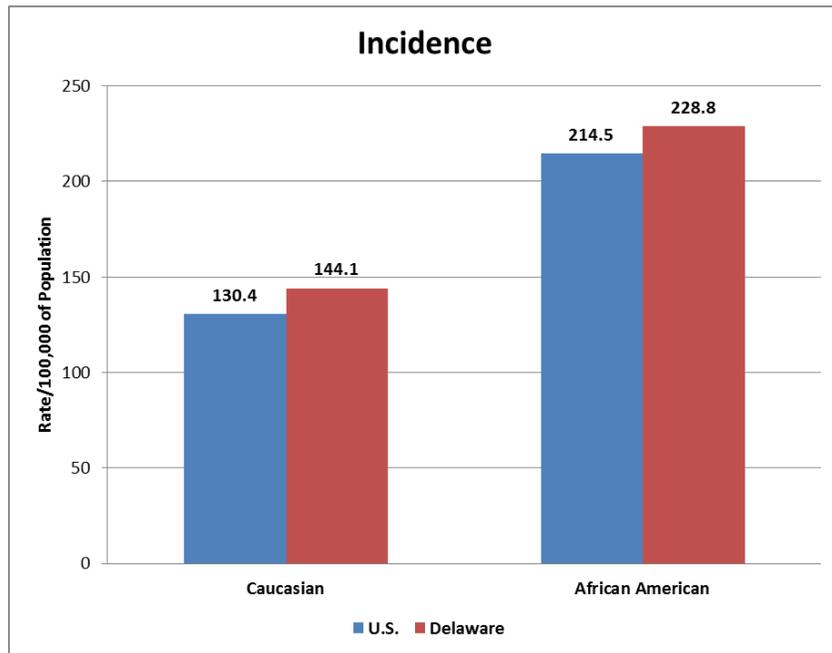
- In Delaware
  - Caucasians (144.1 per 100,000) had a significantly lower prostate cancer incidence rate than African Americans (228.8 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a significantly higher prostate cancer incidence rate than the U.S. (157.0 per 100,000 vs 137.9 per 100,000).
  - Caucasians in Delaware (144.1 per 100,000) had significantly higher prostate cancer incidence rates than Caucasians in the U.S. (130.4 per 100,000).
  - There was no statistically significant difference in prostate cancer incidence rates between African Americans in Delaware (228.8 per 100,000) and the U.S. (214.5 per 100,000).

**TABLE 9-2: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES BY RACE; U.S., DELAWARE AND COUNTIES, 2008-2012**

	All Males	Caucasian	African American
<b>U.S.</b>	137.9	130.4	214.5
<b>Delaware</b>	157.0	144.1	228.8
Kent	180.1	158.0	277.8
New Castle	155.1	143.3	216.5
Sussex	145.9	137.0	214.4

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 9-1: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES BY RACE; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

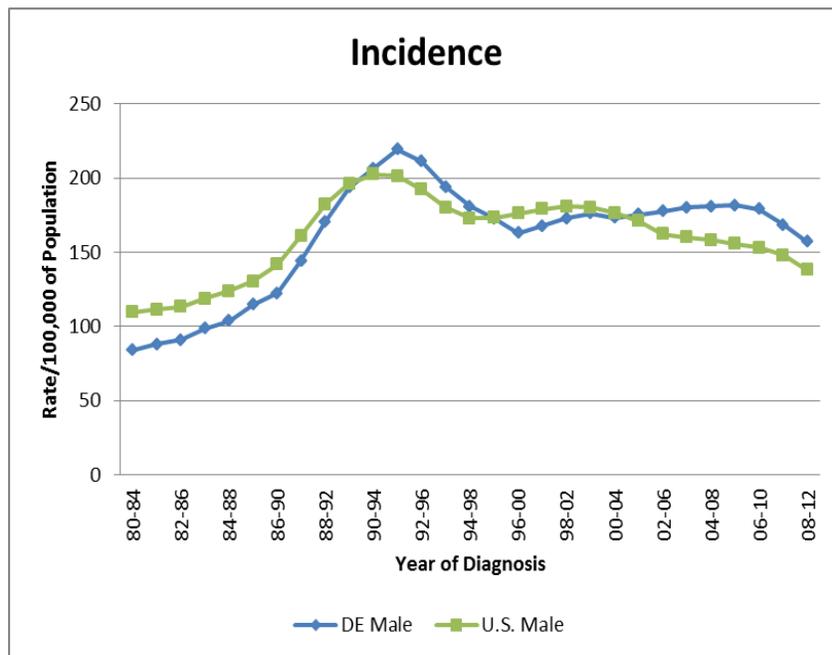
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### TRENDS OVER TIME - DELAWARE AND U.S.

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- For the time period of 1998-2002 to 2008-2012
  - Incidence rates for prostate cancer declined slower in Delaware (9 percent) compared to the U.S. (24 percent).

**FIGURE 9-2: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES; U.S. AND DELAWARE, 1980-2012**

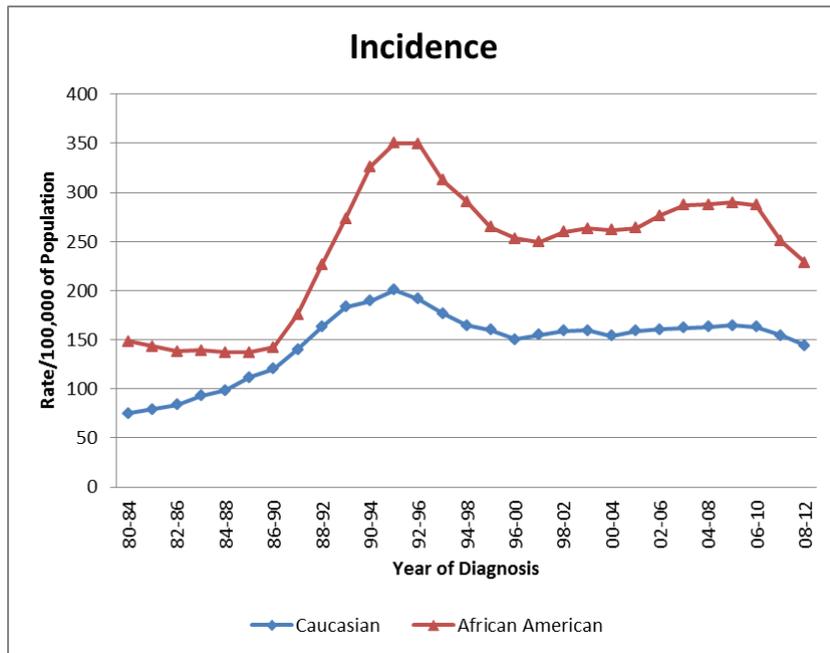


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American males in Delaware saw a bigger decline in prostate cancer incidence (12 percent) than Caucasians (9 percent).

**FIGURE 9-3: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER INCIDENCE RATES BY RACE; DELAWARE, 1980-2012**

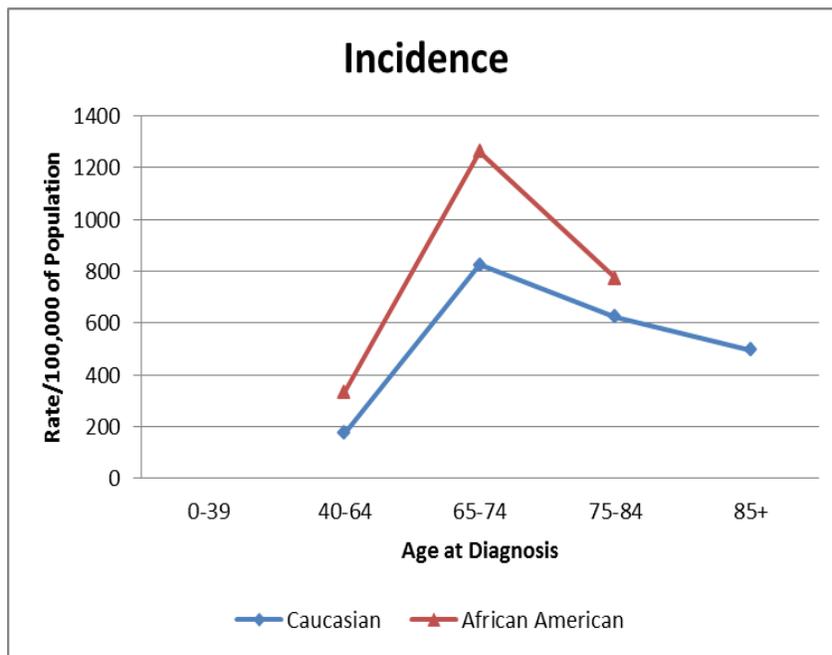


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- The peak age for prostate cancer incidence is 65-74 years of age for both Caucasians and African Americans. Due to low numbers, incidence rates were not able to be computed for some of the age groups.

**FIGURE 9-4: AGE-SPECIFIC PROSTATE CANCER INCIDENCE RATES BY RACE; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TABLE 9-3: AGE-SPECIFIC PROSTATE CANCER INCIDENCE RATES BY RACE; DELAWARE, 2008-2012**

Age at Diagnosis	All Males	Caucasian	African American
0-39	---	---	---
40-64	203.7	176.8	334.9
65-74	887.4	826.3	1,262.2
75-84	640.5	625.3	774.5
85+	498.4	497.3	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

### STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 3,366 (84.7 percent) prostate cancers diagnosed at the local stage; 339 (8.5 percent) at the regional stage; 145 (3.6 percent) at the distant stage; and 125 (3.1 percent) had an unknown stage.
- African Americans had a higher proportion (86.0 percent) of prostate cancer diagnosed at the local stage than Caucasians (84.3 percent).

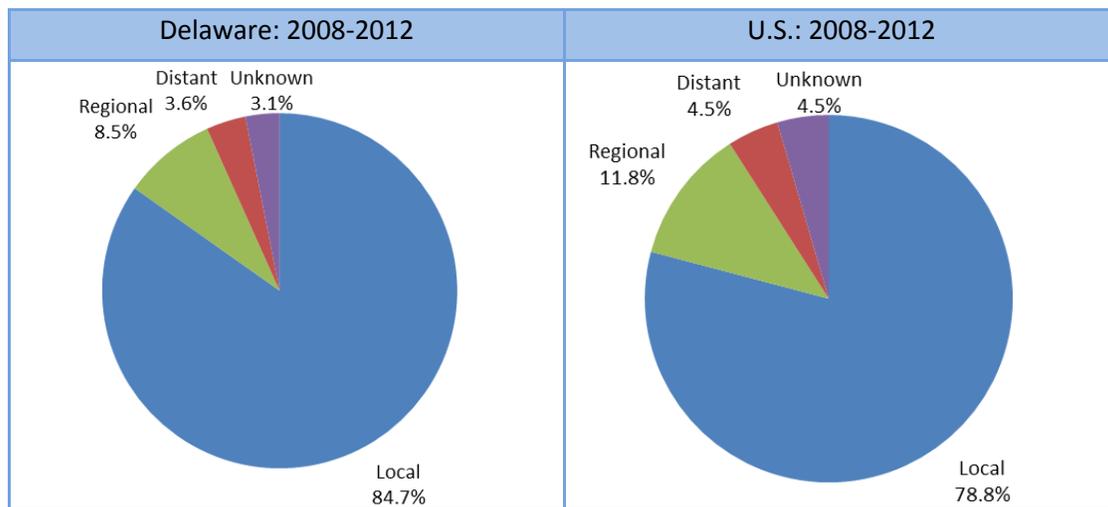
**TABLE 9-4: PROSTATE CANCER CASES BY STAGE AT DIAGNOSIS BY RACE; DELAWARE, 2008-2012**

Stage at Diagnosis	All Males	Caucasian	African American
Local	3,366 (84.7)	2,535 (84.3)	762 (86.0)
Regional	339 (8.5)	262 (8.7)	69 (7.8)
Distant	145 (3.6)	116 (3.9)	27 (3.0)
Unknown	125 (3.1)	94 (3.1)	28 (3.2)
<b>Total</b>	<b>3,975</b>	<b>3,007</b>	<b>886</b>

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

- In comparing U.S. and Delaware data, a higher proportion of prostate cancer was diagnosed in the local stage in Delaware (84.7 percent) than in the U.S. (78.8 percent).
- A higher proportion of prostate cancers were diagnosed at the distant stage in the U.S. (4.5 percent) than in Delaware (3.6 percent).

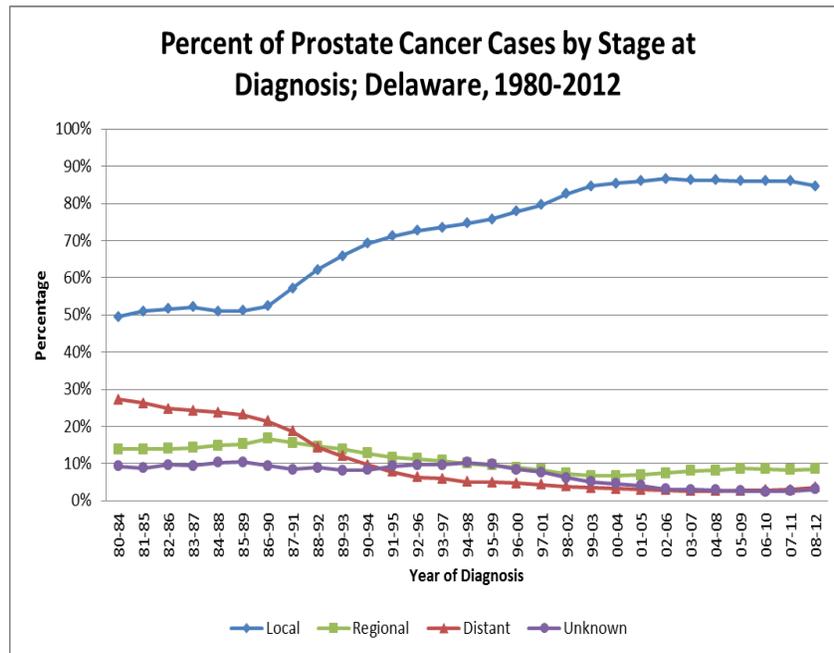
**FIGURE 9-5: DISTRIBUTION OF PROSTATE CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of prostate cancer cases diagnosed at the local stage increased from 49.6 percent to 84.7 percent.
  - Prostate cancer cases diagnosed at the distant stage decreased from 27.3 percent to 3.6 percent.

**FIGURE 9-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR PROSTATE CANCER CASES; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 18<sup>th</sup> in the U.S. for prostate cancer mortality (17<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- Prostate cancer is the second most common cause of cancer deaths among males in the U.S. and Delaware.
- In 2008-2012, there were 459 deaths (9.5 percent of all male cancer deaths) from prostate cancer.
- Caucasians accounted for 76.5 percent of prostate cancer deaths in Delaware.

**TABLE 9-5: NUMBER OF PROSTATE CANCER DEATHS, BY RACE; DELAWARE AND COUNTIES, 2008-2012**

	All Males	Caucasian	African American
<b>Delaware</b>	463	354	105
Kent	69	45	23
New Castle	271	210	60
Sussex	123	99	22

Source: Delaware Health Statistics Center, 2015

- In Delaware
  - Caucasians (20.4 per 100,000) had a significantly lower prostate cancer mortality rate than African Americans (39.1 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a higher prostate cancer mortality rate (22.4 per 100,000) than the U.S. (21.4 per 100,000); this difference was not statistically significant.
  - Caucasians had a higher prostate cancer mortality rate in Delaware (20.4 per 100,000) compared to Caucasians in the U.S (19.8 per 100,000); this difference was not statistically significant.
  - African Americans in Delaware (39.1 per 100,000) had a lower prostate cancer mortality rate than African Americans in the U.S. (46.3 per 100,000) but the difference was not statistically significant.

**TABLE 9-6: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES; U.S., DELAWARE AND COUNTIES, 2008-2012**

	All Males	Caucasian	African American
<b>U.S.</b>	21.4	19.8	46.3
<b>Delaware</b>	22.4	20.4	39.1
Kent	21.4	18.0	---
New Castle	24.1	22.3	35.9
Sussex	20.8	18.6	---

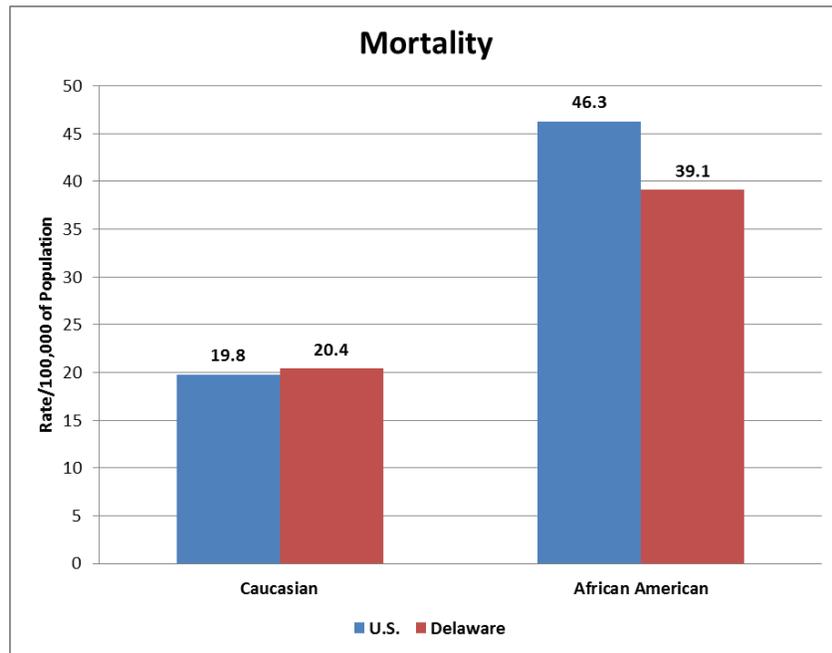
Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

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 PROSTATE CANCER MORTALITY RATES BY RACE; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Health Statistics Center, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

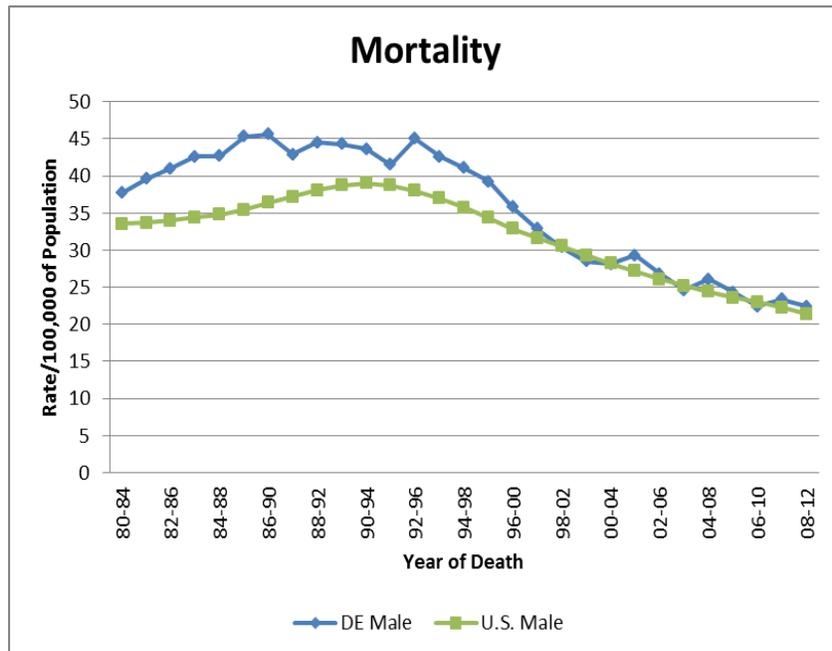
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### TRENDS OVER TIME – DELAWARE AND U.S.

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- From 1998-2002 to 2008-2012
  - Mortality rates for prostate cancer declined by 26 percent in Delaware and by 30 percent in the U.S.

**FIGURE 9-8: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES; U.S. AND DELAWARE, 1980-2012**

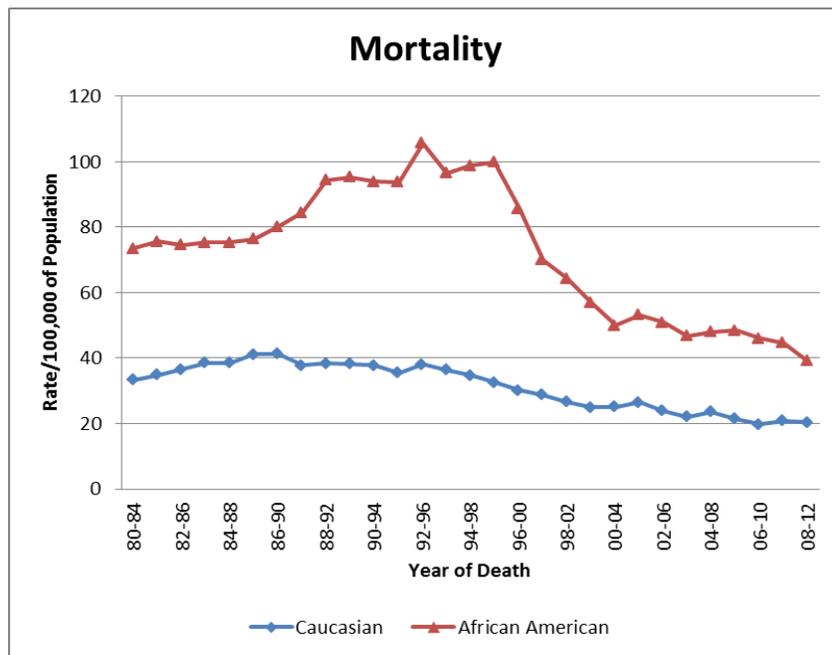


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American males in Delaware saw a 39 percent decline in prostate cancer mortality while Caucasian males saw a 23 percent decline in prostate cancer mortality during the same time period.

**FIGURE 9-9: FIVE-YEAR AVERAGE AGE-ADJUSTED PROSTATE CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC MORTALITY RATES - DELAWARE

- 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.

**TABLE 9-7: AGE-SPECIFIC PROSTATE CANCER MORTALITY RATES BY RACE; DELAWARE, 2008-2012**

Age at Death	All Males	Caucasian	African American
0-39	---	---	---
40-64	6.6	5.1	---
65-74	60.4	52.5	111.1
75-84	183.5	157.8	428.2
85+	525.7	528.1	---

Source: Delaware Health Statistics Center, 2015  
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

## CHAPTER 10: STOMACH CANCER

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### RISK FACTORS

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

- Diet high in smoked foods, pickled vegetables, and salted fish and meats
- Low intake of fresh fruits and vegetables
- Tobacco use (this doubles the risk of stomach cancer)
- Obesity
- Heterocyclic amines and polycyclic aromatic hydrocarbons in grilled, charred, or fried meats and fish

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

- Living in Japan, China, Southern and Eastern Europe, and South and Central America
- Epstein-Barr virus
- Workplace exposures in the coal, metal, and rubber industry

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

- Infection with certain bacteria (e.g. *Helicobacter pylori*)
- Males are at higher risk than females
- Increasing age especially after age 50
- People of Hispanic ethnicity are at increased risk; people of African American or Asian/Pacific Islander race are at increased risk
- Family history of stomach cancer; personal history of stomach lymphoma
- Pernicious anemia (leads to a shortage of red blood cells)
- Type A blood

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

### EARLY DETECTION

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There is no screening test recommended to detect stomach cancer in the general population. Some tests can be used to diagnose stomach cancer in individuals with known risks.

## INCIDENCE

For 2008-2012, Delaware ranked 21<sup>st</sup> in the U.S. for stomach cancer incidence (20<sup>th</sup> in 2007-2011); males ranked 16<sup>th</sup> (19<sup>th</sup> in 2007-2011) and females ranked 28<sup>th</sup> (18<sup>th</sup> in 2007-2011)<sup>8</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 330 stomach cancer cases (1.3 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 65.5 percent of stomach cancer cases.
- Caucasians accounted for 69.4 percent of stomach cancer cases in Delaware.

**TABLE 10-1: NUMBER OF STOMACH CANCER CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	330	216	114	229	152	77	86	55	31
Kent	60	36	24	41	25	16	15	---	---
New Castle	180	120	68	123	80	43	57	35	22
Sussex	82	60	22	65	47	18	14	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Counts less than 6 are not shown to protect patient privacy

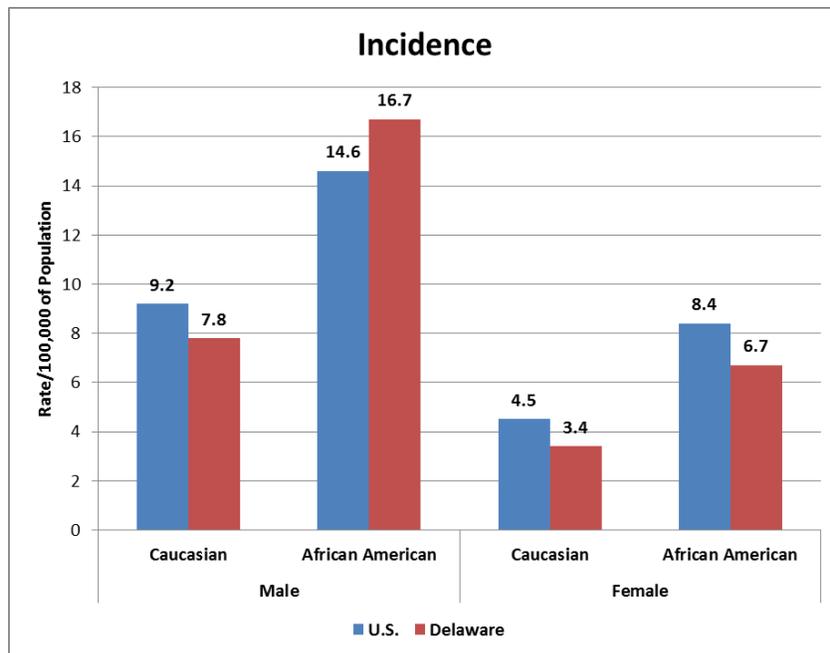
- In Delaware
  - Caucasians (5.4 per 100,000) had a significantly lower stomach cancer incidence than African Americans (10.6 per 100,000).
  - Caucasian females (3.4 per 100,000) had a lower stomach cancer incidence rate than African American females (6.7 per 100,000); this difference was not statistically significant.
  - Caucasian males (7.8 per 100,000) had a significantly lower stomach cancer incidence rate than African American males (16.7 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a significantly lower stomach cancer incidence rate than the U.S. (6.3 per 100,000 vs 7.4 per 100,000).
  - Delaware males (9.3 per 100,000) and females (4.0 per 100,000) had lower stomach cancer incidence rates than U.S. males (10.1 per 100,000) and females (5.3 per 100,000), respectively; only the difference in females was statistically significant.
  - Caucasians in Delaware (5.4 per 100,000) had a significantly lower stomach cancer incidence rate than Caucasians in the U.S. (6.6 per 100,000).
  - There was no statistically significant difference in stomach cancer incidence rates between African Americans in Delaware (10.6 per 100,000) and the U.S. (10.9 per 100,000).

**TABLE 10-2: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	7.4	10.1	5.3
<b>Delaware</b>	6.3	9.3	4.0
Kent	6.6	8.6	---
New Castle	6.7	9.8	4.4
Sussex	5.4	8.6	---

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 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 10-1: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER INCIDENCE RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

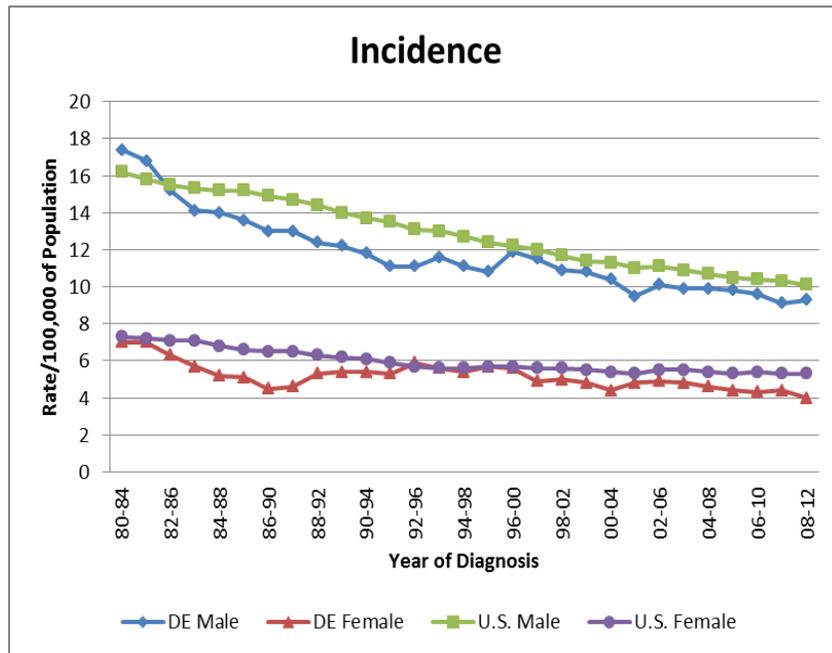


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Incidence rates for stomach cancer declined 16 percent in Delaware and 10 percent in the U.S.
  - Delaware females saw big declines in incidence (20 percent) along with the Delaware male stomach cancer incidence rate, which declined by 15 percent.
  - U.S. female stomach cancer incidence rates saw a slight decline of 5 percent and U.S. male stomach cancer incidence rates saw a decline by 14 percent.

**FIGURE 10-2: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

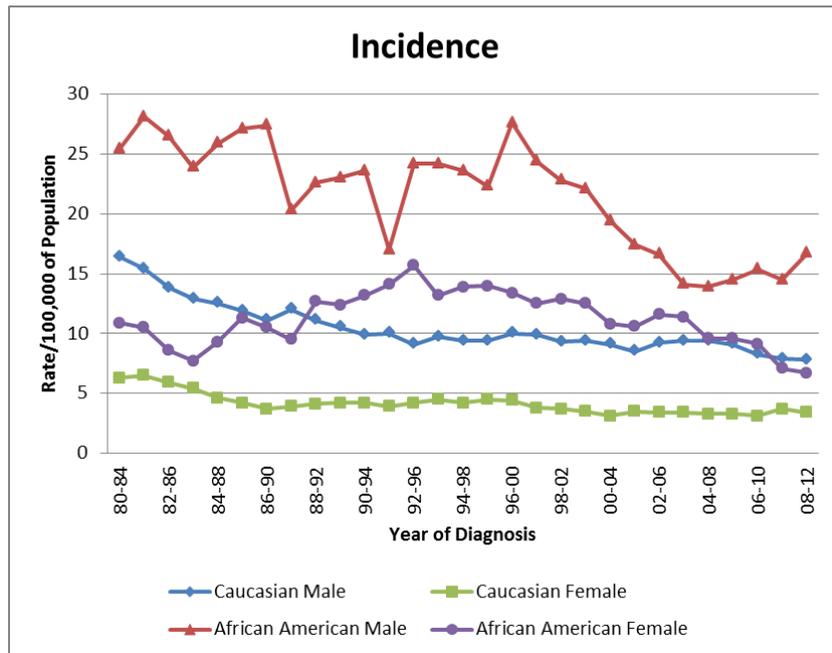


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African American females in Delaware saw the sharpest decline in stomach cancer incidence (48 percent); African American males saw a 27 percent decrease in the incidence rate.
  - Caucasian males saw a 16 percent decline in stomach cancer incidence while Caucasian females saw a slight decline by 8 percent in the same time period.

**FIGURE 10-3: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER INCIDENCE RATES BY RACE AND SEX; DELAWARE, 1980-2012**

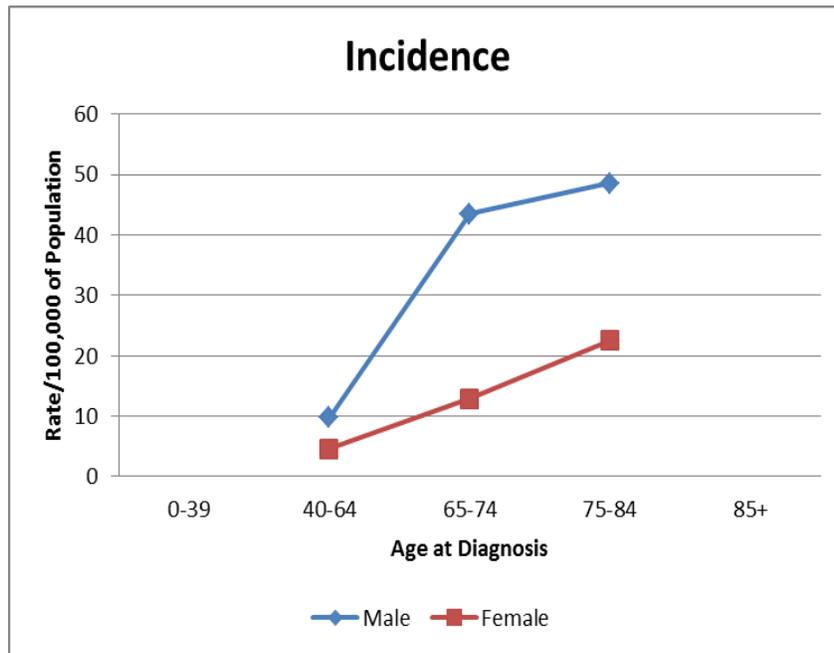


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- The peak age for stomach 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 or 85 and older age groups.

**FIGURE 10-4: AGE-SPECIFIC STOMACH CANCER INCIDENCE RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

- After stratifying by race Caucasian males have peak stomach cancer incidence at 75-84 years of age. Due to low numbers, the incidence rates could not be calculated for the other groups.

**TABLE 10-3: AGE-SPECIFIC STOMACH CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	7.8	---	---	---
65-74	37.8	---	---	---
75-84	47.7	---	---	---
85+	---	---	---	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

### STAGE OF DIAGNOSIS - DELAWARE

- In 2008-2012, there were 76 (23.0 percent) stomach cancers diagnosed at the local stage; 93 (28.2 percent) at the regional stage; 117 (35.5 percent) at the distant stage; and 44 (13.3 percent) had an unknown stage.

- African Americans had a lower proportion (18.6 percent) of stomach cancers diagnosed at the distant stage than Caucasians (25.3 percent).
- Males also had more stomach cancers diagnosed at the distant stage (36.1 percent) than females (34.2 percent).

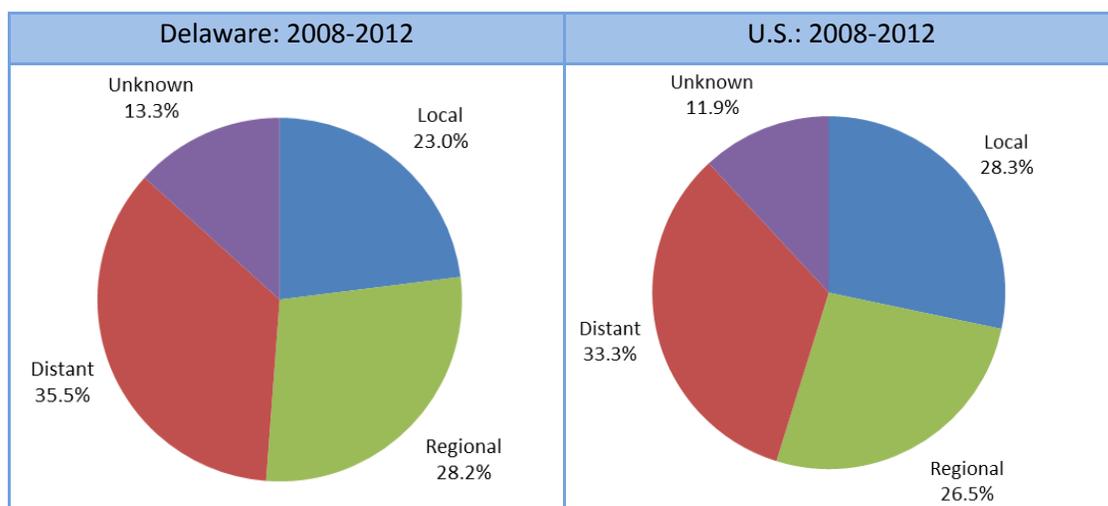
**TABLE 10-4: STOMACH CANCER CASES BY STAGE AT DIAGNOSIS BY RACE AND SEX; DELAWARE, 2008-2012**

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Local</b>	76 (23.0)	50 (23.1)	26 (22.8)	58 (25.3)	39 (25.7)	19 (24.7)	16 (18.6)	---	---
<b>Regional</b>	93 (28.2)	59 (27.3)	34 (29.8)	58 (25.3)	39 (25.7)	19 (24.7)	31 (36.0)	18 (32.7)	13 (41.9)
<b>Distant</b>	117 (35.5)	78 (36.1)	39 (34.2)	83 (36.2)	56 (36.8)	27 (35.1)	30 (34.9)	20 (36.4)	10 (32.3)
<b>Unknown</b>	44 (13.3)	29 (13.4)	15 (13.2)	30 (13.1)	18 (11.8)	12 (15.6)	9 (10.5)	---	---
<b>Total</b>	330	216	114	229	152	77	86	55	31

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Counts less than 6 are not shown to protect patient privacy

- In comparing U.S. and Delaware data, the U.S. had a higher proportion diagnosed at the local stage and fewer at the distant stage when compared to Delaware.

**FIGURE 10-5: DISTRIBUTION OF STOMACH CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**

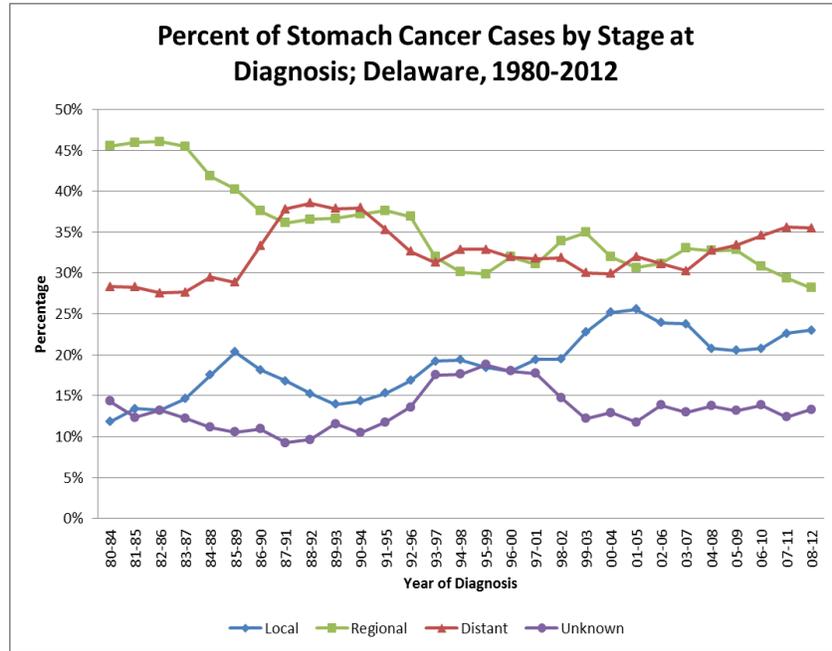


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of stomach cancer cases diagnosed at the local stage increased from 11.8 percent to 23.0 percent.

- Cases of stomach cancer diagnosed at the distant stage increased from 28.3 percent to 35.5 percent.

**FIGURE 10-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR STOMACH CANCER CASES; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 11<sup>th</sup> in the U.S. for stomach cancer mortality (6<sup>th</sup> in 2007-2011); males ranked 6<sup>th</sup> (4<sup>th</sup> in 2007-2011) and females ranked 16<sup>th</sup> (19<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 195 deaths (2.1 percent of all cancer deaths) from stomach cancer.
- Caucasians accounted for 66.7 percent of stomach cancer deaths in Delaware.

**TABLE 10-5: NUMBER OF STOMACH CANCER DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	195	125	70	130	82	48	51	34	17
Kent	35	24	11	25	16	9	7	---	---
New Castle	114	68	46	74	44	30	33	19	14
Sussex	46	33	13	31	22	9	11	---	---

Source: Delaware Health Statistics Center, 2015  
 Counts less than 6 are not shown to protect patient privacy

- In Delaware
  - Males had a significantly higher stomach cancer mortality rate (5.5 per 100,000) compared to females (2.4 per 100,000).
  - Caucasian males (4.4 per 100,000) had a significantly lower stomach cancer mortality rate than African American males (10.4 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a higher stomach cancer mortality rate (3.8 per 100,000) than the U.S. (3.4 per 100,000); this difference was not statistically significant.
  - Males in the U.S. (4.6 per 100,000) had a lower stomach cancer mortality rate than males in Delaware (5.5 per 100,000) and the difference was not statistically significant; females in Delaware and the U.S. had the same mortality rate (2.4 per 100,000).
  - Caucasians in Delaware (3.1 per 100,000) had a higher stomach cancer mortality rate compared to Caucasians in the U.S. (2.9 per 100,000); this difference was not statistically significant.
  - African Americans in Delaware (6.4 per 100,000) had a higher stomach cancer mortality rate than African Americans in the U.S. (6.3 per 100,000); this difference was not statistically significant.

**TABLE 10-6: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

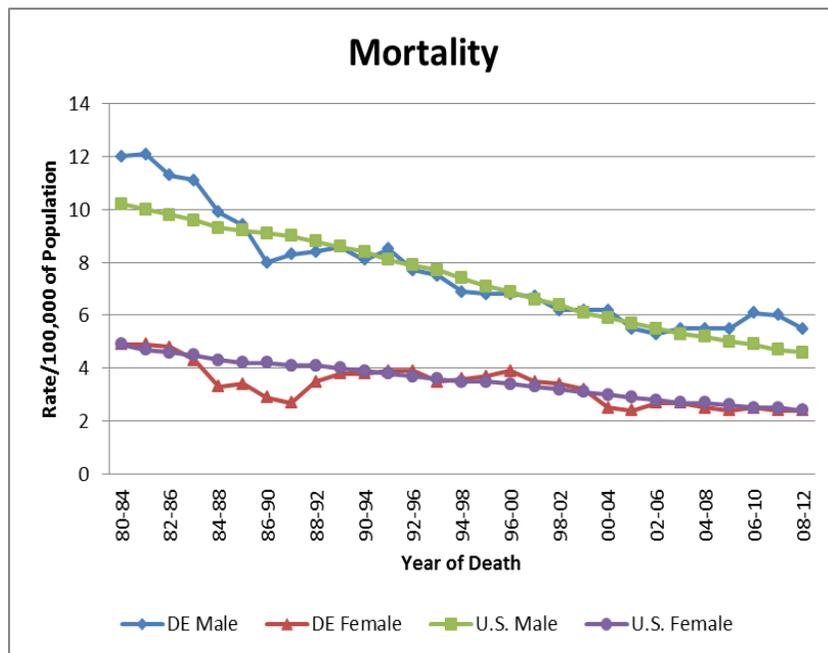
	Overall	Male	Female
<b>U.S.</b>	3.4	4.6	2.4
<b>Delaware</b>	3.8	5.5	2.4
Kent	4.0	---	---
New Castle	4.2	5.7	2.9
Sussex	3.1	4.8	---

Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 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

## TRENDS OVER TIME – DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Mortality rates for stomach cancer declined 17 percent in Delaware and 24 percent in the U.S.
  - Delaware males saw the smallest decline in stomach cancer mortality (11 percent) with Delaware female stomach cancer mortality having the biggest decline of 29 percent.
  - U.S. female stomach cancer decreased 25 percent and U.S. male stomach cancer mortality decreased by 28 percent.

**FIGURE 10-7: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

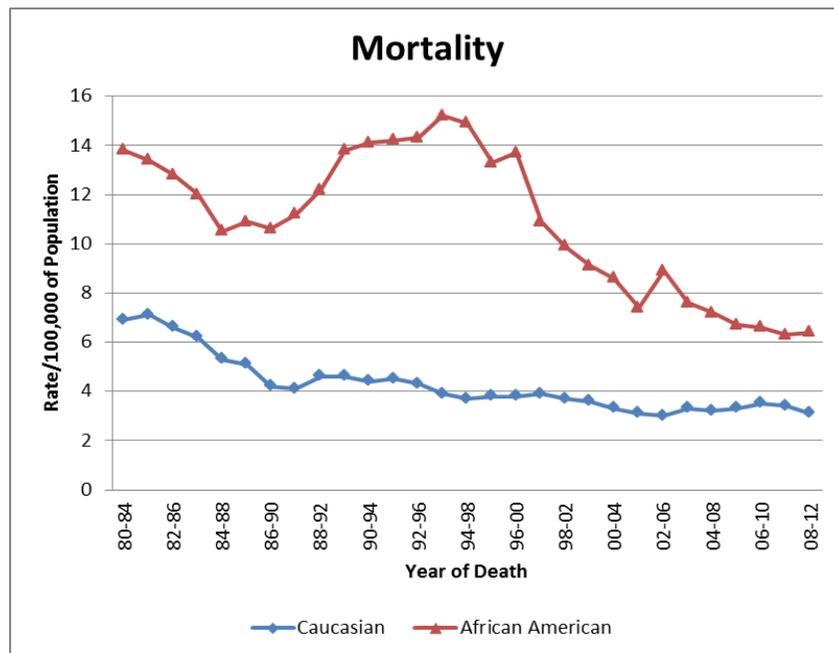


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

## TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - African Americans in Delaware saw the sharpest decline in stomach cancer mortality (35 percent).
  - Caucasians saw a 16 percent decline in the stomach cancer mortality rate.

**FIGURE 10-8: FIVE-YEAR AVERAGE AGE-ADJUSTED STOMACH CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**AGE-SPECIFIC MORTALITY RATES - DELAWARE**

- The peak age for stomach cancer mortality is age 85 years and over. Due to low numbers mortality rates were not able to be computed for most of the age groups.

**TABLE 10-7: AGE-SPECIFIC STOMACH CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	---	---	---	---
65-74	---	---	---	---
75-84	36.8	---	---	---
85+	---	---	---	---

Source: Delaware Health Statistics Center, 2015  
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

## CHAPTER 11: URINARY BLADDER CANCER

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### RISK FACTORS

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

- Smoking cigarettes
- Low fluid consumption
- Excessive use of certain pain medications (e.g. phenacetin)

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

- Workplace exposures to aromatic amines used in the dye industry (e.g. benzidine, beta-naphthylamine)
- Employment in rubber or leather industries
- Arsenic in drinking water
- Treatment with alkylating agent chemotherapy drugs like Cytosan
- Radiation therapy to the bladder
- Exposure to combustion gases and soot from coal

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

- Caucasians are twice as likely as African Americans to have urinary bladder cancer. Asians and American Indians are also at higher risk.
- Hispanics are at higher risk
- Most cases are present in those aged 55 and over (90 percent of cases).
- More common in males than in females
- Personal and family history of bladder cancer
- Certain gene syndromes

To protect against urinary bladder cancer, individuals should avoid tobacco.

### EARLY DETECTION

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Routine screening of the general public for bladder cancer is not recommended by any major professional organization. Screening is recommended for people at very high risk (history of work-related exposures).

## INCIDENCE

For 2008-2012, Delaware ranked 6<sup>th</sup> in the U.S. for urinary bladder cancer incidence (6<sup>th</sup> in 2007-2011); males ranked 6<sup>th</sup> (6<sup>th</sup> in 2007-2011) and females ranked 6<sup>th</sup> (8<sup>th</sup> in 2007-2011)<sup>8</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 1,283 urinary bladder cancer cases (4.9 percent of all cancer cases) diagnosed in Delaware.
- Delaware males accounted for 74.6 percent of urinary bladder cancer cases.
- Caucasians accounted for 90.9 percent of urinary bladder cancer cases in Delaware.

**TABLE 11-1: NUMBER OF URINARY BLADDER CANCER CASES, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	1,283	957	326	1,166	876	290	103	70	33
Kent	241	174	67	214	154	60	23	17	6
New Castle	647	484	163	577	436	141	65	44	21
Sussex	395	299	96	375	286	89	15	9	6

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

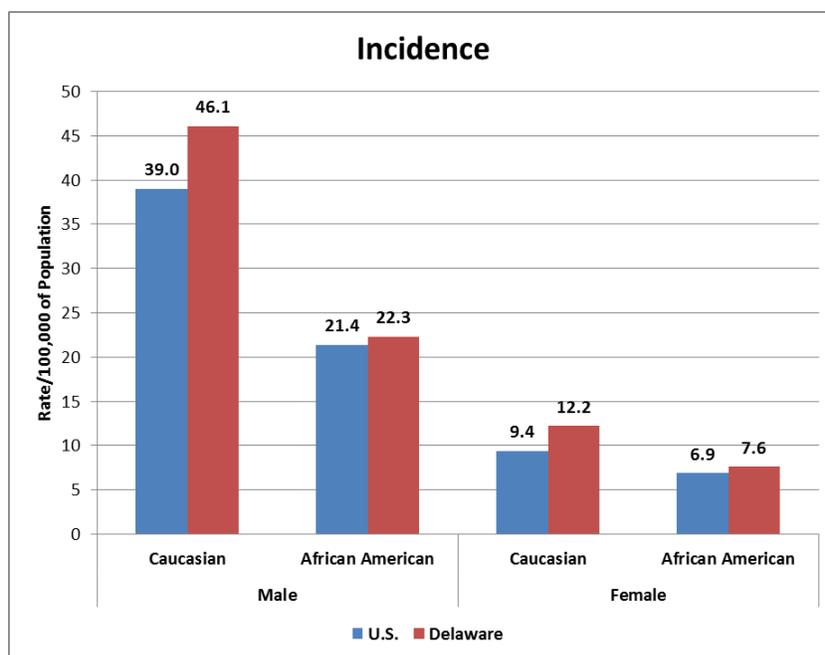
- In Delaware
  - Caucasians (26.8 per 100,000) had a significantly higher urinary bladder cancer incidence rate than African Americans (13.3 per 100,000).
  - Caucasian females (12.2 per 100,000) had a significantly higher urinary bladder cancer incidence rate than African American females (7.6 per 100,000).
  - Caucasian males (46.1 per 100,000) had a significantly higher urinary bladder cancer incidence rate than African American males (7.6 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a significantly higher urinary bladder cancer incidence rate than the U.S. (24.5 per 100,000 vs 20.3 per 100,000).
  - Delaware males (42.4 per 100,000) and females (11.2 per 100,000) had significantly higher urinary bladder cancer incidence rates than U.S. males (35.8 per 100,000) and females (8.7 per 100,000), respectively.
  - Caucasians in Delaware (26.8 per 100,000) had significantly higher urinary bladder cancer incidence rates than Caucasians in the U.S. (22.2 per 100,000).
  - There was no statistically significant difference between urinary bladder cancer incidence rates for African Americans in Delaware (13.3 per 100,000) and the U.S. (12.6 per 100,000).

**TABLE 11-2: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER INCIDENCE RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	20.3	35.8	8.7
<b>Delaware</b>	24.5	42.4	11.2
Kent	27.3	46.7	13.4
New Castle	23.1	41.1	10.2
Sussex	25.6	42.8	11.8

Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**FIGURE 11-1: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER INCIDENCE RATES FOR MALES AND FEMALES BY RACE; U.S. AND DELAWARE, 2008-2012**

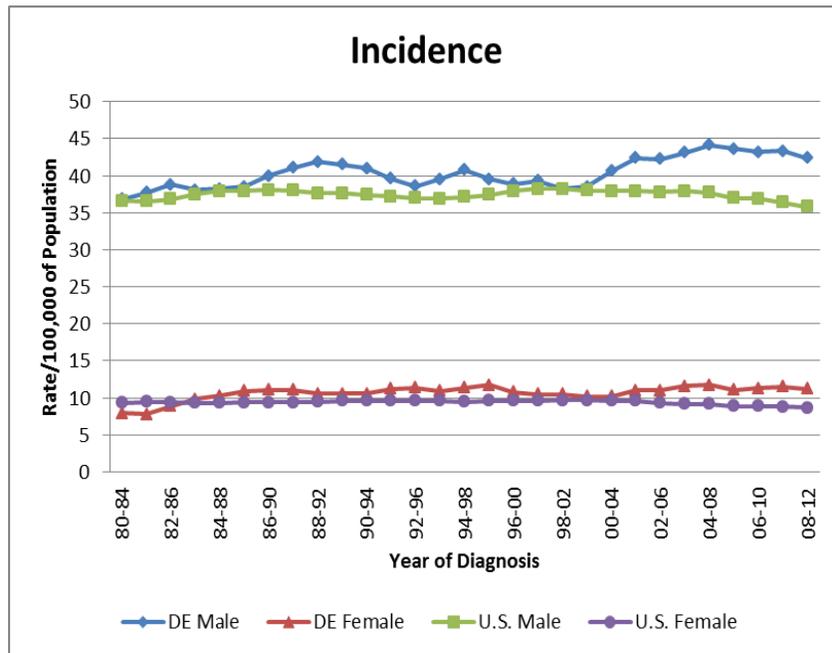


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Incidence rates for urinary bladder cancer increased 10 percent in Delaware but incidence rates decreased in the U.S. by 6 percent.
  - Delaware males saw increases in urinary bladder cancer incidence rates (11 percent) along with Delaware females (7 percent).
  - U.S. males saw a slight decrease in urinary bladder cancer incidence rates by 6 percent and U.S. females saw similar decreases in incidence rates by 10 percent.

**FIGURE 11-2: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER INCIDENCE RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

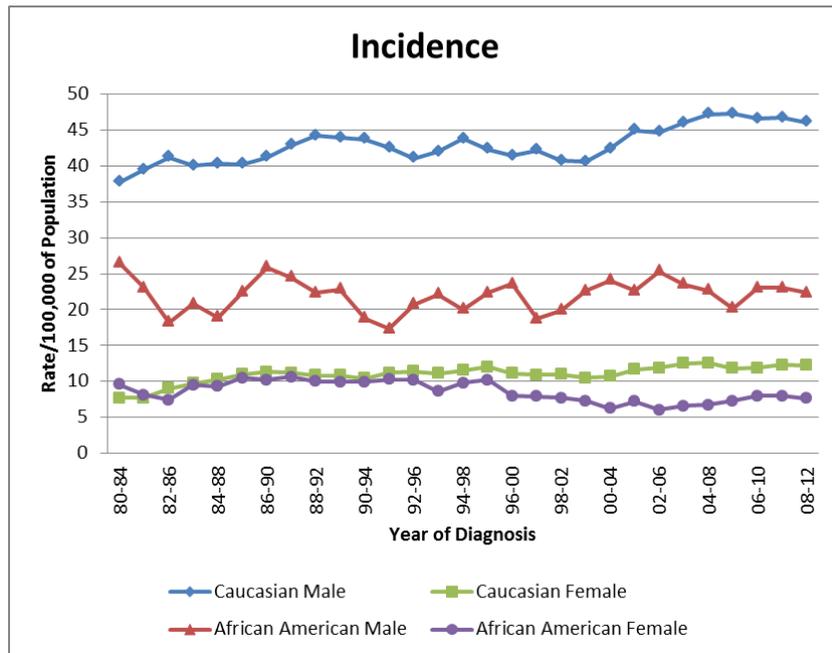


Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### TRENDS OVER TIME - DELAWARE

- From 1998-2002 to 2008-2012
  - Caucasian males saw a urinary bladder cancer incidence rate increase of 13 percent while Caucasian females saw an 11 percent increase.
  - African American males saw a urinary bladder cancer incidence rate increase of 12 percent and African American females saw a 1 percent decline.

**FIGURE 11-3: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER INCIDENCE RATES BY RACE AND SEX; DELAWARE, 1980-2012**

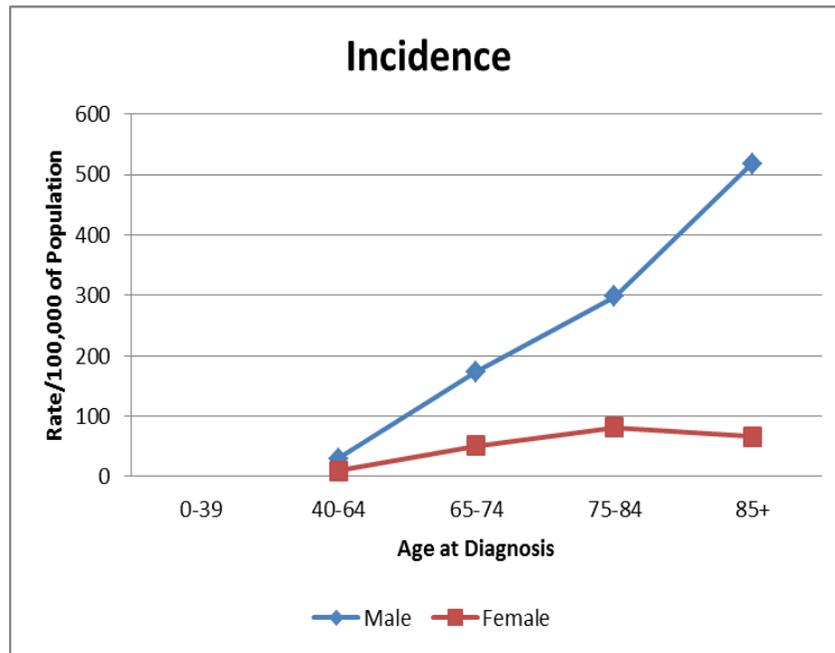


Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

### AGE-SPECIFIC INCIDENCE RATES - DELAWARE

- The peak age for urinary bladder cancer incidence is age 85 and older for males and 75-84 years for females. Due to low numbers, urinary bladder cancer incidence rates were not able to be computed for the 0-39 age group.

**FIGURE 11-4: AGE-SPECIFIC URINARY BLADDER CANCER INCIDENCE RATES BY SEX; DELAWARE, 2008-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

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

**TABLE 11-3: AGE-SPECIFIC URINARY BLADDER CANCER INCIDENCE RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Diagnosis	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	33.2	17.3	10.9	---
65-74	189.6	---	57.8	---
75-84	326.0	---	82.8	---
85+	541.3	---	71.0	---

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
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

### STAGE OF DIAGNOSIS - DELAWARE

- *In situ* urinary bladder cancer cases are included because, based on language used by pathologists, it is difficult to distinguish them from malignant cancers.

- In 2008-2012, there were 687 (53.5 percent) urinary bladder cancers diagnosed at the *in situ* stage; 434 (33.8 percent) at the local stage; 89 (6.9 percent) at the regional stage; 41 (3.2 percent) at the distant stage; and 32 (2.5 percent) had an unknown stage.
- African Americans had a lower proportion (43.7 percent) of urinary bladder cancers diagnosed at *in situ* stage than Caucasians (54.4 percent).
- Males also had more urinary bladder cancers diagnosed at *in situ* stage (54.2 percent) than females (51.5 percent).

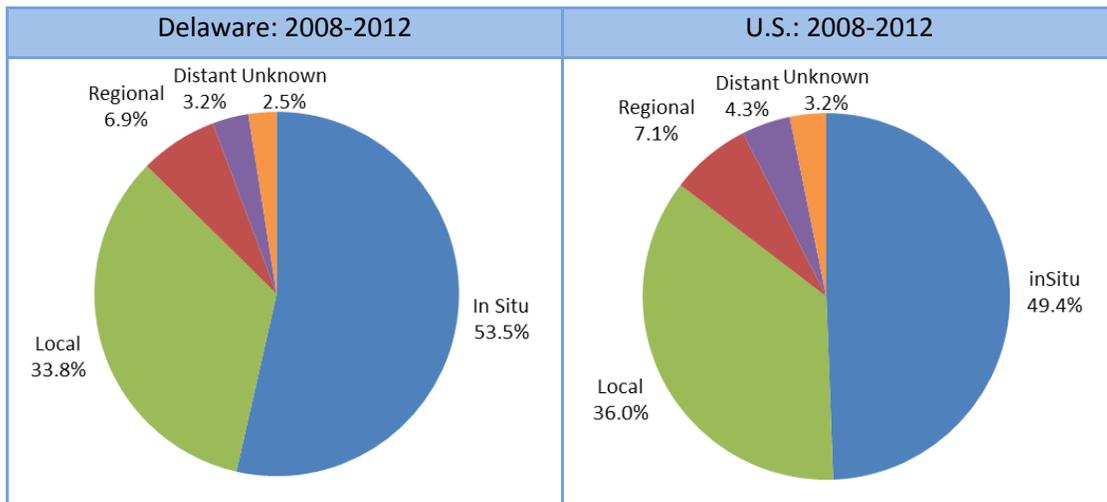
**TABLE 11-4: URINARY BLADDER CANCER CASES BY STAGE AT DIAGNOSIS BY RACE AND SEX; DELAWARE, 2008-2012**

Stage at Diagnosis	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>In situ</b>	687 (53.5)	519 (54.2)	168 (51.5)	634 (54.4)	478 (54.6)	156 (53.8)	45 (43.7)	34 (48.6)	11 (33.3)
<b>Local</b>	434 (33.8)	330 (34.5)	104 (31.9)	390 (33.4)	300 (34.2)	90 (31.0)	39 (37.9)	26 (37.1)	13 (39.4)
<b>Regional</b>	89 (6.9)	57 (6.0)	32 (9.8)	78 (6.7)	51 (5.8)	27 (9.3)	10 (9.7)	---	---
<b>Distant</b>	41 (3.2)	27 (2.8)	14 (4.3)	37 (3.2)	26 (3.0)	11 (3.8)	---	---	---
<b>Unknown</b>	32 (2.5)	24 (2.5)	8 (2.5)	27 (2.3)	21 (2.4)	6 (2.1)	---	---	---
<b>Total</b>	1,283	957	326	1,166	876	290	103	70	33

Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
Counts less than 6 are not shown to protect patient privacy

- In comparing U.S. and Delaware data, Delaware has more *in situ* urinary bladder cancer cases and the U.S had more cases diagnosed at the distant stage.

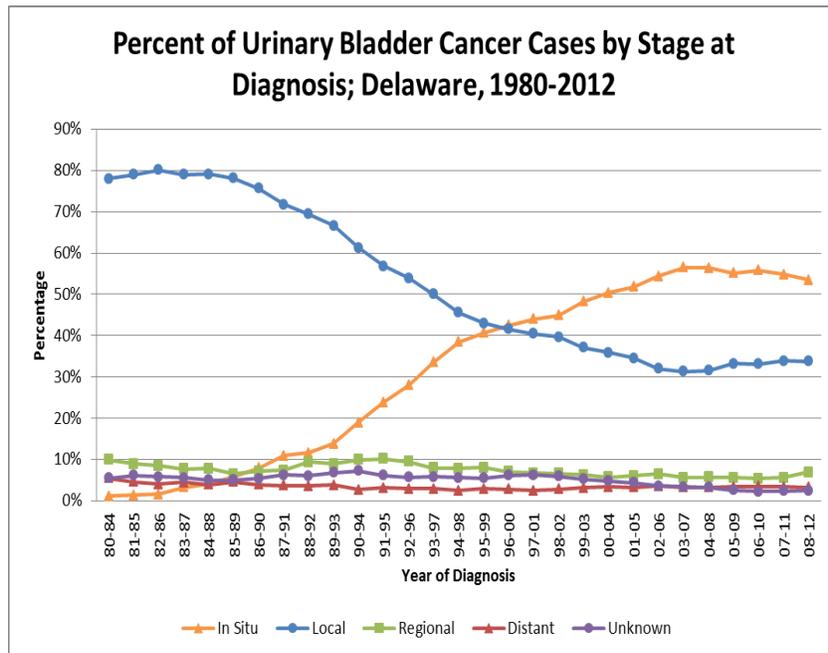
**FIGURE 11-5: DISTRIBUTION OF URINARY BLADDER CANCER CASES BY STAGE AT DIAGNOSIS; U.S. AND DELAWARE, 2008-2012**



Source (Delaware): Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

- From 1980-1984 to 2008-2012 in Delaware
  - The percent of urinary bladder cancer cases diagnosed at the *in situ* stage increased from 1.2 percent to 53.5 percent.
  - Urinary bladder cancer cases diagnosed at the distant stage decreased from 5.4 percent to 3.2 percent.

**FIGURE 11-6: FIVE-YEAR STAGE OF DIAGNOSIS DISTRIBUTIONS FOR URINARY BLADDER CANCER CASES; DELAWARE, 1980-2012**



Source: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

## MORTALITY

For 2008-2012, Delaware ranked 18<sup>th</sup> in the U.S. for urinary bladder cancer mortality (9<sup>th</sup> in 2007-2011); males ranked 21<sup>st</sup> (15<sup>th</sup> in 2007-2011) and females ranked 11<sup>th</sup> (13<sup>th</sup> in 2007-2011)<sup>9</sup>.

### 2008-2012 DATA

- In 2008-2012, there were 243 deaths (2.6 percent of all cancer deaths) from urinary bladder cancer.
- Caucasians accounted for 86.8 percent of urinary bladder cancer deaths in Delaware.

**TABLE 11-5: NUMBER OF URINARY BLADDER CANCER DEATHS, BY RACE AND SEX; DELAWARE AND COUNTIES, 2008-2012**

	All Races			Caucasian			African American		
	All	Male	Female	All	Male	Female	All	Male	Female
<b>Delaware</b>	243	159	84	211	141	70	30	17	13
Kent	47	30	17	45	28	17	---	---	---
New Castle	135	91	44	110	78	32	24	12	12
Sussex	61	38	23	56	35	21	---	---	---

Source: Delaware Health Statistics Center, 2015  
Counts less than 6 are not shown to protect patient privacy

- In Delaware
  - Males had a significantly higher urinary bladder cancer mortality rate (7.5 per 100,000) compared to females (2.8 per 100,000)

- There was no statistically significant difference between the urinary bladder cancer mortality rates for Caucasians (4.8 per 100,000) and African Americans (4.4 per 100,000).
- Comparing Delaware and the U.S.
  - Delaware had a higher urinary bladder cancer mortality rate (4.7 per 100,000) than the U.S. (4.4 per 100,000); this difference was not statistically significant.
  - U.S. males (7.7 per 100,000) and females (2.2 per 100,000) had urinary bladder cancer mortality rates that were not significantly different from their counterparts in Delaware (male: 7.5 per 100,000; female: 2.8 per 100,000).
  - Caucasians had a higher urinary bladder cancer mortality rate in Delaware (4.8 per 100,000) compared to Caucasians in the U.S. (4.6 per 100,000); this difference was not statistically significant.
  - African Americans in Delaware (4.4 per 100,000) had a higher urinary bladder cancer mortality rate than African Americans in the U.S. (3.5 per 100,000); this difference was not statistically significant.

**TABLE 11-6: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER MORTALITY RATES OVERALL AND BY SEX; U.S., DELAWARE AND COUNTIES, 2008-2012**

	Overall	Male	Female
<b>U.S.</b>	4.4	7.7	2.2
<b>Delaware</b>	4.7	7.5	2.8
<b>Kent</b>	5.5	8.5	---
<b>New Castle</b>	4.8	8.0	2.7
<b>Sussex</b>	4.0	5.9	---

Source (Delaware): Delaware Health Statistics Center, 2015

Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015

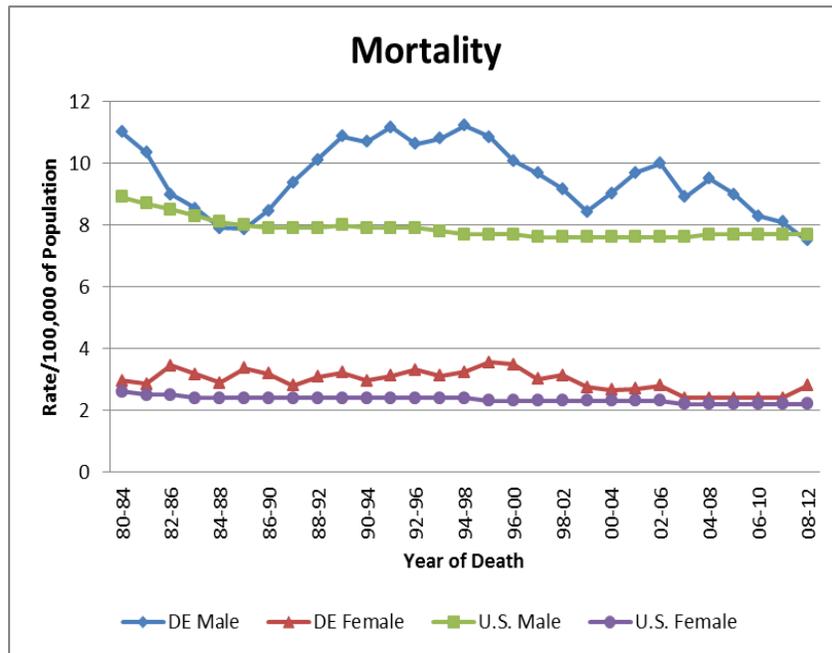
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

Rates based on less than 25 cases are not shown

### TRENDS OVER TIME – DELAWARE AND U.S.

- From 1998-2002 to 2008-2012
  - Mortality rates for urinary bladder cancer declined 15 percent in Delaware but mortality rates remained the same in the U.S.
  - Delaware males saw big declines in urinary bladder cancer mortality rates (18 percent) while the urinary bladder cancer mortality rate for Delaware females declined 10 percent.
  - The urinary bladder cancer mortality rate increased 1 percent among U.S. males and decreased 4 percent among U.S. females.

**FIGURE 11-7: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER MORTALITY RATES BY SEX; U.S. AND DELAWARE, 1980-2012**

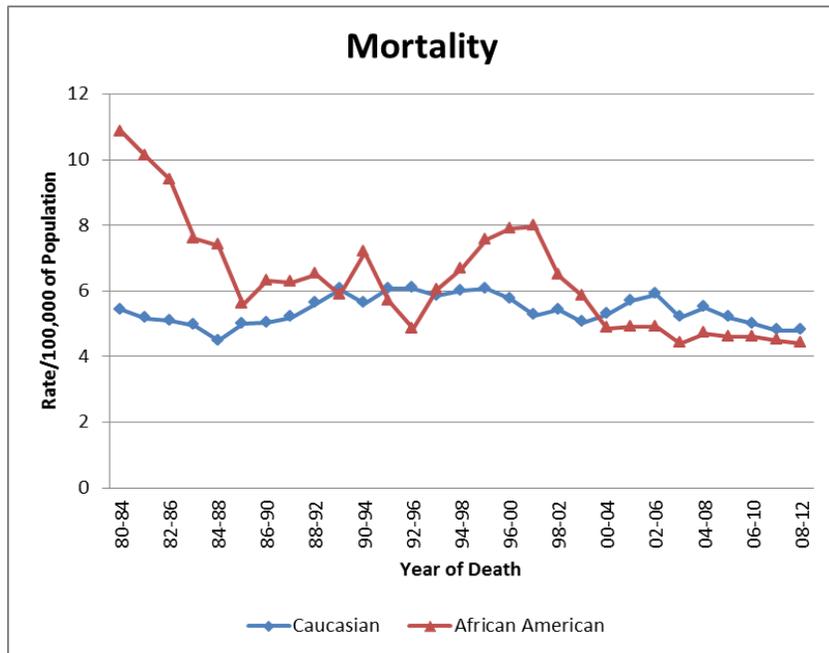


Source (Delaware): Delaware Health Statistics Center, 2015  
 Source (U.S.): Surveillance, Epidemiology and End Results Program (SEER 18), National Cancer Institute, 2015  
 Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**TRENDS OVER TIME - DELAWARE**

- From 1998-2002 to 2008-2012
  - African Americans saw a 32 percent decline in urinary bladder cancer mortality rates while Caucasians saw an 11 percent decline.

**FIGURE 11-8: FIVE-YEAR AVERAGE AGE-ADJUSTED URINARY BLADDER CANCER MORTALITY RATES BY RACE; DELAWARE, 1980-2012**



Source: Delaware Health Statistics Center, 2015  
Rates are per 100,000 of population age-adjusted to the 2000 U.S. standard population

**AGE-SPECIFIC MORTALITY RATES - DELAWARE**

- The peak age for urinary bladder cancer mortality is age 85 and older. Due to low numbers, mortality rates were not able to be computed for most categories.

**TABLE 11-7: AGE-SPECIFIC URINARY BLADDER CANCER MORTALITY RATES BY SEX AND RACE; DELAWARE, 2008-2012**

Age at Death	Males		Females	
	Caucasian	African American	Caucasian	African American
0-39	---	---	---	---
40-64	4.6	---	---	---
65-74	20.1	---	---	---
75-84	55.1	---	---	---
85+	167.2	---	---	---

Source: Delaware Health Statistics Center, 2015  
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

## CHAPTER 12: SMOKING AND CANCER

### SMOKING PREVALENCE

Since the release of the first U.S. Surgeon General’s Report on Smoking and Health in 1964, cigarette use has declined sharply, yet continues. Despite advances in educating the public about the harms of smoking, 20.5 percent of males and 15.8 percent of females still smoked cigarettes in 2012<sup>16</sup>. About 78 percent of those who smoked cigarettes were also daily smokers<sup>16</sup>. Among adults aged 18 and older, the number who smoked 30 or more cigarettes a day decreased significantly from 12.6 percent in 2008 to 7.0 percent in 2012; even so more than 42 million adults in the U.S. smoke cigarettes<sup>16</sup>.

According to the 2014 Behavioral Risk Factor Survey (BRFS) in Delaware<sup>17</sup>, 23.5 percent of males and 16.6 percent of females smoked. When looking at prevalence by race, 17 percent of African Americans and 22 percent of Caucasians were current smokers. When considering age, 28.9 percent of those in the 25-34 year age group had the highest prevalence of current smoking compared to those aged 55-64 and 65 years and older who had a significantly lower prevalence. Delawareans with less than a 12<sup>th</sup> grade education had the highest prevalence of smokers (40.3 percent), while those with more than a 12<sup>th</sup> grade education had a significantly lower prevalence of smokers at 15.3 percent. Table 12-1 gives the percent of adults by smoking status in the Behavioral Risk Factor Survey for both the U.S. and Delaware<sup>18</sup>. The Delaware numbers are prevalence while the U.S. numbers are the national median.

**TABLE 12-1: BEHAVIORAL RISK FACTOR SURVEY DATA SHOWING THE PERCENT OF ADULTS BY SMOKING STATUS, DELAWARE AND U.S 2011-2014**

	Delaware				U.S.			
	2011	2012	2013	2014	2011	2012	2013	2014
<b>Smoke Every Day</b>	16.3	14.6	13.4	14.7	15.2	13.5	13.4	12.9
<b>Smoke Some Days</b>	5.5	5.1	6.1	5.2	5.7	5.7	5.4	5.2
<b>Former Smoker</b>	28.3	26.9	25.4	24.6	25.1	25.2	25.3	25.0
<b>Never Smoked</b>	50.0	53.4	55.0	55.5	52.9	54.4	55.0	55.9
<b>Current Smoker</b>	21.8	19.7	19.6	19.9	21.2	19.6	19.0	18.1

Source: Delaware Behavioral Risk Factor Survey, 2015

### LINK BETWEEN CANCER AND SMOKING

Exposure to the carcinogens present in cigarette smoke activates a chain of events that alters DNA and contributes to mutations which contribute to cancer-causing mechanisms<sup>20</sup>. The contents of the cigarette smoke, including various carcinogens and other products, are foreign to the human body. As such, enzymes in the body try to detoxify these foreign objects. During this process, other products may

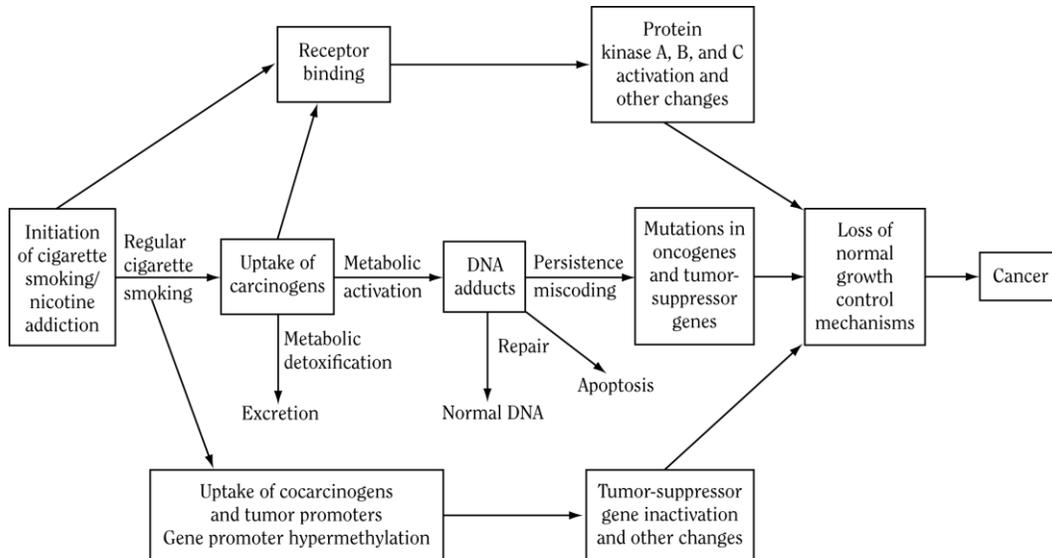
<sup>16</sup> Centers for Disease Control and Prevention, *Current cigarette smoking among adults – United States, 2005-2012, 2014*

<sup>17</sup> Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention

<sup>18</sup> Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health. BRFSS Prevalence & Trends Data [online]. 2015. [accessed Nov 30, 2015]. URL: <http://www.cdc.gov/brfss/brfssprevalence/>.

be formed which, as intermediates, may bind to DNA, and are called adducts. The binding of adducts to DNA alters the DNA. If the DNA is not fixed by the DNA repair enzymes, miscoding can occur during DNA replication, resulting in a permanent mutation of the DNA sequence. If the mutation occurs in an area of the DNA which is crucial to normal growth control mechanisms, it leads to uncontrolled and further mutations and, eventually, to cancer. Figure 12-1 illustrates the causation of cancer by carcinogens in tobacco smoke<sup>20</sup>.

**FIGURE 12-1: PATHWAY FOR CAUSATION OF CANCER BY CARCINOGENS IN TOBACCO SMOKE**



Tobacco-related cancers are associated with high rates of smoking and continued smoking after cancer diagnosis is associated with reduced survival in several cancers including breast, bladder, prostate, and cervical cancer<sup>19</sup>. The U.S. Department of Health and Human Services has identified the following cancers as having a direct link to smoking<sup>20</sup>:

- Acute myeloid leukemia
- Cervix
- Colon and rectum
- Esophagus
- Kidney and renal pelvis
- Larynx
- Lip
- Liver
- Lung and bronchus
- Oral cavity
- Pancreas
- Pharynx
- Stomach
- Trachea
- Urinary bladder

<sup>19</sup> Schnoll, R. A., Martinez, E., Langer, C., Miyamoto, C., & Leone, F. (2011). Predictors of smoking cessation among cancer patients enrolled in a smoking cessation program. *Acta Oncologica*, 50(5), 678-684.

<sup>20</sup> U.S. Department of Health and Human Services. *The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014. Printed with corrections, January 2014.

In 1981, it was estimated that 30 percent of cancer deaths were caused by smoking in the U.S.<sup>21</sup>. In 2010, this number dropped to 28.7 percent for cancers attributed to smoking and rose to 31.7 percent for all cancers regardless of whether they were caused by smoking or not<sup>21</sup>. In addition, for those who continue to smoke after an initial cancer diagnosis, there is an increased risk of recurrence or second primary cancer among bladder, breast, lymphoma, and colorectal cancer patients<sup>19</sup>. In addition to other cancers, patients who smoke are also more likely to suffer from other adverse effects of smoking such as cardiovascular disease and chronic obstructive pulmonary disease (COPD)<sup>20</sup>. Younger patients who smoke need more targeted outreach as they are less likely to quit smoking during or after a cancer diagnosis; males are more likely to quit smoking after a cancer diagnosis than females<sup>19</sup>. Patients who currently smoke are at increased risk of overall mortality and disease-specific mortality when compared to patients who are former or never smokers<sup>22</sup>.

## SMOKING CESSATION AND SMOKING PREVENTION

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To support cessation and smoking prevention efforts, the IMPACT Delaware Tobacco Prevention Coalition (IMPACT) and other tobacco prevention and control stakeholders in Delaware developed the “Plan for a Tobacco-Free Delaware 2011”<sup>23</sup>. In 2015, accomplishments since the 2011 plan include:

- The high school student smoking prevalence was at an all-time low of 9.9 percent
- Adult cigarette smoking prevalence was also at an all-time low of 17.2 percent
- Several areas in Delaware are smoke free including all beaches, hospital campuses, college and university campuses, state parks, and state-owned campuses

Overall in Delaware for 2014, 59.3 percent of people who smoked reported that they had tried to quit at least once during the past year. In 2010, there was \$204 million in annual workplace productivity losses, \$417 million in annual costs of tobacco-related premature death and \$430 million in annual tobacco-related direct medical expenditures<sup>24</sup>. These numbers illustrate how critical tobacco prevention and cessation is in the State. Several goals updated in 2015 from the “Plan for a Tobacco-Free Delaware 2011” include:

- Prevent the initiation and use of tobacco and emerging products among Delawareans
- Increase quitting and quit attempts among Delawareans who use tobacco products
- Eliminate exposure to secondhand smoke, vapors, and other emissions
- Decrease the social acceptability of tobacco, e-cigarettes, and emerging products
- Strengthen and cultivate Delaware’s leadership of all levels in comprehensive tobacco prevention and control

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<sup>21</sup> Jacobs, E. J., Newton, C. C., Carter, B. D., Feskanich, D., Freedman, N. D., Prentice, R. L., & Flanders, W. D. (2015). What proportion of cancer deaths in the contemporary United States is attributable to cigarette smoking?. *Annals of epidemiology*, 25(3), 179-182.

<sup>22</sup> Warren, G. W., Kasza, K. A., Reid, M. E., Cummings, K. M., & Marshall, J. R. (2013). Smoking at diagnosis and survival in cancer patients. *International Journal of Cancer*, 132(2), 401-410.

<sup>23</sup> A new round in the fight against tobacco. The plan for a tobacco-free Delaware. Tobacco Prevention and Control Program. Delaware Division of Public Health

<sup>24</sup> Delaware Tobacco Prevention and Control Program

## CHAPTER 13: CANCER INCIDENCE BY CENSUS TRACT

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### BACKGROUND

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As required by Title 16, Chapter 292 of the *Delaware Code* (Appendix E), the Delaware 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.”*

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### METHODS

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

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

- For 2008-2012, 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 2008-2012 census tract analyses, 26,302 Delaware cancer cases diagnosed during the time period were included in the analyses.
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### RESULTS OF CENSUS TRACT ANALYSES

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Cancer incidence rates by census tract (with confidence intervals) are shown in Appendix H for the 2008-2012 time period. Census tracts shaded in yellow have significantly higher incidence rates and those shaded in blue have significantly lower incidence rates (when compared to the overall state incidence rate).

Results for 2008-2012 show that:

- In 14 of Delaware’s 214 census tracts, the all-site cancer incidence rate was statistically significantly higher than Delaware’s average 2008-2012 incidence rate (510.0 per 100,000)<sup>25</sup>.
- In 14 of Delaware’s 214 census tracts, the all-site cancer incidence rate was statistically significantly lower than Delaware’s average 2008-2012 incidence rate (510.0 per 100,000).
- All-site cancer incidence rates for the remaining 186 census tracts were not significantly different from the state’s average rate for the 2008-2012 time period.

Appendix I shows maps of Delaware census tracts grouped by 2008-2012 all-site cancer incidence quintile. Appendix J shows maps of Delaware census tracts in which census tracts with 2008-2012 all-site cancer incidence rates are significantly different from the state average. These are shaded for ease of identification.

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<sup>25</sup> 510.0 is average 2008-2012 Delaware incidence rate calculated by Excel rather than SEER\*Stat (503.9).

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## DISCUSSION OF RESULTS OF CENSUS TRACT ANALYSES

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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 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 2008-2012 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 513.07 and its all-site cancer incidence rate of 823.3 per 100,000 was significantly elevated, compared to the all-site cancer incidence rate for Delaware as a whole. 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 of 649.2 per 100,000 for 2004-2008 remained significantly elevated, compared to the all-site cancer incidence rate for Delaware. For the most recent time period, 2008-2012, 104 all-site cancer cases were diagnosed in census tract 513.02, yielding an all-site cancer incidence rate of 524.3 per 100,000 – not statistically significantly different from the all-site cancer incidence rate for Delaware.

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”*<sup>26</sup>. Because population estimates for census tracts in analyses during the three initial time periods (2001-2005, 2002-2006, 2003-2007)

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<sup>26</sup> Thun M. Sinks T. Understanding Cancer Clusters. *Cancer: A Cancer Journal for Clinicians*, 54(5), 273-280 (2004)

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.

## APPENDIX A: DATA SOURCES AND METHODOLOGY

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### CANCER INCIDENCE DATA

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#### DELAWARE CANCER REGISTRY

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This report covers data on cancer cases diagnosed among Delawareans from January 1, 2008 to December 31, 2012 and that were reported to the Delaware Cancer Registry (DCR) by May 2014. Trends in incidence rates are based on cancers diagnosed from January 1, 1980 to December 31, 2012.

During 2008-2012, there were 26,302 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)<sup>27</sup>. 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

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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<sup>28</sup>.

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.

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<sup>27</sup> 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.

<sup>28</sup> Surveillance, Epidemiology and End Results (SEER) Program, National Cancer Institute. <http://seer.cancer.gov/about/>

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.

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## CANCER MORTALITY DATA

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### DELAWARE HEALTH STATISTICS CENTER

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Mortality data are provided by the Delaware Health Statistics Center for all death certificates filed in Delaware from 2008 through 2012. Five-year average annual age-adjusted cancer mortality rates are based on deaths that occurred in the five-year time period from January 1, 2008 to December 31, 2012. Trends in cancer mortality are presented for deaths that occurred from 1980 through 2012.

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.

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### NATIONAL CENTER FOR HEALTH STATISTICS

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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 2012. 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<sup>29</sup>.

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### POPULATION ESTIMATES, 2008-2012

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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) in March 2014.

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### RISK FACTORS AND EARLY DETECTION

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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](http://www.cancer.org)) and (2) National Cancer Institute ([www.cancer.gov](http://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

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<sup>29</sup> SEER\*Stat Software, Surveillance, Epidemiology and End Results (SEER) program, National Cancer Institute. <http://seer.cancer.gov/seerstat/index.html>

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 point in time or one population at two or more points in time<sup>30</sup>. 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)<sup>31</sup>. 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:

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

- $c_i$  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.

<sup>30</sup> Anderson RN, Rosenberg HM. Report of the second workshop on age adjustment. National Center for Health Statistics. Vital Health Stat 4(30). 1998.

<sup>31</sup> 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>

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## RACE- AND SEX-SPECIFIC INCIDENCE AND MORTALITY RATES

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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.

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## CONFIDENCE INTERVALS

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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.

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<sup>32</sup> by methodology shown here:<sup>33</sup>

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

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

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<sup>34</sup>.

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## STAGE AT DIAGNOSIS

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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.

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<sup>32</sup> 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>

<sup>33</sup> Tiwari RC, Clegg LX, Zou Z. Efficient interval estimation for age-adjusted cancer rates. *Stat Methods Med Res* 2006;15(6):547-69.

<sup>34</sup> 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.

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.

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### DATA RELEASE STANDARDS

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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<sup>35,36</sup>. Furthermore, a cancer rate based on a very small number of cases is inherently unstable and cannot be reliably interpreted.

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### DEFINITION OF RACE

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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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<sup>35</sup> Coughlin SS, Clutter GG, Hutton M. Ethics in Cancer Registries. *Journal of Cancer Registry Management*, 2: 5-10, 1999.

<sup>36</sup> 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

Cancer Site Group	ICD-O-3 Site (Topography)	ICD-O-3 Histology (Morphology)
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
Lung and Bronchus	C340–C349	excludes 9050–9055, 9140 and 9590–9992
Non-Hodgkin Lymphoma		9590-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687-9691, 9695, 9698-9702, 9705, 9708-9709, 9712, 9714-9719, 9724-9729, 9735, 9737-9738, 9811-9818, 9823, 9827, 9837
Ovarian	C569	excluding 9050-9055, 9140, 9590-9992
Prostate	C619	excludes 9050–9055, 9140 and 9590–9992
Stomach	C160-C169	excluding 9050-9055, 9140, 9590-9992
Urinary Bladder	C670-C679	excluding 9050-9055, 9140, 9590-9992

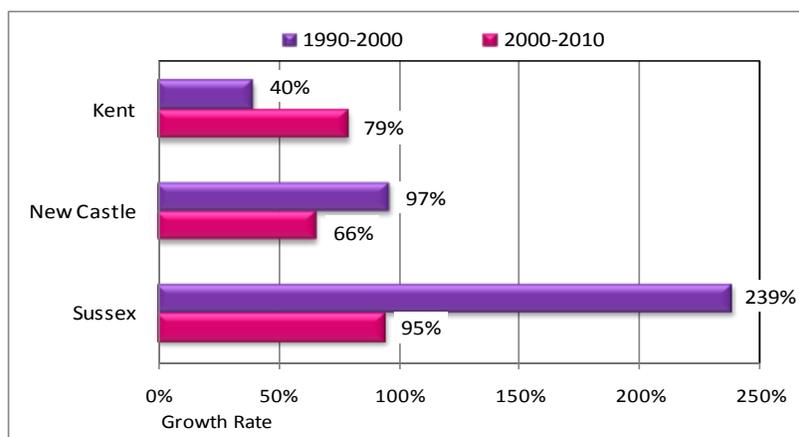
Source: Site Recode ICD-O-3/WHO 2008 Definition [http://seer.cancer.gov/siterecode/icdo3\\_dwhoheme/index.html](http://seer.cancer.gov/siterecode/icdo3_dwhoheme/index.html)

## 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."<sup>37</sup> 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**



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

Hispanic cancer rates were calculated for 2008-2012. 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

<sup>37</sup> Grieco, EM, Cassidy RC. (2001-03). "[Overview of Race and Hispanic Origin: Census 2000 Brief](http://www.census.gov/prod/2001pubs/cenbr01-1.pdf)" U.S. Census Bureau. <http://www.census.gov/prod/2001pubs/cenbr01-1.pdf> Accessed May 26, 2011.

structure of the total population and applying the current percentage of a given age-sex category measured in the American Community Survey for years 2008-2012 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.

- **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. NHIA is used for identification of Hispanic origin in this report. The expert panel continues to evaluate NHIA considering the possibility of under- or over-estimation of Hispanic cancer incidence using this algorithm due to misclassification.
- **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 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.

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### CANCER INCIDENCE AMONG PERSONS OF HISPANIC ETHNICITY

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- During 2008-2012, 667 cases of cancer were reported among Delawareans known to be of Hispanic ethnicity: 318 were male (47.7 percent) and 349 were female (52.3 percent).
- The 2008-2012 all-site cancer incidence rate for Hispanic Delawareans was 412.6 per 100,000 and this incidence rate is significantly lower than the rate for the state of Delaware (503.9 per 100,000).
- The all-site cancer incidence rate among Hispanic males (429.6 per 100,000) is significantly lower than the comparable rate for Delaware males (580.7 per 100,000). Among Hispanic females, however, the all-site cancer incidence rate (400.9 per 100,000) is not significantly different from the comparable rate for Delaware females (447.2 per 100,000).

**TABLE C-1: CANCER CASES, POPULATION SIZE AND AGE-ADJUSTED CANCER INCIDENCE RATES; DELAWARE HISPANIC POPULATION, 2008-2012**

Cancer Site and Sex	Number of Cases	Five-Year Population	Age-Adjusted Incidence Rate and 95% Confidence Interval
All-Site: Both Sexes	667	366,306	412.6 (377.7, 449.7)
All-Site: Males Only	318	189,828	429.6 (376.8, 486.9)
All-Site: Females Only	349	176,478	400.9 (354.9, 450.7)
Breast (Female)	104	176,478	113.2 (90.2, 139.9)
Colorectal: Both Sexes	46	366,306	29.6 (20.8, 40.4)
Colorectal: Males Only	27	189,828	34.3 (21.1, 52.1)
Colorectal: Females Only	19	176,478	---
Lung: Both Sexes	54	366,306	42.0 (30.9, 54.7)
Lung: Males Only	22	189,828	---
Lung: Females Only	32	176,478	48.3 (32.3, 68.5)
Prostate (Male)	99	189,828	154.6 (123.1, 190.9)

\* = Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population

--- = Rate not shown when fewer than 25 cases

SOURCE: Delaware Cancer Registry, Delaware Health and Social Services, Division of Public Health, 2015

#### CANCER MORTALITY AMONG PERSONS OF HISPANIC ETHNICITY

- During 2008-2012, 149 deaths from cancer occurred among Delawareans known to be of Hispanic ethnicity: 85 were male (57.0 percent) and 64 were female (43.0 percent).
- The 2008-2012 all-site cancer mortality rate for Hispanic Delawareans was 118.5 per 100,000 and this mortality rate is significantly lower than the rate for the state of Delaware (181.0 per 100,000).
- The all-site mortality rate among Hispanic males (144.3 per 100,000) is significantly lower than the comparable rate for Delaware males (216.9 per 100,000). The all-site mortality rate for Hispanic females (96.0 per 100,000) is significantly lower than the comparable rate for Delaware females (155.5 per 100,000).

**TABLE C-2: CANCER DEATHS, POPULATION SIZE AND AGE-ADJUSTED CANCER MORTALITY RATES; DELAWARE HISPANIC POPULATION, 2008-2012**

<b>Cancer Site and Sex</b>	<b>Number of Cases</b>	<b>Five-Year Population</b>	<b>Age-Adjusted Incidence Rate and 95% Confidence Interval</b>
All-Site: Both Sexes	149	366,306	118.5 (98.5, 140.9)
All-Site: Males Only	85	189,828	144.3 (112.0, 181.8)
All-Site: Females Only	64	176,478	96.0 (72.1, 124.3)
Breast (Female)	8	176,478	---
Colorectal: Both Sexes	13	366,306	---
Colorectal: Males Only	10	189,828	---
Colorectal: Females Only	3	176,478	---
Lung: Both Sexes	27	366,306	22.1 (14.2, 32.4)
Lung: Males Only	16	189,828	---
Lung: Females Only	11	176,478	---
Prostate (Male)	9	189,828	---

\* = Rates are per 100,000 population and age-adjusted to the 2000 U.S. standard population

--- = Rate not shown when fewer than 25 deaths

SOURCE: Delaware Health Statistics Center, 2015

## APPENDIX D: BEHAVIORAL RISK FACTORS

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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<sup>38</sup>.

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 random-digit-dial telephone survey. Starting with reporting of 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<sup>39</sup>.

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<sup>40</sup>.

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### CERVICAL CANCER SCREENING

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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 (80.2 percent) were second only to Tennessee females (80.3 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 75.2 percent of U.S. females age 18 and older reported having had a Pap test within the previous three years.

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<sup>38</sup> Behavioral Risk Factor Surveillance System <http://www.cdc.gov/BRFS/>

<sup>39</sup> Behavioral Risk Factor Surveillance System (BRFS) Fact Sheet: Raking— Changing Weighting Methodology [http://www.dhss.delaware.gov/dph/dpc/files/rakingweights\\_info.pdf](http://www.dhss.delaware.gov/dph/dpc/files/rakingweights_info.pdf)

<sup>40</sup> Delaware Behavioral Risk Factor Survey – Measuring Behaviors that Affect Health. <http://www.dhss.delaware.gov/dph/dpc/brfsurveys.html>

- In Delaware, Caucasian females were more likely to have had a Pap test within the previous three years (81.3 percent) than African American females (78.1 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 (64.1 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 (91.5 percent and 91.7 percent, respectively); this prevalence was significantly higher than the ages 18-24 and ages 65 and older.
- In Delaware, the prevalence of having had a Pap test within the previous three years was significantly lower among females in the \$15,000 - \$24,999 income bracket (69.5 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 72.9 percent of females with less than a high school education had a Pap test, compared to 87.1 percent of females who completed college (a statistically significant difference).

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### OVERWEIGHT/OBESITY

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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<sup>41</sup>. The following data are specific to the 2014 Delaware BRFSS:

- In Delaware, 67.5 percent of adults ages 18 and over were overweight or obese in 2014, compared to the national median of 64.9 percent.
- In 2014, the prevalence of overweight in Delaware differed significantly by sex: 42.4 percent of males and 31.2 percent of females were overweight.
- However, the prevalence of obesity among adult Delawareans did not differ by sex: 29.4 percent of males and 31.9 percent of females were obese in 2014.
- The prevalence of overweight did not differ significantly between Caucasian (37.9 percent) and African American (32.3 percent) Delawareans.
- In Delaware, significantly more African Americans (37.7 percent) than Caucasians (29.6 percent) were obese. African American females were more likely to be obese (40.6 percent) compared to 34.5 percent of African American males.
- The prevalence of being overweight was highest among Delaware college graduates (37.9 percent) but did not differ significantly from those with any other educational attainment level.

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<sup>41</sup> About BMI for Adults [http://www.cdc.gov/healthyweight/assessing/bmi/adult\\_bmi/index.html](http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html)

- The prevalence of obesity was statistically significantly higher among Delaware adults with some education after high school (32.7 percent) than among college graduates (25.2 percent).
- The prevalence of obesity was lowest among Delaware adults with an income level of more than \$75,000 (24.9 percent) but only barely significantly lower than the obesity prevalence rate among those earning \$35,000-\$49,000 (35.5 percent). No other significant differences were observed.
- Among Delawareans, the prevalence of obesity was highest among those 45-54 (36.7 percent) and was significantly different compared to those who were under the age of 25 (17.4 percent).
- Delawareans ages 55-64 had the highest prevalence of overweight (40.3 percent) and but did not significantly differ from any other age group.

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## PHYSICAL ACTIVITY

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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 2013 BRFSS survey answer a series of questions to determine what percentage of respondents met aerobic guidelines, strengthening guidelines, both, or neither.

- In Delaware, 39.6 percent of adults ages 18 and older did not meet either aerobic or strengthening guidelines, compared with the national median of 39.5 percent.
- In Delaware, the prevalence of adults who reported they did not meet aerobic or strengthening guidelines was significantly higher among females (44.3 percent) than males (34.4 percent).
- African American Delawareans (42.8 percent) were less likely to meet guidelines than Caucasians (38.0 percent). This difference was not statistically significant.
- Delawareans ages 45-54 (44.1 percent) were less likely to meet either aerobic or strengthening guidelines. However, this was not statistically significant compared to any other age group except 18-24, of which only 24.7 percent did not meet guidelines.
- Delawareans in lower income categories reported significantly lower prevalence of physical activity which meets guidelines [less than \$15,000 (49.7 percent); \$15,000-\$24,999 (53.1 percent); and \$25,000-\$34,999 (44.9 percent)], compared to Delawareans in the highest income category, \$75,000 or more per year (33.1 percent).
- In Delaware, adults with less than a high school diploma (51.5 percent) and those with a high school education or GED (45.0 percent) were significantly less likely to meet guidelines than those with some post high school education (37.4 percent) or college graduate (30.3 percent).

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## DIETARY FRUITS AND VEGETABLES

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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 2013 BRFSS:

- In Delaware, 14.2 percent of adults consumed five or more servings of fruits and/or vegetables a day, compared to the national median of 14.5 percent of adults.
- Significantly fewer Delaware males (10.7 percent) consumed five or more servings of fruits and vegetables daily than females (17.4 percent).
- In Delaware, 14.7 percent of Caucasians and 12.6 percent of African Americans consumed five or more servings of fruits and vegetables daily; however, this difference was not statistically significant.

## APPENDIX E: TITLE 16 CHAPTER 292 OF THE DELAWARE CODE

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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<sup>®</sup>, a Lexis Nexis<sup>®</sup> service, is used to assign a valid physical street address to P.O. Box addresses where possible. DCR staff also use Accurint<sup>®</sup> 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<sup>®</sup> and Google Maps<sup>®</sup> online databases.

### PRELIMINARY ANALYSES

Cancer case files created for DPH by the DCR include all eligible<sup>42</sup> cancer cases diagnosed among Delawareans from January 1, 2008 through December 31, 2012. Within this time period, 100 percent of the cases were successfully geocoded (all but five cases); 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 in each time period. The level of certainty code shown in the table below indicates the basis of the assignment of census tract for each individual. More than 99 percent of cases were assigned a census tract based on a complete and valid address of residence.

**TABLE F-1: CENSUS TRACT CERTAINTY**

Census Tract Based on Level of Certainty	2008-2012
1 – complete & valid street address of residence	26,113 (99.3)
2 – residence ZIP + 4	7 (0.03)
3 – residence ZIP + 2	69 (0.26)
4 – residence ZIP code only	87 (0.33)
5 – ZIP code of P.O. Box	22 (0.08)
9 – address missing	5 (0.02)
Total Number of Cases	26,303

<sup>42</sup> 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.

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## FIVE-YEAR POPULATION ESTIMATES BY CENSUS TRACT

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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.

Census tract populations for 2008-2012 were calculated using estimates from the Delaware Population Consortium (DPC) and both the 2000 Census and 2010 Census. Population data specific for each five-year age category and census tract from both the 2000 and 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 2008-2012 study period range from 3,373 for census tract 511.01 in Sussex County to 61,278 for census tract 402.02 in Kent County.

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## AGE-ADJUSTED AND CRUDE INCIDENCE RATES, BY CENSUS TRACT

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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: 2007-2011 CRUDE ALL-SITE INCIDENCE RATE, 45-49 YEAR OLDS, 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.

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## 95 PERCENT CONFIDENCE INTERVALS

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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

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

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

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<sup>43</sup>.

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## COMPARING CENSUS TRACT RATES TO THE STATE RATE

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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

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<sup>43</sup> 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.

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 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.

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### **SUPPLEMENTAL INFORMATION**

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For 2008-2012, there were three census tracts with less than 25 cancer cases: census tracts 145.01, 411.00, and 512.05 (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

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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 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 lower confidence limit is very narrow, there is much less uncertainty in the cancer rate.

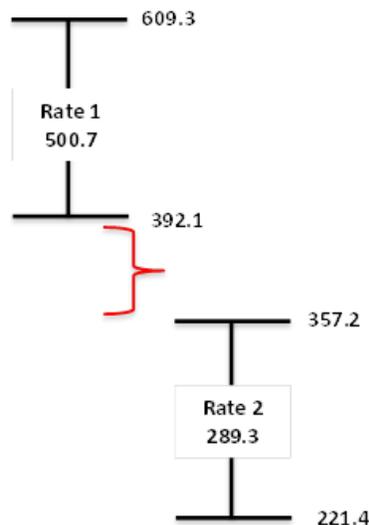
The width of a confidence interval depends on two things: (a) the number of people living in that area and (b) the number of cancer cases diagnosed in that area.

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.

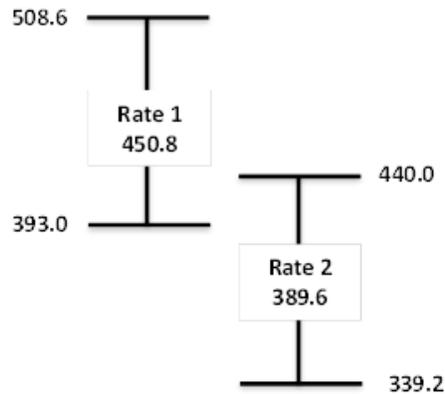
Confidence intervals are important for another reason, too. They help researchers determine if differences in cancer rates for two different areas are statistically significant. If the confidence interval for the incidence rate in one area does NOT overlap with the confidence interval for an incidence 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 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 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 2008-2012 ALL-SITE CANCER INCIDENCE RATES BY CENSUS TRACT, DELAWARE

Blue = Incidence rate is significantly **LOWER** than the state rate.

Yellow = Incidence rate is significantly **HIGHER** than the state rate.

2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)		2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)	
	Age-Adjusted Rate (95% confidence Interval)			Age-Adjusted Rate (95% confidence Interval)	
2.00	489.0	(408.0, 570.0)	109.00	584.1	(479.6, 688.7)
3.00	472.7	(374.8, 588.3)	110.00	463.7	(375.4, 551.9)
4.00	443.4	(351.6, 551.8)	111.00	437.1	(354.1, 533.8)
5.00	441.5	(352.6, 545.9)	112.01	503.7	(382.4, 651.1)
6.01	571.1	(443.5, 724.1)	112.02	509.9	(424.2, 595.7)
6.02	558.0	(440.3, 697.4)	112.03	427.7	(347.8, 507.6)
9.00	567.7	(414.1, 759.6)	112.04	451.8	(369.9, 533.7)
11.00	382.0	(313.1, 450.9)	112.05	414.8	(315.7, 535.0)
12.00	544.9	(403.1, 720.4)	112.06	428.3	(356.6, 500.0)
13.00	452.3	(371.7, 532.9)	113.00	485.4	(393.2, 592.8)
14.00	494.0	(379.6, 632.1)	114.00	426.8	(353.5, 500.2)
15.00	414.6	(317.1, 532.5)	115.00	481.1	(384.8, 594.2)
16.00	346.5	(249.7, 468.3)	116.00	418.7	(335.8, 515.9)
19.02	507.6	(342.5, 724.7)	117.00	408.5	(344.2, 472.8)
21.00	451.3	(317.7, 622.0)	118.00	481.6	(409.0, 554.2)
22.00	445.3	(330.5, 587.0)	119.00	500.8	(412.3, 589.3)
23.00	571.9	(445.8, 722.6)	120.00	526.6	(443.1, 610.0)
24.00	476.0	(389.0, 563.0)	121.00	442.7	(354.1, 544.5)
25.00	527.0	(420.3, 652.4)	122.00	525.7	(431.3, 620.2)
26.00	460.8	(368.1, 569.8)	123.00	578.8	(452.1, 730.1)
27.00	465.2	(311.6, 668.1)	124.00	577.3	(478.1, 676.5)
28.00	454.3	(323.0, 621.0)	125.00	529.3	(445.7, 612.9)
29.00	636.5	(515.9, 757.1)	126.00	544.2	(441.8, 663.2)
30.02	463.0	(307.7, 669.2)	127.00	549.3	(466.3, 632.4)
101.01	559.8	(459.2, 660.4)	129.00	526.5	(431.9, 621.1)
101.04	519.7	(421.5, 634.0)	130.00	576.8	(441.2, 740.9)
102.00	566.0	(439.5, 717.6)	131.00	514.4	(407.3, 641.1)
103.00	502.3	(397.7, 626.0)	132.00	437.2	(340.2, 553.3)
104.00	550.7	(460.5, 641.0)	133.00	466.1	(365.4, 586.1)
105.02	495.0	(419.7, 570.3)	134.00	552.1	(449.4, 654.8)
107.02	406.4	(327.9, 484.9)	135.01	473.2	(418.3, 528.1)
108.00	471.3	(400.0, 542.5)	135.03	474.5	(410.1, 539.0)

\* 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, 2015

### Age-Adjusted 2008-2012 All\_site Cancer Incidence Rates by Census Tract, Delaware continued

Blue = Incidence rate is significantly **LOWER** than the state rate.

Yellow = Incidence rate is significantly **HIGHER** than the state rate.

2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)	2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)
	Age-Adjusted Rate (95% confidence Interval)		Age-Adjusted Rate (95% confidence Interval)
135.05	538.1 (435.4 , 657.8)	148.08	600.0 (503.3 , 696.7)
135.06	547.4 (455.4 , 639.4)	148.09	538.5 (460.9 , 616.1)
136.04	582.8 (487.2 , 678.3)	148.10	580.9 (495.5 , 666.2)
136.07	417.0 (350.0 , 483.9)	149.03	593.2 (488.4 , 698.0)
136.08	464.7 (339.0 , 621.8)	149.04	558.3 (462.0 , 654.7)
136.10	415.5 (344.9 , 486.1)	149.06	431.5 (333.0 , 550.0)
136.11	388.3 (318.2 , 458.3)	149.07	545.4 (444.8 , 646.0)
136.12	386.2 (324.2 , 448.2)	149.08	427.3 (305.3 , 581.9)
136.13	506.0 (427.3 , 584.6)	149.09	458.4 (369.4 , 547.3)
136.14	498.9 (393.1 , 624.5)	150.00	492.9 (411.8 , 574.0)
136.15	535.9 (453.4 , 618.5)	151.00	576.9 (479.2 , 674.5)
137.00	494.7 (396.2 , 610.2)	152.00	503.4 (419.7 , 587.1)
138.00	492.7 (411.7 , 573.8)	154.00	502.8 (405.9 , 616.0)
139.01	521.5 (410.2 , 653.8)	155.02	619.8 (494.4 , 767.4)
139.03	565.2 (456.8 , 691.7)	156.00	517.5 (414.5 , 638.3)
139.04	551.8 (464.7 , 639.0)	158.02	419.9 (308.6 , 558.4)
140.00	428.6 (347.0 , 510.2)	159.00	583.2 (476.1 , 690.2)
141.00	592.7 (490.4 , 694.9)	160.00	525.5 (416.1 , 655.0)
142.00	537.6 (393.6 , 717.1)	161.00	515.8 (409.0 , 642.0)
143.00	436.1 (362.8 , 509.4)	162.00	542.5 (440.4 , 661.1)
144.02	411.8 (322.8 , 517.7)	163.01	629.0 (533.9 , 724.1)
144.03	415.1 (326.5 , 520.3)	163.02	604.2 (516.4 , 691.9)
144.04	433.7 (348.7 , 533.0)	163.05	494.1 (418.3 , 570.0)
145.01*	237.3 (87.1 , 516.6)	164.01	546.5 (455.0 , 638.1)
145.02	621.6 (228.1 , 1352.9)	164.04	553.6 (446.3 , 679.0)
147.02	543.2 (409.2 , 707.1)	166.01	581.1 (517.3 , 644.9)
147.03	500.7 (418.4 , 583.1)	166.02	503.7 (419.4 , 588.1)
147.05	514.8 (432.4 , 597.2)	166.04	574.0 (499.2 , 648.8)
147.06	515.0 (371.2 , 696.2)	166.08	585.1 (482.1 , 688.0)
148.03	465.7 (382.4 , 549.1)	168.01	426.4 (345.6 , 507.1)
148.05	555.9 (478.8 , 632.9)	168.04	539.9 (451.7 , 628.1)
148.07	540.3 (456.3 , 624.3)	169.01	589.1 (468.5 , 731.2)

\* 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, 2015

### Age-Adjusted 2008-2012 All\_site Cancer Incidence Rates by Census Tract, Delaware continued

Blue = Incidence rate is significantly **LOWER** than the state rate.

Yellow = Incidence rate is significantly **HIGHER** than the state rate.

2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)		2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)	
	Age-Adjusted Rate (95% confidence Interval)			Age-Adjusted Rate (95% confidence Interval)	
169.04	553.5	(442.1, 684.4)	433.00	526.5	(436.7, 616.4)
401.00	698.9	(608.7, 789.0)	434.00	569.9	(482.4, 657.4)
402.01	547.2	(448.0, 646.3)	501.01	510.6	(422.8, 598.4)
402.02	505.5	(451.9, 559.0)	501.03	600.8	(514.9, 686.7)
402.03	576.5	(479.6, 673.4)	501.04	490.2	(403.9, 576.5)
405.01	496.4	(413.3, 579.6)	501.05	558.5	(468.8, 648.1)
405.02	480.3	(387.2, 589.1)	502.00	424.4	(332.0, 534.4)
407.00	521.4	(443.0, 599.8)	503.01	563.3	(493.2, 633.4)
409.00	513.6	(411.3, 633.5)	503.02	580.2	(486.4, 673.9)
410.00	451.9	(374.2, 529.5)	504.01	610.0	(508.9, 711.0)
411.00*	394.8	(144.9, 859.3)	504.03	380.1	(301.8, 472.4)
412.00	481.3	(390.9, 571.6)	504.05	615.7	(518.5, 713.0)
413.00	558.7	(426.3, 719.1)	504.06	441.4	(367.3, 515.6)
414.00	482.9	(391.2, 589.7)	504.07	545.9	(462.6, 629.2)
415.00	551.9	(457.0, 646.8)	504.08	626.9	(533.2, 720.6)
416.00	537.7	(435.0, 657.3)	505.01	537.4	(438.3, 636.5)
417.01	596.3	(517.7, 674.9)	505.03	526.1	(423.0, 629.2)
417.02	567.4	(474.4, 660.4)	505.04	485.9	(406.8, 565.0)
418.01	632.4	(562.9, 701.9)	506.01	559.5	(471.7, 647.3)
418.02	539.4	(445.2, 633.6)	506.02	518.5	(444.8, 592.3)
419.00	554.7	(469.8, 639.6)	507.01	492.7	(408.7, 576.8)
420.00	553.3	(448.2, 675.7)	507.03	448.9	(357.6, 556.5)
421.00	571.7	(473.4, 669.9)	507.04	612.8	(529.1, 696.5)
422.01	471.2	(405.4, 537.0)	507.05	538.3	(470.8, 605.9)
422.02	599.6	(527.8, 671.4)	507.06	490.8	(398.9, 597.5)
425.00	564.4	(453.8, 693.7)	508.01	558.5	(458.2, 658.9)
428.00	691.8	(608.2, 775.4)	508.02	548.6	(465.6, 631.5)
429.00	512.6	(429.8, 595.5)	508.03	587.5	(521.9, 653.1)
430.00	617.9	(527.6, 708.2)	509.01	410.6	(320.1, 518.8)
431.00	466.8	(367.2, 585.1)	509.02	580.9	(512.6, 649.2)
432.02	642.7	(539.5, 746.0)	510.03	495.1	(423.6, 566.7)

\* 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, 2015

### Age-Adjusted 2008-2012 All\_site Cancer Incidence Rates by Census Tract, Delaware continued

Blue = Incidence rate is significantly **LOWER** than the state rate.

Yellow = Incidence rate is significantly **HIGHER** than the state rate.

2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)	2010 Census Tract ID	Delaware: 510.0 (503.8, 516.1)
	Age-Adjusted Rate (95% confidence Interval)		Age-Adjusted Rate (95% confidence Interval)
510.04	561.5 (484.3 , 638.8)	513.01	503.3 (442.4 , 564.3)
510.05	519.6 (448.6 , 590.5)	513.02	524.3 (423.5 , 625.0)
510.06	580.6 (489.5 , 671.7)	513.03	511.6 (444.8 , 578.5)
510.07	504.4 (435.9 , 573.0)	513.05	477.9 (399.8 , 555.9)
511.01	525.1 (385.8 , 698.3)	513.06	538.3 (448.1 , 628.4)
511.02	472.6 (357.0 , 613.7)	514.00	537.3 (441.2 , 633.4)
511.03	387.0 (269.6 , 538.2)	515.00	474.6 (400.6 , 548.6)
512.01	315.2 (238.7 , 408.4)	517.01	545.3 (451.9 , 638.6)
512.02	235.5 (164.0 , 327.5)	517.02	536.7 (457.6 , 615.8)
512.03	282.7 (202.0 , 384.9)	518.01	545.9 (459.1 , 632.6)
512.04	392.8 (277.9 , 539.1)	518.02	499.7 (408.7 , 590.6)
512.05*	282.7 (183.0 , 417.4)	519.00	472.4 (392.1 , 552.7)

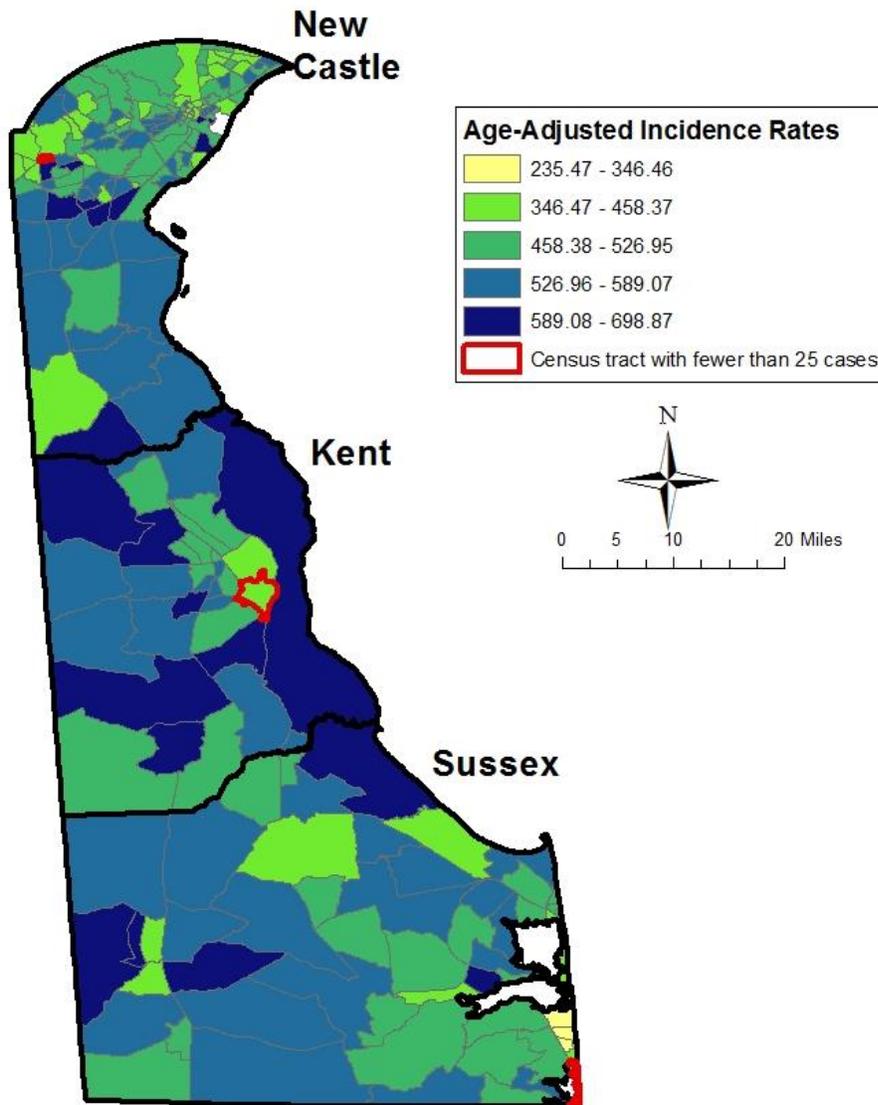
\* Age-adjusted incidence rate is based on fewer than 25 cases

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, 2015

APPENDIX I: MAPS OF DELAWARE CENSUS TRACTS BY 2008-2012  
CANCER INCIDENCE RATE QUINTILES

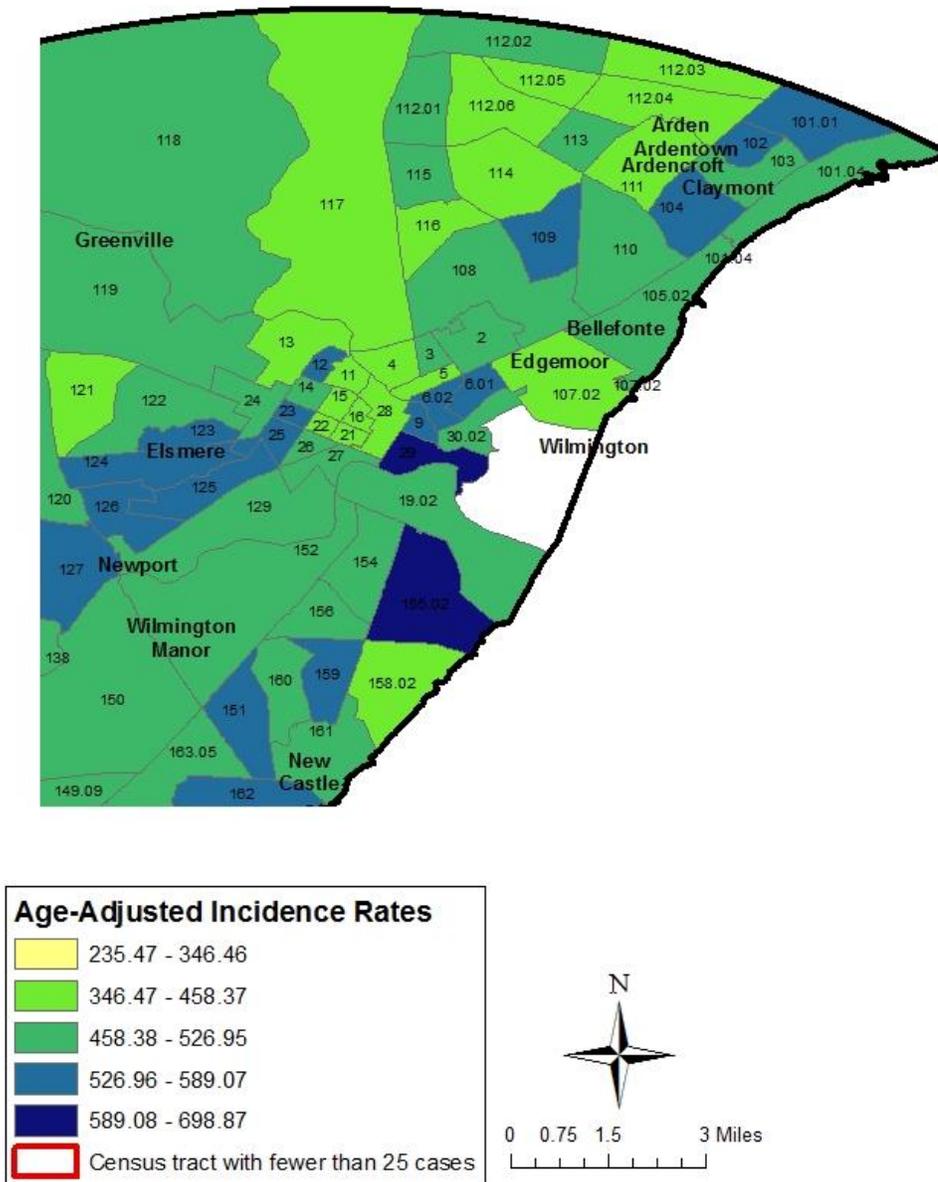
Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

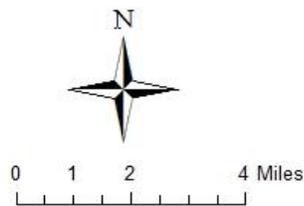
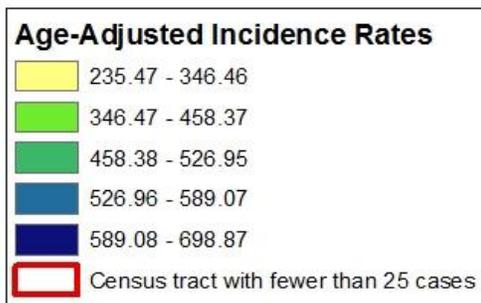
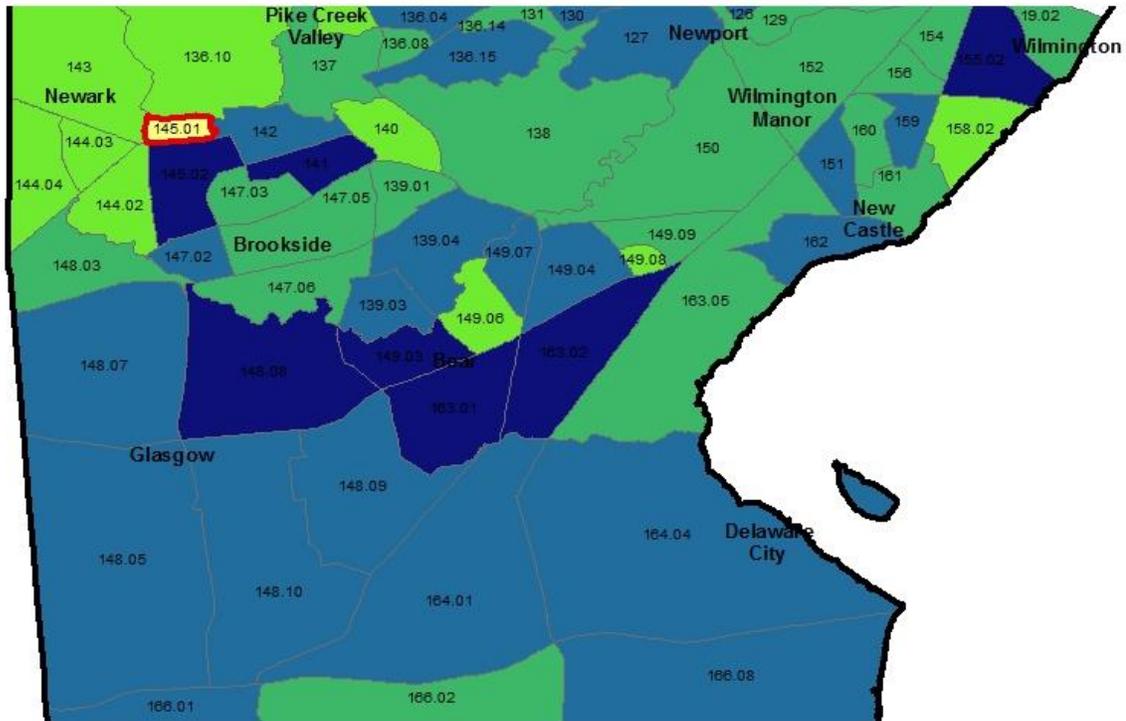
## Wilmington and Northeastern New Castle County



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

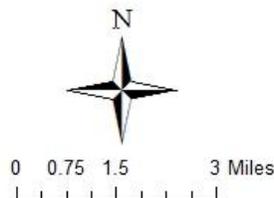
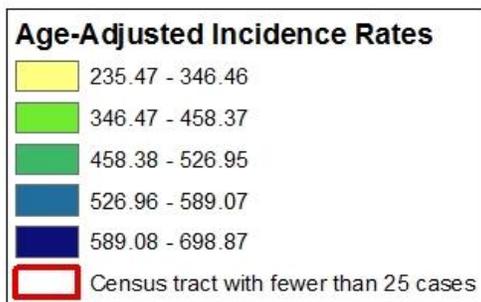
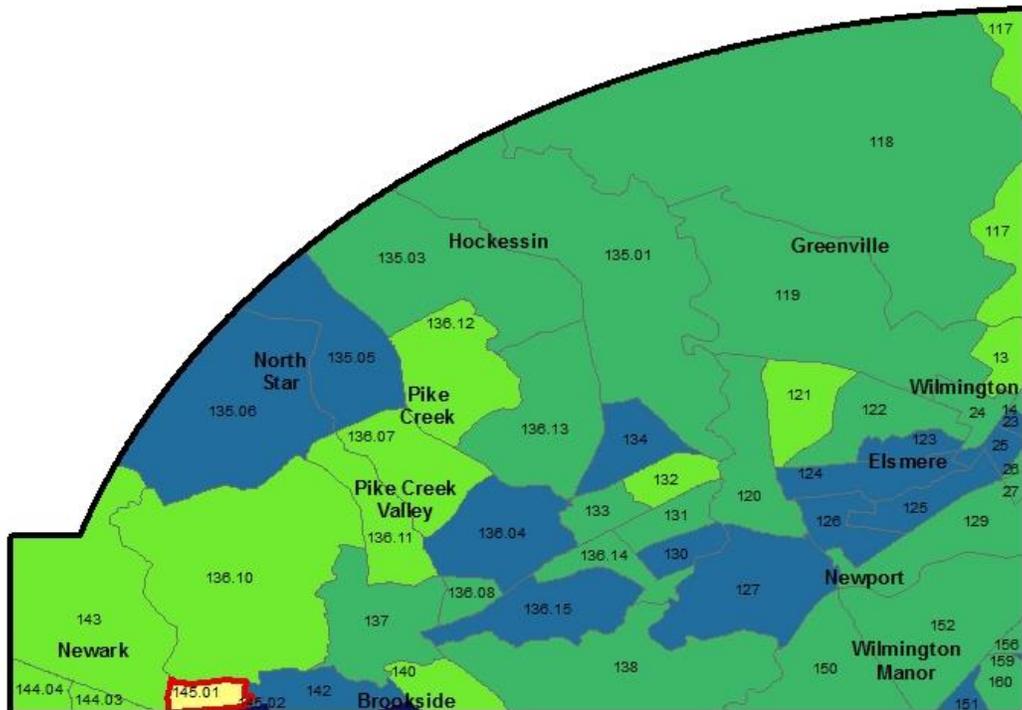
## Newark, New Castle and Central New Castle County



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

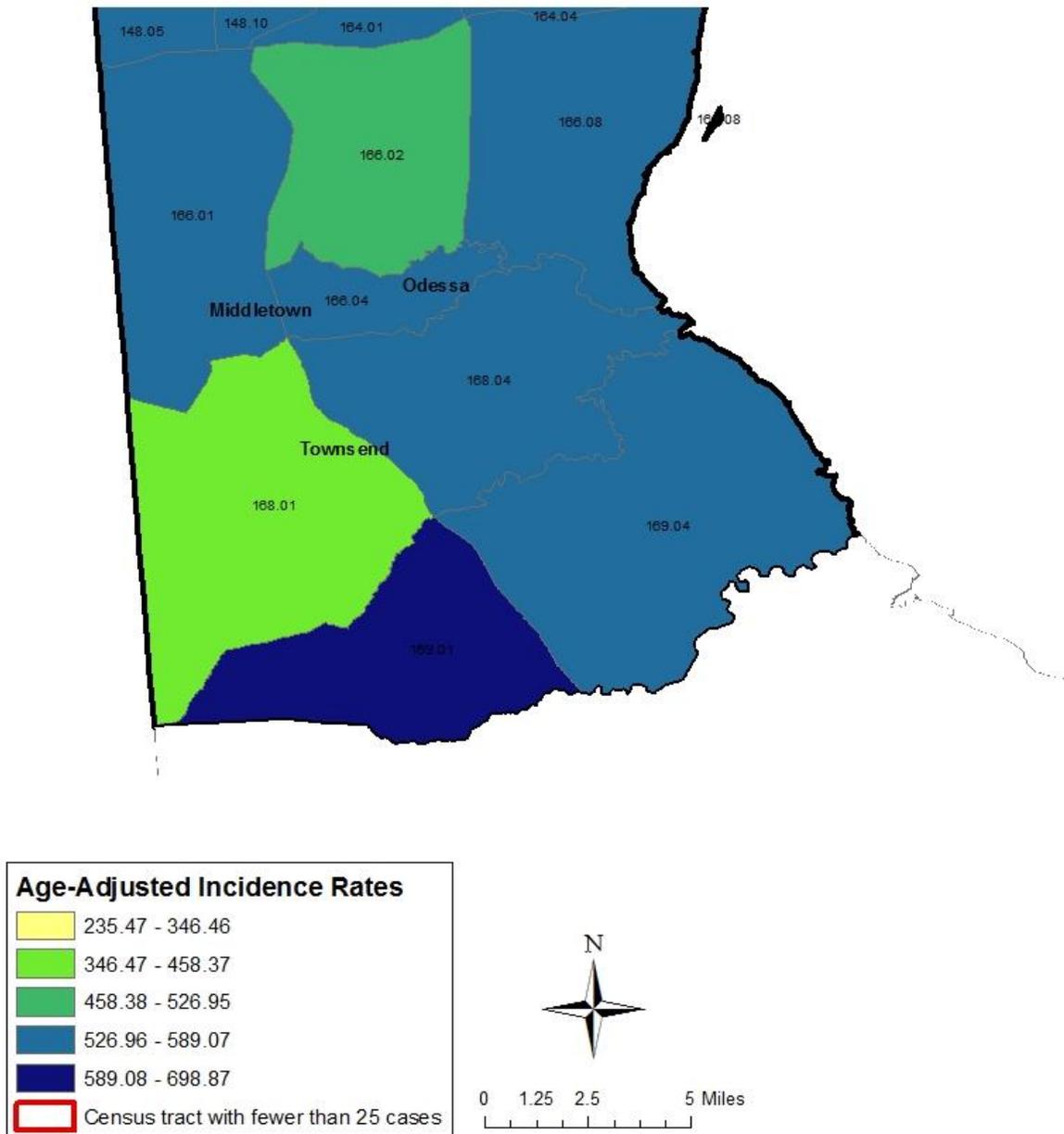
## Hockessin and Northwestern New Castle County



Source: Delaware Cancer Registry

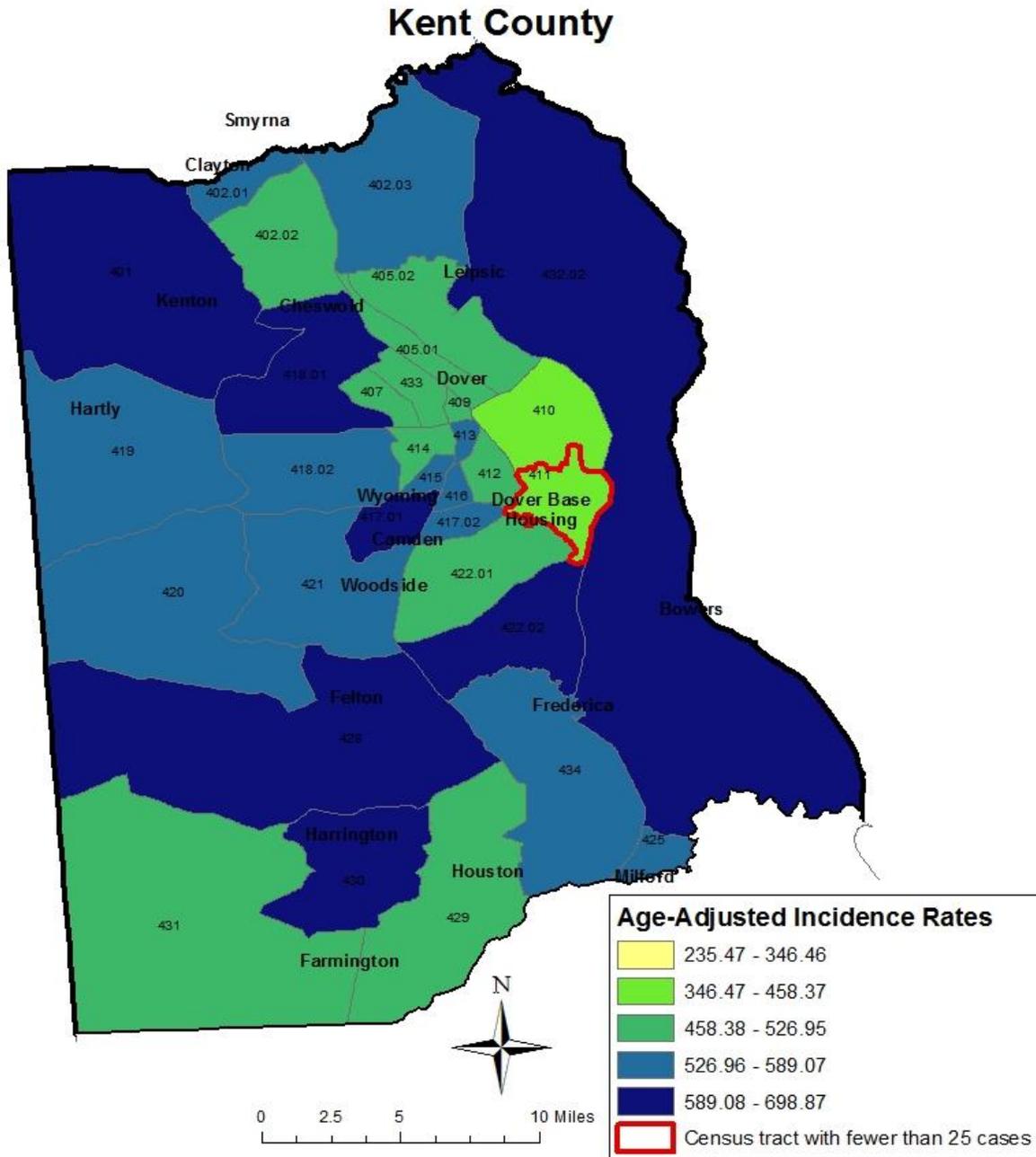
# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

## Southern New Castle County



Source: Delaware Cancer Registry

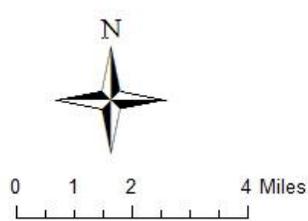
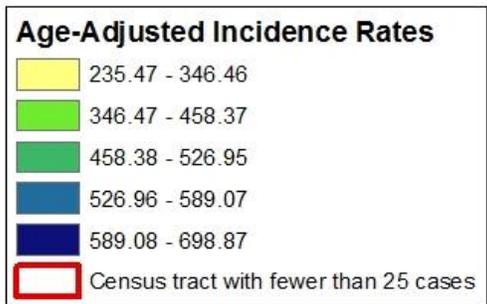
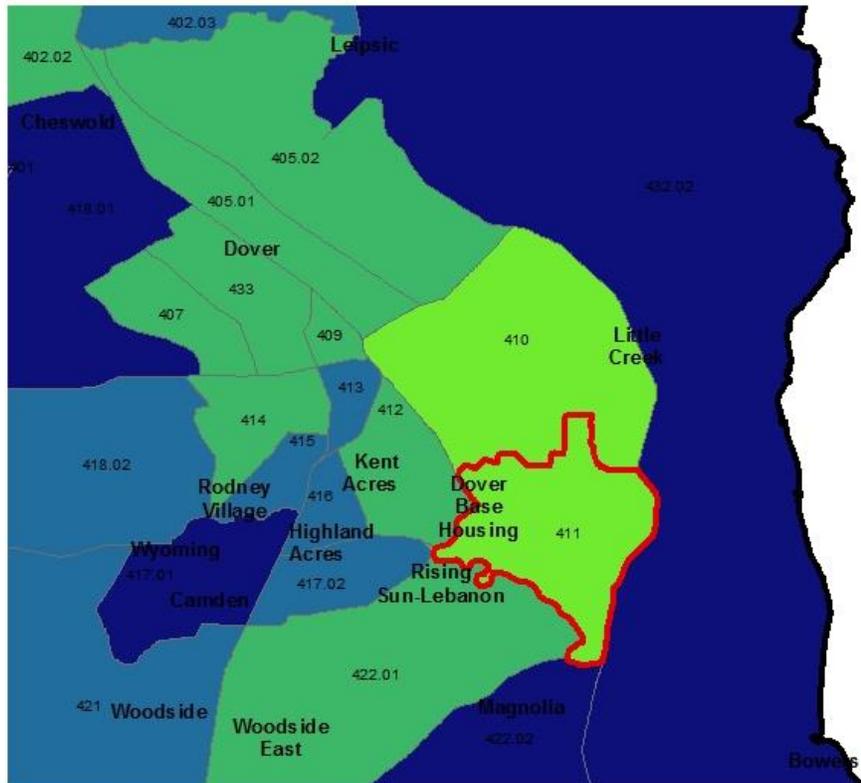
# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

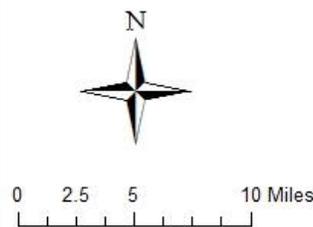
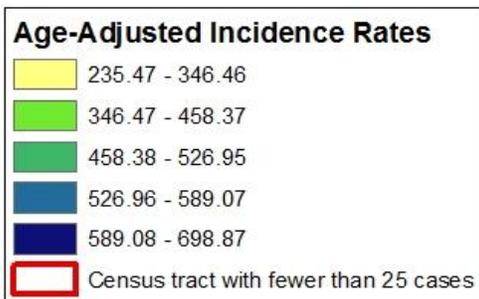
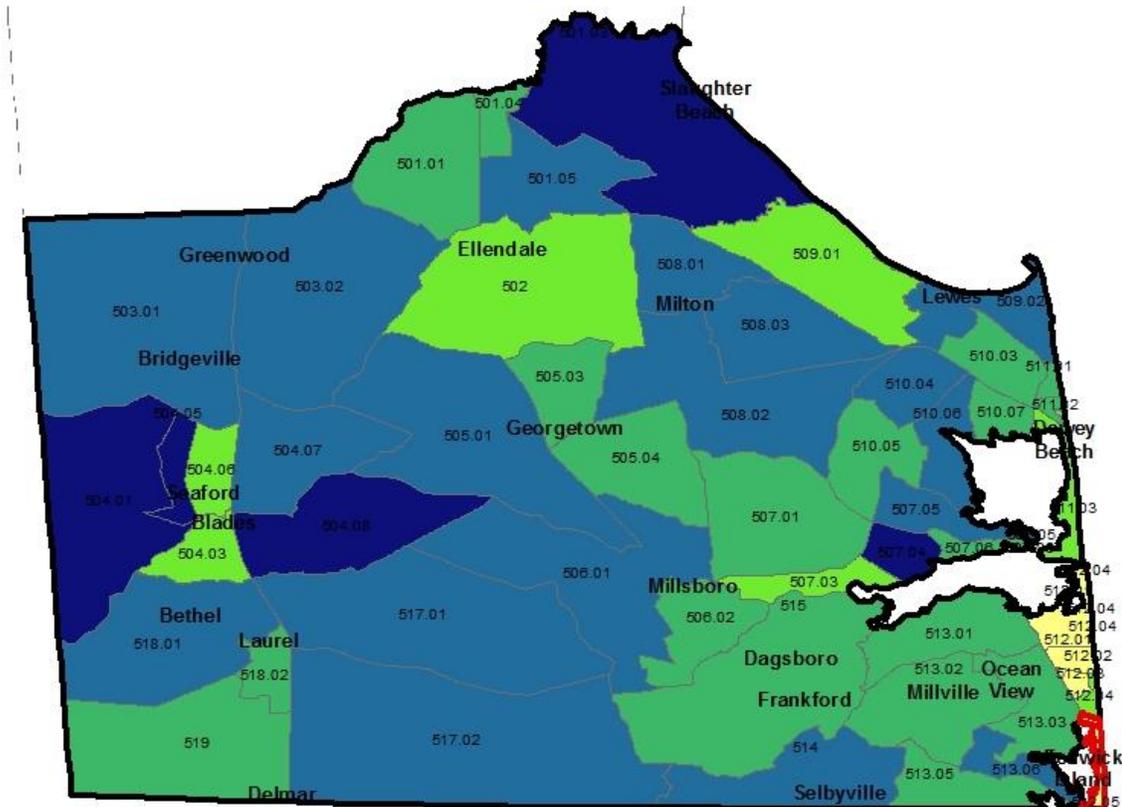
## Greater Dover



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

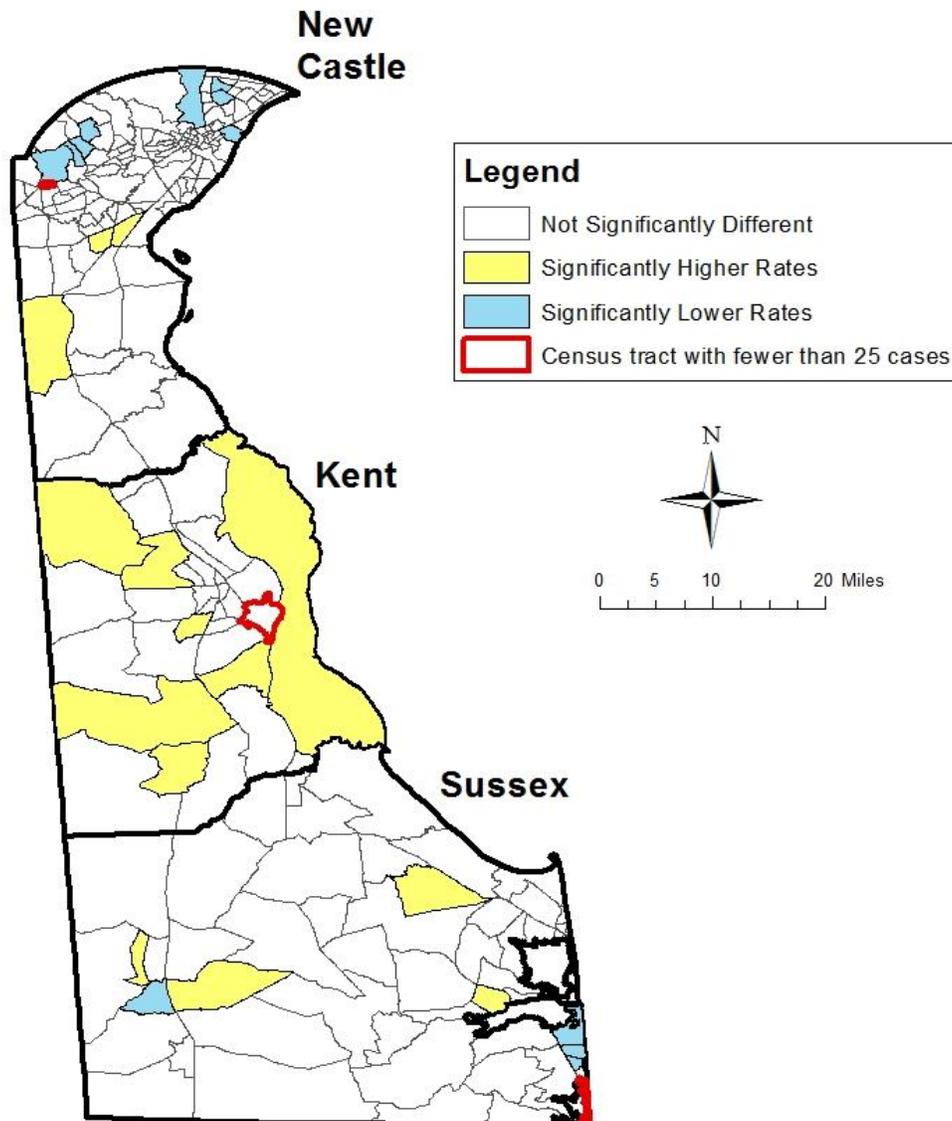
## Sussex County



Source: Delaware Cancer Registry

**APPENDIX J: MAPS OF DELAWARE CENSUS TRACTS BY 2008-2012  
HIGH/LOW CANCER INCIDENCE RATES**

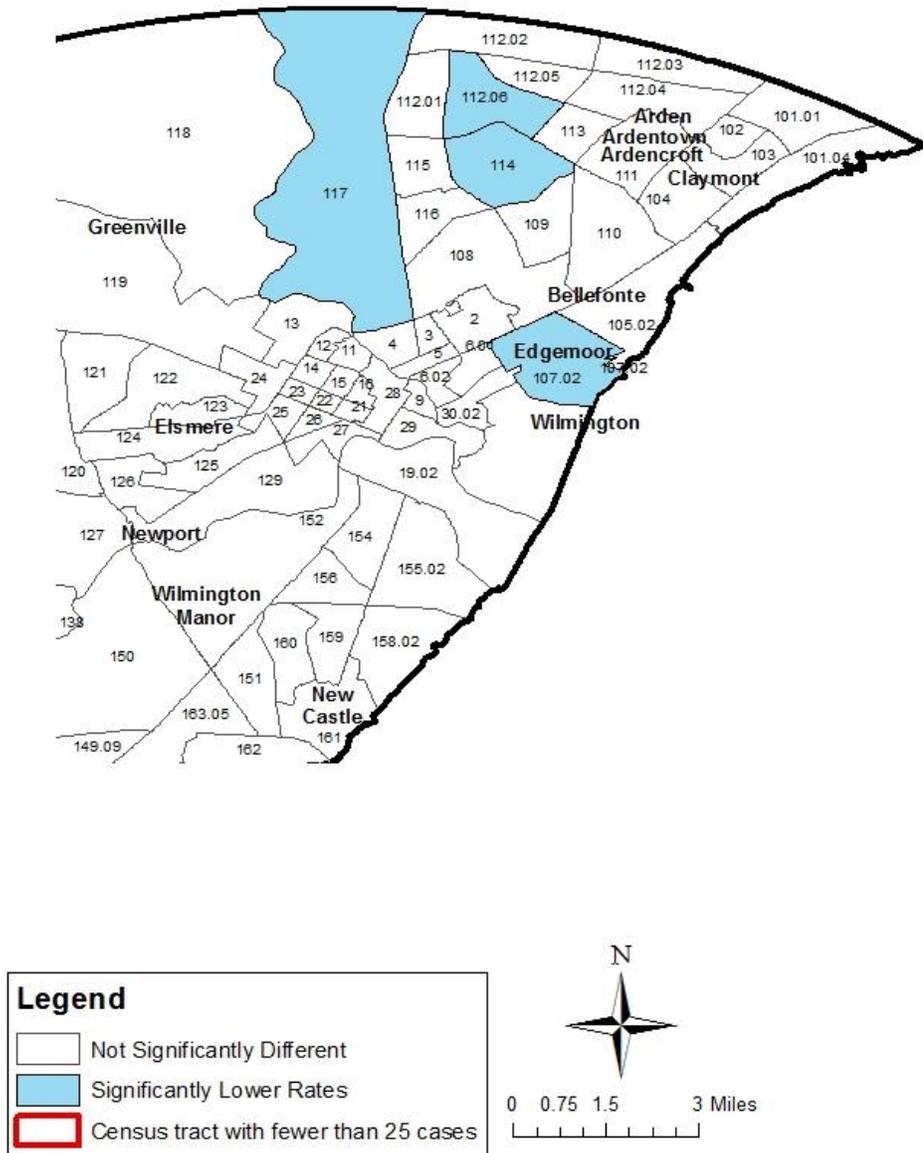
**Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012**



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

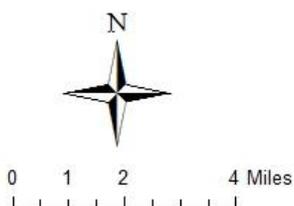
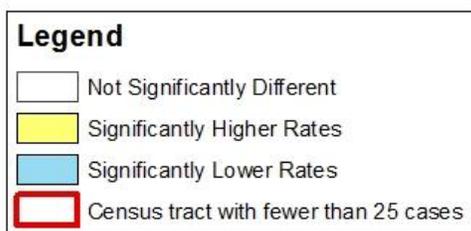
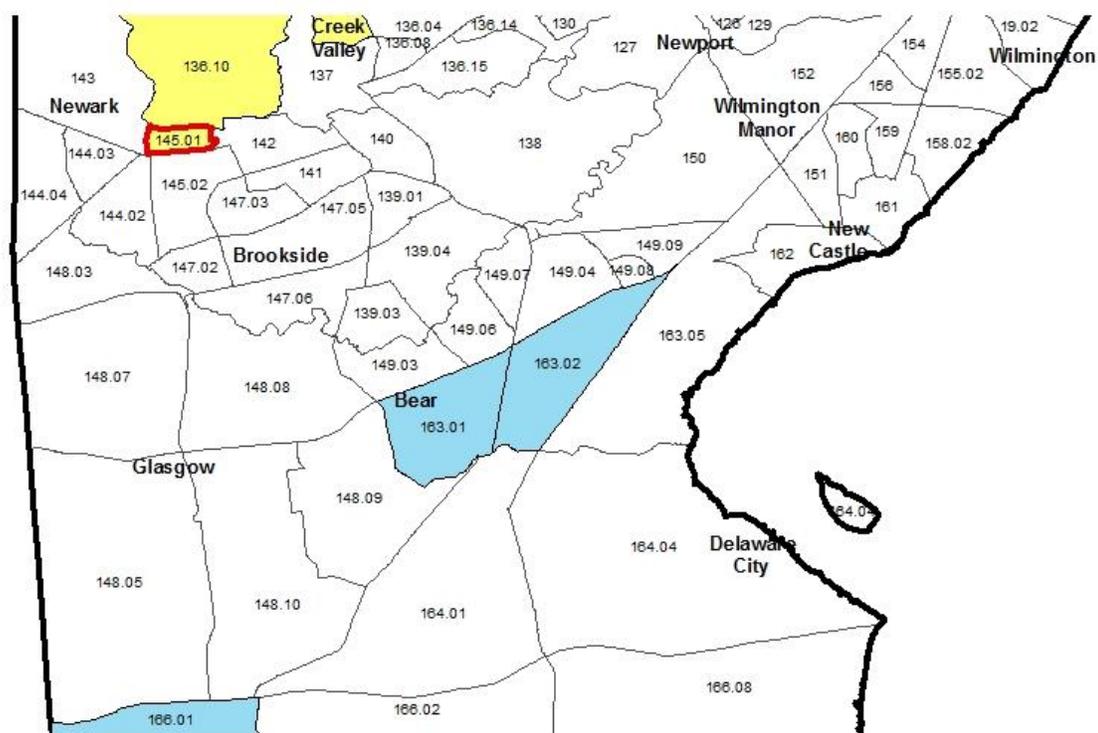
## Wilmington and Northeastern New Castle County



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

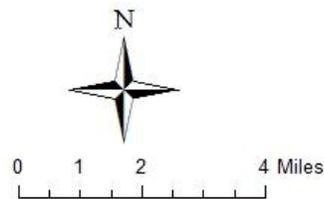
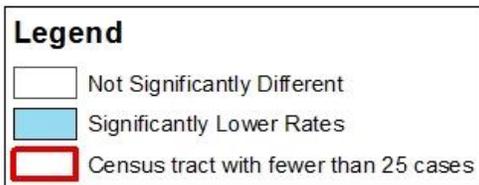
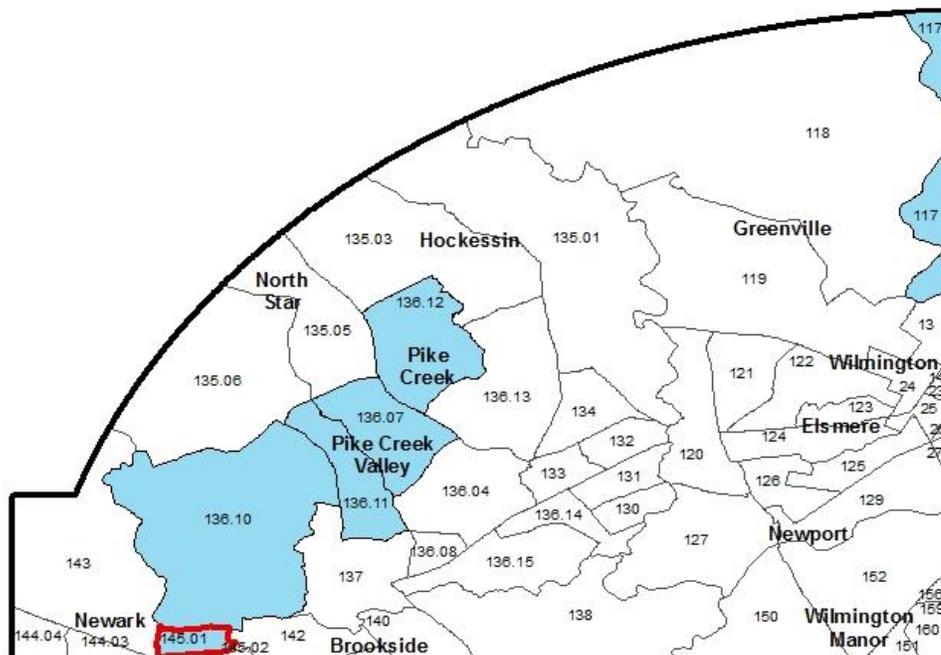
## Newark, New Castle and Central New Castle County



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

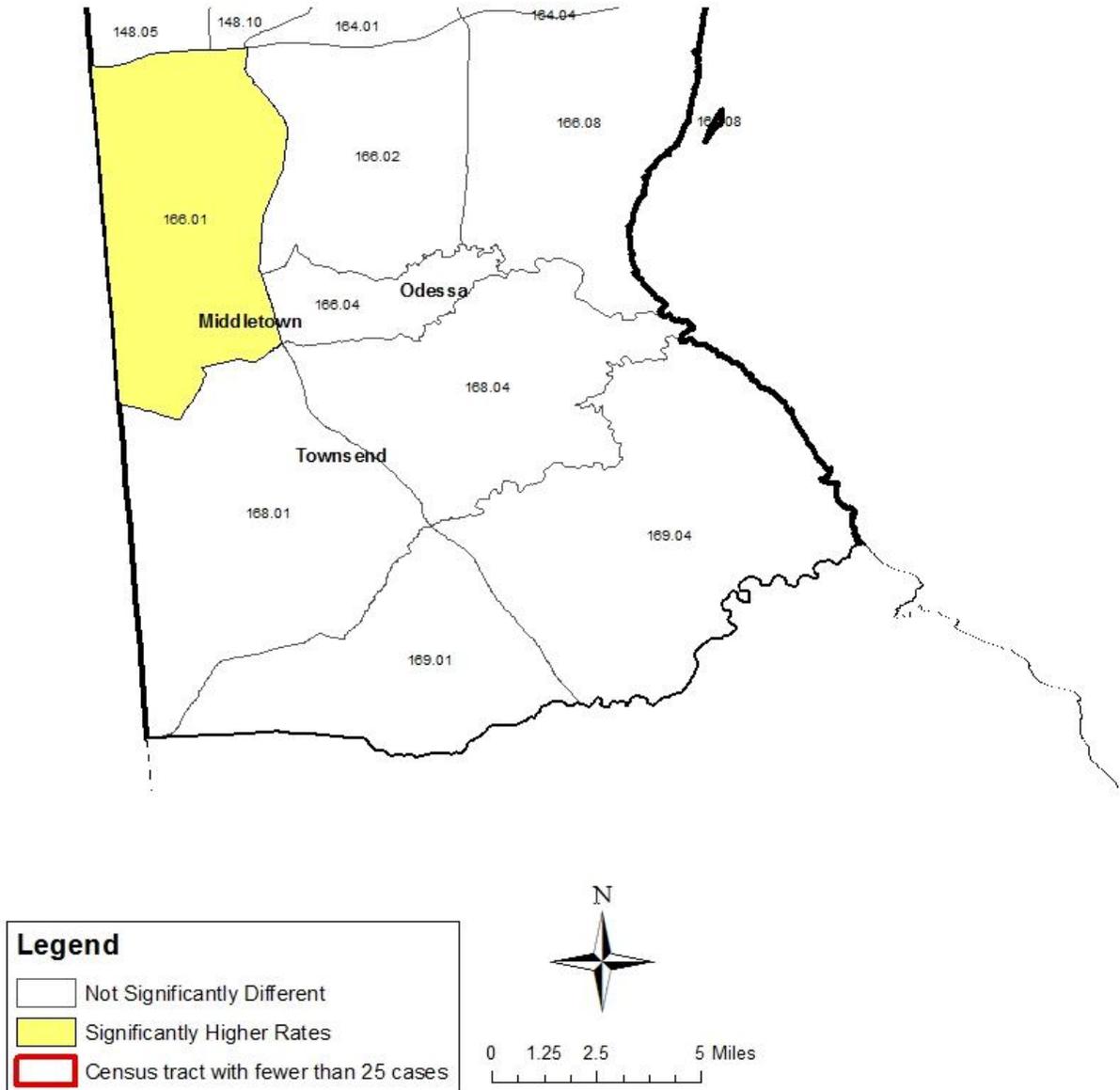
## Hockessin and Northwestern New Castle County



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

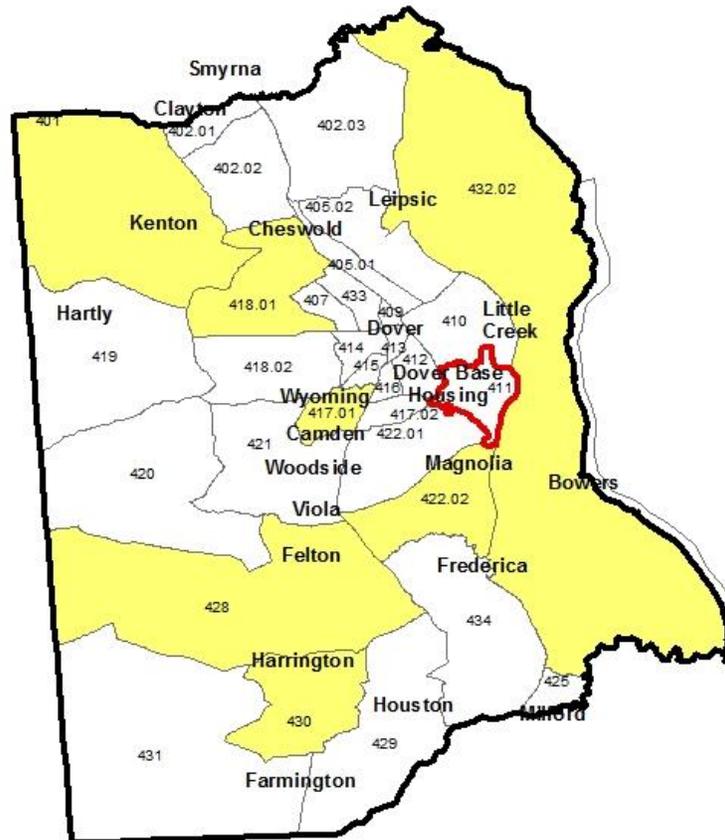
## Southern New Castle County



Source: Delaware Cancer Registry

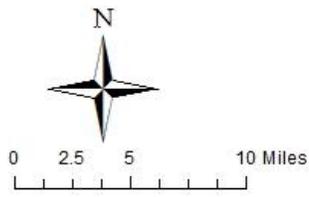
# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

## Kent County



**Legend**

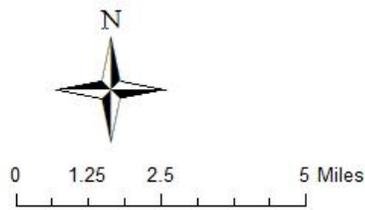
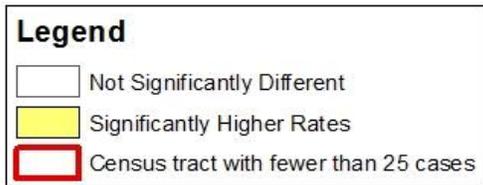
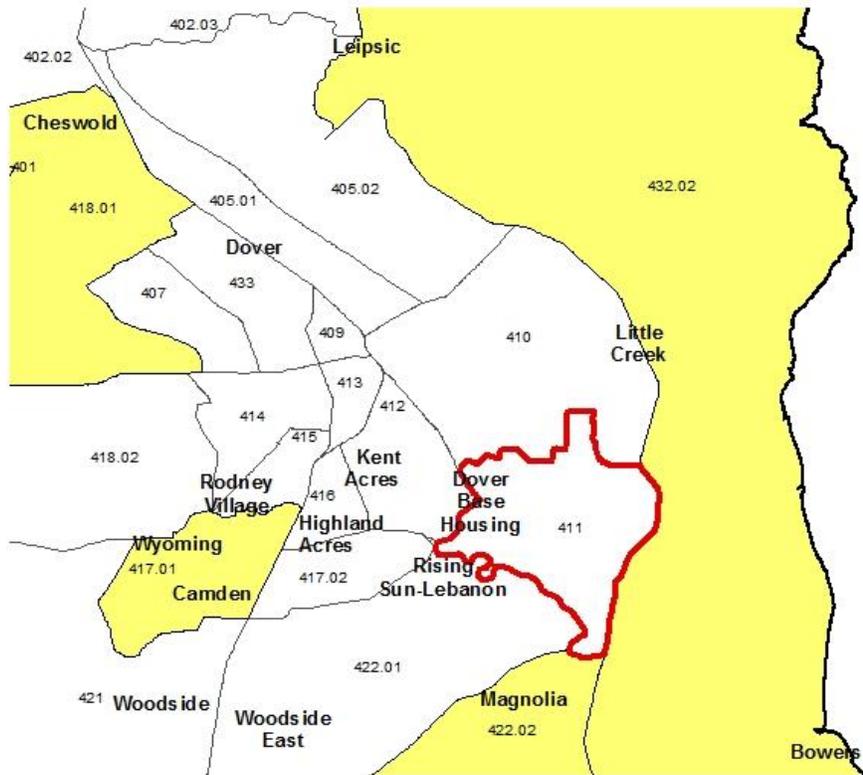
- Not Significantly Different
- Significantly Higher Rates
- Census tract with fewer than 25 cases



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

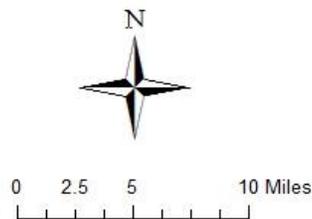
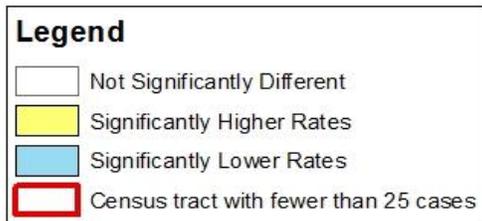
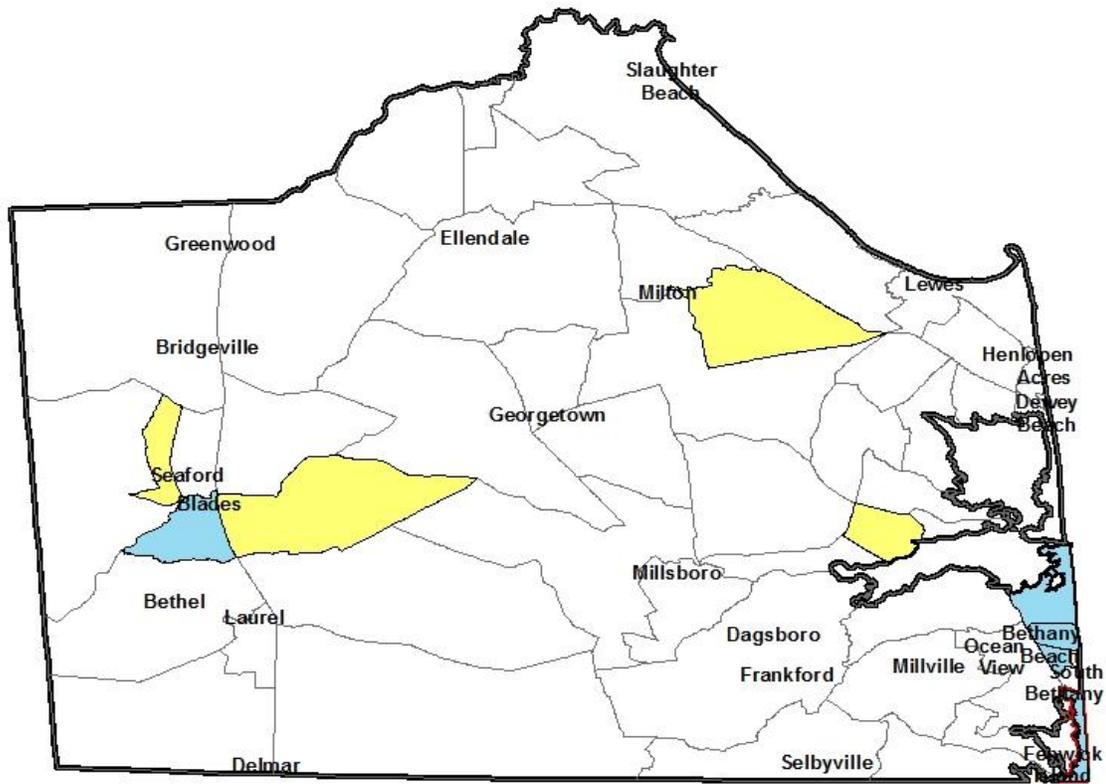
## Greater Dover



Source: Delaware Cancer Registry

# Delaware Five-Year Age-Adjusted Cancer Incidence Rates by Census Tract, 2008-2012

## Sussex County



Source: Delaware Cancer Registry