

Analysis of Census Tracts with 2002-06 Elevated All-Site Cancer Rates August 25, 2010

In May 2010, the Delaware Division of Public Health (DPH) released its annual *Cancer Incidence & Mortality Report*. This report included cancer statistics for the most recently available five-year time period, 2002-06.

As part of the report, and in accordance with Delaware legislation, DPH calculated 2002-06 all-site cancer incidence rates for each of Delaware's 196 census tracts. All-site cancer incidence rates measure the overall cancer burden for an area over a specific period of time. Cancer incidence rates are expressed as the average annual number of new cases diagnosed per year per 100,000 people.

All-site cancer incidence rates for each census tract were compared to the all-site cancer incidence rate for Delaware as a whole. DPH used standard statistical procedures to determine if the difference between each census tract rate and the state rate reached the threshold of statistical significance. If a census tract rate is significantly different from the state rate, the difference between the rates would be interpreted as statistically significant or "larger than would be expected by chance alone." If a census tract rate is not significantly different from the state rate, it is commonly interpreted as "no meaningful difference" between rates.

Of Delaware's 196 census tracts, 22 census tracts had 2002-06 all-site cancer incidence rates that were significantly lower than the rate for Delaware as a whole. Another 129 census tracts had 2002-06 all-site cancer incidence rates that were not significantly different from the state rate. Finally, 45 census tracts had 2002-06 all-site cancer incidence rates that were significantly higher than the rate for Delaware as a whole.

To get a better sense of cancer patterns in these areas, DPH analyzed cancer data pertaining to each of the 45 census tracts with significantly elevated 2002-06 all-site cancer incidence rates. This was done to determine the local need for screening and prevention services. Further, unique patterns could suggest an environmental, occupational, or other unusual cause.

Sex of Cases

To determine if the elevated overall cancer rate in a census tract affected males and females within that census tract differently, age-adjusted 2002-06 all-site cancer incidence rates were calculated separately for males and females. Male- and female-specific rates for each census tract were compared to those at the state level. The 45 census tracts fell into one of the following four categories:

Compared to Delaware as a whole,

- ⇒ **13 census tracts (29%) had significantly elevated all-site cancer incidence rates for males and females.** Within these tracts, both sexes had a higher-than-expected overall cancer rate.
- ⇒ **6 census tracts (13%) did not have significantly elevated all-site cancer incidence rates for either males or females.** Within these tracts, neither sex had a substantially higher-than-expected overall cancer rate. Rather, minor (non-significant) elevations in the male and female cancer rates produced a significantly elevated overall cancer rate for both sexes combined.
- ⇒ **10 census tracts (22%) had significantly elevated all-site cancer incidence rates for males only.** Within these tracts, only males had a higher-than-expected overall cancer rate. The cancer rate for females was not higher than expected.
- ⇒ **16 census tracts (36%) had significantly elevated all-site cancer incidence rates for females only.** Within these tracts, only females had a higher-than-expected overall cancer rate. The cancer rate for males was not higher than expected.

Age of Cases

The median age for all cancer cases in the years 2002-06 was 67.0 years. In other words, half of all Delawareans diagnosed with cancer during this time period were younger than 67.0 years; the other half were older than 67.0 years. The median age of cancer cases in each census tract was compared to the median age of cancer cases at the state level. A younger median age at diagnosis could suggest a unique exposure, such as carcinogenic exposure through occupation. Statistical significance was determined by a test called the “sign test.” Of the 45 census tracts analyzed:

- ⇒ **23 census tracts (51%) had a significantly lower median age at diagnosis;**
- ⇒ **3 census tracts (7%) had a significantly higher median age at diagnosis; and**
- ⇒ **19 census tracts (42%) had a median age at diagnosis that did not differ significantly from the state’s median age at diagnosis.**

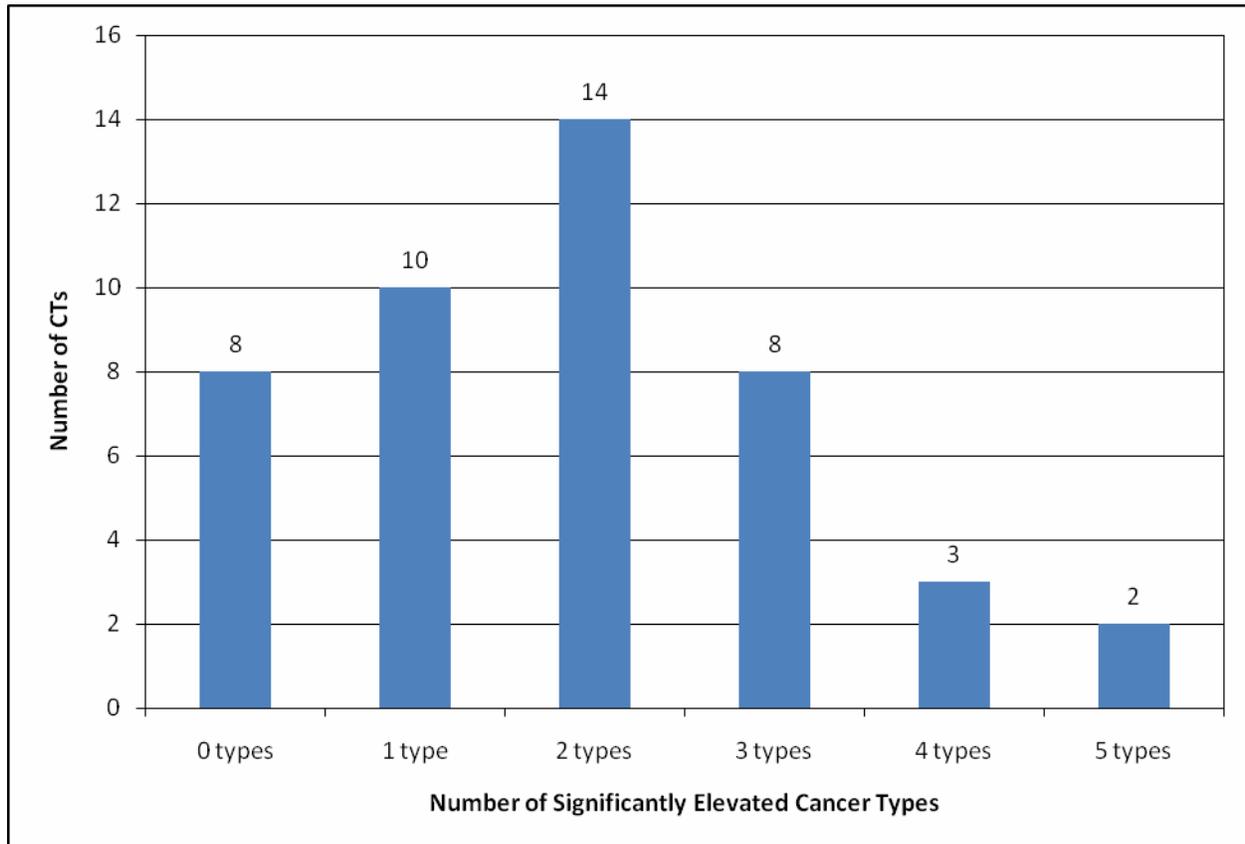
Cancer Type

For each of the 45 census tracts with significantly elevated all-site cancer incidence rates, the incidence rate was calculated for the 23 most-commonly diagnosed cancers. These analyses helped to determine which specific cancers may be contributing to the higher-than-expected overall cancer rate. Results are described below and shown below in Figure 1.

- ⇒ **8 census tracts (18%) were not significantly elevated for any single cancer type.** Within these eight census tracts, minor (non-significant) elevations in one or several cancer types produced a significantly elevated overall cancer rate.
- ⇒ **24 census tracts (53%) were significantly elevated for either one or two specific cancer types.**
- ⇒ **2 census tracts (4%) had significantly elevated incidence rates for five specific cancer types.**
- ⇒ **None of the 45 census tracts were significantly elevated for more than five specific cancers.**

Cancer is a generic term used to describe more than 100 different diseases. Although 45 of Delaware’s 196 census tracts had significantly elevated 2002-06 all-site cancer incidence rates, it is important to note that these census tracts were not elevated for every individual cancer type. The higher-than-expected cancer incidence rates are confined to several cancer types.

Figure 1: Number of Elevated Cancer Types for 45 Census Tracts (CTs) with Age-Adjusted Cancer Rates that were Significantly Higher than the State: Delaware 2002-06.



Source: Delaware Division of Public Health

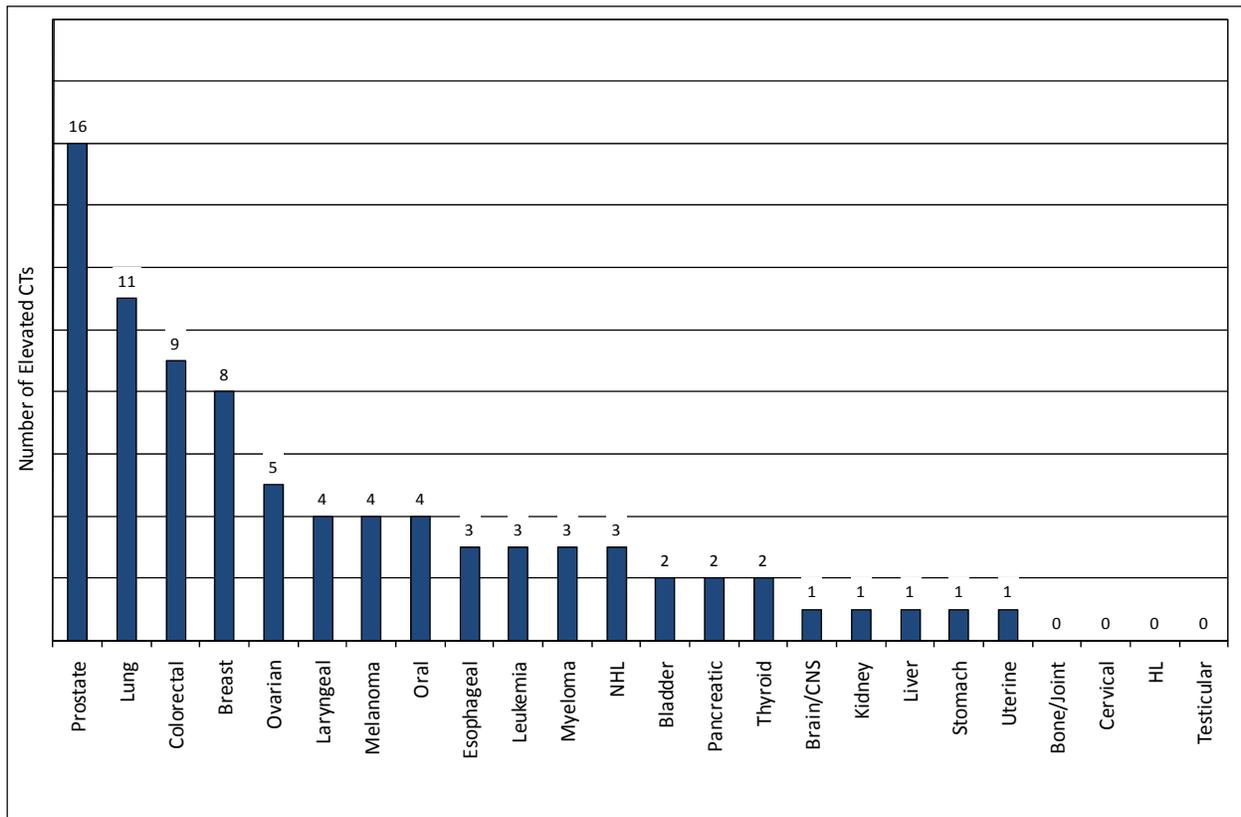
Figure 2, below, shows which specific cancer types were most often significantly elevated within the 45 census tracts analyzed in this report. The frequencies in Figure 2 do not sum to 45 because (as shown in Figure 1), 27 of the 45 census tracts under review were significantly elevated for more than one specific cancer type.

The Delaware Cancer Consortium identified seven cancer types with substantiated environmental risk factors: (a) bladder; (b) brain/CNS; (c) Hodgkin's lymphoma; (d) leukemia; (e) liver; (f) non-Hodgkins lymphoma; and (g) thyroid. It is important to note that while these seven cancers are associated with environmental risk factors, they may also be related to modifiable risk factors. For example, in addition to exposure to chemicals used in the manufacturing of dyes, rubber and leather, tobacco use is the primary risk factor for bladder cancer.

- ⇒ **11 census tracts (24%) had significantly elevated rates for at least one of the seven cancer types with substantiated environmental risk factors.** One of these 11 census tracts was significantly elevated for two of the seven cancer types. The remaining 10 census tracts were significantly elevated for only one of the seven cancers with environmental risk factors.
- ⇒ **34 census tracts (76%) were not significantly elevated for any of the seven cancers with environmental risk factors.** Rather, the most-commonly elevated cancer types involved those thought to be caused mostly by non-environmental risk factors. For example, prostate cancer was significantly elevated in 16 of the 45 census tracts under review. Eleven of the 45 census tracts had significantly elevated lung cancer rates. These findings are not surprising. Breast, colorectal, lung and prostate cancers are the four most commonly diagnosed cancers in Delaware and the U.S. From 2002-06, these four cancers accounted for 55% of all new cancer cases and 53% of all cancer deaths in Delaware.

The 45 census tracts under review accounted for 6,264 incident cancer cases from 2002-06 -- 28% of the total number of cancer cases diagnosed among Delawareans during this period. Of these 6,264 cancer cases, 960 cases (15%) involved one of the seven cancers with environmental risk factors. The remaining 85% of cases diagnosed within these 45 census tracts did not involve these seven cancer types.

Figure 2: Specific Elevated Cancer Types for 45 Census Tracts with Age-Adjusted Cancer Rates that were Significantly Higher than the State: Delaware 2002-06.



Source: Delaware Division of Public Health

Conclusions

High cancer rates in a census tract can occur for many reasons, including those below:

- Chance:** Even if there are more people with one type of cancer in a community than might be expected, it cannot be assumed that the cancers of each individual were caused by a common exposure to a chemical in the environment or a cluster of lifestyle risk factors. Some occurrences of increased (or decreased) cancer rates are due to random variation. This is particularly true where small numbers of people are involved.
- Better access to health care:** If residents from one area are more likely to be screened by their doctor for cancer compared to residents from another area, more cases of cancer are likely to be detected among residents from the first area.
- Grouping of lifestyle behaviors:** Tobacco use, regular physical activity, diet, and other behaviors strongly impact cancer risk. If residents in one area are more likely to engage in unhealthy lifestyle behaviors, the cancer rate for that area may be elevated compared to other areas.
- Environmental or occupational exposure:** If residents in one part of a state are exposed to a harmful substance, either on-the-job or during their daily routines, they may have an increased cancer risk compared to residents in other areas who are not exposed to the same substance.

With this in mind, the four most-frequently elevated cancer types within the 45 census tracts with high overall cancer rates were breast, colorectal, lung, and prostate cancers – the same four most-frequently diagnosed cancers at the state and national levels. Fortunately, three of these cancers can be detected in their earliest stages via reliable screening tests (i.e., mammograms, colonoscopies/sigmoidoscopies, and prostate-specific antigen (PSA) tests).

Of these four common cancers, research has identified a primary causal factor for lung cancer only. An estimated 87% of lung cancers are caused by smoking cigarettes, cigars or pipes.¹ However, all of these cancers have known risk factors.

When census tracts have elevated rates for cancers with many risk factors, it is difficult to pinpoint any single causal factor. Rather, the elevated cancer rate is likely due to a mix of non-modifiable and modifiable risk factors. Adding to the complexity, the interaction of several risk factors may increase a person's cancer risk more than the sum of the individual risk factors. The American Cancer Society (ACS) cites 19 substantiated risk factors for breast cancer alone: 12 of these risk factors are non-modifiable (e.g., age, family history); the remaining seven are modifiable (e.g., lack of exercise, being overweight/obese). The impact of another seven potential breast cancer risk factors is still under scientific review.

While breast, colorectal, lung, and prostate cancers were the most commonly elevated cancers in these 45 census tracts, other cancers, some with environmental risk factors, were also statistically higher compared to the state average. These may simply be statistical aberrations resulting from the very small number of cancer cases in these communities, or, especially when combined with unusual sex and age distributions, there may be underlying occupational or environmental causes that need further investigation. Further investigation of these concerns cannot be conducted with data routinely collected by DPH.

Table 1 summarizes the data utilized in this report and includes a list of specific cancer-related concerns for each of the 45 census tracts. Table 2 lists risk factors associated with each cancer. DPH will work to address these concerns and risk factors within these communities by:

- Educating residents about the findings in this report;
- Seeking guidance from the Environmental Committee of the Delaware Cancer consortium about the policy implications of this report;
- Assuring access to screening and prevention services, including the promotion of healthy lifestyles that prevent cancer from occurring;
- Discussing environmental and occupational concerns with residents and other agencies, including exploration of possible known sources of environmental carcinogens; and
- Collecting and analyzing additional information as appropriate.

¹ 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. (2004). The Health Consequences of Smoking: A report of the Surgeon General. Washington, D.C.

Table 1. Characteristics of 45 Census Tracts with Statistically Elevated Cancer Rates: Delaware, 2002-06.

Table Notes:

- Age-adjusted incidence rates in bold indicate that the census tract rate is significantly elevated compared to the state rate.
- Median ages at diagnosis in bold indicate that the census tract's median age at diagnosis is significantly lower than that of the state.
- Cancer types in bold represent one of the seven cancer types considered by the Delaware Cancer Consortium to have environmentally-substantiated risk factors.

Census Tract	Average number of cases per year	All-Site Cancer Age-Adjusted Incidence Rates (per 100,000), 2002-06		Significantly Elevated Cancer Type	Median Age at Diagnosis (Yrs), 2002-06		Areas of Concern
		Census Tract	Delaware		Census Tract	Delaware	
6.02	24.0	Total: 725.4 Males: 1,144.3 Females: 415.1	Total: 507.0 Males: 603.5 Females: 436.8	Laryngeal Lung Prostate	68.0	67.0	Sex Distribution Prevention Screening
102.00	12.2	Total: 671.6 Males: 563.3 Females: 638.2	Total: 507.0 Males: 603.5 Females: 436.8	Prostate	68.0	67.0	Screening
112.02	23.8	Total: 706.8 Males: 707.5 Females: 599.1	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal Non-Hodgkin's Lymphoma Thyroid	70.0	67.0	Sex Distribution Screening Prevention Cancer Type
112.03	26.0	Total: 622.3 Males: 717.0 Females: 475.9	Total: 507.0 Males: 603.5 Females: 436.8	Laryngeal Pancreatic	66.0	67.0	Prevention
112.05	15.8	Total: 755.2 Males: 796.5 Females: 704.8	Total: 507.0 Males: 603.5 Females: 436.8	Melanoma Ovarian	71.0	67.0	Sex Distribution Prevention
122.00	26.8	Total: 670.4 Males: 738.3 Females: 589.2	Total: 507.0 Males: 603.5 Females: 436.8	Bladder Prostate	66.0	67.0	Sex Distribution Cancer Type Prevention Screening

Census Tract	Average number of cases per year	All-Site Cancer Age-Adjusted Incidence Rates (per 100,000), 2002-06		Significantly Elevated Cancer Type	Median Age at Diagnosis (Yrs), 2002-06		Areas of Concern
		Census Tract	Delaware		Census Tract	Delaware	
127.00	37.6	Total: 651.0 Males: 659.8 Females: 556.6	Total: 507.0 Males: 603.5 Females: 436.8	-----	72.0	67.0	Sex Distribution
131.00	18.0	Total: 703.7 Males: 780.5 Females: 689.0	Total: 507.0 Males: 603.5 Females: 436.8	Lung	71.0	67.0	Sex Distribution Prevention
135.03	39.6	Total: 662.0 Males: 771.2 Females: 560.3	Total: 507.0 Males: 603.5 Females: 436.8	Breast Ovarian Prostate	63.0	67.0	Age Distribution Screening
135.04	36.8	Total: 740.4 Males: 975.1 Females: 561.7	Total: 507.0 Males: 603.5 Females: 436.8	Bladder Breast Myeloma Ovarian Prostate	58.5	67.0	Sex, Age Distribution Cancer Type Screening Prevention
136.13	30.0	Total: 616.4 Males: 662.4 Females: 589.2	Total: 507.0 Males: 603.5 Females: 436.8	-----	64.0	67.0	Sex, Age Distribution
139.01	17.8	Total: 673.8 Males: 841.6 Females: 565.5	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal	64.0	67.0	Sex Distribution Screening Prevention
139.02	37.0	Total: 846.0 Males: 1,232.4 Females: 604.6	Total: 507.0 Males: 603.5 Females: 436.8	Breast Laryngeal Leukemia Lung Prostate	59.0	67.0	Age Distribution Cancer Type Screening Prevention
140.00	24.8	Total: 738.3 Males: 715.3 Females: 741.6	Total: 507.0 Males: 603.5 Females: 436.8	Breast Liver Oral	64.0	67.0	Sex Distribution Cancer Type

Census Tract	Average number of cases per year	All-Site Cancer Age-Adjusted Incidence Rates (per 100,000), 2002-06		Significantly Elevated Cancer Type	Median Age at Diagnosis (Yrs), 2002-06		Areas of Concern
		Census Tract	Delaware		Census Tract	Delaware	
148.05	25.2	Total: 652.7 Males: 739.8 Females: 518.1	Total: 507.0 Males: 603.5 Females: 436.8	-----	57.0	67.0	Age Distribution
148.06	52.8	Total: 776.7 Males: 914.0 Females: 658.4	Total: 507.0 Males: 603.5 Females: 436.8	Esophageal Lung Myeloma Prostate	60.0	67.0	Age Distribution Screening Prevention
148.07	23.6	Total: 701.7 Males: 871.8 Females: 666.9	Total: 507.0 Males: 603.5 Females: 436.8	Breast Melanoma	58.0	67.0	Age Distribution Screening Prevention
149.02	31.8	Total: 749.6 Males: 743.2 Females: 768.5	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal	58.0	67.0	Sex, Age Distribution Screening Prevention
149.03	18.4	Total: 857.6 Males: 963.4 Females: 779.0	Total: 507.0 Males: 603.5 Females: 436.8	Lung Oral	60.0	67.0	Age Distribution Screening Prevention
152.00	31.8	Total: 634.4 Males: 748.5 Females: 499.5	Total: 507.0 Males: 603.5 Females: 436.8	Leukemia Lung	64.0	67.0	Age Distribution Cancer Type Prevention
156.00	16.6	Total: 674.9 Males: 784.5 Females: 625.9	Total: 507.0 Males: 603.5 Females: 436.8	Lung Thyroid	63.0	67.0	Sex, Age Distribution Cancer Type Prevention
159.00	22.2	Total: 687.6 Males: 743.8 Females: 644.1	Total: 507.0 Males: 603.5 Females: 436.8	Esophageal	67.0	67.0	Sex Distribution Prevention
160.00	19.4	Total: 864.4 Males: 999.1 Females: 776.0	Total: 507.0 Males: 603.5 Females: 436.8	Prostate	65.0	67.0	Age Distribution Screening

Census Tract	Average number of cases per year	All-Site Cancer Age-Adjusted Incidence Rates (per 100,000), 2002-06		Significantly Elevated Cancer Type	Median Age at Diagnosis (Yrs), 2002-06		Areas of Concern
		Census Tract	Delaware		Census Tract	Delaware	
163.01	23.0	Total: 661.6 Males: 937.5 Females: 504.6	Total: 507.0 Males: 603.5 Females: 436.8	Prostate	62.0	67.0	Sex, Age Distribution Screening
163.02	21.6	Total: 642.6 Males: 746.8 Females: 553.6	Total: 507.0 Males: 603.5 Females: 436.8	Prostate	59.0	67.0	Age Distribution Screening
164.02	17.4	Total: 642.9 Males: 665.4 Females: 632.2	Total: 507.0 Males: 603.5 Females: 436.8	-----	68.0	67.0	Sex Distribution
166.01	36.4	Total: 638.8 Males: 761.8 Females: 559.0	Total: 507.0 Males: 603.5 Females: 436.8	Prostate	65.0	67.0	Screening
166.04	29.4	Total: 793.6 Males: 919.6 Females: 669.4	Total: 507.0 Males: 603.5 Females: 436.8	Breast Prostate	62.0	67.0	Age Distribution Screening
169.02	15.0	Total: 759.2 Males: 987.3 Females: 516.4	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal Laryngeal	63.0	67.0	Sex, Age Distribution Screening Prevention
401.00	31.4	Total: 647.3 Males: 764.3 Females: 602.9	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal Lung	62.0	67.0	Sex, Age Distribution Screening Prevention
405.00	37.6	Total: 655.0 Males: 871.5 Females: 487.9	Total: 507.0 Males: 603.5 Females: 436.8	Lung Pancreatic Prostate	65.0	67.0	Sex Distribution Screening Prevention

Census Tract	Average number of cases per year	All-Site Cancer Age-Adjusted Incidence Rates (per 100,000), 2002-06		Significantly Elevated Cancer Type	Median Age at Diagnosis (Yrs), 2002-06		Areas of Concern
		Census Tract	Delaware		Census Tract	Delaware	
412.00	19.4	Total: 659.6 Males: 822.8 Females: 511.7	Total: 507.0 Males: 603.5 Females: 436.8	-----	65.0	67.0	Sex, Age Distribution
417.01	29.6	Total: 749.7 Males: 1,131.2 Females: 519.1	Total: 507.0 Males: 603.5 Females: 436.8	Non-Hodgkin's Lymphoma Prostate	66.0	67.0	Sex Distribution Cancer Type
417.02	21.6	Total: 801.6 Males: 1,131.9 Females: 623.7	Total: 507.0 Males: 603.5 Females: 436.8	Breast Oral Prostate	62.0	67.0	Age Distribution Screening Prevention
418.01	40.0	Total: 608.5 Males: 667.2 Females: 562.7	Total: 507.0 Males: 603.5 Females: 436.8	-----	64.0	67.0	Sex, Age Distribution
418.02	19.2	Total: 817.5 Males: 949.0 Females: 693.5	Total: 507.0 Males: 603.5 Females: 436.8	Leukemia Prostate Stomach	61.5	67.0	Age Distribution Cancer Type
422.01	26.8	Total: 691.7 Males: 773.7 Females: 642.1	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal	63.5	67.0	Sex Distribution Screening Prevention
428.00	36.4	Total: 680.9 Males: 847.0 Females: 547.5	Total: 507.0 Males: 603.5 Females: 436.8	Oral Ovarian	63.0	67.0	Sex, Age Distribution Prevention
429.00	25.0	Total: 688.5 Males: 639.6 Females: 757.1	Total: 507.0 Males: 603.5 Females: 436.8	Brain/CNS Breast Myeloma Uterine	61.0	67.0	Sex, Age Distribution Cancer Type Screening.
503.02	22.6	Total: 655.4 Males: 651.6 Females: 665.6	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal Lung Ovarian	66.0	67.0	Sex Distribution Screening Prevention

Census Tract	Average number of cases per year	All-Site Cancer Age-Adjusted Incidence Rates (per 100,000), 2002-06		Significantly Elevated Cancer Type	Median Age at Diagnosis (Yrs), 2002-06		Areas of Concern
		Census Tract	Delaware		Census Tract	Delaware	
504.03	17.2	Total: 676.7 Males: 833.2 Females: 560.4	Total: 507.0 Males: 603.5 Females: 436.8	-----	64.5	67.0	Sex Distribution
510.01	63.0	Total: 717.4 Males: 894.3 Females: 590.2	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal Esophageal Kidney Melanoma	69.0	67.0	Screening Prevention
510.02	55.8	Total: 584.6 Males: 652.5 Females: 534.2	Total: 507.0 Males: 603.5 Females: 436.8	-----	69.0	67.0	
510.03	28.8	Total: 725.5 Males: 877.7 Females: 630.1	Total: 507.0 Males: 603.5 Females: 436.8	Lung Non-Hodgkin's Lymphoma	66.0	67.0	Prevention Cancer Type
517.01	23.6	Total: 725.8 Males: 825.1 Females: 651.4	Total: 507.0 Males: 603.5 Females: 436.8	Colorectal Melanoma	67.0	67.0	Screening Prevention

Source: Delaware Division of Public Health

Table 2. Risk Factors for Cancer Types

Cancer Type	Major Known Risk Factors
Bladder	Smoking, work exposure
Brain	Radiation therapy, certain genetic conditions
Breast	Genetic, family history, early menarche, recent use of birth control pills, hormone therapy
Colorectal	History of bowel disease, family history, diet, smoking, alcohol, diabetes
Esophagus	Tobacco, alcohol, overweight, diet, dry cleaning chemicals
Kidney	Smoking, overweight, workplace exposures, family history, hypertension, medications
Larynx	Tobacco, alcohol, diet, HPV, genetics, workplace exposure
Leukemia	Genetics, diet, alcohol, tobacco, sun, radiation, chemical exposure
Liver	Hepatitis, alcohol, genetics, workplace exposures, steroids, arsenic in drinking water
Lung	Tobacco, radon, asbestos, workplace exposures
Melanoma	UV light, moles, fair skin, family history
Myeloma	Family history, overweight, radiation, workplace exposures
NHL*	Radiation, weakened immune system, certain infections
Oral	Tobacco, alcohol, UV light, HPV, nutrition
Ovarian	Obesity, tubal ligation (protective factor), fertility drugs, hormone therapy
Pancreas	Tobacco, obesity, diabetes, hepatitis, alcohol, workplace exposures, family history
Prostate	Family history, African American race, diet, obesity
Stomach	Certain infections, diet, tobacco, obesity, family history
Thyroid	Lack of iodine, radiation, genetic conditions
Uterine	Radiation, diabetes, diet, obesity, estrogen therapy

Source: Delaware Division of Public Health

* Non-Hodgkin's Lymphoma

For Additional Information

Follow this website link to determine your census tract:

http://factfinder.census.gov/servlet/AGSGeoAddressServlet?_lang=en&_programYear=50&_treeId=420

To view the entire *Cancer Incidence and Mortality in Delaware, 2002-2006* report, visit the DPH website:
http://www.dhss.delaware.gov/dhss/dph/dpc/files/final_imreport_2002-06.pdf

For questions or comments related to this report, please contact the Division of Public Health at the following address:

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