Cancer Burden among Residents of Census Tract 903.02 located in Riverside, Ohio, 1996-2012

Valley Pike Volatile Organic Compounds (VOC) Site

Public Health - Dayton & Montgomery County
Epidemiology Department

February 2016 REVISED

Community Report

Dayton & Montgomery County

Public Health
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Summary

In November of 2010, a site inspection of Mullins Rubber Products (MRP) located in Riverside, Ohio revealed that the groundwater underlying a residential area that boarders MRP had been contaminated with tetracholoethylene (PCE) and trichloroethylene (TCE). While the Environmental Protection Agency (EPA) is conducting a vapor intrusion investigation, Public Health - Dayton & Montgomery County (PHDMC) choose to complete a cancer assessment to evaluate any potential health impact caused by this contamination.

This cancer assessment reviewed the sites/types of new cancer diagnoses within Census Tract (CT) 903.02. This CT contains MRP and the residential area directly impacted by the contamination. The review of cancer cases that occurred over a 17 year period (1996 to 2012), indicated that the number of cases of lung cancer and non-Hodgkin lymphoma were higher than what was expected to occur in this area.

Tobacco use is the primary risk factor for lung cancer but secondhand smoke, family history, and environmental exposures to radon, air pollution, asbestos, and arsenic are also risk factors. There is evidence that long-term exposure to both PCE and/or TCE can cause liver, bladder, and kidney cancers; multiple myeloma; and non-Hodgkin lymphoma. Although non-Hodgkin lymphoma is related to the chemicals responsible for the contamination in the Valley Pike Site, there are several other risk factors that may also contribute to a person's risk of developing non-Hodgkin lymphoma to include age, sex, race, infections, and immune deficiency syndromes.

Community cancer assessments are challenging since the exact cause of each cancer case is difficult to establish. Since there are several risk factors associated with non-Hodgkin lymphoma, there is no known single cause of the disease. Information pertaining to each case's history of environmental exposures, previous residences, and health behaviors is unknown. Additionally, there are a small number of diagnosed cases of non-Hodgkin lymphoma in this area during this time period, and therefore the likelihood that these results could have occurred by chance increases. It is not possible to determine if this particular exposure is associated with the cases analyzed in this assessment.

Public Health - Dayton & Montgomery County will continue to be involved and remain informed of the status of the vapor intrusion investigation being conducted by the EPA and will also continue to monitor non-Hodgkin lymphoma cases in this area.

Valley Pike VOC Site Cancer Assessment

Why was this assessment done?

During a site inspection at Mullins Rubber Products (MRP) in November of 2010, Ohio Environmental Protection Agency (Ohio EPA) found two chemicals of concern in the groundwater, tetrachloroethylene (PCE) and trichloroethylene (TCE). These contaminants were found in both shallow and deep aquifers on the perimeter of MRP and in groundwater underlying a residential area boarding MRP to the west and southwest. When sub-slab and indoor air samples from residential properties near MRP were tested, the results indicated that the contaminants were entering the homes in the area.

PCE is considered "likely to be carcinogenic to humans by all routes of exposure" by the Environmental Protection Agency (EPA)[1] and "probably carcinogenic to humans" by the International Agency for Research on Cancer (IARC).[2] Long-term exposure to PCE might lead to a higher risk of bladder cancer, multiple myeloma, or non-Hodgkin lymphoma. There is strong evidence of cancer risk in animals, but the evidence in humans is limited.[3] Strong evidence supports that long-term exposure to TCE can cause kidney cancer and some evidence that it can cause liver cancer and non-Hodgkin lymphoma in humans.[4] Both the EPA and IARC have classified TCE as "carcinogenic to humans."[5,2]

The EPA is conducting a vapor intrusion investigation to include the installation of vapor intrusion mitigation systems in homes where needed. Public Health - Dayton & Montgomery County (PHDMC) believed it was important to also conduct a cancer assessment to potentially address any health impact.

What is a cancer cluster?

Cancer is not an uncommon disease as it is estimated that 40% of men and women in the United States will be diagnosed with cancer at some point in their life.[6] There are rare occurrences in which there appears to be a greater burden of cancer in a community than normal. These occurrences are typically referred to as "cancer clusters." The Centers for the Disease Control and Prevention defines a cancer cluster "as a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a period of time."[7]

In order to be a true cancer cluster, the group of cancer cases must meet the following criteria:

> › **A greater than expected number:**
>
> The number of observed cancer cases is greater than what would typically be observed in a similar setting.
>
> › **Of cancer cases:**
>
> All of the cancer cases must involve the same type of cancer or the cancer cases must be associated to the same cause.
>
> › **That occurs with a group of people:**
>
> The population in which the cancers are occurring is carefully defined by factors such as race/ethnicity, age, and gender, so that rates can be calculated.
>
> › **In a geographic area:**
>
> The area in which cancer cases are occurring has carefully defined geographic boundaries.
>
> › **Over a period of time:**
>
> The time period chosen is applicable to the calculation of the expected number of cancer cases in the population.[7]

A cancer cluster is a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a period of time.

Even when a cluster is confirmed in an area, identifying a single exposure or cause is difficult. As people move into an area, it is hard to identify prior environmental exposures. In addition, a cluster may have occurred due to chance possibly due to low numbers, a miscalculation of the expected number of cancer cases perhaps as a result of a risk factor within the population, or a known cancer risk factor such as smoking. [7]

How was the assessment area defined?

The residential area directly impacted by contamination from Mullins Rubber Products (MRP) is located within Census Tract (CT) 903.02. In the map below (Figure 1), CT 903.02 is outlined in gray and shaded pink. The area shaded in yellow encompasses 545 properties located to the south of MRP (2949 Valley Pike, Dayton, OH 45404) which are part of the vapor intrusion investigation.

Figure 1. Map of Assessment Area (Census Tract 903.02) in Riverside, Montgomery County as defined by the U.S. Census Bureau, 2010
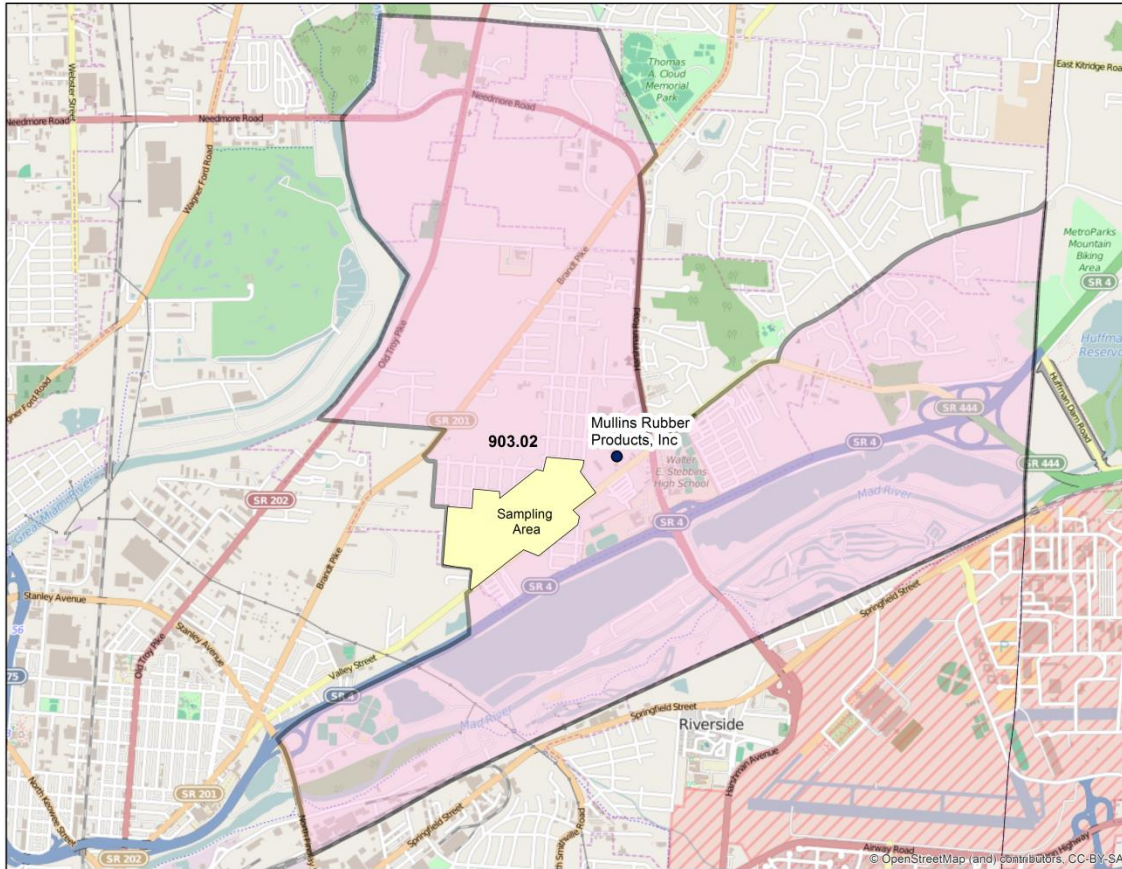
Source: Census 2010 TIGER/Line Files, U.S. Census Bureau-Washington D.C.

What was the purpose of this assessment?

PHDMC completed this assessment of cancer diagnoses in order to determine if the contamination of TCE and PCE increased the burden of cancer in CT 903.02.

There are four primary objectives for this cancer assessment:

1. To determine the number of cancer cases diagnosed among residents of CT 903.02 by site/type of cancer and demographic characteristics for the years 1996 to 2012

2. To compare the number of cancer cases diagnosed among residents of CT 903.02, by site/type of cancer to the number of expected cases based on national incidence rates;

3. To compare the number of cancer cases diagnosed among residents of CT 903.02 by site/type of cancer to the number of expected cases based on Ohio and Montgomery County incidence rates; and

4. To make recommendation for further action, if necessary.

How was this cancer assessment conducted?

Cancer cases were identified through the Ohio Cancer Incidence Surveillance System (OCISS). OCISS is a cancer registry that has collected data on cancer cases diagnosed among Ohio residents since January 1, 1992. The case reporting for Montgomery County for the years 1996 to 2012 is approximately 94% complete.[8] Each record within the registry contains demographic information which includes the patent's address at diagnosis and details related to the cancer diagnosis. Cases in OCISS are grouped by site/type into 23 categories established by the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program .[9] The number of cases that were diagnosed among residents of CT 903.02 are considered to be the "observed" number of cases.

The number of cases "expected" to have been diagnosed from 1996 to 2012 in CT 903.02 were calculated using the national cancer incidence rates obtained from the National Cancer Institute's SEER Program.[10] The age-specific SEER rates per 100,000 were multiplied by the age-specific population counts of the census tract to generate an expected number of cases for each cancer type (please see technical notes for a specific details on how population size was estimated for the time frame).

In order to compare the number of "observed" cases to the number of "expected" cases in the census tract, a "standardized incidence ratio" (SIR) was calculated for each cancer type.

$$\text{SIR} \ = \ \frac{\text{Observed Cases}}{\text{Expected Cases}}$$

If the value of the SIR is equal to one, it means that the number of "observed" cases is equal to the number of cases "expected" to occur. A SIR greater than one means that there are more "observed" cases than "expected" cases, and conversely, a SIR less than one means that there are less "observed" cases than "expected" cases.

In order to account for random error or lessen the probability that results occurred by chance alone, the 95% confidence interval (CI) for each SIR was calculated. The CI represents the range of possible values of the SIR that we are 95% confident contains the true value. If the confidence interval for a given SIR does not include one, the result is considered to be statistically significant. In other words, we are 95% confident that the number of cancer cases that were "observed" among the residents of the census tract is not equal to the number of cases that was "expected."

What were the results of this assessment?

With a population of little more than 6,200, the residents of this census tract are predominately White (85%). The residents are younger (average age approximately 36.5) with 27% of the population under the age of 19. Fifty-one percent of the residents are female and 49% are male (Table 1).

From 1996 to 2012, there were a total of 495 invasive cancer cases diagnosed among residents of CT 903.02. There were an equal number of cases diagnosed between men and women, 96% cases were diagnosed among Whites, and 30% of cases occurred among residents age 65 to 74 (Table 2). The most common cancer types in this area were lung cancer, breast cancer in females, prostate cancer, and colorectal cancer (Table 3). These cancer sites/types are also the most common in Ohio and the United States.[11]

In comparing the observed number of cases to the expected number of cases, the diagnosed cases of lung cancer (SIR=2.20; 95% CI=1.84-2.61) and non-Hodgkin lymphoma (SIR=1.52; 95% CI=1.03-2.27) were significantly higher than the number of cases that were expected (Table 4).

For additional comparisons, the observed numbers of lung cancer and non-Hodgkin lymphoma cases were compared to the expected number of these cancers in Montgomery County and Ohio. The number of lung cancer cases in CT 903.02 was significantly higher than the expected number cases in both Montgomery County (SIR 1.57; 95% CI 1.31-1.86) and Ohio (SIR 1.69; 95% CI 1.41-2.00). Similarly, the number of observed cases of non-Hodgkin lymphoma was significantly higher than the expected number of cases in Montgomery County (SIR 1.56; 95% CI 1.06-2.22) and Ohio (SIR 1.56; 95% CI 1.06-2.21) (Table 5).

What do the results of this assessment mean?

During the 17 years included in this assessment, 497 cases of cancer were diagnosed among residents of CT 903.02 with an average of 29 cases being diagnosed every year (Table 2). Based on the national cancer incidence rate, 483 cases were expected to occur in this census tract. While the overall risk of cancer among the residents appears to be lower than expected, there is a significant increase for the development of lung cancer and non-Hodgkin lymphoma (Table 4).

The primary risk factor for lung cancer is tobacco smoking (cigarette, cigar, and pipe smoking). Ninety percent of lung cancer cases are caused by smoking. Other risk factors include secondhand smoke, family history, and environmental exposures to radon, air pollution, asbestos, and arsenic.[12] Of the cancer patients diagnosed with lung

> More than 75% of lung cancer patients in CT 903.02 reported to be current or former smokers.

cancer from 1996 to 2008, 58% currently smoked, 18% were former smokers, and tobacco history was unknown or unreported for 21% of cases; therefore the prevalence of tobacco use is likely to be even higher (Table 6).

While there is no known single cause of non-Hodgkin lymphoma, there are several risk factors that may contribute to a person's risk of the developing of non-Hodgkin lymphoma. Risk factors include:[13]

› Age - more common in people older than 60 years of age

› Sex - more common in men compared to women

› Race - more common in Whites compared to Blacks and Asians

› Previous exposure to radiation or some chemotherapy drugs

› Exposure to chemicals such as pesticides, fertilizers, or organic solvents

› Use of immunosuppressant drugs following organ transplant surgery

› Infections such as human immunodeficiency virus (HIV), Epstein-Barr virus, Helicobacter pylori (H. pylori) and Human T-lymphottropic virus

› Autoimmune disease such as Sjögren's syndrome, lupus, or rheumatoid arthritis

› Inherited immune deficiency syndromes such as Louis-Barr syndrome and Wiskott-Aldrich syndrome

Only 31 cases of non-Hodgkin lymphoma were diagnosed from 1996 to 2012; 6% of all cancer diagnoses.

Non-Hodgkin lymphoma is related to exposure of PCE and TCE, but there are many other risk factors that are attributed to the development of non-Hodgkin lymphoma. Therefore, it is not possible to determine if this particular exposure is associated with these particular cases. Additionally, with a small number of cases of non-Hodgkin lymphoma diagnosed in CT 903.02 over 17 years, the likelihood that these results could have occurred by chance increases.

Overall, community cancer assessments are challenging because the exact cause of each case of cancer is difficult to determine. There is a lack of case information pertaining to a patient's history of environmental exposures, previous residences, health behaviors, and other cancer-related risk factors.

What happens next?

A contractor with the EPA will complete the sampling of residences and the installation of vapor mitigation systems in the residences that require them. PHDMC will continue to be involved and informed of the progress of the vapor intrusion investigation in the Valley Pike VOC site. Additionally, PHDMC will continue to monitor non-Hodgkin lymphoma cases in CT 903.02.

A more detailed report is available upon request.

References

[1] Environmental Protection Agency (EPA). 2012 *Tetrachloroethylene (Perchloroethylene).* Technology Transfer Network: http://www.epa.gov/airtoxics/hlthef/tet-ethy.html

[2] International Agency for Research on Cancer (IARC). 2006. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Preamble.* http://monographs.iarc.fr/ENG/Preamble/CurrentPreamble.pdf

[3] Agency for Toxic Substance and Disease Registry (ASTDR). 2014. *Toxicological Profile for Tetrachloroethylene (DRAFT).* U.S. Public Service, U.S. Department of Health and Human Services. http://www.atsdr.cdc.gov/toxprofiles/tp18.pdf

[4] Agency for Toxic Substance and Disease Registry (ASTDR). 2014. *Toxicological Profile for Trichloroethylene (DRAFT)*. U.S. Public Service, U.S. Department of Health and Human Services. http://www.atsdr.cdc.gov/toxprofiles/tp19.pdf

[5] Environmental Protection Agency (EPA). 2011. *Trichloroethylene: Carcinogenicity Assessment for Lifetime Exposure*. Integrated Risk Information System: http://www.epa.gov/iris/subst/0199.htm#woe

[6] National Cancer Institute (NIH). 2012. *Cancer Statistics.* http://www.cancer.gov/about-cancer/what-is-cancer/statistics

[7] Centers for Disease Control and Prevention (CDC). 2013. *Cancer Clusters.* http://www.cdc.gov/nceh/clusters/default.htm

[8] Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 1996-2012 data.

[9] International Classification of Diseases for Oncology, Third Edition. World Health Organization, Geneva, Switzerland, 2000.

[10] Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 13 Regs Research Data, Nov 2014 Sub (1992-2012) <Katrina/Rita Population Adjustment> - Linked To County Attributes - Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Surveillance Systems Branch, released April 2015, based on the November 2014 submission.

[11] American Cancer Society East Central Division, Ohio Department of Health, The Ohio State University. *Ohio Cancer Facts & Figures 2010*. Columbus, Ohio: American Cancer Society; 2010.

[12] Centers for Disease Control and Prevention. 2014. *What are the Risk Factors of Lung Cancer?* Center for Disease Control and Prevention. http://www.cdc.gov/cancer/lung/basic_info/risk_factors.htm

[13] Leukemia Society. 2013. *Non-Hodgkin Lymphoma.* http://www.lls.org/content/nationalcontent/resourcecenter/freeeducationmaterials/lymphoma/pdf/nhl.pdf

Appendix: Data Tables

Table 1. Demographic Characteristics of CT 903.02

Demographic Characteristics	Number	Percent
Population	6,296	
Sex		
Male	3,074	49%
Female	3,222	51%
Race		
White	5,351	85%
Black	503	8%
Asian	203	3%
Other Race	239	4%
Age		
Under 5	437	7%
5 to 14	887	14%
15 to 19	479	8%
20 to 24	378	6%
25 to 34	815	13%
35 to 44	906	14%
45 to 54	877	14%
55 to 64	765	12%
65 to 74	450	7%
75 to 84	227	4%
85+	75	1%

Source: U.S. Census, 2010

Table 2. Number and Percent of Cancer Cases by Sex, Race,
Age Group, and Year of Diagnosis in CT 903.02, 1996-2012

Demographic Characteristics	Cases	Percent
Total	495	100%
Sex		
Male	242	49%
Female	253	51%
Race		
White	475	96%
Black	10	2%
Other/Unknown	10	2%
Age		
Under 5	1	0%
5 to 14	2	0%
15 to 19	1	0%
20 to 24	5	1%
25 to 34	6	1%
35 to 44	30	6%
45 to 54	75	15%
55 to 64	104	21%
65 to 74	147	30%
75 to 84	95	19%
85+	29	6%
Year of Diagnosis		
1996	36	7%
1997	30	6%
1998	24	5%
1999	26	5%
2000	18	4%
2001	25	5%
2002	24	5%
2003	26	5%
2004	22	4%
2005	36	7%
2006	39	8%
2007	29	6%
2008	37	7%
2009	27	5%
2010	30	6%
2011	26	5%
2012	40	8%

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, April 2015

Table 3. Number and Percent of Cancer Cases by Site/Type
in CT 903.02, 1996-2012

Cancer Site/Type	Cases	Percent
All Cancer Sites/Types	495	100%
Lung and Bronchus	132	27%
Breast (female)	60	12%
Prostate	48	10%
Colon and Rectum	40	8%
Other Sites/Types[1]	34	7%
Non-Hodgkin Lymphoma	31	6%
Melanoma of Skin	19	4%
Leukemia	17	3%
Bladder	16	3%
Oral Cavity and Pharynx	13	3%
Kidney and Renal Pelvis	13	3%
Pancreas	11	2%
Uterus	10	2%
Liver and Intrahepatic Bile Duct	9	2%
Multiple Myeloma	6	1%
Ovary	6	1%
Brain and Other CNS[2]	6	1%
Cervix	6	1%
Stomach	5	1%
Thyroid	4	1%
Esophagus	4	1%
Larynx	3	1%
Hodgkin Lymphoma	2	0%
Testis	0	0%

Source: Ohio Cancer Incidence Surveillance, Ohio Department of Health, April 2015
[1] Other Sites/Types consists of the following cancers: unspecified (16 cases), vagina (3 cases),
urinary tract (2 cases), anus (2 cases), bone marrow (2 cases), biliary tract (1 case),
gall bladder (1 case), connective tissue (1 case), nasal cavity (1 case), genital tract - female (1 case),
pelvis (1 case), vulva (1 case) and adrenal gland (1 case)
[2] CNS = Central Nervous System

Table 4. Number of Observed and Expected Cancer Cases, Standardized Incidence Ratios (SIR) and 95% Confidence Intervals (CI), by Cancer Site/Type in CT 903.02, 1996-2012[1,2]

Cancer Site/Type	Observed Cases	Expected Cases	SIR	95% CI
All Sites/Types	495	482.48	1.03	(0.94, 1.12)
Lung and Bronchus	132	59.92	2.20	(1.84, 2.61)*
Breast (female)	60	70.06	0.86	(0.65, 1.10)
Prostate	48	70.03	0.69	(0.51, 0.91)
Colon and Rectum	40	47.87	0.84	(0.60, 1.14)
Other Sites/Types	34	NA	NA	NA
Non-Hodgkin Lymphoma	31	20.40	1.52	(1.03, 2.16)*
Melanoma of Skin	19	20.03	0.95	(0.57, 1.48)
Leukemia	17	13.34	1.27	(0.74, 2.04)
Bladder	16	20.14	0.79	(0.45, 1.29)
Oral Cavity and Pharynx	13	14.06	0.92	(0.49, 1.58)
Kidney and Renal Pelvis	13	11.34	1.15	(0.61, 1.96)
Pancreas	11	11.76	0.94	(0.47, 1.67)
Uterus	10	13.97	0.72	(0.34, 1.32)
Liver and Intrahepatic Bile Duct	9	7.90	1.14	(0.52, 2.16)
Multiple Myeloma	6	6.73	0.89	(0.33, 1.97)
Ovary	6	4.26	1.41	(0.52, 3.07)
Brain and Other CNS[3]	6	6.18	0.97	(0.36, 2.11)
Cervix	6	7.17	0.84	(0.31, 1.82)
Stomach	5	8.39	0.60	(0.22, 1.39)
Thyroid	4	4.60	0.87	(0.24, 2.23)
Esophagus	4	11.03	0.36	(0.10, 0.93)
Larynx	3	3.57	0.84	(0.17, 2.46)
Hodgkin Lymphoma	2	2.85	0.70	(0.08, 2.54)
Testis	0	NA	NA	NA

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, April 2015.
[1]Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2012, SEER 13 Registries public-use data file, National Cancer Institute, 2015.
[2]95% confidence intervals were calculated based on a Poisson distribution using Fisher's Exact Test.
[3] CNS = Central Nervous System
* A significantly higher than expected number of cancer cases were diagnosed during this time period.

Table 5. Number of Observed and Expected Invasive Cancer Cases, Standardized Incidence Ratios (SIR) and 95% Confidence Intervals (CI) Generated Using SEER, Ohio, and Montgomery Rates, among Residents of CT 903.02, 1996-2012[1,2]

Cancer Sites/Types	Region Used to Generate Expected	Observed Cases	Expected Cases	SIR	95% CI
Lung and Bronchus	SEER	132	59.92	2.20	(1.84, 2.61)*
	Montgomery County	132	84.08	1.57	(1.31, 1.86)*
	Ohio	132	78.25	1.69	(1.41, 2.00)*
Non-Hodgkin's Lymphoma	SEER	31	20.40	1.52	(1.03, 2.16)*
	Montgomery County	31	19.80	1.56	(1.06, 2.21)*
	Ohio	31	19.90	1.57	(1.06, 2.22)*

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, April 2015.

[1]Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2012, SEER 13 Registries public-use data file, National Cancer Institute, 2015; Ohio and Montgomery – Ohio Cancer Incidence Surveillance System age-specific incidence rates for 1996-2012, Ohio Department of Health, April 2015.

[2]95% confidence intervals were calculated based on a Poisson distribution using Fisher's Exact Test.

* A significantly higher than expected number of cancer cases were diagnosed during this time period.

Table 6. Percent of All Cancer Sites/Types and Lung and Bronchus Cancer Cases by Tobacco History in CT 903.02, 1996-2008

Tobacco[1] History	All Cancer Sites/Types	Lung and Bronchus
Never Used Tobacco	20%	3%
Currently Use Tobacco	39%	58%
Previously Used Tobacco	14%	18%
Unknown/Blank	27%	21%

Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, March 2015.

[1]Tobacco Use includes cigarettes, cigars, pipes, snuff, and chewless, and smokeless tobacco

Technical Notes

Invasive Cancer

Only invasive cancers were included in the calculation of incidence rates in this document; cancers whose behavior was classified as benign or as a carcinoma in situ were excluded. Cancer that has spread beyond the layer of tissue in which the malignant tumor developed and begins growing into the surrounding, health tissue is considered invasive. Invasive cancers are diagnosed at the localized, regional, distant and unstaged/missing stages.

Age-adjusted Rate

An age-adjusted rate is a weighted average of age-specific (crude) rates, where the weights represent the age distribution of a standard population (direct adjustment). The incidence rates presented in this report were standardized to the age distribution of the 2000 U.S. Standard Population. Under the direct method, the population was first divided into 19 five-year age groups, i.e., <1, 1-4, 5-9, 10-14, 15-19...85+, and the age-specific rate was calculated for each age group. Each age-specific rate was then multiplied by the U.S. Standard Population proportion for the respective age group. A rate represents the number of newly diagnosed cases per 100,000 persons during a specified time period (e.g., 1996-2012).

Census Data

The 1996-2012 rates were calculated using the population counts of CT 903.02 from the 2000 and 2010 decennial Census (U.S. Census Bureau). Population counts from the decennial Census conducted closest to the time period of the study were used in rate calculation. Specifically, the population count for the 2000 Census was used for the years 1996 through 2005 and 2010 population counts were used for the years 2006 through 2012. The overall population for the 17 years (1996-2012) of this study was derived using 10 years of population data from the 2000 Census and 7 years of population data from the 2010 Census.