

Cancer Incidence among Residents of Census Tracts 602, 603, 702.01 and 702.02 Montgomery County, Ohio

1996 - 2009

Public Health – Dayton & Montgomery County
Epidemiology Department

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INTRODUCTION

A. Background

An assessment of the burden of cancer among residents of Census Tracts (CTs) 602, 603, 702.01, and 702.02 in Montgomery County, Ohio was conducted by the Epidemiology Department within Public Health - Dayton & Montgomery County (PHDMC) in response to a request from the PHDMC Environmental Health Division in November 2012 who were acting in response to health concerns voiced by community members living near the Clean Water, Ltd. liquid waste processing plant.

Community concerns that odors and air emissions from the plant might be affecting health have been expressed for a number of years. In response to those concerns, an air monitoring project was undertaken by a federal agency in 2007 and 2008. In their analysis of monitoring results, none of the compounds analyzed were detected above health-based values. Data collected in 2001 and 2003-2004 by the Regional Air Pollution Control Agency (RAPCA) supporting the results were also shared at that time. Data recently collected by RAPCA in 2011 also supported the original findings.

Since air sampling data reporting has found no contaminants of concern in excess of a health-based standard; a completed pathway of exposure has not been established in this community. A completed pathway of exposure is said to exist when sampling data finds that residents are being exposed to and inhaling air containing contaminants of concern exceeding health-based standards.

Compounds monitored in response to odors and air emission concerns include trichloroethylene (TCE), tetrachloroethene (PCE), and benzene. Long term exposure to these solvents has been linked to several types of cancers in humans. Chronic exposure to TCE has been associated with kidney cancer¹ and PCE exposure and has been linked to an increased incidence of bladder cancer, multiple myeloma, and non-Hodgkin's lymphoma.² Prolonged exposure to high levels of benzene in the air can cause leukemia.³

Although a completed pathway of exposure was not identified for this community, PHDMC believed it was important to conduct this cancer investigation in response to residents' concerns.

This assessment included all cancer cases diagnosed among residents of CTs 602, 603, 702.01, and 702.02 from 1996-2009 as these years represent the most accurate and complete cancer incidence data available for Ohio.

B. Objectives

There are four primary objectives for this cancer assessment:

1. To determine the number of cancer cases diagnosed among residents of CTs 602, 603, 702.01, and 702.02 by site/type of cancer and demographic characteristics for the years 1996-2009;
2. To compare the number of cancer cases diagnosed among residents of CTs 602, 603, 702.01, and 702.02, by site/type of cancer to the number of expected cases based on national incidence rates;
3. To identify the cancers most prevalent in CTs 602, 603, 702.01, and 702.02 and further compare the number of diagnosed cancer cases to the number of expected cases by race and individual census tract based on national, Ohio, and Montgomery County incidence rates; and
4. To make recommendations for further action, if necessary.

METHODS

A. Study Population

The study population was defined as residents of U.S. Census 2000 CTs 602, 603, 702.01, and 702.02, Montgomery County, Ohio (Figure 1).⁴ Portions of each of these tracts are located within a one mile radius of the Clean Water, Ltd. facility (300 Cherokee Drive, Dayton, OH 45417). The 2000 U.S. Census population count for these four census tracts was 10,027 with the following demographics: 52 percent male (5,181 residents); 48 percent female (4846 residents); 35 percent White (3484 residents); and 63 percent Black (6321 residents).⁵ The population counts by age-group, gender, and by individual census are presented in Table 1.

A “case” was defined as a person diagnosed with invasive cancer while a resident of one of the census tracts within the area of study from 1996 to 2009. Cancer cases were identified through the Ohio Cancer Incidence Surveillance System (OCISS).⁶ All cancer cases diagnosed among Ohio residents since January 1, 1992, with the exception of basal and squamous cell carcinoma of the skin and cervical cancer *in situ*, are required to be reported to the OCISS.

B. National Comparison Data

The incidence of cancer within the study population was compared to national cancer incidence rates from the Surveillance Epidemiology and End Results (SEER) Program of the National Cancer Institute.⁷ Data were available from SEER 9 region for the entire study period and were therefore used for comparison. The SEER 9 registries are Atlanta, Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, Seattle-Puget Sound, and Utah.

C. Analyses

Cancer cases were grouped by site/type into 23 categories based on the International Classification of Diseases for Oncology, Third Edition (ICD-O-3) used by the SEER Program (table 3).⁸ These cases will hereafter be referred to as “observed” cases.

The number of cases expected to have been diagnosed from 1996-2009 in CTs 602, 603, 702.01, and 702.02 were calculated using the national background cancer incidence rates from the SEER 9 region, generated using SEER*Stat software.⁹ These cases will hereafter be referred to as “expected” cases. The age-specific SEER rates per 100,000 were multiplied by the age-specific population counts of the study area to generate expected numbers for all cancer sites/types combined and for each individual cancer site/type. Additionally, expected numbers of cancer cases were generated using 1996-2009 Ohio and Montgomery County age-specific rates for comparison.⁶

The observed and expected numbers for each cancer site/type were compared using the Standardized Incidence Ratio (SIR), where:

$$\text{SIR} = \text{Observed cases} / \text{Expected cases}$$

A SIR greater than one indicates more observed cases than expected, and a SIR less than one indicates fewer observed cases than expected. Statistical significance (hereafter referred to as significance) of the test statistic was determined by calculating 95% confidence intervals (CIs) based on the Poisson distribution using Fisher’s Exact Test.¹⁰ If the confidence interval for a given SIR did not include 1.0, the difference between the observed and expected numbers was significant. In other words, the probability that the observed number of cases was significantly greater than the expected due to chance alone was less than five times out of 100 (p-value < 0.05).

RESULTS

As shown in Table 2, a total of 796 invasive cancer cases were diagnosed and reported from 1996-2009 among residents of CTs 602, 603, 702.01, and 702.02. There were more cases diagnosed among males (443 cases, 56 percent) than among females (353 cases, 44 percent). The majority of cases were diagnosed among blacks (486 cases, 61 percent). This is representative of the demographics of the study area (Table 1). The greatest incidence of cancer cases occurred among residents age 60-69 (246 cases, 31 percent) and 70-79 (234 cases, 29 percent). The number of cases diagnosed per year from 1996-2009 did not increase or decrease throughout the time period, but showed some small fluctuations. Over the 14 year time period, the average number of invasive cancer cases was 56.9 per year.

The most common cancer site/type in the study area from 1996-2009 was lung and bronchus cancer (169 cases, 21 percent) followed by prostate cancer (156 cases, 20 percent), colon and rectum cancer (103 cases, 13 percent), and breast cancer in females (102 cases, 13 percent). These cancer sites/types are also the most common in Ohio and the United States.¹¹ The number and percent of invasive cancer cases among residents of CTs 602, 603, 702.01, and 702.02 by site/type are presented in Table 3.

Comparison to total SEER population

The observed (O) number of cases was compared to the number of expected (E) cases for all sites/types of cancer combined and for each specific site/type of cancer (Table 4). For all cancer sites/types combined, the 796 observed cases in the study area was significantly higher than the

656.69 expected cases at the 95% confidence level (SIR= 1.21; 95% CI= 1.13-1.30). The comparison of observed to expected for each specific site/type was also significantly higher than expected for colon and rectum cancer (O=103; E=68.0; SIR=1.51; 95% CI=1.24-1.84), lung and bronchus cancer (O=169; E=85.80; SIR=1.97; 95% CI=1.68-2.30), pancreatic cancer (O=26; E=15.92; SIR=1.64; 95% CI=1.07-2.40), and prostate cancer (O=156; E=111.0; SIR=1.41; 95% CI 1.19-1.64). TCE, PCE, and benzene exposure has been associated with bladder cancer, kidney and renal cancer, leukemia, liver cancer, multiple myeloma, and Non-Hodgkin's lymphoma. Observed cases of bladder cancer, liver cancer, Non-Hodgkin's lymphoma, and leukemia in the study area were less than the expected number of cases. Although the number of kidney and renal pelvis cancer (O=23) and multiple myeloma cases (O=10) was higher than expected (E=18.20; E=8.16, respectfully), the number of cases was within the expected range (i.e., the confidence interval included one, which indicates no significant difference between the observed and expected).

Comparison to race specific SEER population

Additional steps were made to compare cancer site/types where there was a statistically significant difference between observed and expected cases. These sites/types were compared by race of the resident to the national SEER population of that race. The observed and expected number of cancer cases for all cancer sites/types combined, colon and rectum cancer, lung and bronchus cancer, pancreatic cancer, and prostate cancer for White residents of CTs 602, 603, 702.01, and 702.02 is presented in Table 5. The observed number of cases for all sites/types combined was significantly higher than expected (O=295; E=208.95; SIR=1.41; 95% CI 1.25-1.59). Specifically, the increased number of cases included colon and rectum cancer (O=34; E=20.21; SIR=1.68; CI=1.17-2.35) and lung and bronchus cancer (O=88; E=26.63; SIR=3.30; 95% CI=2.65-4.07). There was not a significant difference between the observed and expected cases of prostate and pancreatic cancer among White residents. Among Black residents of CTs 602, 603, 702.01, 702.02, the number of observed cases of colon and rectum, lung and bronchus, pancreatic and prostate cancers were not significantly different from the expected (Table 6).

Comparison to Ohio and Montgomery County

Since the SEER population demographics differed from the population of the study area, expected numbers of cancer cases for all sites/types combined for all residents; all sites/types combined for White residents, lung and bronchus cancer for White residents, and colon and rectum cancer for White residents were generated using 1996-2009 age-specific rates for Ohio and Montgomery County (Table 7). The 796 observed cases for all site/types combined for CTs 602, 603, 702.01, and 702.02 was significantly higher in Montgomery County (E=728.13; SIR 1.09; 95% CI 1.02-1.17), but not for the state of Ohio (E=735.16; SIR 1.08; 95% CI 1.00-1.16). The observed number of cases all sites/types combined for White residents of the study area for both Ohio (O=295; E=222.02; SIR 1.31; 95% CI 1.18-1.49) and Montgomery County (E=213.28; SIR 1.38; 95% CI 1.23-1.55) were significantly higher than the expected cases. Similarly, observed cases of lung and bronchus cancer for White residents was significantly higher than expected cases; Montgomery County (O=88; E=33.82; SIR 2.60; 95% CI 2.09-3.21) and Ohio (E=32.47; SIR 2.71; 95% CI 2.17-3.34). The 34 observed cases of colon and rectum cancer for the study area was significantly higher in Montgomery County (E=20.54; SIR 1.66; 95% CI 1.15-2.31), but not in Ohio (E=23.60; SIR 1.44; 95% CI 1.00-2.01).

To further analyze the observed cases of lung and bronchus cancer in the CTs 602, 603, 702.01, and 702.02, Table 8 presents the demographic characteristics of these cases. Of the 169 lung and bronchus cancer cases reported from 1996-2009, more cases were diagnosed among males (102 cases, 60 percent) than females (67 cases, 40 percent) and more cases were diagnosed in the White residents (88 cases, 52 percent) than in Black residents (77 cases, 46 percent). This is not representative of the population demographics where only 35 percent of residents in the study area are White and 63 percent are Black (Table 1). The highest percentage of cases occurred in the 70-79 year old age group (58 cases, 34 percent) and the 60-69 year old age group (48 cases, 28 percent). The majority of those diagnosed with lung and bronchus were cigarette smokers (63 cases, 37 percent) and 33 (20 percent) were former smokers. Tobacco history was unknown or unreported for 54 (32 percent) of the cases; thus, the prevalence of tobacco use in the area is likely to be even higher.

Table 9 displays the observed lung and bronchus cancer cases for each census tract compared to the expected lung and bronchus cases in the SEER population. The observed cancer cases is significantly higher than the expected number of cases for every CT except CT 603 (O=47; E=39.27; 95% CI 0.88-1.59). The population of this CT is 82 percent Black and 16 percent White (Table 1).

DISCUSSION

This assessment of the community's cancer burden is a complex task due to the small size of the study population and the instability in case counts over time. The number of cancer cases included in this assessment may be underestimated due to incomplete case reporting to the OCISS. However, the years 1996-2009 were selected for analysis to represent the most accurate, complete data available. In addition estimated completeness for Montgomery County for this time period is 100 percent, suggesting that case reporting for CTs 602, 603, 702.01, and 702.02 is reasonably complete.

The use of SEER population for generating expected numbers of cases is a standard practice for community assessments. The SEER national background rates are based on relatively complete reports of large number of cases, from a large population are relatively stable, and are convenient to use for such analyses. Although the SEER data are collected for a national sample consisting of five states and four metropolitan areas, they may not be similar to the study area in terms of race, socioeconomic status, access to care, and other factors. In light of this, the study population was also compared to the state of Ohio and Montgomery County. Small case counts at the community level often contribute to an inability to achieve statistical significance. Cancers that are more common sites/types are more likely to be significant. Although the overall cancer burden is significantly higher than expected for CTs 602, 603, 702.01, and 702.02, the observed cases of lung and bronchus cancer are a contributing factor.

Community cancer assessments are also difficult due to inaccurate classification of the primary residence. A residence is classified by the address at diagnosis, which may not be the person's primary residence throughout their lifetime. History of residence is not collected by the OCISS and thus cannot be accounted for in this assessment. Also not identified in this assessment are individuals who worked at the Clean Water, Ltd company but lived outside the study area.

An assessment of a community's cancer burden is also complex because cancer is not just one disease. Each cancer sites/types differ in respect to risk factors, latency, course of disease and probability of survival. The most prevalent sites/types of cancer in the study area were lung and bronchus, colon and rectum, pancreas, and prostate. When these cancer sites were analyzed by race (Black and White), the burden of lung and bronchus cancer and colon and rectum cancer among White residents remained higher than national background. Risk factors for lung and bronchus and colon and rectum cancers are presented below:

Lung and bronchus cancer – The principal risk factor for lung and bronchus cancer is tobacco smoking (cigarette, cigar, and pipe smoking). Nine out of ten lung and bronchus cancer cases in men and eight out of ten cases in women are caused by smoking. Other risk factors include secondhand smoke, family history, and environmental exposures to radon, air pollution, asbestos, and arsenic.¹²

Colon and rectum cancer – Colon and rectum cancer is the third most common cancer in the United States. While 75 percent of colon and rectum cancer occur in people with no known risk factors, there are certain lifestyle changes that can help prevent the development of this cancer. Alcohol consumption, tobacco smoking, obesity, high fat/low fiber diet, and physical inactivity have been associated with an increased risk. Family history of colon and rectum cancer, genetic predisposition, personal history of inflammatory bowel disease, and age are also risk factors.^{13, 14}

CONCLUSION

The assessment of cancer among residents of CTs 602, 603, 702.01, and 702.02 revealed higher than expected number of lung and bronchus, colon and rectum, pancreatic, and prostate cancers. However, although the observed number of cancer cases is significantly higher than expected for all cancer types combined, only lung and bronchus cancer and colon and rectum cancer were higher than expected and this was only among White residents. The primary cause of lung and bronchus cancer is tobacco smoking, and the risks of colon and rectum cancer can be decreased through healthy lifestyle choices.

The exact causes of each case of cancer cannot be determined from this assessment due to the variety of cancer sites/types diagnosed among the study population; the scarcity of known risk factors for many cancers; and the lack of case information on history of environmental exposures, length of residence, health behaviors, and other cancer-related risk factors. It is hoped these findings can be used to alleviate the concerns raised by the citizens living near the Clean Water, Ltd facility.

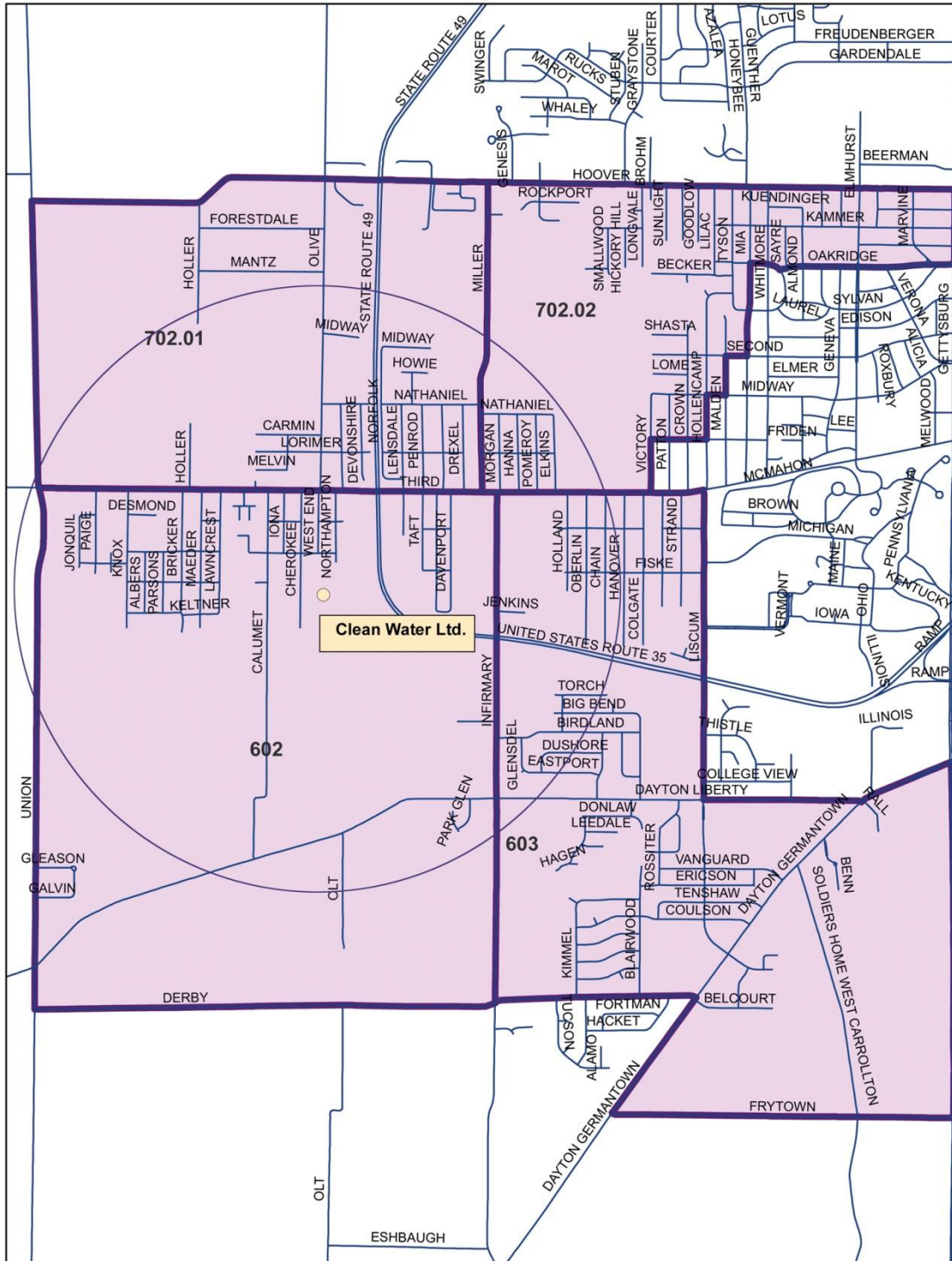
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Figure 1. Map of Study Area (Census Tracts 602, 603, 702.01, and 702.02) in Montgomery County Ohio as defined by the U.S. Census Bureau, 2000¹

Census Tracts 602, 603, 702.02, and 702.02



¹Source: Census 2000 TIGER/Line Files, U.S. Census Bureau-Washington D.C.; 2012

Table 1. Demographics of CTs 602, 603, 702.01, and 702.02, U.S. Census 2000¹

Census Tracts	602		603		702.01		702.02		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Population	1784		4265		1794		2184		10027	
Gender										
Males	850	48%	2504	59%	858	48%	969	44%	5181	52%
Females	934	52%	1761	41%	936	52%	1215	56%	4846	48%
Age Group										
0-29	858	48%	1878	44%	924	52%	917	42%	4577	46%
30-39	231	13%	646	15%	207	12%	289	13%	1373	14%
40-49	249	14%	534	13%	189	11%	281	13%	1253	12%
50-59	198	11%	368	9%	209	12%	256	12%	1031	10%
60-69	112	6%	432	10%	150	8%	232	11%	926	9%
70-79	93	5%	311	7%	88	5%	154	7%	646	6%
80+	43	2%	96	2%	27	2%	55	3%	221	2%
Race										
White	1210	68%	676	16%	1179	66%	419	19%	3484	35%
Black	532	30%	3500	82%	550	31%	1739	80%	6321	63%
Other/Unknown	42	2%	89	2%	65	4%	26	1%	222	2%

¹ Source: U.S. 2000 Census of Population

Table 2. Number and Percent Invasive Cancer Cases, by Sex, Race, Age Group, and Year of Diagnosis, among Residents of CTs 602, 603, 702.01, and 702.02, 1996-2009¹

Demographic Characteristics	Cases	Percent
Total	796	100%
Gender		
Male	443	56%
Female	353	44%
Race		
White	295	37%
Black	486	61%
Other/Unknown	15	2%
Age Group		
0-29	10	1%
30-39	15	2%
40-49	60	8%
50-59	116	15%
60-69	246	31%
70-79	234	29%
80+	114	14%
Year of Diagnosis		
1996	59	7%
1997	64	8%
1998	59	7%
1999	45	6%
2000	59	7%
2001	52	7%
2002	63	8%
2003	57	7%
2004	58	7%
2005	48	6%
2006	56	7%
2007	67	8%
2008	54	7%
2009	55	7%

¹ Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

Table 3. Number and Percent Invasive Cancer Cases by Site/Type among Residents of CTs 602, 603, 702.01, and 702.02, 1996-2009¹

Cancer Site/Type	Cases	Percent
All Cancer Sites/Types	796	100%
Lung and Bronchus	169	21%
Prostate	156	20%
Colon and Rectum	103	13%
Breast (Female)	102	13%
Other Sites/Types ²	49	6%
Pancreas	26	3%
Kidney and Renal Pelvis	23	3%
Bladder	19	2%
Non-Hodgkin's Lymphoma	19	2%
Uterus	18	2%
Leukemia	14	2%
Brain and Other CNS ³	13	2%
Melanoma of Skin	10	1%
Multiple Myeloma	10	1%
Cervix Uteri	9	1%
Larynx	9	1%
Stomach	9	1%
Liver and Interhepatic Bile Duct	8	1%
Esophagus	7	1%
Oral Cavity and Pharynx	7	1%
Ovary	5	1%
Thyroid	5	1%
Hodgkin's Lymphoma	4	1%
Testis	2	0%

¹ Source: Ohio Cancer Incidence Surveillance, Ohio Department of Health, December 2012.

² Other Sites/Types consists of the following cancers: unspecified (19 cases), miscellaneous (7 cases), endocrine (4 cases), large intestine (5 cases), vagina (4 cases), peritoneum (3 cases), vulva (2 cases), small intestine (2 cases), connective tissue (2 cases), and penis (1 case)

³CNS = Central Nervous System

Table 4. Number of Observed and Expected Invasive Cancer Cases, Standardized Incidence Ratios (SIR) and 95% Confidence Intervals (CI), by Cancer Site/Type, among Residents of CTs 602, 603, 702.01, and 702.02, 1996-2006^{1,2,3}

Cancer Site/Type	Observed Cases	Expected Cases	SIR	95% CI
All Cancer Sites/Types	796	656.69	1.21	(1.13, 1.30)*
Bladder	19	28.11	0.68	(0.41, 1.06)
Brain and Other CNS ⁴	13	9.01	1.44	(0.77, 2.47)
Breast	102	96.99	1.05	(0.86, 1.28)
Cervix Uteri	9	5.87	1.53	(0.70, 2.91)
Colon and Rectum	103	68.00	1.51	(1.24, 1.84)*
Esophagus	7	6.37	1.10	(0.44, 2.26)
Hodgkin's Lymphoma	4	3.88	1.03	(0.32, 3.03)
Kidney and Renal Pelvis	23	18.20	1.26	(0.80, 1.90)
Larynx	9	5.00	1.80	(0.82, 3.42)
Leukemia	14	17.70	0.79	(0.43, 1.33)
Liver and Interhepatic Bile Duct	8	9.87	0.81	(0.35, 1.60)
Lung and Bronchus	169	85.80	1.97	(1.68, 2.30)*
Melanoma of Skin	10	25.59	0.39	(0.19, 0.72)
Multiple Myeloma	10	8.16	1.23	(0.59, 2.25)
Non-Hodgkin's Lymphoma	19	27.30	0.70	(0.42, 1.09)
Oral Cavity and Pharynx	7	14.85	0.47	(0.19, 0.97)
Other Sites/Types	49	NA	NA	NA
Ovary	5	10.10	0.50	(0.16, 1.16)
Pancreas	26	15.90	1.64	(1.07, 2.40)*
Prostate	156	111.00	1.41	(1.19, 1.64)*
Stomach	9	11.59	0.78	(0.36, 1.47)
Testis	2	3.81	0.52	(0.06, 1.90)
Thyroid	5	12.85	0.39	(0.13, 0.91)
Uterus	18	18.94	0.95	(0.56, 1.50)

¹Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

²Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2009, SEER 9 Registries public-use data file, National Cancer Institute, 2012.

³95% confidence intervals were calculated based on a Poisson distribution using Fisher's Exact Test.

⁴ 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), by Cancer Site/Type and Race (White), among Residents of CTs 602, 603, 702.01, and 702.02, 1996-2006^{1,2,3}

Cancer Site/Type	Observed Cases	Expected Cases	SIR	95% CI
All Cancer Sites/Types	295	208.56	1.41	(1.25, 1.59)*
Colon and Rectum	34	20.21	1.68	(1.17, 2.35)*
Lung and Bronchus	88	26.63	3.30	(2.65, 4.07)*
Pancreas	5	4.67	1.07	(0.35, 2.50)
Prostate	33	32.24	1.02	(0.70, 1.44)

¹Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

²Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2009, White population, SEER 9 Registries public-use data file, National Cancer Institute, 2012.

³95% 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. Number of Observed and Expected Invasive Cancer Cases, Standardized Incidence Ratios (SIR) and 95% Confidence Intervals (CI), by Cancer Site/Type and Race (Black), among Residents of CTs 602, 603, 702.01, and 702.02, 1996-2006^{1,2,3}

Cancer Site/Type	Observed Cases	Expected Cases	SIR	95% CI
All Cancer Sites/Types	485	502.96	0.96	(0.88, 1.05)
Colon and Rectum	69	56.7	1.22	(0.95, 1.54)
Lung and Bronchus	77	78.41	0.98	(0.77, 1.23)
Pancreas	20	15.62	1.28	(0.78, 1.98)
Prostate	119	115.45	1.03	(0.85, 1.23)

¹Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

²Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2009, Black population, SEER 9 Registries public-use data file, National Cancer Institute, 2012

³95% confidence intervals were calculated based on a Poisson distribution using Fisher's Exact Test.

Table 7. 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 CTs 602, 603, 702.01, and 702.02, 1996-2006^{1,2,3}

Cancer Sites/Types	Region Used to Generate Expected	Observed Cases	Expected Cases	SIR	95% CI
All Cancer Sites/Types	SEER	796	656.69	1.21	(1.13, 1.30)*
	Ohio	796	735.16	1.08	(1.00 - 1.16)
	Montgomery County	796	728.13	1.09	(1.02 - 1.17)*
All - White	SEER	295	208.56	1.41	(1.25, 1.59)*
	Ohio	295	222.02	1.33	(1.18, 1.49)*
	Montgomery County	295	213.28	1.38	(1.23, 1.55)*
Lung and Bronchus - White	SEER	88	26.63	3.30	(2.65, 4.07)*
	Ohio	88	32.47	2.71	(2.17, 3.34)*
	Montgomery County	88	33.82	2.60	(2.09, 3.21)*
Colon and Rectum -White	SEER	34	20.21	1.68	(1.17, 2.35)*
	Ohio	34	23.60	1.44	(1.00, 2.01)
	Montgomery County	34	20.54	1.66	(1.15, 2.31)*

¹Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

²Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2009, SEER 9 Registries public-use data file, National Cancer Institute, 2012; Ohio and Montgomery – Ohio Cancer Incidence Surveillance System age-specific incidence rates for 1996-2009, Ohio Department of Health, December 2012.

³95% confidence intervals were calculated based on a Poisson distribution using Fisher's Exact Test.

Table 8. Number and Percent Lung and Bronchus Cancer Cases, by Sex, Race, Age Group, Year of Diagnosis, and Tobacco Use among Residents of CTs 602, 603, 702.01, and 702.02, 1996-2009¹

Demographic Characteristics	Cases	Percent
Gender		
Male	102	60%
Female	67	40%
Race		
White	88	52%
Black	77	46%
Other/Unknown	4	2%
Age Group		
0-29	0	0%
30-39	0	0%
40-49	7	4%
50-59	28	17%
60-69	48	28%
70-79	58	34%
80+	28	17%
Year of Diagnosis		
1996	16	9%
1997	13	8%
1998	12	7%
1999	14	8%
2000	5	3%
2001	13	8%
2002	14	8%
2003	12	7%
2004	10	6%
2005	10	6%
2006	16	9%
2007	13	8%
2008	10	6%
2009	11	7%
Tobacco Use		
Never used	5	3%
Cigarette smoker, current	63	37%
Cigar/Pipe smoker, current	11	7%
Snuff/Chewless/Smokeless, current	2	1%
Combination use, current	1	1%
Previous use	33	20%
Unknown/Blank	54	32%
Total	169	100%

¹Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

Table 9. Number of Observed and Expected Lung and Bronchus Cancer Cases, Standardized Incidence Ratios (SIR) and 95% Confidence Intervals (CI), by CTs 602, 603, 702.01, and 702.02, 1996-2006^{1,2,3}

Census Tract	Observed Cases	Expected Cases	SIR	95% CI
602	39	12.88	3.03	(2.15, 4.14)*
603	47	39.27	1.20	(0.88, 1.59)
702.01	44	13.05	3.37	(2.45, 4.53)*
702.02	39	20.60	1.89	(1.35, 2.59)*

¹Source: Ohio Cancer Incidence Surveillance System, Ohio Department of Health, December 2012.

²Expected numbers of cases were calculated using the Surveillance, Epidemiology and End Results (SEER) Program U.S. age-specific cancer incidence rates for 1996-2009, SEER 9 Registries public-use data file, National Cancer Institute, 2012.

³95% 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.