Remington Park Cancer Cluster Investigation

WINDSOR-ESSEX COUNTY HEALTH UNIT

September, 2016

WINDSOR-ESSEX COUNTY HEALTH UNIT
Bureau de santé de Windsor-comté d'Essex

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Acknowledgements

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- Public Health Ontario's (PHO) Elaina MacIntyre, JinHee Kim and Ray Copes, who provided us with cancer cluster investigation and epidemiologic expertise, completed a key part of the investigative analysis and shared with us multiple literature searches,
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We additionally thank the above individuals and agencies who were able to provide commentary on this report.

Finally, the Windsor-Essex County Health Unit would like to thank members of the public. A concerned citizen first brought this issue to the attention of the Health Unit and several gracious people participated in the interviews so the investigation could be completed. Without them, this investigation would not have come to fruition.

Glossary

95% Confidence Interval is a set of two numbers (a lower and upper value) that fall around an estimate. The interval between these two numbers is said to have a certain probability (i.e., 95% chance) of containing the actual value. It can be used to determine whether the rate of cancer is significantly higher than what would be expected.

Age-Standardization is a type of analysis that is used to make measurements (e.g., rates) account for changes or differences in the age of the population. Age-standardized rates are often used for comparing populations because the age structure of populations can be different between regions or throughout time and this can affect the measurement of health events (e.g., a population may have a greater rate of cancer because there are fewer children and more seniors).

Cancer Site is the place in the body where the cancer started.

Case Series Study is a type of study design whereby a collection of patients with a common health outcome (e.g., lung cancer) are studied and the characteristics (e.g., exposures, demographics, clinical aspects) of the cases are described.

Epidemiology is the study of the occurrence, patterns, and causes of disease and health-related outcomes in populations.

Expected Rate is the number of cancer cases that would be seen under usual circumstances within a given timeframe for a set population.

Incidence Rate is the number of new health events (e.g., new cancer cases) that occur within a specific time period (i.e., 2010 calendar year) for a set population (per 100,000 population).

Mortality Rate is the number of deaths (specific to a health event) that occur within a specific time period (i.e., 2010 calendar year) for a set population (per 100,000 population).

Observed Rate is the actual number of cancer cases reported within a given timeframe for a set population.

Risk Factors are attributes or exposures that change the probability of health-related outcomes (e.g., smoking tobacco is a risk factor because it increases the probability of lung cancer). Some risk factors are 'modifiable' which means that the factor can be changed or controlled to reduce the risk of a health-related outcome (e.g., a person can quit smoking tobacco to reduce their risk of developing lung cancer).

Social Determinants of Health are economic and social conditions (socio-economic factors) that are associated with health-related outcomes. For example, high-income individuals are more likely to live longer than low-income individuals.

Standardized Incidence Ratio (SIR) is used to tell us whether the amount of cancer in a small area is higher or lower than expected. Because cancer rates go up with age, the SIR takes into account the age of those in the area. The SIR is calculated by dividing the observed number of cases by the expected number of cases. SIR values greater than 1.0 means that the actual number of cases is higher than what would be expected, although it may not be significantly higher.

Statistical significance indicates that there is high enough confidence to conclude that there is a difference between two values. Two values may appear different but statistical testing may reveal that there is not enough confidence to determine whether the values are different or whether the observed difference is simply due to chance.

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Executive Summary

In 2015, the Windsor-Essex County Health Unit, with help from the agencies listed in the Acknowledgements section (see p.3), studied a cancer cluster located in a part of Remington Park in Windsor, Ontario. Between 2000 and 2009, the rate of new lung cancer cases in that part of Remington Park was 2.2 times greater than the Ontario rate. Other forms of cancer were not above the provincial average.

For this study, the Health Unit tried to contact people who were diagnosed with lung cancer between 2000 and 2009 while living in Remington Park. The Health Unit met with 12 people or their next of kin to find common exposures that could explain the lung cancer cluster. Some key findings were:

- Lung cancer takes at least 10 years to develop after first exposure. It often takes 20-25 years. For this group, the earliest exposure could have begun in 1951 with the latest period ending in 1999.
- The 12 people in this study were mostly male (10 male and 2 female) and their age at diagnosis ranged from 40 to 83 years. The average age at diagnosis was 62 years.
- Family history is a risk factor for lung cancer and 3 people (25%) in this study had a family member (mother, father or sibling) with a previous diagnosis of lung cancer.
- No data are available on residential radon levels for the 12 people in this study.
- Job-related exposure may be relevant for 11 people (92%). Four worked in manufacturing, five in construction, two in transportation, two in metals, and one in pulp and paper.
- Five people had hobbies that could increase their risk of lung cancer, including: car repair, woodworking (mostly hard wood), gardening, and arc welding.
- Ten people or their next of kin had environmental concerns related to at least one of their previous homes. Air pollution from nearby industry, motor vehicle traffic, and rail transportation were concerns shared.
- All 12 people in this study were exposed to first-hand or second-hand tobacco smoke. Nine (75%) were daily smokers ranging from a few cigarettes to two packs a day. Two (17%) were occasional smokers and the one non-smoker had lived in a home with a smoker.

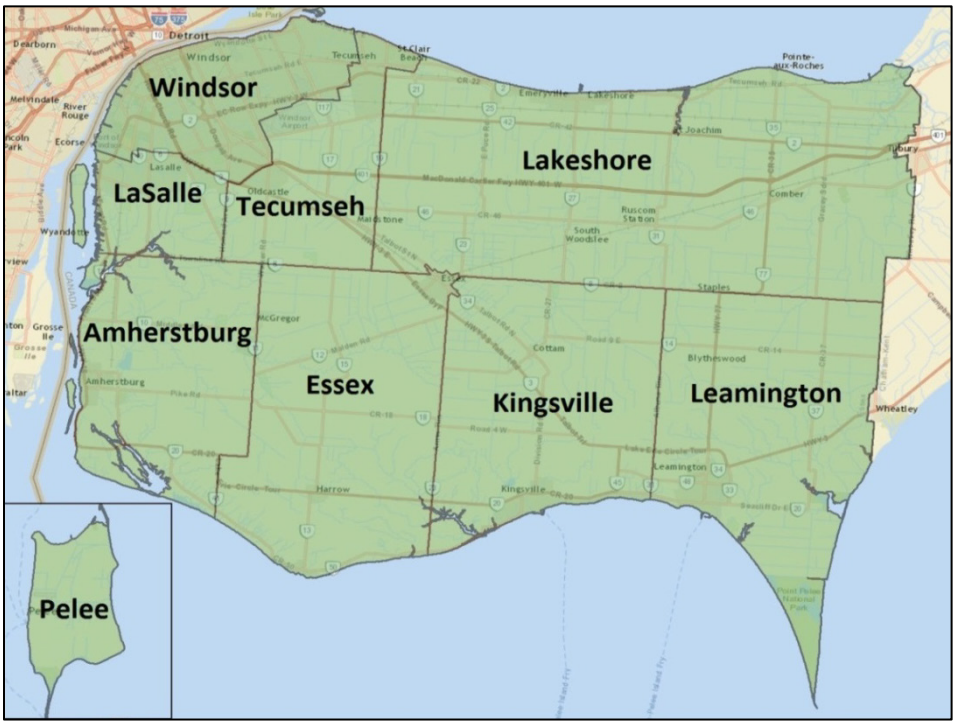
In conclusion, tobacco smoke was the only lung cancer carcinogen that all 12 people were exposed to in this study. Other risk factors were present, but not consistent among all people. The Health Unit will continue to monitor lung cancer rates in Remington Park and will continue to work with our partner agencies to inform our community on how to lessen their risk of developing cancer.

Introduction

Profile of Windsor-Essex County and Remington Park

Windsor-Essex County is the southernmost region of Ontario and is comprised of 9 municipal areas which include the Towns of Amherstburg, Essex, Lakeshore, LaSalle, Leamington, Kingsville and Tecumseh, the Township of Pelee and the City of Windsor (see **Figure 1**). The region shares international borders with the United States, and over 50% of the North American population is within an 8-hour drive of Windsor-Essex County (Windsor-Essex Economic Development Corporation, 2011). The region is also situated between two large bodies of freshwater: Lake St. Clair and Lake Erie.

Figure 1. The regions of Windsor-Essex County (WEC) that are served by the Health Unit.



Windsor-Essex County covers 1,850 km^2 of land and has a total population of 388,732 according to Canada's 2011 Census of Population. Some key demographic statistics for Windsor-Essex County are as follows:

- There are over 150,000 households with an average of 2.5 persons per household.
- Nearly 60% of adults have a post-secondary education (college or university).
- English is not the first language for nearly 1 in 4 residents.
- Over 20% of residents identify as an immigrant; 2.7% are new immigrants (lived in Canada for less than 5 years).
- Two-percent of the population identifies as Aboriginal.
- Nearly 1 in 5 households live in subsidized housing and 1 in 4 children live in poverty (according to Statistic Canada's low income measure after-tax).

There are social and economic determinants (e.g., income, education) that are strongly associated with health outcomes in certain populations (PHAC, 2011). For example, the Public Health Agency of Canada notes that "low-income Canadians are more likely to die earlier and to suffer more illnesses than Canadians with higher incomes, regardless of age, sex, race and place of residence" (PHAC, 2011). The link between social determinants and health is complex, but improvement and investment in living conditions, education, and other social determinants can greatly improve health and prevent illness (PHAC, 2011).

Demographics and some key social determinants of health were compared between Windsor-Essex County and the neighbourhood of Remington Park, which was the area of focus for this cancer cluster investigation (see **Table 1**). There were some differences in social determinants when comparing Windsor-Essex County to Remington Park. In particular, Remington Park had a greater proportion of the following social determinants of health among its population: low-income individuals, adults with lower educational attainment, lone parent families, and unemployed workforce. In addition, Remington Park also had a greater proportion of older dwellings (constructed before 1961) and a greater proportion of a manufacturing workforce when compared to Windsor-Essex County. The age distributions were relatively similar between Remington Park and the whole of Windsor-Essex County.

Table 1. The demographic characteristics of Remington Park and Windsor-Essex County, 2006.

Characteristic	Remington Park	Windsor-Essex County
Total population (2006)	1,913	393,402
Children, 0 – 9 years old (%)	12.0	12.2
Youth, 10 – 19 years old (%)	13.6	13.7
Adults, 20 – 64 years old (%)	61.4	60.7
Seniors, 65 years old and over (%)	13.1	13.3
Highest education among adults (25-65 years old)		
Less than high-school (%)	20.5	15.4
High-school certificate or equivalent (%)	38.2	29.2
College certificate or diploma (%)	19.1	22.2
University certificate, degree, or diploma (%)	5.5	24.1
First language learned and spoken		
English (%)	76.5	72.4
French (%)	4.4	3.2
Unofficial language (%)	18.3	22.9
Most common industries of the workforce		
Manufacturing (%)	32.7	23.9
Retail trade (%)	11.1	11.0
Health care and social services (%)	8.0	9.8
Unemployment rate, 2006 (%)	11.3	7.9
Low income individuals, after-tax (%)	12.8	9.9

Characteristic	Remington Park	Windsor-Essex County
Lone parent family households (%)	21.7	16.4
Total immigrant population (%)	20.9	22.3
Aboriginal identity (%)	2.1	1.6
Visible minority (%)	8.6	14.2
Total number of occupied private dwellings	800	150,845
Constructed before 1961 (%)	68.8	37.9
Constructed 1961 – 1980 (%)	17.5	28.1
Constructed after 1980 (%)	13.8	34.0

Source: 2006 Census of Population, Statistics Canada.

Note:

- The 2006 Census was used as it captures the demographic profile of the population during the studied time period (2000-2009) of this investigation.

Cancer in Windsor-Essex County

What is cancer?

Cancer is a disease where cells that were once healthy undergo changes that trigger them to multiply uncontrollably. Normally, new cells replace old cells that have died in an orderly process that is controlled by genetics. Cancer is caused when the genetics of this process are changed. There are many different factors that can cause this change (National Institutes of Health, 2015).

What causes cancer?

There are many causes of cancer. Most cancer is caused by lifestyle factors and genetics. Cancer can be caused by exposure to specific substances known as carcinogens. The overall risk of developing cancer depends on a combination of all of these different factors (National Institutes of Health, 2015). The length of time required to develop cancer is known as the latency period and this varies by cancer type.

Some prevalent modifiable factors which increase the risk of several cancers include smoking and tobacco use, alcohol use, inactivity, obesity, certain infections, and radiation exposure (National Institutes of Health, 2015). In fact, smoking tobacco is linked to over 15 types of cancer and is the leading cause of 8 types of cancer (acute myelogenous leukemia, bladder cancer, esophageal cancer, kidney cancer, lung cancer, oral cavity cancer, pancreatic cancer, and stomach cancer), and scientists estimate that 30% of all cancer deaths are caused by smoking tobacco (National Institutes of Health, 2015; IARC, 2015).

Cancer Risk Factors in Windsor-Essex County

There are several modifiable risk factors that are associated with many chronic diseases, including cancer. Some of these risk factors are self-reported through the 2013/2014 Canadian Community Health Survey and the statistics are presented in **Table 2**.

Table 2. Chronic disease risk factors, Windsor-Essex County (WEC) and Ontario (2013/2014).

Risk Factor	WEC	ON
Smoking: individuals 19 years old and over who self-reported being a daily or occasional smoker.	21.4%	19.6%
Alcohol: individuals 19 years old and over who self-reported exceeding the low-risk alcohol drinking guidelines for chronic disease.	22.2%	21.0%
Inactivity: individuals 12 years old and over who self-reported being inactive during leisure time.	47.0%	45.3%
Poor Diet: individuals 12 years old and over who self-reported consuming fruits and vegetables fewer than five times per day	65.1%	61.1%

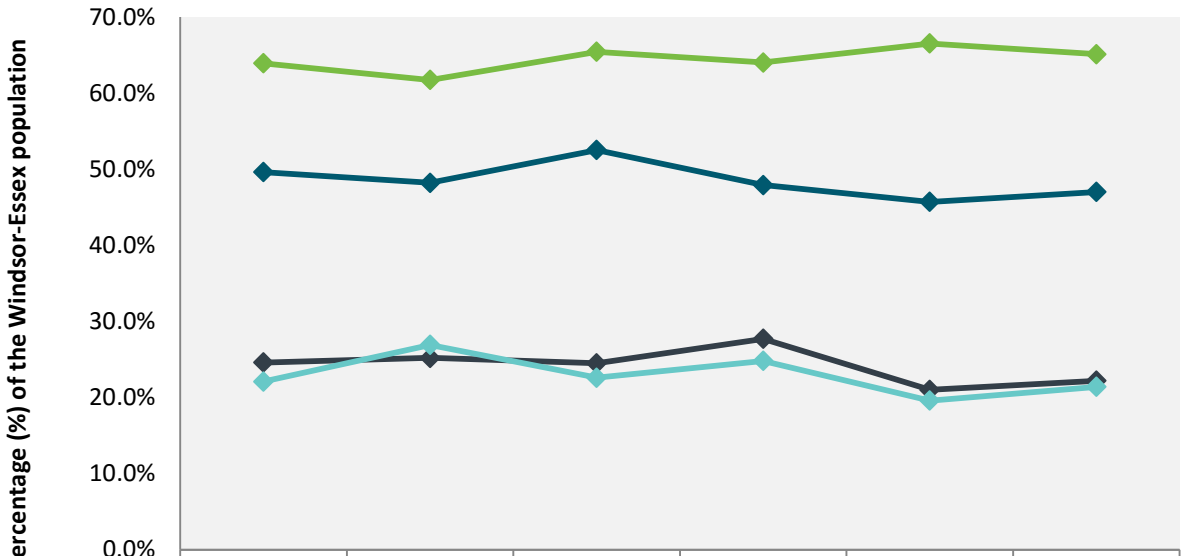
Source: Public Health Ontario. Snapshots: Windsor-Essex County Health Unit: Health Behaviours 2013-2014. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2015 Dec 14 [cited 2016 May 3].

Note:

- The estimates were not significantly different between Windsor-Essex County and Ontario.

The local historical trends in health behaviours (smoking, excessive alcohol use, inactivity, and poor diet) which increase the risk of chronic diseases, such as cancer, are reported in **Figure 2** for Windsor-Essex County. The proportion of Windsor-Essex County residents who engage in these behaviours has remained relatively unchanged for the past 12-year period (2003-2014).

Figure 2. Trends in health behaviours for the Windsor-Essex County population (2003-2014).



	2003	2005	2007-08	2009-10	2011-12	2013-14
Poor Diet	63.9%	61.7%	65.4%	64.0%	66.5%	65.1%
Inactivity	49.6%	48.2%	52.5%	47.9%	45.7%	47.0%
Alcohol	24.6%	25.2%	24.5%	27.7%	21.0%	22.2%
Smoking	22.1%	26.9%	22.6%	24.8%	19.6%	21.4%

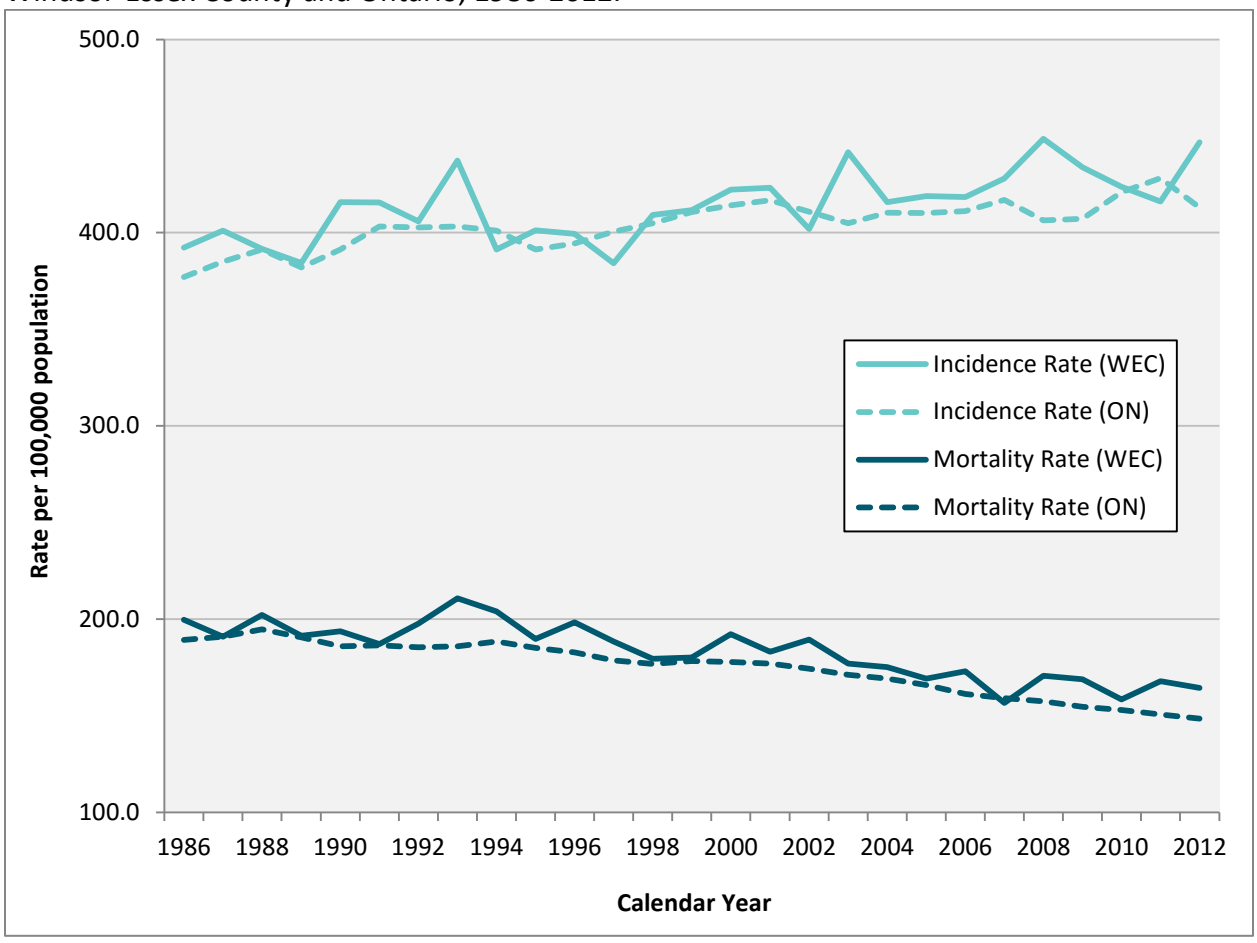
Source: Public Health Ontario. Snapshots: Windsor-Essex County Health Unit: Health Behaviours 2003-2014. Toronto, ON: Ontario Agency for Health Protection and Promotion; 2015 Dec 14 [cited 2016 May 3].

Note: the health indicators reported in this figure are defined as follows:

- *Smoking* – Percentage (%) of Windsor-Essex County residents 19 years old and over who self-reported being a daily or occasional smoker.
- *Poor Diet* – Percentage (%) of Windsor-Essex County residents 12 years old and over who self-reported consuming fruits and vegetables fewer than 5 times per day.
- *Inactivity* – Percentage (%) of Windsor-Essex County residents 12 years old and over who self-reported being inactive (less than 1.5 kcal/kg/day) during leisure time
- *Alcohol* – Percentage (%) of Windsor-Essex County residents 19 years old and over who self-reported exceeding the low-risk alcohol drinking guidelines for chronic disease.

The Health Unit monitors the occurrence and trend of cancer in the local population. The historical rates of incidence (new cases) and mortality for all cancers is reported in **Figure 3** for Windsor-Essex County and Ontario (1986-2012). These rates are age-standardized which means that these measurements account for changes or differences in the age of the population. For both Windsor-Essex County and Ontario, the rate of new cases of cancer has been increasing over time and the rate of cancer mortality has been decreasing over time. These changing trends may be attributed to multiple factors such as improvements in cancer treatment and screening uptake, population-wide reduction of risk factors (e.g., tobacco), or other cancer initiatives (Coldman, et al., 2013; Kachuri, et al., 2013). Further detailed information on cancer incidence and mortality in Windsor-Essex County is described in the forthcoming sections.

Figure 3. The historical trend in incidence (new cases) and mortality rates for all cancer in Windsor-Essex County and Ontario, 1986-2012.



Source: CCO SEER*Stat Package Release 10 - OCR (Aug. 2015). Pop Est Summary (Statistics Canada, Ontario Ministry of Finance), Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, extracted May 2015.

Notes:

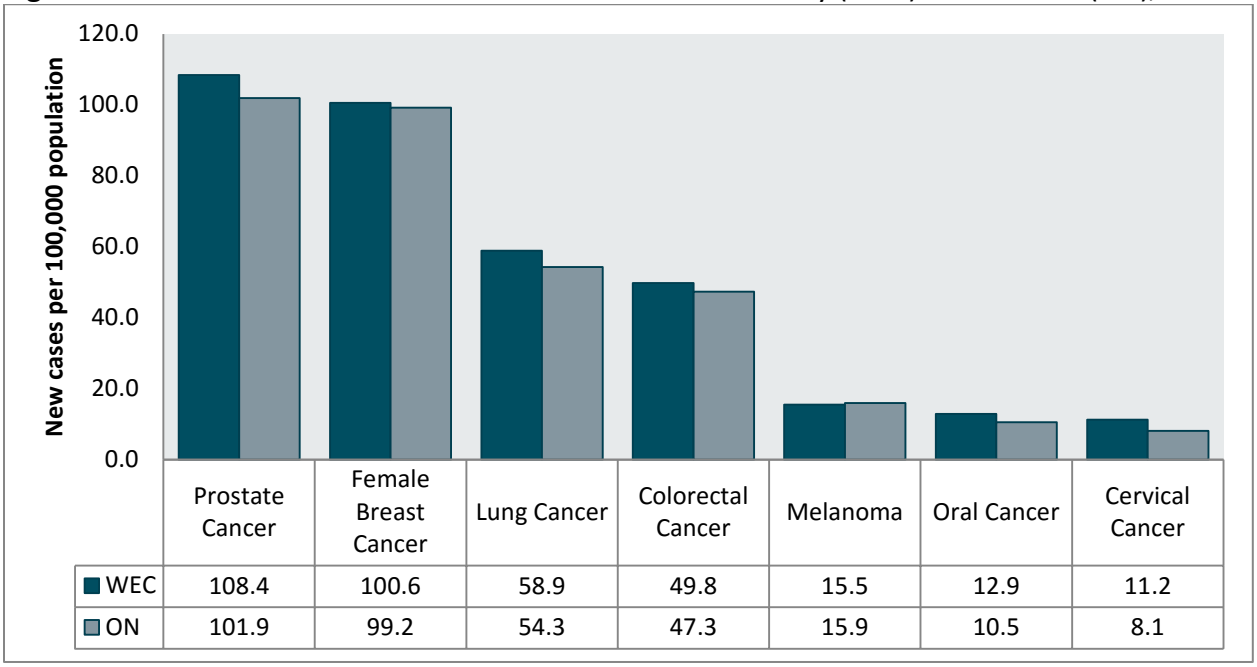
- The rates were age-standardized using the 1991 Canadian population standard.
- The incidence rates have been adjusted to adhere to the IACR standards for counting multiple primary cancers. This allows for direct comparisons of incidence rates over time.

Cancer Incidence

Cancer is a considerable burden on the population health of Windsor-Essex County. There were 2,598 new cases of cancer in Windsor-Essex County in 2012, and in Ontario there were 85,648 new cases of cancer in 2012. When these counts are transformed into age-standardized incidence rates and statistically compared, the overall rate for Windsor-Essex County (446.8 new cases per 100,000 population) was significantly greater than the provincial rate (413.0 new cases per 100,000 population). Of the 36 public health units in Ontario, Windsor-Essex County had the 8th highest rate of new cases of cancer in 2012. These rates are age-standardized which means that these measurements account for changes or differences in the age of the population.

The most common types of new cancer cases in Windsor-Essex County and Ontario are reported in **Figure 4** for 2012; none of these specific rates were significantly greater in Windsor-Essex County when compared to Ontario. Prostate cancer was the most common type of new cancer diagnosed in Windsor-Essex County and Ontario in 2012, followed by female breast cancer and lung cancer.

Figure 4. The rate of new cancer cases in Windsor-Essex County (WEC) and Ontario (ON), 2012.



	Prostate Cancer	Female Breast Cancer	Lung Cancer	Colorectal Cancer	Melanoma	Oral Cancer	Cervical Cancer
WEC	108.4	100.6	58.9	49.8	15.5	12.9	11.2
ON	101.9	99.2	54.3	47.3	15.9	10.5	8.1

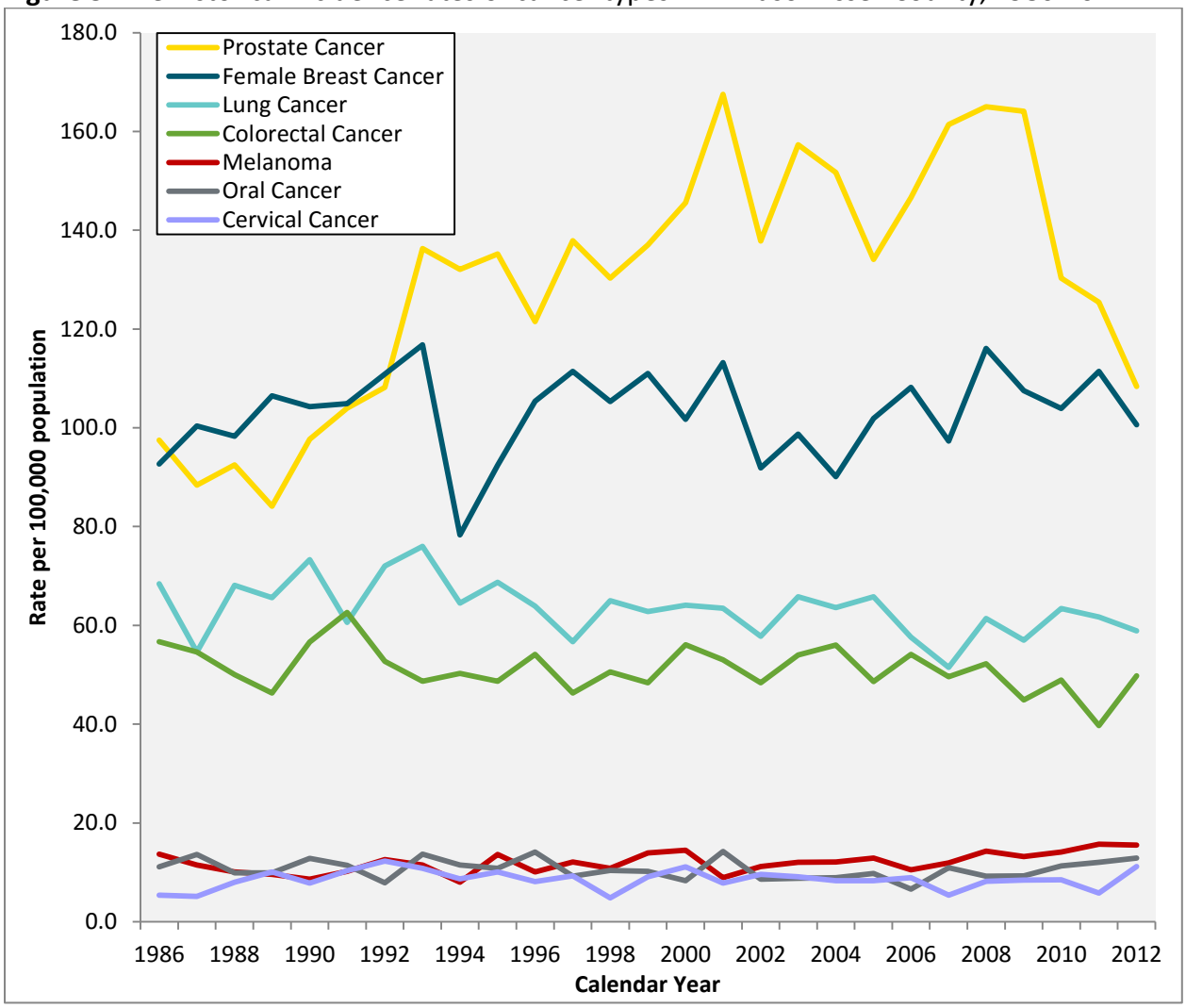
Source: CCO SEER*Stat Package Release 10 - OCR (Aug. 2015). Pop Est Summary (Statistics Canada, Ontario Ministry of Finance), Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, extracted May 2015.

Notes:

- The rates of prostate cancer, female breast cancer, and cervical cancer were calculated for those populations at risk (e.g., only females are at risk for cervical cancer).
- The rates were age-standardized using the 1991 Canadian population standard.
- The incidence rates have been adjusted to adhere to the IACR standards for counting multiple primary cancers. This allows for direct comparisons of incidence rates over time.

The historical rates of new cancer cases are reported in **Figure 5** for Windsor-Essex County (1986-2012) by type of cancer. Trends for these rates may not be indicative of a true change in new cancer cases in the community; rather, such changes may be attributed to improvements in cancer screening awareness and uptake, or other cancer awareness initiatives.

Figure 5. The historical incidence rates of cancer types in Windsor-Essex County, 1986-2012.



Source: CCO SEER*Stat Package Release 10 - OCR (Aug. 2015). Pop Est Summary (Statistics Canada, Ontario Ministry of Finance), Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, extracted May 2015.

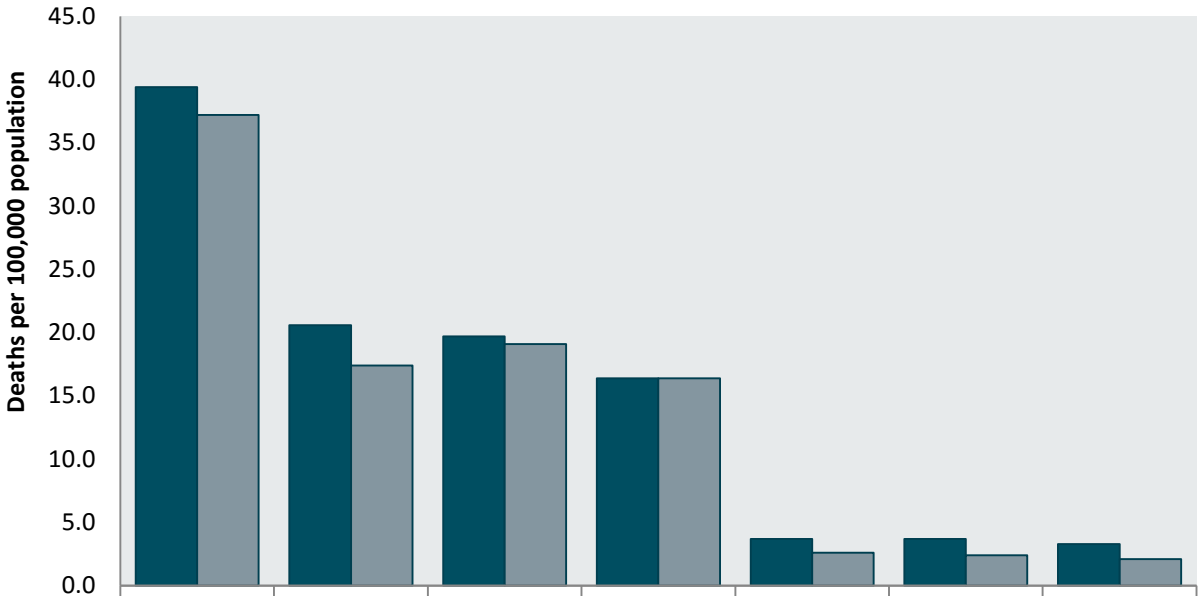
Notes:

- The fluctuation of incidence rates may be due to the small case counts reported annually.
- The rates of prostate cancer, female breast cancer, and cervical cancer were calculated for those populations at risk (e.g., only females are at risk for cervical cancer).
- The rates were age-standardized using the 1991 Canadian population standard.
- The incidence rates have been adjusted to adhere to the IACR standards for counting multiple primary cancers. This allows for direct comparisons of incidence rates over time.

Cancer Mortality

Cancer is the leading cause of preventable death in Windsor-Essex County and Ontario. In 2012, there were 944 deaths due to cancer in our region. When these deaths are transformed into an age-standardized rate (164.5 deaths per 100,000 population) and compared to the equivalent provincial rate (148.5 deaths per 100,000 population), statistical analysis indicates that the mortality rate of cancer in Windsor-Essex County is significantly greater than Ontario. Compared across the 36 public health unit regions in Ontario, Windsor-Essex County had the 18th highest rate for all cancer mortality. The 2012 mortality rates by cancer type are reported in **Figure 6** for Windsor-Essex County and Ontario. The rates for specific cancer types in Windsor-Essex County were not significantly different from the equivalent Ontario rates. Lung cancer was the most common cause of cancer-related death in 2012, followed by prostate cancer and female breast cancer.

Figure 6. Cancer mortality rates by cancer type in Windsor-Essex County (WEC) and Ontario (ON), 2012.



	Lung Cancer	Prostate Cancer	Female Breast Cancer	Colorectal Cancer	Melanoma	Oral Cancer	Cervical Cancer
WEC	39.4	20.6	19.7	16.4	3.7	3.7	3.3
ON	37.2	17.4	19.1	16.4	2.6	2.4	2.1

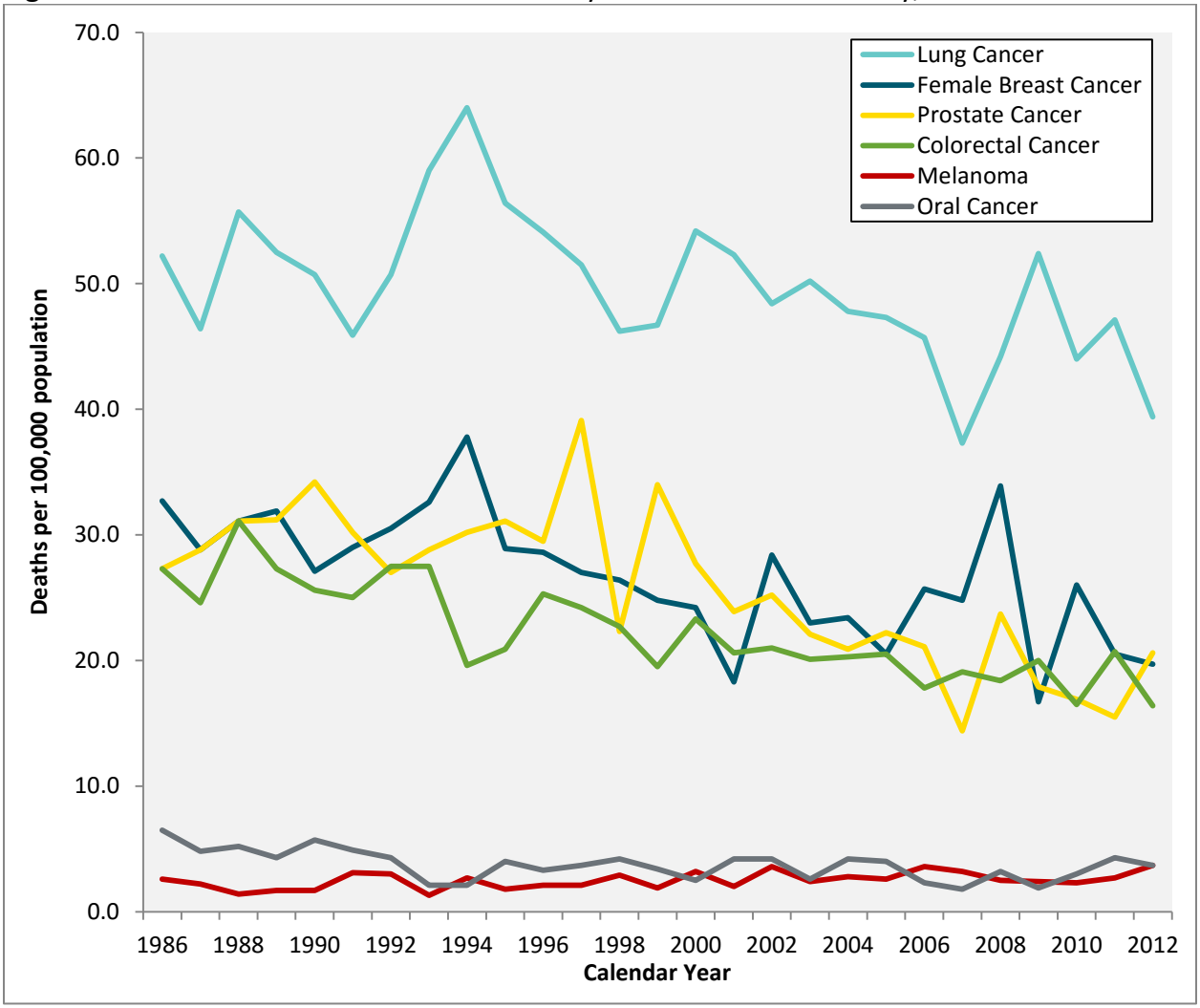
Source: CCO SEER*Stat Package Release 10 - OCR (Aug. 2015). Pop Est Summary (Statistics Canada, Ontario Ministry of Finance), Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, extracted May 2015.

Notes:

- The rates of prostate cancer, female breast cancer, and cervical cancer were calculated for those populations at risk (e.g., only females are at risk for cervical cancer).
- The rates were age-standardized using the 1991 Canadian population standard.

The historical rates of cancer mortality are reported in **Figure 7** for Windsor-Essex County (1986-2012) by type of cancer. Trends for these rates may not necessarily be attributed to changes in the rate of new cases of cancer; rather, such changes may be explained by improvements in cancer treatments and care. These rates are age-standardized which means that these measurements account for changes or differences in the age of the population.

Figure 7. The historical rates of cancer mortality in Windsor-Essex County, 1986-2012.



Source: CCO SEER*Stat Package Release 10 - OCR (Aug. 2015). Pop Est Summary (Statistics Canada, Ontario Ministry of Finance), Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, extracted May 2015.

Notes:

- The fluctuation of incidence rates may be due to the small case counts reported annually.
- Cervical cancer was not reported due to very low sample sizes.
- The rates of prostate cancer and female breast cancer were calculated for those populations at risk (e.g., only females are at risk for cervical cancer).
- The rates were age-standardized using the 1991 Canadian population standard.

Cancer Prevention and Screening

Public Health has an active role in the assessment and prevention of cancer and other chronic diseases in our community. The Health Unit does this by monitoring the rate of cancer and other chronic diseases, promoting healthy choices, assessing health hazards, and partnering with other agencies in Windsor-Essex County. Individuals can reduce their risk of cancer through the following healthy behaviours:

- Do not smoke tobacco or use tobacco products
- Reduce alcohol consumption
- Reduce exposure to radiation (including the sun)
- Follow safety regulations when working with hazardous substances, such as carcinogens
- Regular physical activity
- Eating nutritious, healthy foods

Deaths due to cancer can also be mitigated through early detection and treatment. Screening programs can find cancer in people who appear healthy and are an effective way for catching cancer at the early stages when it is easier to treat. There are specific recommendations for who should be screened and the frequency of screening (visit CancerCareOntario for more information). The percentage of individuals who are up-to-date on their cancer screenings is reported in **Table 3** and is similar for Windsor-Essex County and Ontario. Individuals can also learn more about their own risk of developing cancer by completing a personalized cancer risk assessment (visit My Cancer IQ for more information).

Table 3. Cancer screening rates for Windsor-Essex County and Ontario, 2013.

Cancer Screening	WEC	ON
Breast cancer screening: women (50-74 years old) who had at least 1 mammogram in a 30-month period (2013-2014) (%)	64.4	64.8
Breast cancer screening retention: women (50-74 years old) who had a subsequent screening within 30 months of a previous mammogram (2012) (%)[1]	84.9*	82.6
Cervical cancer screening: women (21-69 years old) who had at least 1 Pap test in a 42-month period (2012-2014) (%)	60.0*	63.4
Cervical cancer screening retention: Women (20-66 years old) who had a subsequent Pap test within 42 months of a previous Pap test (2011) (%)	73.3*	71.5
Colorectal cancer screening: Men and women (50-74 years old) who were overdue for colorectal screening in 2014 (%)	40.3	39.9

*Statistically significant difference between Windsor-Essex County and Ontario estimates.
Source: Cancer Care Ontario, Cancer System Quality Index (2016), accessed 24 May 2016. CSQI
Prepared by: Cancer Screening Evaluation and Reporting, Cancer Care Ontario.

Lung Cancer

What is lung cancer?

The lungs are responsible for bringing oxygen into the body and expelling carbon dioxide. Sometimes the cells that make up the lungs become genetically mutated and will start to grow uncontrollably. This can lead to either a benign tumor that is not cancerous (does not spread and is usually not life-threatening) or a malignant tumor that is cancerous (potential to spread and may be life-threatening). When a malignant tumor starts in the lungs it is referred to as primary lung cancer and when cancer spreads into the lungs from other body sites this is referred to as secondary or metastatic cancer (Canadian Cancer Society, 2016).

What causes lung cancer?

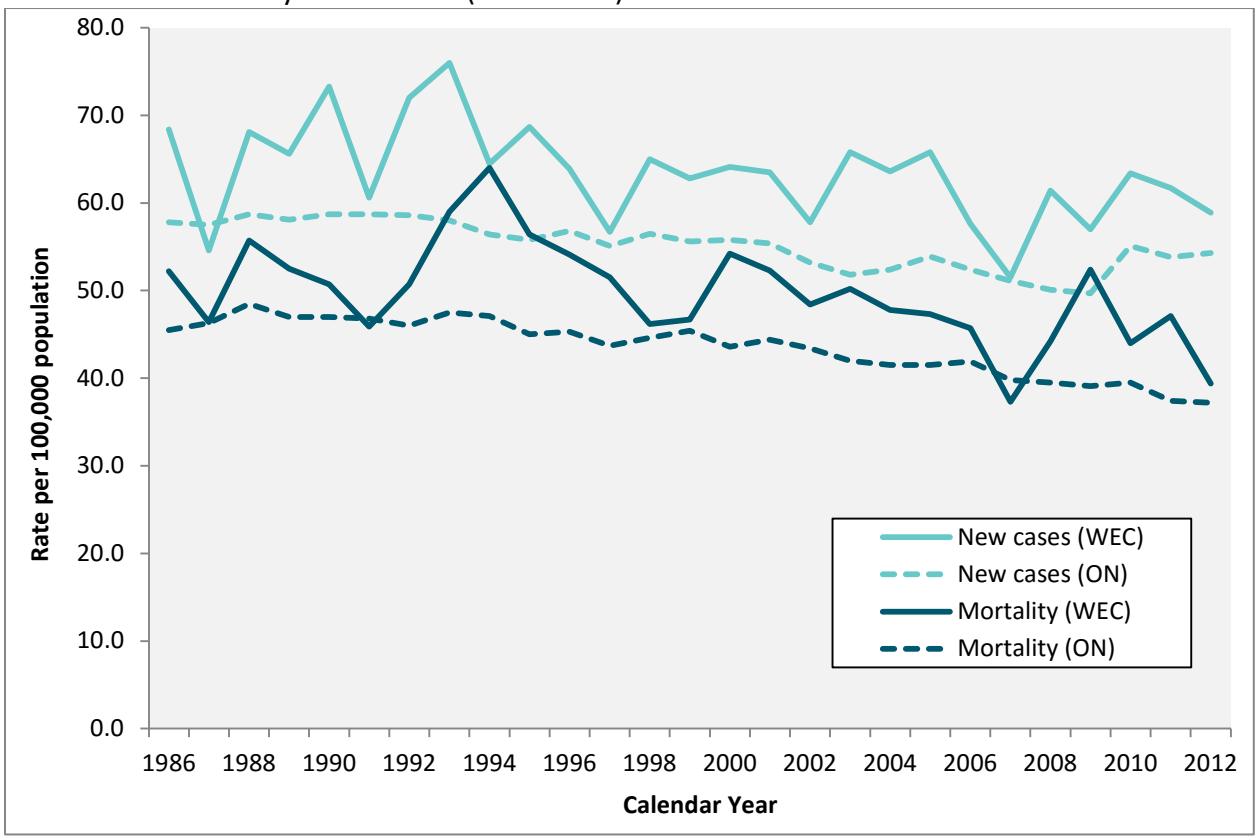
Lung cancer is the leading cause of cancer deaths in Windsor-Essex County. The primary cause of lung cancer is smoking tobacco; every 9 in 10 cases of lung cancer in men are caused by smoking tobacco (National Institutes of Health, 2015). However, there are many other causes of lung cancer. The International Agency for Research on Cancer (IARC) is a specialized branch of the World Health Organization (WHO). The IARC has groups of scientific experts who review scientific knowledge and research studies to determine hazards which can cause cancer. As of November 2015, the IARC has determined that there is sufficient evidence in humans to classify the following 29 agents as lung cancer carcinogens (listed alphabetically):

- Acheson process (occupational exposures associated with)
- Aluminum production
- Arsenic and inorganic arsenic compounds
- Asbestos (all forms)
- Beryllium and beryllium compounds
- Bis(chloromethyl)ether; chloromethyl methyl ether (technical grade)
- Cadmium and cadmium compounds
- Chromium (VI) compounds
- Coal, indoor emissions from household combustion
- Coal gasification
- Coal-tar pitch
- Coke production
- Engine exhaust, diesel
- Hematite mining (underground)
- Iron and steel founding
- MOPP (vincristine-prednisone-nitrogen mustard-procarbazine mixture)
- Nickel compounds
- Outdoor air pollution
- Painting
- Particulate matter in outdoor air pollution
- Plutonium
- Radon-222 and its decay products
- Rubber production industry
- Silica dust, crystalline
- Soot
- Sulfur mustard
- Tobacco smoke, second-hand
- Tobacco smoking
- X-radiation, gamma-radiation

Lung cancer in Windsor-Essex County

There were 224 deaths due to lung cancer in Windsor-Essex County in 2012 (age-standardized rate of 39.4 deaths per 100,000 population). This makes lung cancer the number one cause of cancer-related deaths in the region. Males and females accounted for 54.0% and 46.0% of lung cancer deaths, respectively. Almost all (96.4%) of these deaths were among individuals 50 years old and over. The historical rates (per 100,000 population) of new lung cancer cases (incidence) and lung cancer mortality are reported in **Figure 8** for Windsor-Essex County and Ontario (1986-2012). From 1986 to 2012, the rates of lung cancer incidence and mortality have decreased across the province; there is also a decreasing trend for these rates in Windsor-Essex County (although, there is greater variability from year to year). These rates are age-standardized which means that these measurements account for changes or differences in the age of the population of Windsor-Essex County and Ontario.

Figure 8. Rates (per 100,000 population) of lung cancer incidence (new cases) and mortality in Windsor-Essex County and Ontario (1986-2012).



Source: CCO SEER*Stat Package Release 10 - OCR (Aug. 2015). Pop Est Summary (Statistics Canada, Ontario Ministry of Finance), Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO, extracted May 2015.

Notes:

- The rates were age-standardized using the 1991 Canadian population standard.
- The incidence rates have been adjusted to adhere to the IACR standards for counting multiple primary cancers to allow for direct comparisons of incidence rates over time.

Cancer Clusters

Clusters of non-communicable diseases (such as cancer) are defined as a greater than expected number of health events among a defined population within a specific geographic area and time period (Centers for Disease Control and Prevention, 2013).

Investigating a cancer cluster is difficult and complex. There are several factors that challenge the process of conducting any cancer cluster investigation, and each of these important factors must be considered when conducting such investigations:

- Cancer is usually caused by multiple factors, either together or independently. For example, both smoking and radon independently increase the risk of lung cancer but this risk is multiplied if a person is exposed to both (Peterson, et al., 2013).
- Most cancers have a long latency period; that is, it can take many years from when an individual is exposed to a carcinogen to when the cancer is diagnosed. For example, it can take 30 years for lung cancer to be diagnosed after exposure to asbestos.
- Defining a population in a specific geographical area is difficult. Adequate data may be limited due to the small size of the population, and there can be lots of movement of the population and change in population dynamics over long periods of time.
- Cancer clusters can happen randomly by chance or because certain populations are structured in a way that groups many high-risk individuals within a geographical area.

Due to the difficulties and complexities associated with cancer cluster investigations, most investigations are not able to accurately determine any specific cause. It is extremely rare for investigations to identify a common exposure that exists for all cancer cases. For example, of 428 cancer cluster investigations conducted during the period of 1990-2010 in the U.S.A., only one (0.2%) investigation revealed a clear cause (Goodman, et al., 2012).

Remington Park Cancer Cluster

Initiation of Investigation

In November of 2013, a concerned citizen from the community contacted the Health Unit about an unusual number of cancer cases in the neighbourhood of Remington Park in Windsor, Ontario. These concerns were addressed with a preliminary assessment of the rates of cancer in Remington Park which were compared to the expected Ontario rates. The area of Remington Park was defined according to four dissemination areas with outer boundaries defined by Howard Avenue (west), South Pacific Avenue (north), Parent Avenue (east), and Grand Marais (south) (see **Figure 9**).

CCO calculated Standardized Incidence Ratios (SIRs) which indicate whether the observed rate of cancer is different from what would be seen in a comparison population (Ontario was the comparator). This initial assessment revealed that the number of lung cancer cases was 2.2 times greater than expected (95% CI: 1.4 – 3.2) during the 2000-2009 time period and this difference was statistically significant. This information was shared with the concerned citizen in April, 2014. The numbers of female breast cancer, colorectal cancer, prostate cancer, and other cancers were not significantly greater than what is expected for the population of Remington Park (see **Table 4**). These findings prompted further investigation into a potential cluster of lung cancer cases. This and other information was presented at a town hall meeting in April 2015 (*meeting minutes available online or available upon request*).

Table 4. The incident cases (counts) and Standardized Incidence Ratios (SIRs), using indirect standardization, for cancer in Remington Park* compared to Ontario, 2000-2009.

Cancer site	New Cases (Observed)	New Cases (Expected)	SIR	95% Confidence Internal (Lower, Upper)
Female breast	11	11.2	1.0	(0.5, 1.8)
Colorectal	NP	NP	1.3	(0.7, 2.2)
Lung	24	11.1	2.2	(1.4, 3.2)
Prostate	13	12.6	1.0	(0.5, 1.8)
Most common cancers ranked 5 to 10 in Ontario†	20	17.2	1.2	(0.7, 1.8)
All other cancers	NP	NP	1.2	(0.8, 1.7)

Report date: April 2015, **Source:** CCO (Ontario Cancer Registry, 2012)
Prepared by: CCO, Prevention and Cancer Control (Population Health and Prevention)
Notes:

- *DAs for Remington Park: 35370546, 35370545, 35370543, 35370544
- †Most common cancers ranked 5 to 10 in Ontario: Non-Hodgkin lymphoma, melanoma, leukemia, thyroid, bladder and body of uterus. These are based on rates from all Ontario.
- NP: Data could not be provided because these numbers were so small that individual privacy and personal health information could be inadvertently disclosed to the public.

Figure 9. Map of the geographical area investigated for Remington Park.

Methods and Analysis

Several health organizations and working groups have established guidelines for investigating cancer clusters, including the Centers for Disease Control and Prevention's "Guidelines for Investigating Clusters of Health Events" (Centers for Disease Control and Prevention, 2013).

The Health Unit, in consultation with PHO, conducted the Remington Park cancer cluster investigation using the following methods described in **Table 5**.

Table 5. Summary of the methodology for conducting the investigation of the Remington Park cancer cluster.

	Methodology	Timeframe
Initial Investigation	**Preliminary Assessment** • The Health Unit received the initial notification from a resident in the community. • Non-identifying preliminary information was collected. • Cancer statistics were provided by CCO and reviewed by the Health Unit containing age-standardized rate for the four dissemination areas in Remington Park and the Windsor-Essex rate, the Erie-St. Clair LHIN rate and the Ontario rate. • A report, based on the above rate differences, was created and shared with the initial informant (*available upon request*).	November, 2013 to April, 2014

	Methodology	Timeframe

Case Series Study	**Initial Response**
	• The Medical Officer of Health (MOH) contacted CCO, PHO and ESCRCP regarding proceeding with a cancer cluster investigation.
	• A Health Unit Cancer Cluster Investigation Working Group was formed to lead the investigation. Members included: the Medical Officer of Health, Associate Medical Officer of Health, Director of Knowledge Management and Communications Manager.
	• After examining local data, it was found (through CCO) that lung cancer rates were statistically higher in Remington Park compared to the expected provincial rates. The rates of other types of cancer were not statistically higher in Remington Park (see **Table 4**).
	• PHO best practice guidance for conducting cancer cluster investigations was reviewed.
	• A communications plan was developed outlining communication activities with families, partners and stakeholders, internal staff, media and the public. Partners and stakeholders identified as:
	  ○ CCO
	  ○ PHO
	  ○ Health Canada
	  ○ ESCRCP
	  ○ MOECC
	  ○ Residents of Remington Park
	  ○ Media
	  ○ Individuals diagnosed with primary lung cancer between 2000-2009 in Remington Park or their next of kin
	• The Health Unit responded to community concerns with meetings and presentations at the Board of Health, outreach via the Health Unit's communication team, a town hall with the public to provide information about cancer clusters, lung cancer, cancer statistics and the initiation of an investigation.
	• PHO gathered and shared more information to familiarize the Health Unit on lung cancer clusters by conducting a literature review (*PHO summary document available upon request*).
	• A case definition was developed:
	Case Definition: A person diagnosed with primary lung cancer between 2000 and 2009 while living in one of the four dissemination areas in the Remington Park area.
		March to May, 2015

	Case Ascertainment and Finding • The CCO analysis in March 2014 identified 24 individuals that met the case definition, but due to privacy legislation it was not possible for CCO to provide additional information to the Health	March, 2015 to January, 2016

	Methodology	Timeframe
	Unit about these cases. • The Health Unit developed a media plan (newspaper and radio interviews) and an online community survey to identify potential individuals or their next of kin. • Some additional potential individuals or their next of kin were identified through the Health Unit's own outreach process; the community survey was used to confirm that all individuals met the case definition. • ESCRCP aided the Health Unit in confirming the potential individuals or their next of kin through an informed consent process signed by the individuals or their next of kin. • In a single case, an individual (or his/her next of kin) self-identified to the Health Unit and was confirmed by a local physician after informed consent was obtained. • In total, between June, 2015 and January, 2016, 12 individuals (or their next of kin) identified themselves and were confirmed as meeting the case definition. Prior to ending the interview phase of the investigation, the Health Unit informed the public this phase would include through a change to the Health Unit's Remington Park Cancer Cluster Investigation landing page, through an announcement at the September, 2015 Board of Health meeting and through subsequent interviews with local media outlets.	

	Methodology	Timeframe
	Feasibility and Epidemiologic Studies & Verification of Disease Status • A case series was selected for the study design based on methodological considerations. Thorough interviews with the individuals or their next of kin were the most feasible method to collect detailed information. • Consent forms were developed and approved by the Privacy Officer and ESCRCP (*available upon request*). **Questionnaire Development** • PHO assisted the Health Unit in developing a detailed questionnaire to collect exposure information on known lung cancer risk factors through past exposures at home, work and during activities. The questionnaire was based on current scientific evidence and involved expert consultation (*available upon request*). • The final questionnaire included a minimum of 21 questions with space for additional comments throughout. • Questions probed for information about: personal information, lung cancer diagnosis, and main risk factor history (demographics, family history, residential history, occupational exposure history, and environmental exposure history). • A Research Assistant was trained on questionnaire implementation.	May to June, 2015
	• The individuals or their next of kin were interviewed by the Research Assistant using a standardized approach. Interviews were conducted in-person (n=8) and by telephone (n=4) at the convenience of the interviewee.	June, 2015 to January, 2016

	Methodology	Timeframe

Post study	**Conclusion**
	• A database was developed to store all interview data.
	• A version of the database, without individual or next of kin names, was sent to PHO securely via the Secure File Transfer Protocol (SFTP) server.
	• Analyzed data was sent back to the Health Unit via the SFTP server.
	• PHO reviewed the results with the Health Unit.
	• This report was written by the Health Unit and PHO, and CCO, ESCRCP and MOECC were invited to provide commentary on it.
	• This report will be made publically available at a 2nd Town Hall meeting, where the report will be discussed and participants will be offered education about lung cancer, its risk factors and ways to mitigate some of the risks.
	• The Health Unit planned its next steps to continue beyond the 2nd Town Hall, including:
	  ○ Continuing to invite the public to share their concerns:
	  ▪ Contact us through our website at www.wechu.org
	  ▪ Call us at 519-258-2146, ext. 1421
	  ▪ Connect with us on Facebook or Twitter via private messaging
	  ○ Continuing to monitor the lung cancer incidence in the 4 Remington Park DA's in coordination with CCO, and
	  ○ Promoting the Ontario Health Study (Ontario Health Study), a long-term research study designed to create a large database of people to better understand complex chronic diseases, such as cancer, and develop strategies for their prevention and treatment.
		January to September, 2016

Results and Discussion

This section describes the results of the in-depth interviews of individuals or next of kin belonging to the Remington Park cancer cluster. In total, 12 individuals or next of kin who approached the Health Unit met the case definition for this investigation and in-depth interviews were conducted with these individuals. To investigate a potential cause, these interviews were designed to capture information pertaining to demographics, personal information, lung cancer diagnosis, and risk factor histories (residential history, occupational exposure history, and environmental exposure history).

Examining Relevant Exposure Histories

Lung cancer develops slowly over many years following carcinogen exposure. The length of time required to develop cancer, also known as the latency period, varies by cancer type. For lung cancer, the average length of time between carcinogen exposure and cancer diagnosis is generally 20-25 years and the minimum length of time is generally 10 years. The maximum length of time required to develop lung cancer, or maximum latency, has been defined as 50 years for the purposes of this investigation so as to include all potentially relevant exposure history information.

The latency period allows us to identify a period of time, also known as a relevant exposure window, in which carcinogen exposures may have played a role in the development of cancer. For the 12 individuals, based on date of diagnosis, the earliest relevant exposure period began in 1951 and the latest relevant exposure period ended in 1999. For each individual, only residential and occupational histories reported during their relevant exposure period are important for this investigation. For individuals who were under the age of 50 at the time of lung cancer diagnosis, their relevant exposure period began at birth.

Residential Information

One individual lived in Remington Park at the time of their diagnosis, but was not living in the area at any time during their relevant exposure window. Five individuals lived in Remington Park for less than 5 years during their relevant exposure window. The remaining six individuals lived in Remington Park for more than 20 years during their relevant exposure window – three of these individuals had more than one residence in Remington Park.

Gender and Age

The 12 individuals were predominantly male (10 male and 2 female) and their age at diagnosis ranged from 40 to 83 years (average 62 years). This finding was as expected because in Windsor-Essex County and Ontario the incidence rate of lung cancer in males is almost twice the rate in females, and lung cancer diagnoses generally peak between 65-89 years.

Family History

Family history is a risk factor for lung cancer. Three (25%) individuals had a first degree relative (mother, father or sibling) with a previous diagnosis of lung cancer.

Occupational Information

Individuals may be exposed to lung cancer carcinogens through their occupation. For 11 individuals, occupational exposures may be relevant for the development of lung cancer.

Industries (and occupations) in the occupational histories of these 11 individuals included: construction (fire restoration, siding installation, general labourer), transportation (truck driver, railroad maintenance and inspection), manufacturing (dye grinder, pit cleaners, automobile robots, line worker, forklift operator, lathe operator, hammer man, machine maker, factory maintenance), sales (cashier, beautician) food/hospitality industry (cook, washer) & general maintenance (custodian, car mechanic).

The most common industries reported were manufacturing (4 individuals) and construction (5 individuals). Transportation (2 individuals), metals (2 individuals) and pulp & paper (1 individual) were also reported. The total time spent in each occupation ranged from 1-22 years and 10 individuals had at least one job for 14 years or more. Some occupational histories listed specific exposures (e.g., asbestos, metal working fluids, diesel, formaldehyde), while others were less specific (e.g., organic solvents, rubber manufacturing, and asphalt).

Hobby Information

Five individuals had relevant hobby information that may be related to lung cancer. Most hobbies were life long, beginning as a teenager or young adult, and included: car repair, woodworking (mostly hard wood), gardening and arc welding.

Outdoor Air Quality

Outdoor air pollution and particulate matter in outdoor air pollution can cause lung cancer. Globally, in 2010 it was estimated that 223,000 deaths from lung cancer could be attributed to air pollution for that year (IARC, 2013). Ten individuals or their next of kin voiced environmental concerns related to at least one of their current or previous residences. These were mainly concerns about air pollution due to nearby industrial facilities (metal recycling and metal forging), motor vehicle traffic and rail transportation.

An assessment of air quality was completed in Windsor during 1991-1993 (Committee, Windsor Air Quality, 1994). Overall, this study found that health risks due to outdoor air pollution were less than those due to indoor air pollution for the area of Windsor. It was noted that pollutant concentrations collected in north central Windsor were slightly higher than pollutant concentrations collected at other areas, but no lung cancer carcinogens exceeded existing Ontario air quality criterion.

More recent information on air pollutants in the Windsor area is available from MOECC. MOECC operates two ambient air monitoring stations and five research monitoring stations in the Windsor area. There are also two privately operated monitors that collect information on air emissions from an industrial facility. Based on information collected up to 2015, no lung cancer carcinogens exceed current Ontario air quality standards in the Windsor area.

Radon in Residential Homes

Radon is an important risk factor for lung cancer. No information on residential radon levels was available for the 12 individuals. Based on a 2012 Health Canada report, 13.8% of homes in Windsor-Essex County tested above the current Health Canada guideline versus 4.6% of homes in Ontario overall (Ontario Agency for Health Promotion and Protection, 2014).

Tobacco Smoke

Smoking is an important risk factor for lung cancer. In fact, 80-90% of lung cancer is attributed to smoking tobacco (National Institutes of Health, 2015). All 12 individuals were exposed to first-hand and/or second-hand tobacco smoke. Nine (75%) individuals were daily smokers – ranging from a few cigarettes to two packs of cigarettes per day – and two (17%) individuals were occasional smokers. The one non-smoker had lived in a home with a smoker. Six individuals smoked at least one pack a day. Regarding second-hand smoke, nine individuals lived in a home with someone who smoked cigarettes daily. Eight individuals were exposed to tobacco smoke through their occupation.

Table 6. Summary of relevant exposure histories of lung cancer in individuals or their next of kin from the Remington Park cancer cluster.

Exposures linked to lung cancer	Information about the investigated exposures	Exposure histories of the individuals or their next of kin in the Remington Park cancer cluster investigation
Tobacco Smoke	80-90% of lung cancer is caused by tobacco smoke.	All 12 individuals were exposed to tobacco smoke; nine were daily smokers, two were occasional smokers, and the one non-smoker had resided with a smoker.
Radon	Radon is the second leading cause of lung cancer.	No information was available for residential radon levels.
Occupation	Individuals may be exposed to lung cancer carcinogens through their occupation.	Occupational exposure may be relevant for 11 individuals. Four worked in manufacturing, five in construction, two in transportation, two in metals, and one in pulp and paper.
Outdoor Air Quality	Outdoor air pollution and air particulate matter can cause lung cancer.	Ten individuals or their next of kin voiced concerns about pollution (industry, traffic, railroads) near at least one of their residences.
Hobbies	Individuals may be exposed to lung cancer carcinogens through their hobbies.	Five individuals had hobbies that may be relevant, including: car repair, woodworking, gardening and arc welding.
Family History	Family history is a risk factor for lung cancer.	Three of the 12 individuals or had a family history of lung cancer.

Next Steps

The objective of this cancer cluster investigation was to collect detailed information on the individuals making up the Remington Park cancer cluster to identify lung cancer carcinogens and/or other factors that could have possibly caused the lung cancer cluster in Remington Park.

Based on available data, the only known lung cancer carcinogen that all of the 12 individuals were exposed to during their relevant exposure period was tobacco smoke. This finding is not unusual as exposure to tobacco smoke typically accounts for 80-90% of lung cancer cases in North America (National Institutes of Health, 2015). It has previously been reported that individuals of similar socio-economic status can cluster into particular neighbourhoods and this can give rise to clustering of similar health behaviours, such as smoking habits (Meijer, et al., 2013; Hystad, et al., 2013). For example, in the urban core of Guelph, Ontario it was found that males had a significantly higher incidence of lung cancer, but when accounting for socio-economic factors, household income inequalities, and suspected elevated smoking rates, it explained the greater than expected increase in lung cancer cases in that area (Holowaty, et al., 2010). Clustering of individuals with similar socio-economic status is actually more frequent in Windsor, Ontario than in any other city in Canada (Prieur, 2014), and according to a recently published study (Seliske, et al., 2016), it is estimated that 25.0-29.9% of Remington Park residents reported being a current smoker during 2000-2010, which is greater than the 2005 estimates for current smokers in Ontario (17.5%) and Windsor-Essex County (21.9%).

The Health Unit recognizes the burden that lung cancer has on our community. We are actively working with community partners on a number of efforts to reduce exposure to tobacco smoke. This is a part of a comprehensive tobacco control program that is guided by the Smoke-Free Ontario Act with three main areas of focus: cessation (quitting), prevention, and protection. These efforts include free smoking cessation treatment through our internal clinic as well as group workshops (e.g., “STOP” workshops) in order to increase access to nicotine replacement therapy and counselling. The Health Unit also encourages municipalities and organizations to create more smoke-free spaces through by-law and policy development. In fact, 6 out of 9 local municipalities have by-laws in place which protect residents from the carcinogens in second-hand smoke. For more information on tobacco or tobacco cessation services, please visit the Health Unit’s website (www.wechu.org) or call the Chronic Disease and Injury Prevention Department (519-258-2146, ext. 3100).

In addition to tobacco smoke, there were a number of other risk factors that were identified among some of the individuals, but these other risk factors were not consistent among all individuals. There was concern among individuals about outdoor air quality in Remington Park and these concerns were primarily about air pollution due to nearby industrial facilities (metal recycling and metal forging), motor vehicle traffic, and rail transportation. This investigation determined that, based on outdoor air quality data collected up to 2015, no lung cancer carcinogens exceed current Ontario air quality standards in the Windsor area. Furthermore, the role of indoor radon gas could not be assessed due to the lack of data related to indoor radon levels in residential dwellings.

To address some of the findings of this investigation, the following actions have already been taken in response to the Remington Park lung cancer cluster:

- **'Know Your Level' Radon Awareness Campaign**: In November 2015 the Health Unit launched a major campaign to better understand radon levels in homes in Windsor-Essex County. One thousand radon kits were made freely available to local residents. Following Health Canada-recommended guidelines, radon testing kits were used inside homes during the winter months and then returned to the Health Unit for laboratory analysis. This campaign will help the Health Unit better understand the levels of radon in Windsor-Essex County and identify particular areas where mitigation may be necessary.

- **Ongoing surveillance of lung cancer in Remington Park**: In April 2016 the Health Unit requested an updated analysis from CCO on new lung cancer cases in Remington Park (see **Table 7**). For the most recent period for which data is currently available, 2010-2012, there were 9 new cases of lung cancer observed in Remington Park. Compared to an expected number of 4.5 new cases of lung cancer for that time period and location; this produces a calculated SIR of 2.0 (95% CI: 0.9 – 3.8) which is higher than what would be estimated from Ontario data, but is not statistically significant. The Health Unit will continue to monitor the incidence of lung cancer in Remington Park and provide updates as new data becomes available.

Table 7. Incident cases (counts) and Standardized Incidence Ratios (SIRs), using indirect standardization, for lung cancer*, in Remington Park† compared to Ontario‡, 2000-2012.

Years	New cases (Observed)	New cases (Expected)	SIR	95% CL (Lower, Upper)
2000–2009	24	11.0	2.2	(1.4, 3.2)
2010–2012§	9	4.5	2.0	(0.9, 3.8)
2000–2012§	33	15.5	2.1	(1.5, 3.0)

Report date: April 2016, Source: Cancer Care Ontario (Ontario Cancer Registry, 2015).
Prepared by: Cancer Care Ontario, Prevention and Cancer Control (Population Health and Prevention).
Notes:

- *Lung cancer (ICD-O-3 C34).
- †DAs for Remington Park: 35370546, 35370545, 35370543, 35370544.
- ‡Cases with unknown residence were excluded.
- §The Ontario Cancer Registry adopted the NCI SEER standards for counting multiple primaries for cases diagnosed in 2010 and beyond. In order to allow for direct comparison of counts over time, cases diagnosed for 2010 and beyond have been adjusted to adhere to the International Association of Cancer Registries (IACR) standards for counting multiple primary cancers (the standards which were used for cases diagnosed to 2009).

Conclusion

In summary, this cancer cluster investigation was initiated after it was determined that, between 2000 and 2009, there was an elevated rate of lung cancer among residents of the Remington Park neighbourhood of Windsor, Ontario. Detailed interviews were conducted with 12 individuals or next of kin from the cancer cluster to identify lung cancer carcinogens and/or other factors that could have possibly caused the lung cancer cluster in Remington Park.

The investigation determined that individuals were potentially exposed to multiple risk factors; however, the only known lung cancer carcinogen that all 12 individuals were exposed to during their relevant exposure period was tobacco smoke. The Health Unit will continue to monitor lung cancer rates in Remington Park, and will continue to maintain existing, and implement new, efforts to prevent and mitigate cancer in our community.

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