Health Consultation

Cancer Incidence in the Population Living near the
Ringwood Mines/Landfill Site, 1979-2008

RINGWOOD BOROUGH, PASSAIC COUNTY, NEW JERSEY

EPA FACILITY ID: NJD980529739

Prepared by the
New Jersey Department of Health and Senior Services

DECEMBER 13, 2011

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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New Jersey Department of Health and Senior Services
Under Cooperative Agreement with the
U. S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry

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Summary

Introduction   The Ringwood Mines/Landfill Site (Ringwood Borough, Passaic County, New Jersey) includes abandoned mine shafts and surface pits, an inactive landfill and other disposal areas, and dozens of residences. In the late 1960s and early 1970s, wastes from the Ford Motor Company, including paint sludge, solvents and automobile parts, were dumped at the site. The draft Public Health Assessment (PHA) for the site (ATSDR 2006) concluded that there were completed exposure pathways to site-related contaminants in the past, by incidental ingestion of contaminated soil, sediment, paint sludge and surface water. Contaminants include heavy metals and organic chemicals associated with paint sludge and other sources.

The draft PHA presented an analysis of cancer incidence in the period 1979 through 2002 in the population living near the site. Overall cancer incidence was not elevated in the population, but lung cancer in males was statistically significantly elevated, based on six observed cases. Since the draft PHA was issued, an additional six years of cancer incidence data have become available for further analysis. This Health Consultation describes the methods used to examine cancer incidence and the results of these analyses.

NJDHSS and ATSDR have reached the following conclusion in this Health Consultation:

Conclusion   NJDHSS and ATSDR conclude that overall cancer incidence (all cancers combined) and the incidence of several specific cancers were not elevated in the community living near the Ringwood Mines/Landfill site in the time period 1979 through 2008, in comparison to cancer rates in the State of New Jersey. Lung cancer in males, however, was statistically significantly higher than expected, based on nine cases observed. Since the primary risk factor for lung cancer is tobacco smoking, it cannot be concluded that the increased incidence is attributable to site-related exposures.

This analysis of 30 years of cancer incidence in the population living near the Ringwood Mines/Landfill site does not suggest that potential exposures to site-related contamination have affected the cancer rate in the community.

Basis for Conclusion	Tobacco smoking is estimated to account for 85% of all lung cancer cases. Since the prevalence of tobacco smoking is not available for these cases, it is unknown what influence this important risk factor may have played.
	Environmental factors may be expected to affect cancer rates in males and females similarly, if exposure levels are comparable and there are no reasons to believe there are differences in sensitivity by sex. The fact that lung cancer is not elevated in females argues against an environmental factor as an underlying cause of the increase in lung cancer in males.
Next Steps	The NJDHSS and ATSDR have no further recommendations regarding cancer incidence investigation in relation to the Ringwood Mines/Landfill site.
	NJDHSS and ATSDR will continue participation in meetings of the Ringwood Community Advisory Group (CAG) as needed to address health concerns with community representatives.
For More Information	Copies of this Health Consultation will be provided to concerned residents via the township libraries and the Internet. NJDHSS will notify area residents that this report is available for their review and provide a copy upon request.
	Questions about this Health Consultation should be directed to:
	Environmental and Occupational Health Surveillance Program
Consumer and Environmental Health Services
New Jersey Department of Health and Senior Services
P.O. Box 369
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Purpose

In May 2006, the New Jersey Department of Health and Senior Services (NJDHSS) and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR) released a draft Public Health Assessment for the Ringwood Mines/Landfill site in Ringwood Borough, Passaic County, New Jersey (ATSDR 2006). As part of the draft Public Health Assessment, NJDHSS and ATSDR presented an analysis of cancer incidence in the period 1979 through 2002 in the Upper Ringwood population living on or near the site. At the time, the agencies concluded that overall cancer incidence was not elevated in the population. However, lung cancer in males was statistically significantly elevated, based on six observed cases when 2.2 would have been expected in that population over that time period.

Since the time that the draft Public Health Assessment was completed, an additional six years of cancer incidence data have become available for further analysis. Also, the 2010 U.S. Census data is now available, allowing for accurate intercensal population estimates for the years after 2000. This Health Consultation describes the methods used to examine cancer incidence and the results of these analyses.

Background and Statement of Issues

The Ringwood Mines/Landfill Site is located in Ringwood Borough, Passaic County, New Jersey. The site includes abandoned mine shafts and surface pits, an inactive landfill, an industrial waste disposal area, small surface dumps, a municipal recycling area, and dozens of residences. The site has both wooded and open areas.

In the late 1960s and early 1970s, wastes from the Ford Motor Company, including paint sludge, solvents and automobile parts, were dumped at the site on the ground, in open pits and in mine shafts. The draft Public Health Assessment (PHA) for the site concluded that there were completed exposure pathways to environmental contaminants in the past, by incidental ingestion of contaminated soil, sediment, paint sludge and surface water. Contaminants of concern include several heavy metals (lead, arsenic and others) and organic chemicals (polycyclic aromatic hydrocarbons (PAHs) and others), associated with paint sludge and other sources ATSDR 2006). As discussed in the draft PHA, there have been numerous community concerns about the potential health impacts of exposures to site-related contaminants, including several types of cancers.

Methods

Geographic Area, Population, and Time Period

The geographic area around the Ringwood Mines/Landfill for the cancer incidence analysis (the "Focus Area") consists of the U.S. Census blocks within Ringwood Borough in close proximity to the site (Figure 1). In the U.S. Census for the year 2000, the Focus Area was defined by five census blocks (4006, 4007, 4008, 4009, and 4012), and in the U.S. Census for the year 2010 the same area was defined by three census blocks (2000, 2002, 2004). The population consists of persons residing in the census blocks during the period January 1, 1979 through

December 31, 2008. Age group- and sex-specific population data for these blocks were obtained from the 2000 and 2010 U.S. Censuses (U.S. Census Bureau 2011).

Cancer Case Ascertainment

The New Jersey State Cancer Registry (NJSCR) was used for the ascertainment of cancer cases. The NJSCR is a population-based cancer incidence registry covering the entire state of New Jersey. By law, all cases of newly diagnosed cancer are reportable to the NJSCR except certain carcinomas of the skin. In addition, the NJSCR has reporting agreements with the states of New York, Pennsylvania, Maryland, North Carolina, Delaware, and Florida. Information on New Jersey residents who are diagnosed in those states is supplied to the NJSCR. The NJSCR has been in operation since October 1, 1978.

A "case" was defined as an individual who was diagnosed with a new primary malignant cancer during the time period (January 1, 1979, through December 31, 2008) while residing in the Focus Area within Ringwood Borough. Registry cases identified only through search of death records were excluded from this evaluation. (Generally, "death certificate only" (DCO) cases have limited address information preventing accurate case geocoding. DCO cases are removed from the case counts as well as from comparison population rates.) Information in the NJSCR includes the case's identifying information, demographic characteristics such as age, sex and race, residence at time of diagnosis, and specific cancer diagnosis, among other data. Information on some important cancer risk factors, such as genetics, personal behaviors (e.g., diet and smoking), or occupational history, is not available from the NJSCR.

Data Analysis

Analyses were completed for all malignant cancer types combined and for select cancer types. The select cancer types examined include: bladder, brain and central nervous system (CNS), female breast, colorectal, esophageal, pancreas, lung, leukemia, non-Hodgkin lymphoma, liver, bone, stomach, and kidney. These cancer types were evaluated because they represent cancer groupings that may be more sensitive to the effects of environmental exposures. Males and females were evaluated separately.

Standardized incidence ratios (SIRs) were used for the quantitative analysis of cancer incidence in the study areas (Kelsey, Thompson, and Evans 1986; Breslow and Day 1987). The SIR is calculated by dividing the observed number of cases by an expected number for the surveyed population over the time period reviewed.

The expected number was calculated by multiplying a comparison population's age-sex-specific incidence rates and the study area age-sex-specific population numbers. The comparison rates used to derive the expected number of cases were the New Jersey age-specific average annual incidence rates for 1979 to 2008. The age-sex-specific population for the Focus Area was determined from the 2000 and 2010 Census data (U.S. Census Bureau 2011). For this analysis, population data for the year 2000 were used as sex- and age-specific populations over the period 1979 through 2000. For years 2001 through 2008, age-specific populations were

determined by linear interpolation between the 2000 and 2010 U.S. Census figures. For each sex, eighteen age-specific population groups were used in the analysis.

Evaluation of the observed and expected numbers is accomplished by interpreting the ratio of these numbers. If the observed number of cases equals the expected number of cases, the SIR will equal one (1.0). An SIR less than one indicates that fewer cases were observed than expected, while an SIR greater than one indicates that more cases were observed than expected.

Statistical significance of deviations from SIR equal to 1.0 was evaluated using a 95% confidence interval (CI). The 95% CI was used to evaluate the probability that the SIR may be greater or less than 1.0 due to chance alone, and was based on the Poisson distribution (Breslow and Day 1987; Checkoway et al. 1989). If the confidence interval excludes 1.0, then the estimated SIR is considered to be statistically significantly different than 1.0. Random fluctuations may account for some SIR deviations from 1.0.

To protect the privacy of confidential medical information, case counts under five are presented as "<5". For this Health Consultation, only data for those cancer types with two or more cases over the study period (in both sexes combined) are discussed or presented in tables; however, information on these cancer cases is included in the analysis of "all cancers."

Results

Table 1 presents the Focus Area population by age group, sex, and race at the times of the 2000 and 2010 U.S. Censuses.

Table 2 presents the number of all incident malignant cancer cases by sex and age group for the Focus Area. There were 32 cancer cases diagnosed among the Focus Area population from 1979 through 2008, with more cases among males (20) than females (12). The majority of cases occurred among individuals age 45 to 69 years. A break-down by race is not presented in Table 2 because NJSCR race codes are not comparable to census data for race.

In the Focus Area, the most frequently diagnosed cancer types include lung, breast, colorectal and cervical cancers. Table 3 presents standardized incidence ratio (SIR) results by sex for all races combined, for those cancer types selected for analysis and for which there were two or more cases in the period 1979 through 2008. The SIRs for all cancers combined were not statistically significantly elevated for males or females. One SIR, for lung cancer, was statistically significantly elevated for males (SIR=3.6; 95% CI=1.7, 6.9, based on nine cases observed). None of the other SIRs in the Focus Area were statistically significantly elevated.

Discussion

The purpose of this Health Consultation was to evaluate cancer incidence in a population living relatively near to areas potentially contaminated by the Ringwood Mines/Landfill site. In the Focus Area, over the 30-year observation period, lung cancer in males was significantly

higher than expected. This finding is similar to that of the earlier cancer incidence analysis for the period 1979 through 2002 (ATSDR 2006).

Cancer is a group of more than 100 different diseases (i.e., cancer types and subtypes), each with its own set of risk factors. Most types of cancer have more than one cause, which complicates the interpretation of cancer incidence data and potential risk factors.

While there are many risk factors for lung cancer, tobacco smoking is considered the most important risk factor, estimated to account for more than 85% of all lung cancer cases (NCI 2011). Other known risk factors for lung cancer include indoor exposure to radon, environmental tobacco smoke, occupational exposure to asbestos and other cancer-causing agents in the workplace (including radioactive ores; chemicals such as arsenic, vinyl chloride, nickel, chromates, coal products, mustard gas, and chloromethyl ethers; fuels such as gasoline; and diesel exhaust), and exposure to air pollution (NCI 2011).

At the Ringwood Mines/Landfill site, contaminants have included a variety of metals and organic chemicals associated with paint sludge and other sources. Arsenic exposure has been identified as a risk factor for certain cancer types in humans, including lung cancer (ATSDR 2007). Some PAHs have also been identified as probable human carcinogens based on animal experiments, and exposure to these chemicals may increase the risk of skin and lung cancers (American Cancer Society 2011; ATSDR 1995).

There are limitations to the interpretation of the cancer incidence analysis reported in this Health Consultation. One limitation is the inability to assess actual past exposure levels to individuals in the population. Important information needed to assess a cause-effect relationship includes data on actual personal exposure to the contamination as well as other relevant risk factors over time; that is, who was exposed and who was not exposed and the magnitude of the exposure that did occur. Another interpretation problem is that cancer is a chronic disease that takes many years after exposure to manifest as clinical disease. The information supplied by the NJSCR provides only an address at time of diagnosis for each case. No information is available on length of time an individual may have lived at the address before diagnosis. It is possible that some cases were short-term residents with little or no exposure to the site; in contrast, long-time residents who may have been exposed to site contaminants could have moved out of the Focus Area prior to diagnosis and would not have been included in this analysis. Population mobility cannot be accounted for in this analysis. Finally, interpretation is limited since information on other important risk factors (such as genetics, behaviors such as tobacco smoking, occupational exposures, etc.) is not known for the individuals in the population.

Conclusions and Recommendations

Overall cancer incidence (all cancers combined) and the incidence of several specific cancers were not elevated in the Focus Area, in comparison to cancer rates in the State of New Jersey. Lung cancer in males, however, was statistically significantly higher than expected, based on nine cases observed compared to 2.5 cases expected. Lung cancer in females was

somewhat lower than expected, though the difference was not statistically significant. Since the prevalence of tobacco smoking, the most important risk factor for lung cancer, is not available for these cases, it is unknown what influence smoking may have played.

Environmental factors may be expected to affect cancer rates in males and females similarly, if exposure levels are comparable and there are no reasons to believe there are differences in sensitivity by sex. The fact that lung cancer is not elevated in females argues against environmental exposures to contaminants from the Ringwood Mines/Landfill site as an underlying cause of the increase in lung cancer in males. This analysis of 30 years of cancer incidence in the population living near the Ringwood Mines/Landfill site provides little evidence to suggest that potential exposures to site-related contamination have affected the cancer rate in the community.

The NJDHSS and ATSDR have no further recommendations regarding cancer incidence investigation in relation to the Ringwood Mines/Landfill site.

Public Health Action Plan

The purpose of a Public Health Action Plan (PHAP) is to ensure that a Health Consultation not only identifies public health hazards but also provides a plan of action to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR and NJDHSS to follow up on the plan to ensure that it is implemented. The following are actions undertaken or planned in relation to community concerns about cancer incidence in the population living near the Ringwood Mines/Landfill site:

Public Health Actions Undertaken by NJDHSS and ATSDR

1. A draft Public Health Assessment was completed in 2006, which included an analysis of cancer incidence in the community in the period 1979 through 2002.

2. This Health Consultation includes an updated analysis of cancer incidence for the 30-year period 1979 through 2008.

Public Health Actions Planned by NJDHSS and ATSDR

1. NJDHSS and ATSDR will make copies of this Health Consultation available to concerned residents via the township libraries and the Internet. NJDHSS will notify area residents that this report is available for their review and provide a copy upon request.

2. NJDHSS and ATSDR will continue participation in meetings of the Ringwood Community Advisory Group (CAG) as needed to address health concerns with community representatives.

3. NJDHSS and ATSDR will integrate the findings from this Health Consultation into the final version of the Public Health Assessment for the Ringwood Mines/Landfill site.

Any questions concerning this document should be directed to:

Environmental and Occupational Health Surveillance Program
Consumer and Environmental Health Services
New Jersey Department of Health and Senior Services
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Report Preparation

This Health Consultation for the Ringwood Mines/Landfill Site was prepared by the New Jersey Department of Health and Senior Services under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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Tables and Figure

Table 1.   Population data in the years 2000 and 2010 for the Focus Area[+] in Ringwood Borough, by age group, sex and race (U.S. Census Bureau 2011).

Demographic Characteristic	U.S. Census 2000	U.S. Census 2010
Total	328	287
Sex		
Male	168	141
Female	160	146
Age Group (years)		
0 – 19	116	81
20 – 44	126	102
45 – 69	77	91
70+	9	13
Race		
White	41	44
Black	67	34
American Indian and Alaska Native	154	133
Asian or Pacific Islander	4	0
Multiple Races	47	72
Other/Unknown	15	4

+   Focus Area includes U.S. census blocks 4006, 4007, 4008, 4009 and 4012 (as designated in the year 2000), and U.S. census blocks 2000, 2002 and 2004 (as designated in the year 2010) (see Figure 1).

Note: 1980 and 1990 populations are unavailable by census blocks.

Table 2. Counts of incident cases of malignant cancers, 1979 through 2008, in the Focus Area of Ringwood Borough, by age group and sex.

Demographic Characteristic	Cancer Case Count
Total	32
Sex	
Male	20
Female	12
Age Group (years)	
0 – 44	9
45 – 69	17
70+	6

Note: Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services.

Table 3.   Standardized Incidence Ratio (SIR)[1] results for the incidence of malignant cancers, selected cancer types with two or more cases, in the Focus Area of Ringwood Borough, 1979 through 2008.

Cancer Type	Sex	Observed	Expected	SIR[2]	95% CI
All Cancers Combined	Male	20	16.0	1.25	(0.76 , 1.93)
	Female	12	14.3	0.84	(0.43 , 1.47)
Bladder	Male	<5	NR	1.9	(0.2 , 6.7)
	Female	0	0.32	0.0	--
Colorectal	Male	<5	NR	1.6	(0.3 , 4.5)
	Female	0	1.5	0.0	--
Non-Hodgkin Lymphoma	Male	<5	NR	1.4	(0.02 , 8.0)
	Female	<5	NR	2.0	(0.03 , 11.2)
Lung	Male	9	2.5	3.6*	(1.7 , 6.9)
	Female	<5	NR	0.7	(0.01 , 3.7)
Breast	Female	<5	NR	0.6	(0.1 , 1.9)

[1] The SIR is defined in the Methods section of the text.

[2] Note: *= statistically high, **= statistically low, NR= not reported because observed number of cases less than five (<5).

Data are from the New Jersey State Cancer Registry, New Jersey Department of Health and Senior Services

Figure 1. Focus Area with Ringwood Borough for cancer incidence analysis.