

# Health Consultation

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ANALYSIS OF LUNG CANCER INCIDENCE NEAR  
CHROMIUM-CONTAMINATED SITES IN NEW JERSEY  
(a/k/a Hudson County Chromium Sites)  
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

SUMMARY

SEPTEMBER 30, 2008

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Public Health Service  
Agency for Toxic Substances and Disease Registry  
Division of Health Assessment and Consultation  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

An ATSDR health consultation is a verbal or written response from ATSDR 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 which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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

## Summary

In response to community requests, the New Jersey Department of Environmental Protection (NJDEP) and the New Jersey Department of Health and Senior Services (NJDHSS) evaluated the relationship between historic exposure to chromium from chromium ore processing residue (COPR) sites and the incidence of lung cancer in Jersey City (Hudson County), New Jersey over a 25 year period.

Hudson County was a major center for chromium ore processing and manufacturing. Nearly three million tons of COPR was produced, and much of was used as fill material in construction of residential and commercial sites in the 1950s and 1960s. More than 160 COPR disposal sites have been identified in Hudson County, 136 sites in Jersey City alone. COPR contained high concentrations of total chromium, with small and varying proportions being hexavalent chromium ( $\text{Cr}^{+6}$ ), the most toxic form.  $\text{Cr}^{+6}$  is known to cause lung cancer in humans.

This investigation of lung cancer incidence included the population residing in Jersey City from 1979 through 2003. Annual population estimates were derived from U.S. Census Bureau data. The New Jersey State Cancer Registry in the NJDHSS was used to determine the number of lung cancer cases occurring in the Jersey City population. A total of 3,249 malignant incident lung cancer cases (2,040 males and 1,209 females) were included in this investigation. Lung cancer cases were aggregated by U.S. Census Bureau census block groups, based on the case's residence at the time of diagnosis.

The NJDEP, using historic information on the location of known COPR sites along with their contaminant levels, characterized census block groups as to their potential for residential  $\text{Cr}^{+6}$  exposure in Jersey City. The Appendix to this Health Consultation contains a detailed description of the chromium exposure categorization. For the epidemiological analysis, census block groups were aggregated into "exposure intensity groups" (none, low, or high) based on the proportion of the residential part of the block group within 300 feet of COPR site boundaries. Four alternative definitions were considered for the "high" exposure intensity group.

Data were analyzed two ways. The first approach compared the incidence of lung cancer in Jersey City for the populations classified within each exposure intensity group to cancer incidence for the entire state during the same 25-year time period. The second approach compared the lung cancer incidence in each exposure intensity group in Jersey City over the entire exposure period to the lung cancer incidence in the non-exposed group in Jersey City during the same period. The analyses showed similar results.

Compared to the state, lung cancer incidence in Jersey City was higher than expected in all exposure groups for males and lower than expected in all exposure groups for females.

In both analysis approaches, an increase in the rate of lung cancer incidence was found for populations living in closer proximity to historic COPR sites. Based on the internal Jersey City comparison, males in the high exposure group had a lung cancer incidence rate ranging from 7% to 17% higher than the no exposure group, depending on the definition of high exposure. Similarly, females in the high exposure group had a lung cancer incidence rate ranging up to 10% higher than the no exposure group.

Lung cancer is the second most common cancer diagnosed in both males and females, and is the leading cause of cancer mortality for both sexes in New Jersey and the country. Recent trends indicate that incidence and mortality rates have been declining nationwide for males, but continuing to rise for females. Tobacco smoking is considered the most important risk factor, accounting for more than 85% of all lung cancer deaths. Other known risk factors for lung cancer include indoor exposure to radon and environmental tobacco smoke, occupational exposure to cancer-causing agents in the workplace, and exposure to air pollution. Information on these potential risk factors was not available for analysis in this investigation.

Residential proximity to COPR sites at the time of cancer diagnosis was used as a crude surrogate for exposure potential. However, it is unlikely that all of the residents in the designated areas were exposed to hexavalent chromium from the COPR sites, and those living outside the designated exposed areas may have been exposed to chromium. In addition, no information was available on the residence histories of cases. The consequence of misclassifying true exposure in this investigation is to decrease the chances of seeing differences in incidence rates due to exposure.

Based on the internal comparison within Jersey City, an increased risk of lung cancer incidence was found for populations living in close proximity to historic COPR sites, although the increases were not statistically significant. The results suggest that living closer to COPR sites is a potential risk factor for the development of lung cancer, but these findings do not prove a cause-effect relationship. While the findings are consistent with evidence from occupational health studies, other potential risk factors that could not be accounted for in the analysis cannot be ruled out.

It is important to note that the historic potential exposures described in this investigation do not represent the current conditions in the city, since considerable remediation of the COPR sites has occurred. However, it is recommended that efforts to remediate COPR sites to limit human exposure to hexavalent chromium should continue.

Recent information from the National Toxicology Program indicates that ingestion of  $\text{Cr}^{+6}$  in drinking water increases the risk of oral and small intestine cancers in laboratory animals. A recent study of a Chinese population exposed to  $\text{Cr}^{+6}$  in drinking water provided evidence of an increased risk of stomach cancer. Therefore, the NJDHSS should consider evaluating additional cancer types in relation to proximity to COPR sites.