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Division of Public Health

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**Cluster Investigation for Buncombe County**

**Background**

The Occupational and Environmental Epidemiology Branch (OEE) of the Division of Public Health contacted the North Carolina Central Cancer Registry (CCR) to investigate cancer incidence in the area surrounding the EPA Superfund Site at 273 Mills Gap Road, Asheville, NC 28803. A previous report focused on all cancers in Buncombe County. This report focuses on liver cancer, kidney cancer (which includes cancer of the renal pelvis), and non-Hodgkin lymphoma in a one-mile radius around the area of concern and provides the methods and results of the investigation. These cancers were chosen, based on prior studies that indicate a link between these cancers and trichloroethylene.<sup>1</sup>

**Methods**

In order to be certain that all non-Hodgkin lymphoma, liver cancer, and kidney cancer cases were identified, the CCR used several sources of data. Reporting of cancer cases to the CCR is required of all health care providers. Most reports are received from hospitals, but physicians whose practices include cancer patients who are diagnosed and treated in their outpatient clinics also report cases. In addition, the CCR links its data with death certificate files to be sure that all cancers identified on death certificates are in the CCR database.

The CCR was established in 1986 and the first year of data collected was in 1987. These data came from 14 hospitals in the state and represented less than 50 percent of the cancer cases diagnosed in the state. Between 1987 and 1989, the CCR worked with hospitals across the state to establish reporting procedures and to train hospital staff in the collection of data. In 1990 the CCR became a statewide, population-based registry with all hospitals reporting cases. Since 1990, over 90 percent of the state's cases have been reported to the CCR, and in recent years, that percentage is over 98 percent. Most of the cases that are missed are those that are easily diagnosed and treated as outpatient cases, such as cases of skin and prostate cancer. The CCR has relatively complete data only since 1990. Hence this study is based on all liver, kidney, and non-Hodgkin lymphoma cases reported since 1990.

To evaluate whether there has been greater than expected cancer incidence in the area surrounding the site, we compared the number of cases in the study area with the expected number of cases in the same time period. The procedure used for calculating the expected number of cases for each block group was to apply the age-specific cancer incidence rates for the state to the age-specific populations of the census block groups. This gives an expected number of cases for each age group. These were added to arrive at an expected number for the entire

<sup>1</sup> Siemiatycki J, et al. *Listing Occupational Carcinogens*. Environmental Health Perspectives, Vol. 112, Nov 2004.



census block group; the sums for the census block groups were then added to obtain the overall expected number for the study area.

### Record Selection

A total of 2,296 records with non-Hodgkin lymphoma, liver cancer, and kidney cancer in Buncombe County for 1990-2014, were identified and downloaded for analysis and geocoding. An attempt has been made to either batch or manually geocode each of these records.

Some error has been shown to exist in the County of Diagnosis field. To account for this, an attempt was made to correct possible ZIP code errors based on Address of Diagnosis and City of Diagnosis fields. After removing duplicates from both sets of records and limiting the cases to those within a one-mile radius of the site, 140 records remained and formed the basis of the investigation.

### Study Area

The study area (Figure 1) was delineated with all Census 2010 Block Groups that intersect a one mile radius of 273 Mills Gap Road, Asheville, North Carolina. This study area was determined with the assistance of the Occupational and Environmental Epidemiology Branch of NC Division of Public Health, based on the areas that were previously tested for contamination. NC CCR also used municipal water supply line data provided by the City of Asheville in determining the study area.

The CCR is obligated by law to protect the confidentiality of the data, including protecting the identity of cancer cases. To publish information for areas smaller than a one-mile radius area would make it possible to identify individual cancer cases. The analyses in this report use a study area defined by the census block groups that intersect a one mile radius of the site.

### Geocoding Results

Of the 2,296 records that were analyzed for this investigation, 2218 were geocoded. Of these, 210 did not have street addresses. Street addresses were researched for these records, and were assigned to 12 records for subsequent geocoding. The remaining 198 were geocoded to a ZIP code area centroid. All other cases were geocoded to street level. Of the successfully geocoded records, a total of 140 are within the study area.

## **Results**

Table 1 presents observed and expected incidence in the one-mile study area:

<b>Observed and Expected Cases in Study Area, 1990-2014</b>				
<b>Type of Cancer</b>	<b>Observed</b>	<b>Expected</b>	<b>Observed/ Expected</b>	<b>95% Confidence Interval<sup>2</sup> (Lower, Upper)</b>
NH Lymphoma	81	77	1.05	(0.83, 1.30)
Liver	16	22	0.73	(0.42, 1.19)
Kidney	43	61	0.70	(0.51, 0.95)

<sup>2</sup> 95% confidence intervals were calculated for the observed/expected ratios using the method described in: Standardized Incidence Ratio and Confidence Limits. The National Cancer Institute: Surveillance, Epidemiology and End Results. URL: [http://seer.cancer.gov/seerstat/WebHelp/Standardized\\_Incidence\\_Ratio\\_and\\_Confidence\\_Limits.htm](http://seer.cancer.gov/seerstat/WebHelp/Standardized_Incidence_Ratio_and_Confidence_Limits.htm). Accessed on March 18, 2015.



As shown in Table 1, there were 1.05 times as many observed non-Hodgkin lymphoma cases, 0.73 times as many liver cancer cases, and 0.70 times as many kidney cancer cases. The 95 percent confidence intervals for the ratios of observed to expected included 1.0 for all analyses, with the exception of kidney cancer, in which the upper bound of the confidence interval (0.95) was lower than 1.0. With the exception of kidney cancer, the difference between the observed and expected cases is not statistically significant. For kidney cancer, there is evidence to suggest that the number of observed cases is significantly lower than the number of expected cases. Please note that the statistics for liver cancer are based on a small number of observed cases, which can lead to unstable results. Statistical significance does not imply causation, nor does a lack of statistical significance address the issue of biological relevance.

### **Limitations**

The CCR has no residential, occupational, or medical histories about cases except as they may pertain to an earlier diagnosis of cancer. The CCR uses the county at the time of diagnosis as provided by the diagnosing facility, in addition to geocoding results, to analyze cases by residence. It is recognized that this may not be the relevant address in terms of etiology for a disease with a long latent period, especially given the mobility of many populations. However, since we do not know at what point the disease process that was later diagnosed as a malignant tumor actually began, it is not possible to know what the relevant address is. The focus of the CCR is on cancer surveillance, and hence, we use the address at diagnosis. This approach is consistent with procedures used by all other cancer registries in the United States including the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program, the North American Association of Central Cancer Registries, and the Centers for Disease Control and Prevention. Incidence rates for a chronic disease with a long latent period are useful for disease surveillance, but they may not be good indicators for investigating the etiology of a disease. The CCR also uses the date of diagnosis as provided by the reporting facility to determine in which year to classify each case.

### **Summary**

The results of the investigation indicate that the observed number of non-Hodgkin lymphoma and liver cancer cases all fall within the normal range. The observed number of kidney cancer cases is less than what is expected based on the North Carolina state rate. At this time, there is no evidence of a clustering of cancer cases. Of the cancers we examined that may have a link to exposure to Trichloroethylene, none appear to be present in elevated numbers.



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