

**Review of the Incidence of Cancer Cases among Residents of Rowan
County, North Carolina, and Residents Living Near Industrial
Facilities in Salisbury, North Carolina**

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Summary

To address community concerns about an increased occurrence of cancer, we compared cancer rates among people living within 1 mile of industrial facilities on Jake Alexander Boulevard in Salisbury, North Carolina, with cancer rates among people living in Rowan County for the years 1990–2000. We found the standardized incidence rates for oral cancers and all cancers in the Salisbury area were lower than the Rowan County rates. Because of a request from a former resident of this neighborhood, we also analyzed cancer rates among residents of two specific census block groups—0513031 and 0513032—near the industrial site. When calculated for total cancer, for lymphoma, and for brain cancer, we found the cancer rates in the two census blocks were statistically significantly higher than the rates for residents living within the 1 mile area. But this finding is based on only seven lymphoma cases and six brain cancer cases, and any additional interpretative data (e.g., personal or occupational cancer risks) are unavailable. Thus at this time ATSDR cannot establish any casual relationship between these elevated rates and any contaminant or condition in the test area.

Background

A former resident of Milford Hills, a neighborhood near the industrial facilities, noticed that many area residents had cancer. This resident was concerned that the air and water pollution from a nearby industrial area on Jake Alexander Boulevard might be causing these cancers. The area in question contains a gas fuel processing and shipping plant and an asphalt production and shipping plant. Nearby residents complained of odors and polluted groundwater, and expressed concern that this pollution was causing their illnesses. To respond to this concern, staff from the North Carolina Central Cancer Registry examined the occurrence of selected cancers in that area. In a report entitled “Evaluation of Reported Cluster of Cancer Cases Salisbury, North Carolina,”

Dale Herman found that the age-adjusted incidence rates for 26 different types of cancers observed among residents of Rowan County were either lower than or equal to expected incidence rates. The report explained that the age-adjusted rate for brain cancer within 1 mile of the asphalt plant located on Jake Alexander Boulevard was 1.89 times as many as would be expected when compared with people living in other counties in North Carolina (North Carolina Department of Health and Human Services 2003). Following the release of this report, the petitioner requested further review of the cancer data by the Agency for Toxic Substances and Disease Registry (ATSDR).

Because information describing the specific chemicals and levels of exposure from industrial pollutants was not available, we defined “exposure” as the area within 1 mile of the industrial facilities. We then determined the number of people with the same types of cancer as reported by the North Carolina Central Cancer Registry who lived within 1 mile of the Jake Alexander Boulevard industrial facilities. The census block groups that were examined were 0513031, 0513032, 0513033, 0513034, 505003, 504002, and 0512021. These blocks included all of the neighborhoods within 1 mile surrounding the industrial facilities (Figure 1 & 2).

We estimated the expected number of cases within 1 mile of the facilities by multiplying the Rowan County cancer-specific rates by the estimated number of people living within the prescribed 1 mile area. We estimated the number of people living in that area by applying the proportion of the census block group included within 1 mile area of the plants to the average number of people living in the total area of the census blocks as reported by the Bureau of the Census in 1990 and 2000. We then compared the expected number of cancers to the number of cancer cases reported to the cancer registry and obtained an estimate known as a standardized incidence ratio (SIR).

We then adjusted this and other ratios for age. The ratios for certain gender-specific cancers, such as breast cancer, were adjusted for both age and sex. Adjusting is a way to control for differences in age and sex distribution among populations in two areas, given that cancers occur at different rates as men and women age. When the number of cases of a certain type of cancer was fewer than six in any of the analyzed census blocks, the actual number of cases was not reported, thus reducing the possibility that any persons might be identified.

In addition to the Bureau of the Census data, we also reviewed tax parcel data to verify the appropriateness of using the 1 mile boundary as a measure of exposure and to ensure the study population included a majority of residents who were most likely to be exposed. Block groups 0513031 and 0513032, which can be described as the Milford Hills neighborhood, accounted for 65% of the total number of homes within the 1 mile radius (Table 1). In the census block group 0513031, 100% of the homes contributed to the 1 mile radius. Similarly, 84% of the homes in census block group 0513032 contributed to the study population within the 1 mile area (Table 2).

Results

From 1990 to 2000, among residents living within 1 mile of the industrial facilities, 105 persons developed cancer (Table 3), with lung, breast, prostate, and colon cancers as the most common. This ranking was similar to the cancers diagnosed in the state of North Carolina and in the United States as a whole.

No cancers were found to be statistically significantly elevated among residents living within the 1 mile radius. Oral cancer and total cancer had, however, statistically lower rates.

Despite the small number of cancer cases and the small number of residents, in response to community concerns we also analyzed the rates in two other census block groups: 0513031 and

0513032. The standardized incidence rates indicated that within these two block groups, lymphomas were diagnosed almost five times more often than would be expected in Rowan County residents. Also, brain cancers were diagnosed six times more often than they were in Rowan County (Table 4). That said, however, these results were based on estimates using very few cases (i.e., six brain cancer cases and seven lymphoma cases). While the estimates for the occurrence of many other types of cancer in these two census blocks were elevated, none of their rates were found to be statistically significant.

Conclusion

The results of this cancer data review suggest that persons living within 1 mile of the industrial plants near Jake Alexander Boulevard during 1990–2000 did not have a statistically significant higher rate of cancer than 1) other residents of Rowan County, 2) other residents in the state of North Carolina, or 3) people throughout the United States. The residents of census block groups 0513031 and 0513032, however, did have a statistically significant higher rate of lymphoma and brain cancer than did those who live in Rowan County. For the other types of cancers, the rates among the residents of the two census block groups did not differ statistically from the rates in Rowan County as a whole.

Because data on individual risk factors for developing cancer (e.g., smoking, nutrition, family history), work-related exposures to cancer-causing chemicals, and residency were not available, this analysis cannot explain why the rates of certain cancers among residents of the two block groups appear elevated. Information about the quantities and types of chemicals to which people may have been exposed is unknown as well. Nevertheless, these are all known cancer risk factors, and they could explain the difference in the expected and in the actual number of cancers diagnosed among residents within 1 mile of the Salisbury industrial site.

Additionally, persons reported as living in the study area at the time of the cancer diagnosis may have only recently moved to the neighborhood. It is also possible that persons who once lived in the study area may have moved away before they learned of their cancer diagnosis.

With regard to the findings of lymphoma and brain cancer in the two census blocks, the limited overall number of cases and the lack of information about possible risk factors and chemical exposures weaken any observed statistically significant increase. While the number of lymphoma and brain cancer diagnoses among residents of blocks groups 0513031 and 0513032 from 1990–2000 may have been greater than expected, the results cannot explain how or why these rates may have been elevated. Additionally, the results cannot be generalized to other populations who live near other asphalt or petroleum production and transport facilities.

The cancers diagnosed among the residents living within 1 mile of the industrial facility on Jake Alexander Boulevard may have been related to exposures from the industrial facilities, exposures at the workplace, and exposures at a previous residence. Or they may have been associated with other, unmeasured risk factors such as smoking, diet, or a family history of disease. A review of cancer registry data is not designed to determine whether exposure to the industrial pollutants may have caused these cancers.

ATSDR believes, however, that the data from the North Carolina Central Cancer Registry is complete. As with any registry data, the potential for some missed cases is always present. Still, according to the North American Association of Central Cancer Registries—a professional group that develops and promotes uniform data standards for cancer registration—this registry collects between 90–95% of all diagnosed cancers.

(http://www.naaccr.org/index.asp?Col_SectionKey=12&Col_ContentID=54).

Recommendations

ATSDR scientists will continue to collect data to describe the different chemicals that may be in the area. The North Carolina Central Cancer Registry also plans continued monitoring of the rates at which new Rowan County cancer cases occur.

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Figure 1. Site area map

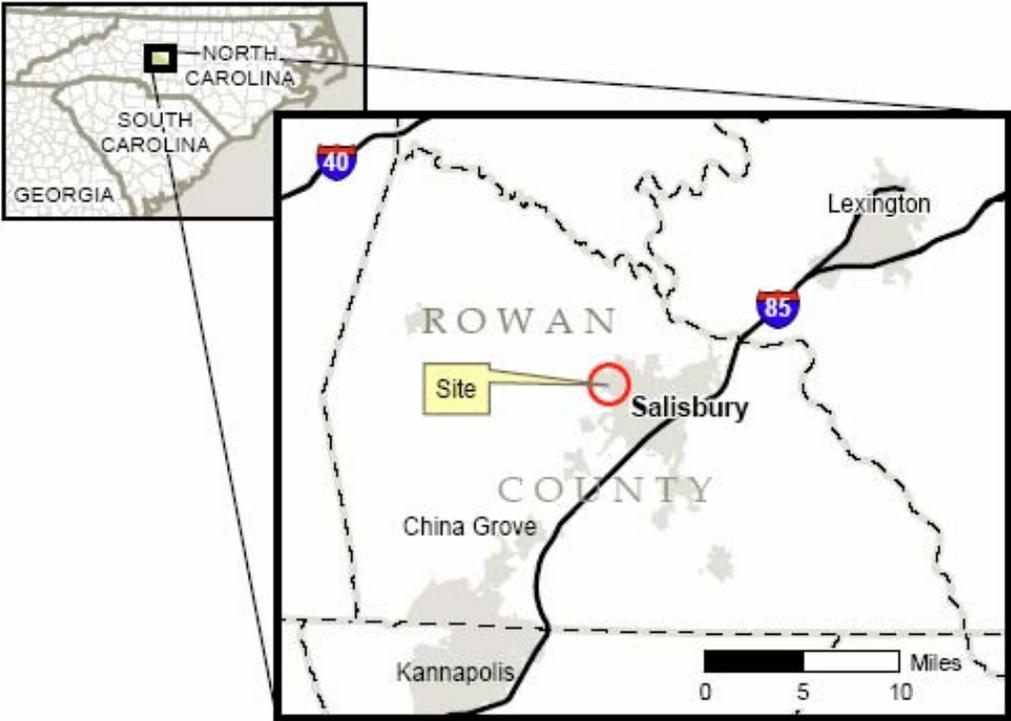


Figure 2. Map of Salisbury, North Carolina, showing residential housing units by census block group

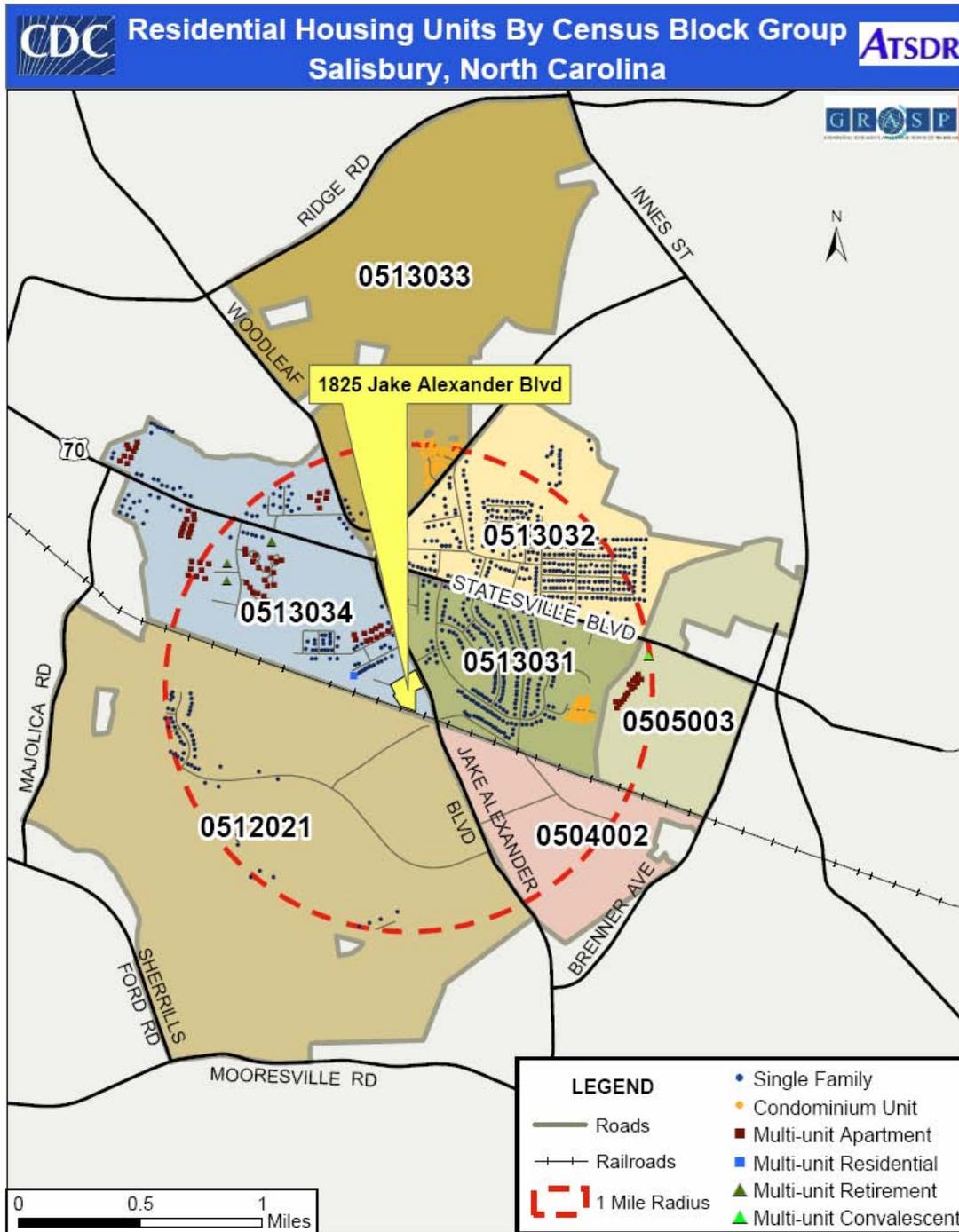


Table 1. Number and Cumulative Percentage of Housing units by Block Group Contained Within the 1-Mile Study Area (Rowan County Tax Parcel Data 2004)

<i>Housing unit by Block Group</i>	<i>Estimated number of housing units in analysis Block Group</i>	<i>Percentage of housing units of Block Group in 1 mile</i>
0504002	0	0%
0505003	16	2%
0512021	55	6%
0513031	300	32%
0513032	306	33%
0513033	77	8%
0513034	176	19%

Table 2. Number and percentage of housing units from Rowan County Tax parcel data by census block group

<i>Housing unit by Block Group</i>	<i>Number of housing units in Census Block Group</i>	<i>Estimated number of housing units in analysis Block Group</i>	<i>Percentage of housing units in analysis Block Group (%)</i>
0513031			
single unit	300	300	100
multiple units	0	0	0
total units	300	300	100%
0513032			
single unit	365	306	84%
multiple units	0	0	0
total units	365	306	84%
0513034			
single unit	106	73	69%
multiple units	70	45	64%
total units	176	118	67%

Table 3. The Number and Percentage of Select Cancers by Primary Tumor Site and Location, 1990–2000

<i>Primary Cancer Site</i>	<i>Number of cases in Rowan County</i> <i>N (%)</i>	<i>Number of cases within 1 mile of asphalt plant</i> <i>N (%)</i>
Bladder	237 (5.0)	6 (5.7)
Brain	100 (2.1)	6 (5.7)
Breast (Female)	724 (15.3)	23 (21.9)
Cervix	83 (1.7)	≤5*
Colon	440 (9.3)	8 (7.6)
Corpus Uteri	129 (2.7)	≤5*
Esophagus	33 (0.7)	≤5*
Hematopoietic	176 (3.7)	≤5*
Hodgkin's Disease	22 (0.5)	≤5*
Kidney	113 (2.4)	0
Leukemia	124 (2.6)	≤5*
Lung	727 (15.4)	12 (11.4)
Lymphoma	175 (3.7)	7 (6.7)
Multiple Myeloma	39 (0.8)	≤5*
Non-Hodgkin's Lymphoma	7 (0.2)	0
Oral	91 (1.9)	≤5*
Ovary	96 (2.0)	≤5*
Pancreas	93 (2.1)	≤5*
Prostate	487 (10.3)	8 (7.6)
Stomach	72 (1.5)	≤5*
All Cancers	4720	105

* When the number of cancer cases of a certain type of cancer was less than six in any of the areas that were analyzed, the actual number of cases is not reported to reduce the possibility that individuals will be identified.

Table 4. Age-Adjusted Standardized Cancer Incidence Rates in the One-Mile Area Surrounding Industrial Facilities on Jake Alexander Boulevard, Salisbury, North Carolina and in Two Specific Census Block Groups, 1990-2000

<i>Site</i>	<i>SIR within 1 mile of asphalt plant</i>	<i>95% confidence interval</i>	<i>SIR Block Groups 0513031 & 0513032</i>	<i>95% confidence interval</i>
Bladder	0.81	(0.30, 1.77)	2.32	(0.75, 5.42)
Brain	1.70	(0.45, 4.33)	6.16	(1.66, 15.78)*
Breast (Female) †	1.13	(0.72, 1.70)	1.39	(0.82, 2.20)
Cervix	0.45	(0.01, 2.49)	0	--
Colon	0.57	(0.25, 1.13)	3.71	(0.76, 3.89)
Corpus Uteri †	0.84	(0.17, 2.46)	1.31	(0.26, 3.82)
Esophagus	2.11	(0.24, 7.62)	3.30	(0.04, 18.38)
Hematopoietic	1.03	(0.33, 2.41)	2.20	(0.44, 6.43)
Hodgkin's Disease	1.68	(0.02, 9.33)	0	--
Kidney	0	--	0	--
Leukemia	0.89	(0.18, 2.60)	2.22	(0.25, 8.01)
Lung	0.57	(0.30, 1.00)	1.40	(0.64, 2.66)
Lymphoma	1.37	(0.55, 2.83)	4.94	(1.80, 10.76)*
Multiple Myeloma	0.85	(0.01, 4.70)	0	--
Non-Hodgkin's Lymphoma	0	--	0	--
Oral	0.12	(0.02, 0.36)*	1.40	(0.02, 7.76)
Ovary †	0.81	(0.09, 2.93)	0.64	(0.01, 3.56)
Pancreas	1.08	(0.22, 3.16)	2.35	(0.26, 8.50)
Prostate †	0.54	(0.23, 1.06)	0.98	(0.42, 1.94)
Stomach	0.44	(0.01, 2.47)	0.44	(0.01, 2.47)
All Cancers	0.77	(0.62, 0.93)*	1.32	(1.07, 1.60)*

* Statistically significant results

† Sex-specific rates

What We Have Learned About Cancer in our Neighborhood

What do I need to know about cancer data to understand these results?

- Cancer registry data does not tell you whether exposure to industrial pollutants caused your cancer.
- Cancer registry data does not contain information about known cancer risk factors (family history, diet, etc.) or the type and amount of chemical exposures. The lack of this information reduces the ability to associate exposures to the development of cancer.
- More information on individual risk factors and exposure are needed to make associations with exposures to cancer.

From 1990 through 2000, how many people were diagnosed with cancer?

- The North Carolina Central Cancer Registry received reports on 105 people who were diagnosed with cancer and who lived within 1 mile of the plants located on Jake Alexander Boulevard in Salisbury, North Carolina, .

What were the most common cancers?

- The most common cancers diagnosed were
 - Lung
 - Breast
 - Prostate
 - Colon

Where any rates elevated within the 1-mile radius of the industrial facilities on Jake Alexander Boulevard?

- No, no cancers were found to be diagnosed at higher-than-expected rates.

- When looking at all of the cancers that were diagnosed, overall fewer cancers were diagnosed than would be expected.
- Oral cancer was one specific cancer that was found to occur less often than expected.

What about the cancer rates among residents of Milford Hills?

- Lymphomas—that is, cancers that begin in cells of the immune system—were diagnosed almost five times more often than would be expected.
- Brain cancers were diagnosed almost six times more often than would be expected.

What does this mean for me?

- Some environmental exposure may have contributed to the increases in cancer rates.
- Without additional information about individual risk factors, exposures, and residency, we do not know why there may be an elevated occurrence of lymphoma and brain cancers.
- Because of the very small number of cancers diagnosed the elevated rates might not be true.
- Continue to make healthy lifestyle choices:
 - Do not smoke
 - Eat nutritious and well-balanced meals
 - Get regular exercise

What additional work is being done?

- ATSDR will continue to assess the different chemicals that may be in the area.
- The North Carolina Central Cancer Registry will continue to monitor the rates of new cancer cases.