

MICHIGAN DEPARTMENT OF COMMUNITY HEALTH
Bureau of Disease Control, Prevention, and Epidemiology

SOUTHWEST DETROIT CANCER INCIDENCE AND MORTALITY REPORT
1999 TO 2008/2009

Statement of the Problem

Residents of Southwest Detroit are concerned about the health effects of pollutants associated with heavy industry in the area. In response to community concerns that exposure to pollutants may have resulted in increased cancer, this investigation focused on cancer incidence (newly identified cancers) and mortality (deaths from cancer) in the four ZIP codes of concern identified by policy makers (48209, 48210, 48216, and 48217) (see Map in *Appendix A*).

Investigation Process

Cancers

The investigation focused on cancers that were potentially related to environmental exposures as determined by Centers for Disease Control and Prevention's Environmental Health Tracking program. These are:

- 1) brain and central nervous system cancer
- 2) female breast cancer
- 3) leukemia
- 4) lung and bronchus cancer
- 5) non-Hodgkin's lymphoma
- 6) thyroid cancer
- 7) urinary bladder cancer.

These cancers and the suspected environmental contaminants associated with them are shown in *Appendix B*. A category labeled "All invasive cancer," which included the specific types above plus all other types reported to the registry, was also examined.

Data Collection

The Michigan Department of Community Health's (MDCH) Division for Vital Records and Health Statistics collects data on newly-diagnosed (incident) cancers statewide. Hospitals and healthcare providers are required to report on all types of cancer diagnosed or treated in Michigan including the cancers listed above. These individual case reports are combined into summary files used for public health and research purposes.*

*For this investigation, information on the cancers listed above that were potentially related to environmental exposures was obtained from *Michigan Resident Cancer Incidence files from 1999 to 2008*.

The MDCH Division for Vital Records and Health Statistics also manages death certificate information. Information on individual deaths, including primary and underlying cause of death, is provided to MDCH by funeral directors, local county registrars, and medical examiners. The attending physician at the time of death must certify the death and specify the type of cancer if cancer was the primary or related cause of death. MDCH has combined individual death reports into statistical files for public health and research purposes.**

The method we used to determine whether or not there was an excess of cancer incidence and mortality in the ZIP codes of concern was to calculate standardized incidence ratios (SIRs) and standardized mortality ratios (SMRs).

This technique allows us to compare the cancer experience of the four ZIP codes and the cancer experience of a comparison population (i.e., general population). The population under study, in this case the four ZIP codes, supplies the “observed” number of cancers. The “expected” number of cases is the number that would occur in the study population if its disease rate was similar to that of a comparison population. Comparing the observed to expected number of cancers results in standardized incidence ratios (SIR) or standardized mortality ratios (SMR).

This technique also allows us to make adjustments for age- and sex- differences between the four ZIP codes and comparison populations. Adjusting for age, for example, is important because populations with more elderly people would have higher numbers of cancers.

Sampling

We chose three comparison communities to provide the greatest likelihood of detecting differences between the cancer experience in the four ZIP codes (48209, 48210, 48216, and 48217) and the comparison populations. The comparison populations were 1) Detroit City minus the four ZIP codes, 2) Wayne County minus Detroit City, and 3) Michigan minus Wayne County.

For calculation of the SIRs and SMRs, the 1999 to 2006 population estimates were based on the 2000 census, while the population estimates from 2007 to 2008 (incidence) or 2009 (mortality) were based on the 2010 census.

The expected number of cancer cases comes from the three comparison populations and uses the age and sex-adjusted incidence of that population. The expected number of cancer cases was then compared to the observed number of cases for the four ZIP codes. Similar calculations were made for mortality cases. Differences between the four ZIP codes and the comparison areas were considered significant if the likelihood that the difference was due to chance was less than 5%.

** For this investigation we used the *Michigan Resident Death files from 1999 to 2009* to identify the number of persons dying from the incident cancers noted above.

Findings

In general, we found little or no difference in the patterns of cancer experience for most of the cancers in the four ZIP codes when compared to the City of Detroit and Wayne County.

The standardized incidence ratios (SIRs) for the four ZIP codes individually and combined were calculated for the selected cancers and are presented in Sections A, B, and C of Table 1.

In Section A, the comparison community is Detroit minus the four ZIP codes. Here we see no consistent elevation in the incidence ratios among the different cancers or within the ZIP codes. Sporadic elevations are seen for brain (ZIP code 48210) and bladder (ZIP code 48209). Generally, these findings indicate that the cancer experience in the ZIP codes is similar to that in other parts of Detroit. All cancer and breast cancer were significantly lower in two ZIPs and in the combined ZIPs, suggesting that these cancers are found less often in the four ZIP codes.

Table 1A.
Standardized incidence ratios, by ZIP code and cancer, SW Detroit, 1999-2008

AREA	Ratios using Detroit minus 4 ZIP codes as the comparison community							
	All CA	Brain	Female Breast	Leukemi a	Lung & Bronchus	Non-H Lymph	Thyroid	Bladder
4 ZIPs	0.89 ^c	1.15	0.84 ^c	1.08	1.03	1.07	0.88	1.09
48209	0.79 ^c	0.62	0.66 ^c	1.21	1.01	0.87	0.90	1.53^a
48210	0.92 ^c	1.71^b	0.81 ^d	0.82	1.07	1.13	0.68	0.77
48216	0.90	0.77	0.88	0.97	0.93	1.12	1.62	1.13
48217	1.05	1.15	1.24	1.45	1.05	1.36	0.95	0.99

^a Ratio of observed to expected was significantly greater than 1.00 (p<0.01)

^b Ratio of observed to expected was significantly greater than 1.00 (p<0.05)

^c Ratio of observed to expected was significantly less than 1.00 (p<0.01)

^d Ratio of observed to expected was significantly less than 1.00 (p<0.05)

When the ZIP codes are compared individually and as a group to a population that consists of Wayne County minus Detroit, none of the SIRs show a significant elevation (Table 1, Section B). This means that the cancer experience of the ZIP codes is similar to that of Wayne County residents residing outside of Detroit.

Table 1B.
Standardized incidence ratios, by ZIP code and cancer, SW Detroit, 1999-2008

AREA	Ratios using Wayne County minus Detroit as the comparison community							
	All CA	Brain	Female Breast	Leukemia	Lung & Bronchus	Non-H Lymph	Thyroid	Bladder
4 ZIPs	0.88 ^a	0.67 ^b	0.76 ^a	0.80 ^b	1.03	0.79 ^a	0.58 ^a	0.62 ^a
48209	0.78 ^a	0.36 ^a	0.60 ^a	0.91	1.03	0.66 ^b	0.58 ^b	0.86
48210	0.90 ^a	1.00	0.73 ^a	0.61 ^a	1.06	0.82	0.45 ^a	0.44 ^a
48216	0.90	0.46	0.79	0.74	0.95	0.84	1.07	0.64
48217	1.03	0.70	1.11	1.08	1.01	0.92	0.68	0.57 ^b

^a Ratio of observed to expected was significantly less than 1.00 (p<0.01)

^b Ratio of observed to expected was significantly less than 1.00 (p<0.05)

The cancer experience in the ZIP codes was also compared to the population of Michigan that excluded Wayne County (Table 1, Section C). We again see a few sporadic elevations. The only consistently elevated SIRs were for cancers of the lung and bronchus where three of the four ZIP codes had SIRs that were higher than expected. This means that three of the four ZIP codes have experienced significantly more cancer of the lung and bronchus than the rest of Michigan outside of Wayne County.

Table 1C.
Standardized incidence ratios, by ZIP code and cancer, SW Detroit, 1999-2008

AREA	Ratios using Michigan minus Wayne County as the comparison community							
	All CA	Brain	Female Breast	Leukemia	Lung & Bronchus	Non-H Lymph.	Thyroid	Bladder
4 ZIPs	0.97	0.68 ^d	0.77 ^c	0.89	1.27 ^b	0.84 ^c	0.62 ^c	0.65 ^c
48209	0.86 ^c	0.36 ^c	0.60 ^c	1.00	1.26 ^a	0.71 ^d	0.61 ^d	0.90
48210	0.99	1.01	0.74 ^c	0.68 ^d	1.31 ^a	0.88	0.48 ^c	0.46 ^c
48216	0.99	0.47	0.80	0.83	1.18	0.89	1.14	0.67
48217	1.14 ^a	0.71	1.13	1.22	1.25 ^b	0.97	0.76	0.60

^a Ratio of observed to expected was significantly greater than 1.00 (p<0.01)

^b Ratio of observed to expected was significantly greater than 1.00 (p<0.05)

^c Ratio of observed to expected was significantly less than 1.00 (p<0.01)

^d Ratio of observed to expected was significantly less than 1.00 (p<0.05)

Additional Findings

We also looked at deaths from these selected cancers and all cancers combined (Table 2: Sections A, B, and C). What the information in Section A of Table 2 shows us is that the cancer mortality experience of the four ZIP codes is similar to the rest of Detroit. When the comparison population is Wayne County outside of the city of Detroit, we see sporadic elevations in 48210 for lung and bronchus and for all cancers (Table 2 B). Deaths from all cancers combined were also elevated in the combined ZIP codes.

Table 2A.
Standardized Mortality Ratios, by ZIP code and cancer, SW Detroit, 1999-2008

AREA	<u>Ratios using Detroit minus 4 ZIP codes as the comparison community</u>							
	All CA	Brain	Female Breast	Leukemia	Lung & Bronchus	Non-H Lymph.	Thyroid	Bladder
4 ZIPs	0.90^b	1.30	0.69^b	1.02	0.97	1.15	1.13	0.98
48209	0.81^b	1.11	0.33^b	1.08	0.96	1.04	0.00	1.39
48210	0.97	1.62	0.86	0.96	1.01	0.90	1.92	0.84
48216	0.70	0.00	0.63	0.71	0.73	1.58	0.00	0.47
48217	1.00	1.54	0.99	1.11	0.98	1.74	1.75	0.79

^a Ratio of observed to expected deaths was significantly greater than 1 (p<0.01)

^b Ratio of observed to expected deaths was significantly less than 1 (p<0.01)

AREA	<u>Table 2B.</u> <u>Ratios using Wayne County minus Detroit as the comparison community</u>							
	All CA	Brain	Female Breast	Leukemia	Lung & Bronchus	Non-H Lymph.	Thyroid	Bladder
4 ZIPs	1.12^a	0.89	0.94	0.99	1.12	0.80	0.85	0.90
48209	0.79	0.79	0.46 ^b	1.09	1.14	0.77	0.00	1.28
48210	1.20^a	1.12	1.17	0.93	1.17^a	0.62	1.40	0.78
48216	0.89	0.00	0.88	0.71	0.87	1.14	0.00	0.43
48217	1.19 ^a	0.99	1.29	1.04	1.09	1.08	1.45	0.73

^a Ratio of observed to expected deaths was significantly greater than 1 (p<0.01)

^b Ratio of observed to expected deaths was significantly less than 1 (p<0.01)

Section C of Table 2 shows that two of the four ZIP codes (48209 and 48210) have cancer deaths due to lung and bronchus cancers that are elevated (1.25 and 1.28, respectively) when compared to residents of Michigan minus Wayne County. This was not observed for 48217.

Table 2C.

Ratios using Michigan minus Wayne County as the comparison community

AREA	All CA	Brain	Female Breast	Leukemia	Lung & Bronchus	Non-H Lymph.	Thyroid	Bladder
4 ZIPs	1.15^a	0.82	1.00	0.98	1.22^a	0.80	0.77	0.84
48209	1.06	0.72	0.49^b	1.07	1.25^a	0.77	0.00	1.19
48210	1.24^a	1.04	1.24	0.92	1.28^a	0.62	1.29	0.72
48216	0.92	0.00	0.94	0.70	0.95	1.15	0.00	0.40
48217	1.22^a	0.94	1.38	1.04	1.19	1.07	1.27	0.68

^a Ratio of observed to expected deaths was significantly greater than 1 (p<0.01)

^b Ratio of observed to expected deaths was significantly less than 1 (p<0.01)

Because of the elevated SIRs, we chose to look more closely at trends in lung and bronchus cancer (Figure 1). Both SIRs and SMRs decreased from 1999 to 2004. After that there were a few spikes for incidence and mortality. The most recent SIR or SMR were at or above the earliest values (1999).

Since we also observed an increase in mortality due to all cancers in the four ZIP codes when compared to Michigan minus Wayne County, we did a similar time trend analysis for all cancers (Figure 2). In general there was a gradual decline in both SIRs and SMRs from 1999 through 2004. This was followed by increases which peaked in 2007 and then declined, but at values that were at (SMRs) or above (SIRs) the 1999 values. Thus for both lung and all cancers, the overall trends were for decreasing values from 1999 through 2004 followed by increases and decreases through 2008 (SIR) or 2009 (SMR). A visual inspection of other significant cancers, including brain and bladder, over time did not reveal any trends.

Figure 1. SW Detroit Lung SIRS SMRS
 Four ZIP Codes vs Michigan - Wayne County

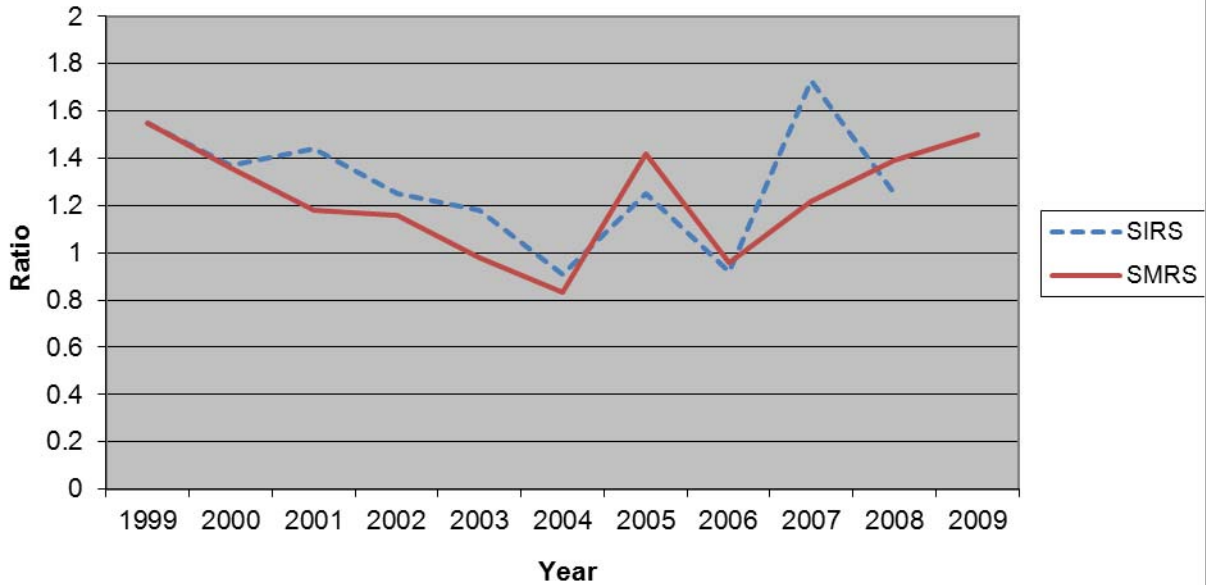
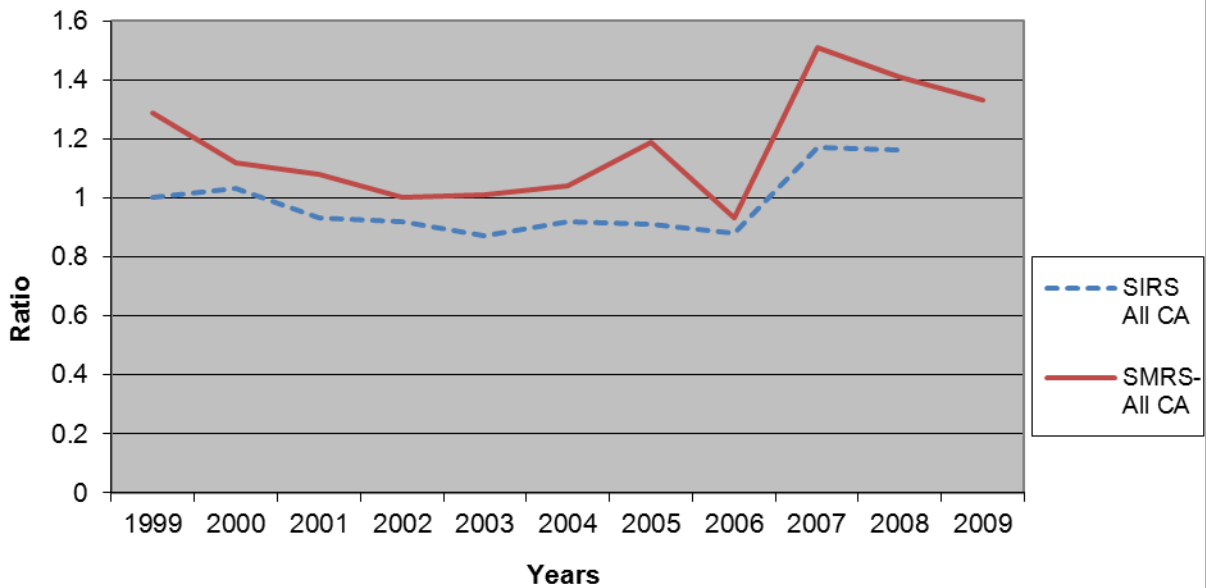


Figure 2. SW Detroit All Cancer SIRS SMRS
 Four ZIP Codes vs Michigan - Wayne County



Conclusions

- Overall there were few significant increases in cancer incidence or mortality from 1999 to 2008 or 2009 in the four ZIP codes compared to the other Michigan communities. In most cases the SIRs and SMRs in the ZIP codes are similar to the comparison communities cancer experience.
- The only exceptions were cancers of the lung and bronchus and all cancers where there were elevations in the incidence and mortality compared to Michigan minus Wayne County. The time trend analyses suggest slight decreases for both, followed by increases. The variations may also reflect our inability to understand population movement in these areas.
- The elevations in cancers of the lung and bronchus seen when Michigan minus Wayne County is the comparison community may have many causes, including tobacco smoking, excessive alcohol drinking and exposure to radon, asbestos, and/or workplace chemicals (Mayo Clinic ***). While tobacco smoking decreased in both Michigan and in the Detroit area from 1999 through 2009, tobacco smoking in the Detroit area was about 6% higher than in Michigan during the same period. This may in part explain the higher incidence and mortality due to cancer of the lung and bronchus in SW Detroit compared to Michigan. If the 1970s and 80s had similar patterns, then tobacco use may be influencing the lung and bronchus findings.
- While the category “all invasive cancers” includes lung and bronchus, it also includes other cancers that were not identified in the reports. These may include cancers not likely to be related to environmental exposures, such as hereditary cancers.
- Finally, it is also important to note that the majority of the SIRs for the four ZIP codes were decreased or at the same levels as the comparison communities suggesting little increased cancer risk for the four ZIP codes overall. These observations are supported by the declining incidence rate (number of new cases/100,000 residents) of cancer of the lung and bronchus from 105.0 in 1999 to 2001 to 85.2 in 2001 to 2008 (data not shown).

Cancer is likely to be caused by a combination of factors that act together over many years. These factors can include features of our lifestyle, genetics, and exposure to cancer-causing agents (carcinogens). There are many different carcinogens including viruses, medicines, and chemicals, and the various factors can modify each other over many years in ways that are not well understood. Even so, the American Cancer Society (ACS) estimates that 30% of cancer could be prevented by eliminating tobacco use. In terms of other chemical exposures, the ACS estimates that exposure to chemicals in workplaces accounts for about 4% of cancer and exposure to pollutants in non-work settings accounts for about 2%.

Cancers today are usually related to events that happened many years ago. There are

*** <http://www.mayoclinic.com/health/lung-cancer/DS00038/DSECTION=risk-factors>

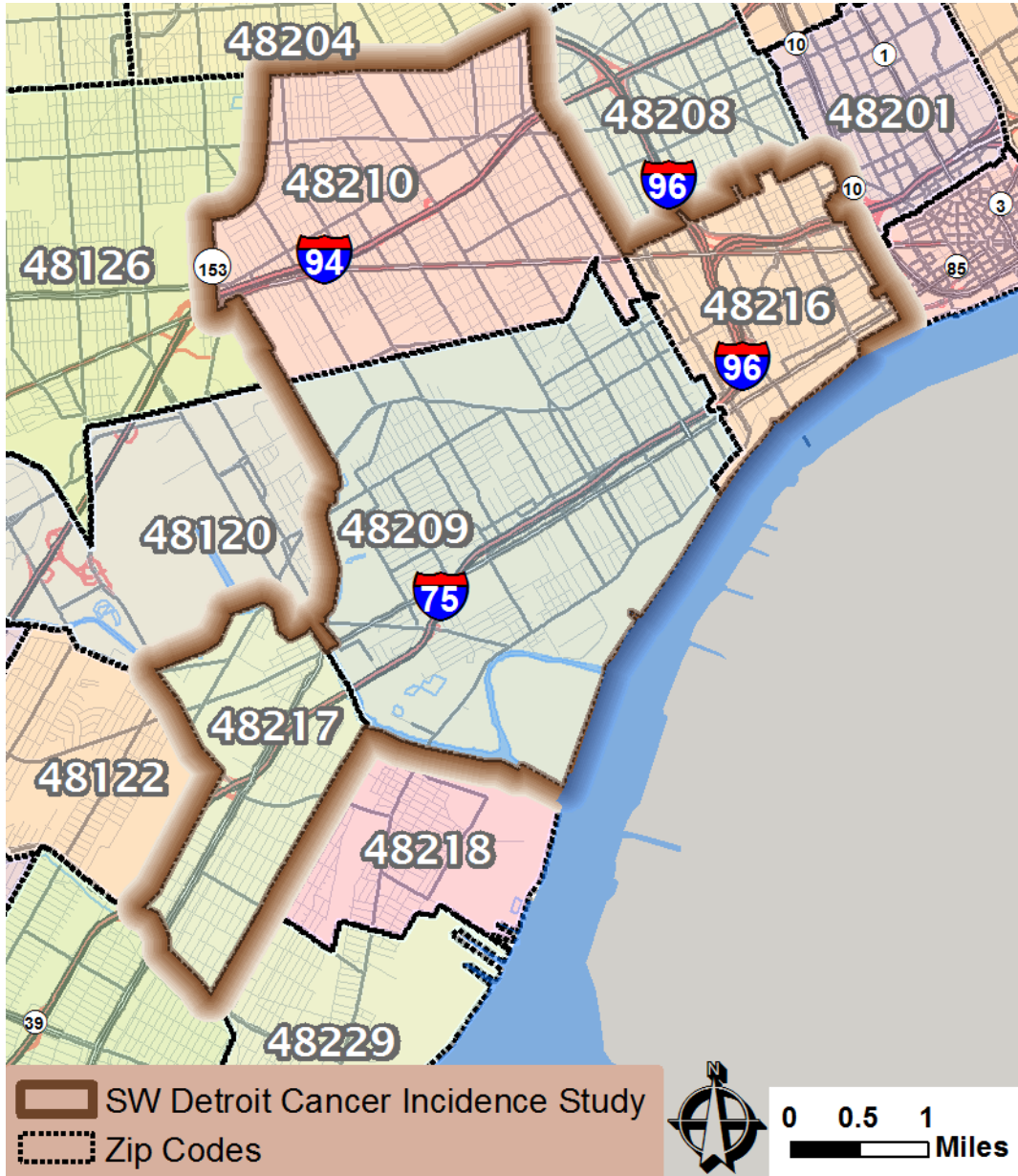
generally many years between an exposure to a carcinogen and a diagnosis of cancer. The time lag between a possible exposure and the development of cancer makes it difficult to track what caused the cancer. Even if a chemical in the environment caused the cancer, the chemicals in the environment today can be very different from those in the environment many years ago when the cancer-causing exposure occurred.

Recommendations

MDCH will continue to promote cancer screening and tobacco cessation programs as smoking tobacco is a known risk factor for lung and cancer of the bronchus. Michigan Department of Environmental Quality (MDEQ) will continue to work with communities on air pollution monitoring issues and will assist communities in interpretation of the results of air monitoring studies currently underway at Marathon Refineries, which is located in the 48217 ZIP code area.

Appendix A

MAP OF FOUR ZIP CODE AREA



Appendix B

CANCERS MOST LIKELY TO BE RELATED TO ENVIRONMENTAL EXPOSURES*

Cancer site	Reasons for concern ^{1,2}
Breast	Breast cancer is the most commonly diagnosed cancer among women. Some breast cancers are known to respond to hormone levels in women's bodies, and a variety of persistent chemicals such as DDT, PCBs, and dioxin have the potential to alter hormone activities in people.
Lung and bronchus	Lung cancer is the leading cause of cancer death in the United States. Occupational exposure to certain metals, polycyclic aromatic compounds, and vinyl chloride have been associated with lung cancer. Certain types of air pollution have also been associated with this disease.
Bladder	Occupational exposures to truck exhaust and compounds used in the textile and leather dye industries have been associated with bladder cancer.
Brain and other nervous system	Occupational exposures to radiation and a variety of metallic, petrochemical, and organic compounds have been associated with brain cancer. There is some concern that children may be at risk when their parents are exposed to these substances, particularly during pregnancy.
Thyroid	Increases in risk for thyroid cancer have been observed with exposure to ionizing radiation.
Non-Hodgkin lymphoma	Rates of this disease have increased dramatically over the last few decades, although no reasons for this increase have yet been found.
Leukemia	Rates of various forms of leukemia are increasing among children, although the reasons for this are not known. Exposure to ionizing radiation, benzene, and some agricultural chemicals has been associated with increased risk.

¹Centers for Disease Control and Prevention's Environmental Health Tracking program. URL: http://www.ehib.org/page.jsp?page_key=143#cancer_environmentaldisease.

²Irigaray P, Newby JA, Clapp R, Hardell L, Howard V, Montagnier L, Epstein S, Belpomme D. Biomed Pharmacother. Lifestyle-related factors and environmental agents causing cancer: an overview. Biomed Pharmacother. 2007;61(10):640-658.