

Division of Chronic Disease, Primary Care and Rural Health



Martinsville Cancer Inquiry Report 2024



Summary

Background

The Indiana Department of Health opened a cancer cluster investigation for Martinsville, Indiana, in March 2024, at the request of a researcher from University of Illinois Chicago. The researcher contacted IDOH for data from the Martinsville Cancer Incidence Study, which was part of a larger Purdue based study titled “*Assessing and Addressing Community Exposures to PCE Contamination*”.

Methods

The Centers for Disease Control and Prevention (CDC) and the National Cancer Institute (NCI) define a cancer cluster as a greater than expected number of the same or etiologically-related cancer cases that occurs within a group of people in a geographic area over a defined period of time.¹ IDOH follows the statistical methods outlined in the CDC’s Guidelines for Examining Unusual Patterns of Cancer and Environmental Concerns.²

Results

The results do not show evidence of a cancer cluster. Where a statistically significant* higher rate is shown, no conclusions regarding causation can be drawn from this report. Morgan County has a history of having one of the highest rates of cancer of any county in Indiana. This makes it difficult to distinguish whether any high rates in Martinsville are due to Morgan County having high rates or if it’s possible Martinsville having high rates causes Morgan County’s elevated rates. This analysis does not resolve this issue. To attempt to distinguish these rates, all analysis conducted for this report was conducted for both Morgan County and the Martinsville ZIP code. It can be deduced that if Martinsville has a statistically significantly high rate of a specific type of cancer, but Morgan County does not have a high rate then the high rate is specifically for Martinsville, but if both are high it could be simply due to the high rates of Morgan County effecting towns within Morgan County. For example, due to the highly correlated relationship between lung cancer and tobacco use it is difficult to find a cancer cluster of lung and bronchus cancer related to a specific environmental exposure.

Cancer Surveillance and Data

The Indiana State Cancer Registry was established in 1986 due to a law mandating that beginning in January 1987 all reportable cancers must be reported to the Indiana State Cancer Registry. This means that since 1987 the Indiana State Cancer Registry has collected every single case of reportable cancer from hospitals, clinics, labs, and other entities. This database is extensive with data that covers the patient from first diagnosis of cancer through death. Information on patient demographics, diagnosis data, and treatment information is collected. The cancer registry staff at IDOH work to collect this data and ensure quality control.



*Statistically Significant: The determination that a result or an observation from a set of data is due to intrinsic qualities and not random variance of a sample. Statistical significance does not imply the size, importance, or practicality of an outcome; it simply indicates that the outcome’s difference from a baseline is not due to chance. <https://www.britannica.com/topic/statistical-significance>

The IDOH Cancer Section analyzes all available cancer data including the data available through the Indiana State Cancer Registry. Some of this analysis can be found in the [IDOH Fact Sheets](#) and is available by request to the IDOH Cancer Section at cancer@health.in.gov.

The complex nature of cancer makes it difficult to identify, interpret and address cancer clusters. Cancer is a term used to describe more than 100 different diseases that share a similar characteristic: uncontrollable growth and division of the body's cells. Each type of cancer has its own risk factors and causes.¹ This is why true cancer clusters rarely involve more than one type of cancer. In most cases, identified cancer clusters must have one of the following characteristics:

- There are several cases of a rare type of cancer.
- There are greater-than-expected numbers of a more common type of cancer.
- It is a type of cancer that is not usually seen in a certain group of people (e.g. children with a type of cancer usually seen in adults).²

Confirmation of cancer cluster does not mean that there is a known cause or hazard. A confirmed cancer cluster could be the result of chance (random events with no known cause), miscalculation of the expected number of cases, differences in the case definition between observed cases (actual number of cases) and expected cases (the rate that cancer normally occurs), known causes of cancer (e.g. high smoking rates), and unknown cause(s) of cancer. Follow-up investigations can be done but can take years to complete, and the results are typically inconclusive (i.e., usually no cause is found).²

IDOH takes every report of a suspected cancer cluster seriously. While the steps are similar, each investigation is slightly different, based on the type of cancer, number of cases involved and other factors. IDOH also wants to make it clear that regardless of whether or not an inquiry results in a confirmed cancer cluster or not that we understand that each cancer case represents a family or a loved one and that even if statistical significance is not found that these cases are still important.

Background

In March 2024, a researcher from University of Illinois Chicago contacted IDOH looking for data for the Martinsville Cancer Incidence Study, which was part of a larger Purdue based study entitled "*Assessing and Addressing Community Exposures to PCE Contamination*". The italicized information below has been provided here verbatim as part of the original research request detailing the background and scope of the cancer concern:

Martinsville, IN is a community that overlays several known groundwater contamination sites or plumes, including a U.S. Environmental Protection Agency (EPA)-designated Superfund site (US EPA, no date). The total size of the groundwater contamination is over 60 acres, all in the same aquifer. The contaminants are chlorinated volatile organic compounds, primarily tetrachloroethylene (PCE) and trichloroethylene (TCE), and their



degradation products such as vinyl chloride. The possible sources of contamination are several dry cleaning and metal degreasing operations (US EPA, no date.; ATSDR, no date).

In 2002, the City of Martinsville Water Utility, providing drinking water to 15,000 people, detected PCE in one of the source water wells. An activated carbon filtration system has been in operation since 2005 to remove PCE from the municipal water. However, it is not known how long Martinsville community water was contaminated prior to 2002.

The ATSDR published a Health Consultation in 2019 that concludes that people's health may be harmed by breathing indoor air contaminated via vapor intrusion, the migration of volatile compounds from contaminated groundwater and soil into buildings above (ATSDR, no date; US EPA, 2018). PCE is an organic solvent that is widely used for dry cleaning, metal-degreasing, and synthesizing other chemicals. PCE is classified as a probable human carcinogen (Group 2A) by the International Agency for Research on Cancer and a reasonably anticipated human carcinogen by National Toxicology Program (IARC, 2014; NTP, 2021). TCE is a known human carcinogen, with increased risk for kidney and liver cancer and non-Hodgkin lymphoma, while PCE exposure has been shown to increase the risk of bladder cancer, multiple myeloma and non-Hodgkin's lymphoma (Cocco et. Al., 2013; Cohn et.al., 1994; Costantini et. al., 2008; Hansen et. al., 2001; IARC, 2014; Karimi et. al., 2012; Kim et. al., 2014; Mandel et. al., 2006; McLaughlin and Blot, 1997; Purdue et. al., 2011; Vlaanderen et. al., 2013; Wartenberg et. al., 2000; Weiss 1996; Vlaanderen et. al., 2014). Vinyl chloride, a known carcinogen, is associated with angiosarcoma of the liver, hepatocellular carcinoma, lung cancer and neoplasms of connective and soft tissues (Chien et. al., 2012; Fedeli et. al., 2019; Mundt et. al., 2000, 2017; Ward et. al., 2001).

Martinsville is located in Morgan County, which has the highest age-adjusted total cancer incidence rate of all counties in Indiana for 2013-2017. Further, age adjusted incidence of prostate, female breast and lung cancer are significantly higher in Morgan County compared to the overall Indiana rates. Overall, site-specific cancer incidence rates for Martinsville are not publicly available. Martinsville, the largest city in Morgan County, is a community of 11,000 residents and 4,600 households with a high poverty rate and low education level (US Census Bureau, 2020).

Based on information gathered from focus groups we conducted, there is a wide spectrum of awareness about the groundwater contamination in the community. While some residents know little about the contamination, those who know are deeply worried about their exposure and believe their health has been impacted, with the primary concern being cancer as well as concerns about diabetes, hypertension, autoimmune diseases, drug abuse, and mental health. Given the known high cancer incidence rates in Morgan County, long-term exposure of the community to probable and known carcinogens through groundwater contamination, and community concerns about the contamination and local cancer rates, we propose an investigation of cancer incidence rates in Martinsville by leveraging surveillance data from the Indiana State Cancer Registry (ISCR).

After discussion with IDOH, the researcher decided to request a cancer cluster investigation. This was decided due to the amount of experience IDOH has with cancer cluster investigations, ensure appropriate data analysis and interpretation, and to protect patient privacy and data



security. Cancer cluster investigations include a formal data analysis process that is conducted by the IDOH Cancer Inquiry Team. This team is comprised of members of IDOH Cancer Section, IDOH Environmental Health, and the Indiana Department of Environmental Management (IDEM). The remainder of this report details the findings from the cancer cluster inquiry investigation.

Pike and Mulberry Streets PCE Plume Superfund Site in Martinsville

A brief background provided by IDEM is here and additional information about ongoing work in the area can be found in the 'Other Resources' section below.

The Pike and Mulberry Streets PCE Plume Superfund Site in Martinsville, Indiana, addresses groundwater and soil vapor contamination from industrial solvents, primarily tetrachloroethylene (PCE) and trichloroethylene (TCE). These contaminants, used in dry cleaning and metal degreasing operations, have impacted an area of approximately 60 acres, affecting the aquifer that supplies drinking water to the city's residents.

Historical contamination is linked to several sources, including the former Master Wear dry cleaning facility, which operated from 1986 to 1991. The IDEM responded to this issue by removing hazardous waste drums from the facility in 1992 and conducting investigations from 1996 to 1999. In 2002, elevated PCE levels were detected in one of Martinsville's municipal wells, leading to its temporary closure. To address this, a granular activated carbon (GAC) treatment system was installed in 2005 to ensure safe drinking water.

In 2013, the site was added to the EPA's National Priorities List (Superfund) due to the contamination risks. The EPA, in collaboration with IDEM, developed a comprehensive cleanup plan issued in 2021. This plan includes continued operation of the GAC system, in situ treatment of groundwater near the contamination source, and installation of vapor intrusion mitigation systems (VIMS) in affected buildings.

The Agency for Toxic Substances and Disease Registry (ATSDR) has also evaluated the site. In its health consultation, the ATSDR concluded that long-term exposure to PCE and TCE may pose health risks. The contaminants can enter buildings as vapors, leading to exposure through inhalation.

Besides the Pike and Mulberry streets site, Martinsville has separate areas of environmental concern. IDEM has identified and is addressing several sites within the city but outside of the EPA Superfund plume where groundwater and soil contamination exist.

Community engagement and transparency are key components of the ongoing remediation



efforts. The EPA and IDEM conduct regular public meetings, provide educational resources, and maintain open communication channels with residents to ensure they are informed and involved in the cleanup process. These measures aim to mitigate health risks and restore environmental safety for Martinsville residents.

Please email IDEM Site Manager Doug Petroff at DPetroff@idem.IN.gov, for more information on the remediation efforts. The collaboration between federal and state agencies reflects a strong commitment to addressing and resolving the environmental challenges in Martinsville.

Methods

The Centers for Disease Control and Prevention (CDC) and the National Cancer Institute (NCI) define a cancer cluster as a greater than expected number of the same or etiologically related cancer cases that occurs within a group of people in a geographic area over a defined period of time.¹ Clusters are typically limited to one type of cancer or a rare form of it, or a type of cancer that strikes people at an age when they usually are not at risk. If there is a cancer cluster based on a statistically excessive number of cases, it doesn't necessarily mean that the cancers are caused by something unique within the area. Clustering of cases of cancer can happen by chance. While this investigation may show a statistical increase in cancer in this area, this does not prove causality. According to the National Cancer Institute, U.S. state health departments receive more than 1,000 suspected cancer cluster reports each year with fewer than 1 percent of those reported able to be linked to a possible exposure or a clear source.

IDOH follows the statistical methods outlined in the CDC's Guidelines for Examining Unusual Patterns of Cancer and Environmental Concerns.² As it is still unknown when the exposure started, the original request was for 20 years of retrospective data in five-year increments. While the original request was to find a comparison population to compare the area of concern to, as it is impossible to be sure that any comparison area doesn't also have unknown environmental exposures, Indiana was used as the comparison population. This is the standard methodology utilized by IDOH for these investigations. When investigating possible cancer clusters, it is typical to narrow down the concern to the same or etiologically related cancer cases; however, with this request, the interested citizens wanted to investigate many types of cancer to see what impact the environmental concern may have on different types of cancer. These types of cancer were organized in two groups: Those known to be related to TCE, PCE, and vinyl chloride environmental exposures and other requested types of cancer. While analysis was done for the other types of cancer as it was a part of the request and is thus within the results, these are considered separate from the cancer cluster inquiry regarding TCE-, PCE- and vinyl chloride-related cancers. Tables 1 and 2 consist of results regarding TCE-, PCE- and vinyl chloride-related cancers and Tables 3 and 4 consist of results from the other requested types of cancer.

All cancer data for this investigation are pulled from the Indiana State Cancer Registry (ISCR). In 1985, the State of Indiana passed Public Law 174-1985 establishing a cancer registry which means that since January 1987 the ISCR has collected every reportable case of cancer from all hospitals, clinics, labs etc. For the means of this report, the geographic boundaries of



Martinsville as the area of concern are any cases that were diagnosed with a residence at diagnosis within the ZIP code of 46151. The period of data utilized for this investigation included cases diagnosed between 2000 and 2019. The original request included 2020 data, but unfortunately 2020 ISCR data is still considered incomplete and thus could not be utilized. Age-adjusted rates were calculated at the Indiana, county, and ZIP code level to view the level of cancer in the county compared to Indiana. These rates can be found in Table 1 and Table 3.

The county of concern is Morgan County. Because chances of being diagnosed with cancer increase as an individual gets older, it is standard to age-adjust cancer rates to the U.S. Standard 2000 population to compare rates across different populations. Population data was unavailable at the ZIP code level prior to 2007 so calculating any analysis at the ZIP code level prior to this was not feasible. These are marked as Not Available (NA) on the tables. Standardized incidence ratios (SIRs) were then calculated for the county as well as the ZIP code of concern. An SIR is an estimate of the occurrence of cancer in a population relative to what might be expected if the population had the same cancer experience as the larger comparison population. In this case that larger population is all of Indiana. SIR results can be found in Table 2 and Table 4.

As can be seen in the tables, case counts of fewer than five are suppressed to protect against patient identifiability. Rates and SIRs are considered statistically significant if they have a p-value less than 0.05. Any rate that is based on a count of fewer than 20 is considered statistically unstable.

As previously mentioned in the researcher's provided background, Morgan County has a history of having one of the highest rates of cancer of any county in Indiana. This makes it difficult to distinguish whether any possible high rates in Martinsville are due to Morgan County having high rates or if Martinsville having possible high rates is causing Morgan County as a whole to have elevated rates. This analysis does not resolve this issue. To attempt to distinguish these rates, all analysis conducted for this report was conducted for both Morgan County and the Martinsville ZIP code. It can be deduced that if Martinsville has a statistically significantly high rate of a specific type of cancer, but Morgan County does not have a high rate then the high rate is specifically for Martinsville, but if both are high it could be simply due to the high rates of Morgan County effecting towns within Morgan County. For example, due to the highly correlated relationship between lung cancer and tobacco use it is incredibly difficult to find a cancer cluster of lung and bronchus cancer related to a specific environmental exposure. Morgan County has statistically significantly high rates of lung and bronchus cancer at multiple analyzed periods.

There are limitations to this analysis. Population data was not available at every level of interest. Also, the process and specificity of cancer data that is reported to the ISCR from hospitals and physicians has not been consistent in the past 20 years making it complicated to compare data from 2000 to 2019. Finally, due to the way that address at diagnosis is recorded within the ISCR and the way that population data is calculated, the area of concern of Martinsville had to be defined as the ZIP code of 45151 instead of the specific borders of Martinsville. These limitations should be kept in mind as the results are reviewed.



Results

Due to the many different types of cancer analyzed and the different known causes of each, the results below are reviewed by individual types of cancer as well as by their grouping (TCE, PCE, vinyl chloride-related cancers, and other types of cancer). The results discussed below can be found in Tables 1-4.

TCE-, PCE- and Vinyl Chloride-Related Cancers³

When looking at these types of cancers as a group of cancers that are known to be correlated with the exposures that have been found in Martinsville, the results do not show evidence of a cluster. The results for individual cancer analysis can be found below.

Kidney and Renal Pelvis

From 2010 through 2019 both Morgan County and Martinsville had statistically significantly high rates of kidney and renal cancer compared to Indiana. Similarly, from 2010 to 2019 both Morgan County and Martinsville had statistically significantly high SIRs showing that there is a higher-than-expected levels of cancer of the kidney and renal pelvis in both Morgan County and Martinsville from 2010-2019.

Non-Hodgkin's Lymphoma (NHL)

None of the rates for NHL were found to be statistically significant. Similar results were found for SIRs, where no SIRs were found to be statistically significant.

Liver

From 2000 to 2004 and 2005 to 2009 Morgan County had fewer than 20 cases of liver cancer which causes the age-adjusted rates to be considered statistically unstable and not statistically significant. Similar results were found in Martinsville from 2010-2014 and 2015-2019. According to the SIRs there was not a statistically higher than expected number of cases of liver Cancer at any point for Morgan County or Martinsville.

Urinary Bladder

None of the age-adjusted rates or SIRs for urinary bladder cancer yielded a statistically significant result for Morgan County or Martinsville.

Myeloma

While Morgan County did not have any statistically significantly high rates or SIRs, from 2010-2014 Martinsville had a statistically significantly higher than expected number of myelomas. This is shown in both the age-adjusted rates as well as the SIR. This is the only period where this result was found, as during 2015-2019 Martinsville had a slightly lower rate of myelomas than Indiana.

Brain

During the 20 years of data analyzed, Morgan County had no statistically significant rates of brain cancer. The SIRs for Morgan County were not found to be statistically higher than Indiana. For Martinsville there were less than twenty cases during each period causing for the results to be statistically unstable.



Lung and Bronchus

Due to the highly correlated relationship between lung cancer and tobacco use it is difficult to find a cancer cluster of lung and bronchus cancer related to a specific environmental exposure. Morgan County has statistically significantly high rates of lung and bronchus cancer at multiple analyzed periods. The SIRs for Morgan County lung and bronchus cancer were only statistically significant from 2015-2019. Martinsville fluctuated throughout the period between having slightly higher and slightly lower rates of lung and bronchus cancer, but none were statistically significant. No SIRs for Martinsville lung and bronchus cancer were found to be statistically significant.

Leukemias

There were no statistically significant results for Morgan County. From 2015-2019 Martinsville leukemia rates and SIRs were statistically significantly higher than the state and should continue to be monitored as new data come in.

Other Requested Cancers

While not known to be correlated with exposures of concern, the requestor mentioned other types of cancer that were a concern anecdotally among Martinsville residents. Many of these types of cancers are some of the most common types of cancer in Indiana and thus do not normally meet the definitions for a cancer cluster.

Colorectal

Regarding age-adjusted rates, no colorectal cancer rates within Morgan County or Martinsville were found to be statistically significantly higher than Indiana. Similarly, while SIRs for some periods in Morgan County and Martinsville were found to be slightly higher than Indiana, no statistically significant results were found.

Female Breast

From 2005-2014 Morgan County had significantly high rates and SIRs for female breast cancer. No results for female breast cancer in Martinsville were found to be statistically significant. There is a limited amount of scientific research showing environmental exposures cause female breast cancer aside from radiation.

Prostate

Morgan County has statistically significantly high rates of prostate cancer from 2000-2004 and from 2010-2019. SIRs for Morgan County were also statistically significant from 2000-2004 and 2010-2014. While not statistically significant, Martinsville also has a higher-than-average amount of prostate cancer; however, the results suggest an increase at the county level instead of specifically within the area of concern.

Stomach

Stomach cancer rates in Morgan County fluctuated between unstable, lower than Indiana, and higher than Indiana, but none were found to be significant. Similarly, the SIRs for Morgan County also fluctuated between being higher or lower with no SIRs being significantly higher than expected. As there were consistently fewer than 20 cases of stomach cancer in each five-year period of Martinsville all the stomach cancer rates in



Martinsville were unstable so the SIRs are the better measure to look at. From 2010-2019 Martinsville had higher than expected number of stomach cancer cases compared to Indiana, but these results were not found to be statistically significant. This should continue to be monitored as new data are available.

Small Intestine

All the rates for cancers of the small intestine were unstable due to less than twenty cases so SIRs are the best measure. Morgan County has a lower-than-expected number of cases of cancers of the small intestine. While the results were not found to be statistically significant, Martinsville did have higher than expected number of cases of cancer of the small intestine. As Morgan County shows less than expected, this may signify an issue that needs to be monitored even without a significant result. Additional data should be looked at as it becomes available within the ISCR.

Gallbladder

In Morgan County and Martinsville, gallbladder cancer has low counts that cause many rates to be suppressed or unstable. Due to the low numbers the SIRs of Morgan County also fluctuate between being significantly low and high depending on the period. No evidence of increased gallbladder cancer was found.

Thyroid

Thyroid cancer has been increasing throughout Indiana including Morgan County during the time periods analyzed. Some, but not all, of the five-year periods' age-adjusted rates and SIRs for Morgan County were statistically significantly above the Indiana rate. Thyroid cancer rates and SIRs in Martinsville were not statistically significantly higher than the state rate.

Pancreas

Age-adjusted rates for pancreatic cancer showed no significant increase for Morgan County or Martinsville. In fact, from 2010-2019 both Morgan County and Martinsville had lower than expected number of cases of pancreatic cancer according to their SIRs. Although there were no statistically significant results outside of 2000-2004, these results indicate no issue within pancreatic cancer in Morgan County and the area of concern.

Melanoma

There were statistically significantly high rates of melanoma in Morgan County and Martinsville from 2010-2019 as well as statistically significantly high SIRs for the same time. While there is no known correlation between melanoma and the types of environmental exposure associated with the EPA super-fund site of concern, community outreach may be needed about sun safety and other skin cancer risk factors.



Oropharyngeal

According to the ISCR data analyzed, oropharyngeal cancer rates have increased in Indiana during the investigated period with statistically significantly high rates of oropharyngeal cancer in 2010-2014 in Morgan County and Martinsville and in Morgan County in 2015-2019. SIRs in both Morgan County and Martinsville were statistically significantly high in 2010-2014 but not significant in 2015-2019.

Results Summary

- The results do not show evidence of a cancer cluster.
- Where a statistically significant higher rate or SIR is shown, no conclusions regarding causation can be drawn from this report.
- TCE, PCE, and Vinyl Chloride-Related Cancers:
 - Martinsville and Morgan County both showed statistically significant higher rates and SIRs of kidney and renal pelvis cancers from 2010-2019.
 - Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of non-Hodgkin's lymphoma.
 - Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of liver cancer.
 - Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of urinary bladder cancers.
 - Martinsville showed a statistically significant higher rate and SIR of myeloma in 2010-2014, but a statistically significant lower rate in 2015-2019. Morgan County did not show any statistically significant higher rates or SIRs of myeloma.
 - Neither Martinsville nor Morgan County showed a statistically significant higher rate or SIR of brain cancer.
 - Martinsville did not show a statistically significant higher rate or SIR for lung and bronchus cancer. Morgan County did show a statistically significant higher rate of lung and bronchus cancer from 2000-2004, and again from 2010-2019
 - Martinsville did show a statistically significant higher rate and SIR for leukemias in 2015-2019. Morgan County did not show a statistically significant higher rate or SIR of leukemias.
- Cancers Unrelated to TCE, PCE and Vinyl Chloride:
 - Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of colorectal cancer.
 - Martinsville did not show a statistically significant higher rate or SIR of female breast cancer. Morgan County did show a statistically significant higher rate and SIR of female breast cancer from 2005-2014.
 - Martinsville did not show a statistically significant higher rate or SIR of prostate cancer. Morgan County did show a statistically significant higher rate of prostate cancer from 2000-2004 and 2010-2019 and a statistically significant higher SIR of prostate cancer from 2000-2004 and from 2010-2014.
 - Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of stomach cancer.



- Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of small intestine cancer.
- Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of gallbladder cancer.
- Martinsville did not show a statistically significant higher rate or SIR of thyroid cancer. Morgan County did show a statistically significant higher rate of thyroid cancer from 2005-2009 and 2015-2019.
- Neither Martinsville nor Morgan County showed statistically significant higher rates or SIRs of pancreatic cancer.
- Both Martinsville and Morgan County showed a statistically significant higher rate and SIR of melanoma from 2010-2019.
- Both Martinsville and Morgan County showed a statistically significant higher rate of oropharyngeal cancer from 2010-2019 and a statistically significant higher SIR of oropharyngeal cancer from 2010-2014.

Final Conclusions

It should be stated that while this analysis did find multiple statistically significant results for different types of cancer, an investigation/analysis of this nature is not intended to prove causality between environmental exposure and certain cases of cancer. This analysis can only show the currently observed versus expected amount of cancer in the population, as well as trends for comparison areas. Due to the multiple complex factors involved in the chances of being diagnosed with different types of cancer, it is extremely unlikely that causality can be proven.

Morgan County and Martinsville do have higher than expected amounts of multiple different types of cancer. As Morgan County is known to have one of the highest rates of overall cancer compared to other counties, it is hard to specifically isolate what rates/SIRs are high simply due to Morgan County having high rates and which are high due to Martinsville specifically. Community outreach, education on risk factors and cancer screening, and additional analysis as new data becomes available within the ISCR is suggested moving forward. At this point in time no cancer cluster was found.

IDOH will continue to update the TCE, PCE and vinyl chloride cancer analysis when newer years of data comes in to account the fact that this analysis had to use older data due to the tendency for cancer registries to be behind in data in accordance with the CDC Guidelines. With that said this report will only be updated should the overall conclusion change upon future analysis.



Table 1: TCE-, PCE- and Vinyl Chloride-Related Cancer Rates between Indiana and Area of Concern

Type of Cancer 2000-2004	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Kidney and Renal Pelvis	4,927	15.93	63	19.29	NA	NA
NHL	6,077	19.73	66	20.74	NA	NA
Liver	1,199	3.86	9	2.78U	NA	NA
Urinary Bladder	6,701	21.82	77	26.52	NA	NA
Myeloma	1,763	5.73	21	6.67	NA	NA
Brain	2,018	6.55	20	6.01	NA	NA
Lung and Bronchus	25,022	81.38	294	93.95*	NA	NA
Leukemia	4,153	13.51	48	14.86	NA	NA
Type of Cancer 2005-2009	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Kidney and Renal Pelvis	5,869	17.55	62	16.51	NA	NA
NHL	6,793	20.52	84	23.24	NA	NA
Liver	1,670	4.87	19	5.33U	NA	NA
Urinary Bladder	7,099	21.47	69	19.83	NA	NA
Myeloma	2,119	6.38	22	6.67	NA	NA
Brain	2,221	6.75	25	7.43	NA	NA
Lung and Bronchus	26,725	80.57	313	89.21	NA	NA
Leukemia	4,496	13.71	41	12.49	NA	NA
Type of Cancer 2010-2014	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Kidney and Renal Pelvis	6,676	18.41	96	23.56*	47	27.57*
NHL	6,978	19.45	95	23.04	42	22.94
Liver	2,238	5.81	26	6.13	11	6.01U



Urinary Bladder	7,941	21.92	96	24.55	41	23.15
Myeloma	2,556	7.04	35	8.91	22	13.11*
Brain	2,290	6.58	28	7.70	12	7.83U
Lung and Bronchus	27,189	74.46	340	84.96*	144	87.30
Leukemia	5,198	14.75	62	16.88	31	18.47
Type of Cancer 2015-2019	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Kidney and Renal Pelvis	7,605	19.50	117	26.12*	60	31.46*
NHL	7,322	18.89	98	21.91	52	24.92
Liver	2,688	6.33	34	7.40	16	7.18U
Urinary Bladder	8,480	21.29	99	22.20	46	22.07
Myeloma	2,724	6.88	35	7.46	16	6.86U
Brain	2,355	6.42	27	6.26	15	8.15U
Lung and Bronchus	28,662	70.57	382	81.99*	146	67.35
Leukemia	5,384	14.16	70	14.16	40	21.38*

Data Source: Indiana State Cancer Registry

Rates are Age-adjusted to the US 2000 Standard Population

*County/ZIP code rate is statistically significantly higher or lower than the state rate

U Rates for cases fewer than 20 are statistically unstable

^ Case counts fewer than 5 are suppressed

Excludes in situ and benign tumors

NA data is Not Available

Table 2: TCE-, PCE- and Vinyl Chloride-Related Cancer Standardized Incidence Ratios

Type of Cancer 2000-2004	Morgan County			Martinsville ZIP Code (46151)		
	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Kidney and Renal Pelvis	1.20	0.90-1.49	0.1920	NA	NA	NA
NHL	1.04	0.79-1.29	0.7617	NA	NA	NA
Liver	0.70	0.24-1.16	0.2067	NA	NA	NA
Urinary Bladder	1.13	0.88-1.39	0.3004	NA	NA	NA
Myeloma	1.17	0.67-1.66	0.5161	NA	NA	NA
Brain	0.92	0.52-1.32	0.6849	NA	NA	NA



Lung and Bronchus	1.13	1.00-1.26	0.0528	NA	NA	NA
Leukemia	1.13	0.81-1.45	0.4167	NA	NA	NA
Type of Cancer	Morgan County			Martinsville ZIP Code (46151)		
2005-2009	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Kidney and Renal Pelvis	0.96	0.72-1.20	0.7383	NA	NA	NA
NHL	1.16	0.91-1.41	0.2078	NA	NA	NA
Liver	1.04	0.57-1.50	0.8804	NA	NA	NA
Urinary Bladder	0.93	0.71-1.15	0.5448	NA	NA	NA
Myeloma	0.98	0.57-1.39	0.9372	NA	NA	NA
Brain	1.04	0.64-1.45	0.8307	NA	NA	NA
Lung and Bronchus	1.09	0.97-1.21	0.1464	NA	NA	NA
Leukemia	0.87	0.61-1.14	0.3594	NA	NA	NA
Type of Cancer	Morgan County			Martinsville ZIP Code (46151)		
2010-2014	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Kidney and Renal Pelvis	1.28*	1.02-1.53	0.0342	1.46*	1.04-1.87	0.0315
NHL	1.24	0.99-1.48	0.0630	1.28	0.89-1.67	0.1556
Liver	1.02	0.63-1.41	0.9173	1.01	0.41-1.60	0.9811
Urinary Bladder	1.11	0.89-1.33	0.3303	1.12	0.78-1.46	0.5010
Myeloma	1.24	0.83-1.64	0.2599	1.83*	1.07-2.60	0.0332
Brain	1.11	0.70-1.53	0.5911	1.11	0.48-1.73	0.7373
Lung and Bronchus	1.12	0.99-1.24	0.0532	1.12	0.94-1.30	0.2013
Leukemias	1.11	0.83-1.38	0.4426	1.29	0.84-1.75	0.2081
Type of Cancer	Morgan County			Martinsville ZIP Code (46151)		
2015-2019	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Kidney and Renal Pelvis	1.34*	1.10-1.58	0.0060	1.50*	1.12-1.88	0.0095
NHL	1.19	0.95-1.42	0.1159	1.36	0.99-1.73	0.0558
Liver	1.09	0.73-1.46	0.6198	1.11	0.57-1.66	0.6810
Urinary Bladder	1.04	0.84-1.15	0.6994	1.04	0.74-1.33	0.8188
Myeloma	1.13	0.76-1.50	0.4991	1.11	0.57-1.65	0.6918



Brain	1.04	0.65-1.43	0.8460	1.26	0.62-1.90	0.4220
Lung and Bronchus	1.16*	1.04-1.28	0.0057	0.94	0.79-1.10	0.4632
Leukemias	1.17	0.90-1.45	0.2136	1.45*	1.00-1.90	0.0497

Data Source: Indiana State Cancer Registry

Rates are Age-adjusted to the US 2000 Standard Population

*County/ZIP code rate is statistically significantly higher or lower than the state rate

U Rates for cases less than 20 are statistically unstable

^ Cases less than 5 are suppressed

Excludes in situ and benign tumors

NA data is Not Available

Table 3: Other Requested Cancer Rates between Indiana and Area of Concern

Type of Cancer 2000-2004	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Colorectal	18,065	58.71	168	53.28	NA	NA
Female Breast	20,935	132.5	208	123.3	NA	NA
Prostate	19,598	130.6	262	162.0*	NA	NA
Stomach	3,375	5.65	25	8.00	NA	NA
Small Intestine	666	2.15	^	^	NA	NA
Gallbladder	351	1.14	^	^	NA	NA
Thyroid	2,296	7.46	33	10.05	NA	NA
Pancreas	3,517	11.42	24	7.66	NA	NA
Melanoma	5,108	16.59	67	20.18	NA	NA
Oropharyngeal	3,375	10.86	48	13.98	NA	NA
Type of Cancer 2005-2009	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Colorectal	17,452	52.42	195	56.97	NA	NA
Female Breast	21,514	127.3	283	153.2*	NA	NA
Prostate	20,478	121.3	239	123.1	NA	NA
Stomach	1,755	5.31	10	2.86U	NA	NA
Small Intestine	767	2.31	8	2.23U	NA	NA
Gallbladder	348	1.05	^	^	NA	NA



Thyroid	3,330	10.36	30	8.42	NA	NA
Pancreas	3,931	11.76	52	15.27	NA	NA
Melanoma	5,962	18.13	65	18.00	NA	NA
Oropharyngeal	3,981	11.71	42	10.99	NA	NA
Type of Cancer 2010-2014	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Colorectal	16,671	46.08	208	52.96	103	54.05
Female Breast	23,429	129.7	302	150.3*	129	142.3
Prostate	17,831	92.11	247	107.4*	120	104.7
Stomach	2,099	5.79	22	5.07	13	6.72U
Small Intestine	956	2.61	10	2.17U	6	3.08U
Gallbladder	429	1.17	^	^	0	0
Thyroid	4,042	12.10	52	13.86	29	17.17
Pancreas	4,710	12.83	49	11.43	23	11.53
Melanoma	6,758	19.14	101	26.35*	55	31.10*
Oropharyngeal	4,658	12.51	74	16.48*	40	19.94*
Type of Cancer 2015-2019	Indiana		Morgan County		Martinsville ZIP Code (46151)	
	Count	Rate	Count	Rate	Count	Rate
Colorectal	16,322	41.95	208	47.85	94	47.48
Female Breast	26,044	135.3	303	138.3	139	138.9
Prostate	20,705	95.19	279	108.3*	127	105.8
Stomach	2,349	5.97	29	6.14	17	8.54U
Small Intestine	1,079	2.79	9	1.96U	7	3.25U
Gallbladder	391	0.98	7	1.56U	^	^
Thyroid	4,245	12.41	62	17.45*	29	17.39
Pancreas	5,554	13.79	65	14.24	26	13.21
Melanoma	8,652	22.85	136	31.01*	62	30.94*
Oropharyngeal	5,321	13.31	76	17.66*	33	16.24



Data Source: Indiana State Cancer Registry

Rates are Age-adjusted to the US 2000 Standard Population

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U Rates for cases less than 20 are statistically unstable

^ Case counts fewer than 5 are suppressed

Excludes in situ and benign tumors

NA data is Not Available

**Table 4: Other Requested Cancers
Standardized Incidence Ratios (SIR)**

Type of Cancer 2000-2004	Morgan County			Martinsville ZIP Code (46151)		
	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Colorectal	0.92	0.78-1.06	0.2390	NA	NA	NA
Female Breast	0.94	0.81-1.06	0.3278	NA	NA	NA
Prostate	1.23*	1.09-1.39	0.0020	NA	NA	NA
Stomach	1.42	0.86-1.97	0.1425	NA	NA	NA
Small Intestine	0.28*	0-0.67	0.0003	NA	NA	NA
Gallbladder	1.14	0.02-2.26	0.8060	NA	NA	NA
Thyroid	1.29	0.85-1.73	0.1955	NA	NA	NA
Pancreas	0.67*	0.40-0.94	0.0173	NA	NA	NA
Melanoma	1.21	0.92-1.51	0.1477	NA	NA	NA
Oropharyngeal	1.31	0.94-1.68	0.1015	NA	NA	NA
Type of Cancer 2005-2009	Morgan County			Martinsville ZIP Code (46151)		
	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Colorectal	1.06	0.91-1.21	0.4209	NA	NA	NA
Female Breast	1.21*	1.07-1.35	0.0031	NA	NA	NA
Prostate	1.03	0.90-1.16	0.7018	NA	NA	NA
Stomach	0.54*	0.21-0.88	0.0081	NA	NA	NA
Small Intestine	0.96	0.29-1.63	0.9076	NA	NA	NA
Gallbladder	0.85	0-1.81	0.7555	NA	NA	NA
Thyroid	0.81	0.52-1.10	0.2019	NA	NA	NA
Pancreas	1.26	0.91-1.60	0.1418	NA	NA	NA
Melanoma	1.00	0.76-1.24	0.9934	NA	NA	NA
Oropharyngeal	0.95	0.66-1.23	0.7068	NA	NA	NA



Type of Cancer 2010-2014	Morgan County			Martinsville ZIP Code (46151)		
	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Colorectal	1.13	0.98-1.29	0.0882	1.21	0.98-1.45	0.0753
Female Breast	1.16*	1.03-1.29	0.0177	1.09	0.90-1.27	0.3640
Prostate	1.18*	1.03-1.32	0.0179	1.16	0.95-1.37	0.1325
Stomach	0.94	0.55-1.34	0.7799	1.20	0.55-1.85	0.5452
Small Intestine	0.93	0.35-1.51	0.8168	1.22	0.24-2.19	0.6598
Gallbladder	0.22*	0-0.64	0.0003	0	0	0
Thyroid	1.16	0.84-1.47	0.3220	1.44	0.92-1.96	0.1004
Pancreas	0.95	0.68-1.21	0.7003	0.95	0.56-1.34	0.8058
Melanoma	1.35*	1.08-1.61	0.0098	1.60*	1.18-2.02	0.0054
Oropharyngeal	1.40*	1.08-1.71	0.0147	1.65*	1.14-2.17	0.0124
Type of Cancer 2015-2019	Morgan County			Martinsville ZIP Code (46151)		
	SIR	95% CI	P-Value	SIR	95% CI	P-Value
Colorectal	1.13	0.98-1.28	0.1002	1.11	0.89-1.33	0.3390
Female Breast	1.03	0.91-1.14	0.6379	1.05	0.87-1.22	0.6093
Prostate	1.13	1.00-1.26	0.0518	1.09	0.90-1.28	0.3614
Stomach	1.09	0.69-1.49	0.6596	1.38	0.73-2.04	0.2524
Small Intestine	0.73	0.25-1.21	0.2648	1.23	0.32-2.13	0.6231
Gallbladder	1.60	0.41-2.78	0.3222	^	^	^
Thyroid	1.32	0.99-1.65	0.0544	1.38	0.88-1.89	0.1349
Pancreas	1.03	0.78-1.29	0.7878	0.89	0.55-1.24	0.5416
Melanoma	1.39*	1.16-1.63	0.0010	1.39*	1.05-1.74	0.0261
Oropharyngeal	1.23	0.96-1.51	0.0951	1.18	0.78-1.58	0.3776

Data Source: Indiana State Cancer Registry

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Excludes in situ and benign tumors

NA data is Not Available



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Other Resources

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