

Public Health Assessment
Response to Vapors in Hartford Homes
Hartford, Madison County, Illinois

Prepared by:

The Illinois Department of Public Health
under cooperative agreement with the
Agency for Toxic Substances and Disease Registry

Table of Contents

Summary	1
Background and Statement of Issues	2
Description of Area	2
May 2002 Vapor Intrusions	3
Events Since July 1, 2002, Health Consultation	3
Discussion	4
Indoor Air Sampling Results	4
Exposure and Toxicological Evaluation	4
Questionnaire Results	5
Community Health Concerns Expressed at the August 22, 2002 Public Availability Session	6
Hartford Cancer Incidence Report	6
Conclusions	7
Recommendations and Public Health Action Plan	7
Preparers of Report	8
References	8
Tables	11
Attachments	13

Summary

The Village of Hartford is in western Madison County, Illinois. The town is between the Mississippi River levy and the Premcor oil refinery. Oil products have been manufactured in the area during most of the last century, and Hartford residents have been exposed to petroleum products through the years from reported air emissions, spills, and oil line breaks. Also, volatile organic chemicals (VOCs) have been found in soil and a nonaqueous layer of petroleum products currently floats on groundwater under Hartford.

Soil gas and vapors have affected homes mainly in the north end of Hartford. Previous complaints dating from the mid-1960s suggest that combustible air and gas mixtures and petroleum odors were present in homes in Hartford.

On May 13, 2002, after several weeks of heavy rain, residents of Hartford contacted IDPH staff. One caller reported that the family was awakened at 12:30 a.m. by strong odors. The family left the home and alerted other neighbors. The residents of several homes along East Watkins Street also reported indoor odors.

Although residents returned to their homes in June, IDPH occasionally sampled air in the basements of impacted homes to determine “background” VOC levels. In July, two homes were sampled, and in August, samples were taken at two homes not previously sampled.

On August 20, 2002, staff from IDPH, Illinois EPA, and the Madison County Health Department, with the support of the Village of Hartford distributed a questionnaire to about 550 addresses in Hartford. IDPH received 112 questionnaires and entered the information provided into a database for analysis.

Residents in NE Hartford have reported higher rates of gasoline odors, acute health symptoms, and health concerns than the rest of Hartford. NE Hartford has been historically affected by gasoline vapor intrusions. Residents are concerned that the vapor intrusion system for NE Hartford is inadequate to prevent present and future vapor exposures.

The Division of Epidemiologic Studies did not find evidence in the Illinois State Cancer Registry that an increased rate of leukemia, a cancer associated with benzene exposure, exists in Hartford.

In the July 1, 2002 health consultation, IDPH concluded that the residential vapor intrusions in Hartford, Illinois during the week of May 13, 2002, were a public health hazard to persons in affected homes. Under current conditions, exposure to the level of benzene in some Hartford basements poses no apparent increased cancer risk. Based on historical evidence that suggests the conditions that produced the May 2002 vapor intrusions could return, IDPH concludes that this situation poses a public health hazard.

Purpose

The Illinois Department of Public Health (IDPH) prepared this public health assessment to report public health activities that have taken place since July 1, 2002, when the first health consultation for vapor intrusions in Hartford, Illinois was completed. In that health consultation, IDPH concluded that the residential vapor intrusions in Hartford, Illinois, during the week of May 13, 2002, were a public health hazard to persons in affected homes.

Key points of the recommendations were:

- C A door-to-door survey should be conducted for residents near the sampled homes to determine the extent of the fugitive soil gas vapors in homes in the recent past.
- C State epidemiologists should look at the incidence of cancer cases plausible for exposure to volatile organic chemicals (VOCs) and specifically for the chemicals of interest.

These recommendations have been completed and the results are discussed in this document.

Background and Statement of Issues

Description of Area

The Village of Hartford is in western Madison County, Illinois, in a floodplain known as the American Bottoms (Attachment 1). The town is between the Mississippi River levy and the Premcor oil refinery. Hartford has a population of about 1,550 persons and much of the residential population is near the Premcor refinery. The homes nearest the refinery are within 500 feet of the refinery property line. According to the 2000 census, there are 650 occupied homes in Hartford. This community is one of several towns near large oil refining, processing, storage, and distribution facilities in the East St. Louis Metro area.

Oil products have been manufactured in the area during most of the last century, and Hartford residents have been exposed to petroleum products through the years from reported air emissions, spills, and oil line breaks. Also, VOCs have been found in soil and a nonaqueous layer of petroleum products (estimated to be millions of gallons) currently floats on groundwater under Hartford. The water table varies, but the depth to groundwater is about 10 feet below the surface. The layer of petroleum products was presumed lost from underground pipelines traversing Hartford.

Soil gas and vapors have affected homes mainly in the north end of Hartford. Previous complaints dating from the mid-1960s suggest that combustible air and gas mixtures and petroleum odors were present in homes in Hartford. In the 1970s, an explosion and several fires in Hartford homes were linked to combustible soil gas. According to residents, three homes on East Watkins Street have had fires in the past. By 1992, a vapor recovery system was operational

in Hartford and continues to operate today. It extends to about two blocks north of the homes affected by the May 2002 vapor intrusions.

Flooding in the American Bottoms has been problematic for many years. How the vapor recovery system or other pumping and drainage systems are affected during periods of wet weather is not known. Residents who have lived in Hartford for many years report that vapor intrusions into homes are associated with rain events, a high level of the Mississippi River, and a high water table. These events might create conditions that cause vapors to enter basements.

May 2002 Vapor Intrusions

On May 13, 2002, after several weeks of heavy rain, residents of Hartford contacted IDPH staff. One caller reported that the family was awakened at 12:30 a.m. by strong odors. The family left the home and alerted other neighbors. The residents of several homes along East Watkins Street also reported indoor odors.

Premcor, the Illinois Environmental Protection Agency (Illinois EPA), and the local fire department used survey instruments during visits throughout May 2002. The survey instrument readings measured by Illinois EPA emergency response staff in the basements of the six affected homes on May 13 ranged from 10,000 to 11 million parts per billion (ppb) of total VOCs. During the week of May 13, Illinois EPA and IDPH recommended that homes with odors be ventilated and that residents find alternative housing until further investigations determined that levels of VOCs were no longer an acute health hazard.

During the week of May 13, 2002, IDPH staff placed stainless steel SUMMA canisters in the basements of four homes along the south side of East Watkins Street and collected 24-hour air samples. The Illinois EPA laboratory in Springfield analyzed the SUMMA canisters. This laboratory uses the same methods as certified air laboratories and agreed to provide IDPH with estimated concentrations of VOCs in response to this emergency. The residents were ventilating their homes during the sampling.

IDPH also collected basement and upstairs air samples during the weeks of May 26 and June 2. While VOC levels had dropped dramatically, one home still had benzene present at 10.4 ppb in the basement on May 27 and 28, and at 12 ppb on the main floor on June 6 and 7. Another home had 11.3 ppb of benzene in the basement on June 5 and 6. Affected homes had basement walls made of cement block.

Events Since July 1, 2002, Health Consultation

Although residents returned to their homes in June, IDPH occasionally sampled air in the basements of impacted homes to determine “background” VOC levels. In July two homes were sampled, and in August samples were taken at two homes not previously sampled.

On August 20, 2002, staff from IDPH, Illinois EPA, and the Madison County Health Department, with the support of the Village of Hartford, went door-to-door to distribute a questionnaire (Attachment 2) with a postage-paid return envelope to about 550 addresses in Hartford. Residents were asked to return the questionnaire by September 20, 2002. IDPH received 112 questionnaires and entered the information provided into a database for analysis.

On August 22, 2002, IDPH held a public availability session at the Hartford Village Hall to talk with concerned residents and answer questions. About 20 persons attended the session. In September 2002, the IDPH Division of Epidemiologic Studies released a cancer incidence report for Hartford.

In the spring of 2003, IDPH and Illinois EPA met to plan to collect indoor air samples in selected homes throughout Hartford as funding will allow.

On May 29, 2003, the Illinois Attorney General and the Madison County State's Attorney filed suit to force Premcor Refining Group, Inc and Apex Oil Company to clean up the gasoline underneath the Village of Hartford.

Discussion

Indoor Air Sampling Results

IDPH compared the results of each air sample with the appropriate screening comparison value used to select chemicals for further evaluation for carcinogenic and noncarcinogenic health effects. Chemicals found at levels greater than comparison values or those for which no comparison value exists were selected for further evaluation. A description of each comparison value is found in Attachment 3.

On the basis of sampling in May 2002, the chemicals of interest are benzene, toluene, n-hexane, and total VOCs. The highest level of these chemicals of interest detected in May 2002 and the levels detected in sampling completed since July 1 are shown in Table 1. Benzene, toluene, and hexane are the chemicals of interest as a result of the later sampling.

Exposure and Toxicological Evaluation

Residents may be exposed to VOCs by breathing them in their indoor air during periods when conditions exist that lead to vapors entering their homes. The actual exposure depends on many factors including the amount of VOCs entering the basement, the mixing of basement air with air elsewhere in the home, and the time spent in the basement and the home.

IDPH assumed that adults and children living in the sampled homes would be exposed each day to the levels detected in their basements in July and August (assumed to be typical levels found during the absence of vapor intrusion). IDPH assumed that adults weighed 70 kilograms (kg) and breathed 20 cubic meters (m³) each day and that children weighed 20 kg and breathed 10 m³ each day. Based on this scenario, exposure to the levels of benzene, toluene, and hexane detected in the basement air is not likely to cause adverse noncancer health effects. Benzene is listed by the Department of Health and Human Services as a known human carcinogen based on long-term exposure. IDPH assumed adults lived in their Hartford home 30 years of their lifetime and that children lived in their Hartford home 18 years of their lifetime. Based on this scenario, exposure to the levels of benzene detected in the basement air poses no apparent increased risk of cancer.

The contamination on the groundwater beneath Hartford is likely gasoline, so hundreds of VOCs are potentially present. Mixtures of many VOCs have been detected in the indoor air samples in Hartford. Researchers have attempted to determine the health hazards of exposure to petroleum-based mixtures like gasoline. Studies of animals exposed to hydrocarbon mixtures have shown effects on the lungs, central nervous system, liver, kidney, and reproductive system and developmental problems. The most common adverse human health effects associated with breathing gasoline mixtures include nose and throat irritation, headaches, dizziness, nausea, vomiting, confusion, and breathing difficulties.

Exposure to gasoline components from filling fuel tanks, spilled engine oil, or the use of solvents in commercial products is common today. Because gasoline and petroleum products are widely used, most communities have a “background” level of VOCs in air in urban settings more so than rural. In areas near large petroleum facilities the background levels of VOCs can be measurable. The Agency for Toxic Substances and Disease Registry (ATSDR) cites background levels of benzene in air ranging from 0.02 to 34 parts per billion (ppb). Exposure of people experiencing VOC infiltration into their homes from contaminated groundwater and soil gas would be expected to be greater than “background” from the refineries or from consumer goods alone.

Questionnaire Results

From August 23 to September 24, 2002, IDPH received 112 questionnaires from Hartford residents. Of these, 108 provided the respondent’s address. For analysis purposes, IDPH divided Hartford into north and south areas using Hawthorne Street and into east and west areas using Delmar Street.

Responses were received from throughout Hartford (Attachment 4). The northeast (NE) portion of Hartford is the section of town that vapor intrusions have historically affected. Eighty-six percent of respondents from NE Hartford reported odors in their home associated with gasoline vapors or a chemical smell compared with 45 percent for the rest of Hartford. Of those reporting these odors, 67 percent of NE Hartford residents specifically identified gasoline or fuel odors

compared with 33 percent for the rest of Hartford (Attachment 5). Half of the NE Hartford residents said the indoor gasoline odors were worse after rain events.

Respondents were given the opportunity to provide self-reported health symptoms. Of these, headaches and breathing problems were reported most frequently. Twice as many NE Hartford residents reported these symptoms as residents of the rest of Hartford.

Respondents were also provided the opportunity to share other concerns and health issues on the questionnaire. NE Hartford respondents averaged about three concerns or issues per questionnaire compared with about 1.5 concerns or issues per questionnaire for the rest of Hartford (Attachment 6).

Community Health Concerns Expressed at the August 22, 2002 Public Availability Session

One resident shared that the vapor recovery system installed in the early 1990s does not extend to East Watkins Street. The resident at this address had installed a basement exhaust system to reduce the amount of vapors during heavy rain events. This resident indicated that the information was shared with the U.S. Environmental Protection Agency (USEPA), but USEPA was not interested.

Another resident shared that their house experienced two explosions from vapor intrusions in 1977 and 1978. When the vapor recovery system was installed in 1992, conditions were better for awhile, but in the past few years the gasoline odors in their home have returned after rains. The resident questioned whether the vapor recovery system is still working properly.

Another resident shared a similar concern that the vapor recovery system was “not keeping up” and that they had installed a system to ventilate their basement. Residents also said that refinery emissions occasionally settle onto homes, vehicles, and yards at night leaving an oily film. They said that sometimes outdoor odors in the morning cause them to have headaches.

Residents are concerned about long-term adverse health outcomes from exposure to VOCs. Concerns were shared about leukemia, reproductive problems, adverse pregnancy outcomes, and chronic blood disorders.

Residents also reported high levels of distress, fears for the safety and health of their families, and concern for their pets. Residents also are especially concerned about future vapor intrusions. Residents were particularly critical of both USEPA and Illinois EPA, citing lack of action by these regulatory agencies.

This public health assessment was available for public comment from March 19, 2003 to May 19, 2003. Comments received can be found in Attachment 7.

Hartford Cancer Incidence Report

The IDPH Division of Epidemiologic Studies evaluated cancer data for the 62048 zip code area, which is specific for Hartford (Attachment 8). All cases of cancer diagnosed and reported among residents of the study area from 1990 to 1999 were identified from the Illinois State Cancer Registry. All cancer cases from the study area were grouped by tumor site, sex and age, and the observed cancer rates were determined. These were compared with the expected cancer rates determined from a comparable Illinois population.

Of all the cancer types, only colorectal cancer in males was found at a significant excess (14 cases observed vs. 6 cases expected). Cancer of the colon and rectum are the third most common cancer in both males and females. About 90 percent of the cases occur after age 50. Risk factors for colorectal cancer are mainly non-environmental and include family history, physical inactivity, inflammatory bowel disease, obesity, consumption of red meat, smoking, and alcohol use. Exposure to VOCs is not a suspected risk factor for colorectal cancer.

The Division of Epidemiologic Studies did not find evidence in the Illinois State Cancer Registry that an increased rate of leukemia, a cancer associated with benzene exposure, exists in Hartford.

Child Health Considerations

ATSDR recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of their environment. Children were the most sensitive population considered when evaluating potential exposure to VOCs in Hartford.

Conclusions

In the July 1, 2002, health consultation, IDPH concluded that the residential vapor intrusions in Hartford, Illinois, during the week of May 13, 2002, were a public health hazard to persons in affected homes. Under current conditions, exposure to the level of benzene in some Hartford basements poses no apparent increased cancer risk. Based on historical evidence that suggests the conditions that produced the May 2002 vapor intrusions could return, IDPH concludes that this situation poses a public health hazard.

Residents in NE Hartford have reported higher rates of gasoline odors, acute health symptoms, and health concerns than the rest of Hartford. NE Hartford has been historically affected by gasoline vapor intrusions. Residents are concerned that the vapor intrusion system for NE Hartford is inadequate to prevent present and future vapor exposures.

The Division of Epidemiologic Studies did not find evidence in the Illinois State Cancer Registry that an increased rate of leukemia, a cancer associated with benzene exposure, exists in Hartford.

Recommendations and Public Health Action Plan

IDPH recommends that the present vapor recovery system be evaluated and possibly expanded to reduce the likelihood that vapors will enter homes. IDPH will work with Illinois EPA to determine how this can be done.

IDPH will consult with ATSDR and other agencies to consider a possible health advisory and the feasibility of public health follow-up activities due to the vapor infiltration of VOCs in Hartford.

IDPH, in conjunction with Illinois EPA, will conduct quarterly sampling of homes in Hartford beginning in June 2003. The sampling is being conducted to determine what the variation in levels of VOCs might be in Hartford homes throughout the year. IDPH will provide letters to the residents giving a health-based interpretation of the sample results. IDPH will write a follow-up health consultation to discuss the results when sampling is complete.

Preparers of Report

Preparers of Report

Catherine Copley

Ken Runkle

Environmental Toxicologists

Illinois Department of Public Health

Reviewer

Jennifer Davis

Environmental Toxicologist

Illinois Department of Public Health

ATSDR Regional Representative

Mark Johnson

Regional Operations

Office of the Assistant Administrator

ATSDR Technical Project Officers

Allen Robison

Division of Health Assessment and Consultation

Steve Inserra

Division of Health Studies

Sylvia Allen-Lewis

Division of Health Education and Promotion

References

Agency for Toxic Substances and Disease Registry. Interim Guidance for Benzene in Indoor Air. Atlanta: US Department of Health and Human Services; 1999 Mar.

Agency for Toxic Substances and Disease Registry. Toxicological profile for automotive gasoline. Atlanta: US Department of Health and Human Services; 1995 Jun.

Agency for Toxic Substances and Disease Registry. Toxicological profile for benzene. Atlanta: US Department of Health and Human Services; 1997 Sep.

Agency for Toxic Substances and Disease Registry. Toxicological profile for n-hexane. Atlanta: US Department of Health and Human Services; 1999 Jul.

Agency for Toxic Substances and Disease Registry. Toxicological profile for total petroleum hydrocarbons. Atlanta: US Department of Health and Human Services; 1999 Sep.

Illinois Environmental Protection Agency, Collinsville Regional Office. Hartford file. 2002.

Illinois Department of Public Health. Preliminary health assessment of Hartford, Roxana, South Roxana, and Wood River, Illinois. Springfield: Illinois Department of Public Health; 1990 Mar.

Illinois Department of Public Health. Incidence of cancer in zip code 62048 of Hartford, Illinois. Springfield: Illinois Department of Public Health; 2002 Sep.

Certification

This Hartford Vapor Intrusion public health assessment was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

W. Allen Robison
Technical Project Officer
Superfund Site Assessment Branch (SAAB)
Division of Health Assessment and Consultation (DAC)
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

Roberta Erlwein
Chief, State Programs Section
SSAB, DHAC, ATSDR

Tables

Table 1. Chemicals of Interest in Basement Indoor Air (in parts per billion).

Chemical	Home 1 May 13-14	Home 2 May 13-14	Home 3 May 14-15	Home 3 July 24-25	Home 4 May 15-16	Home 4 July 24-25	Home 5 August 14-15	Home 6 August 15-16	Comparison Value (ppb)
benzene	270	330	170.3	5.7	266.3	1.3	1.6	0.6	0.03 CREG 10 ATSDR 50 Acute MRL
toluene	490	604	533.6	11.4	810	3.8	15.5	12	80 Chronic MRL 1,000 Acute MRL
n-hexane	11,873	12,218	5,662	9.3	9,105	2.7	4.6	< 1	56 Intermediate MRL 600 Chronic MRL
Total of 56 organic chemicals detected	215,630	216,939	84,503	2,193	145,008	391	124	423	no comparison value

Notes: Home 1 was not sampled in July and August 2002

CREG— cancer risk evaluation guide

ATSDR Benzene Interim Guidance, March 1999

Acute MRL—minimal risk level for exposures less than 14 days of duration

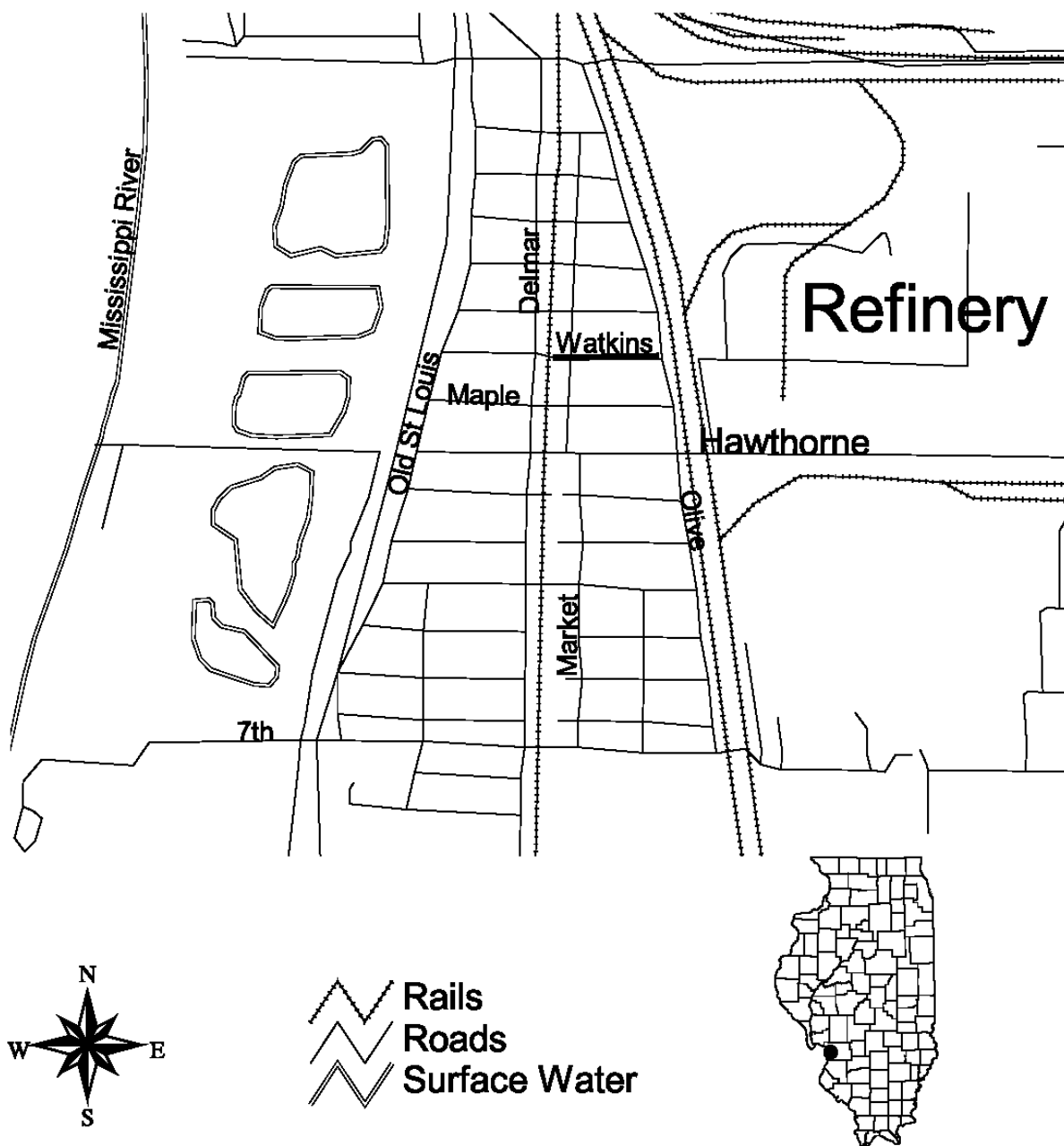
Intermediate MRL—minimal risk level for exposures from 15 to 364 days of duration

Chronic MRL—minimal risk level for exposures more than 365 days of duration

Attachments

Hartford, Illinois

(with East Watkins Street darkened)



Source: IDPH Toxicology Section

0.1 0 0.1 0.2 Miles

Hartford Vapor Exposure Questionnaire

Several Hartford residents have indicated that they have experienced adverse health effects that may be related to exposure to gasoline vapors during wet weather conditions. The Illinois Department of Public Health conducted some limited sampling and are trying to determine the extent of this problem. Department staff would like to ask a few questions and may contact you in the future to clarify your responses or with additional questions.

Name (optional) _____

Address _____

Daytime phone/fax/cell _____

1) How long have you lived at this Hartford home? _____ Own or Rent? _____

2) Do you have a private well in use, and if yes, do you drink or use this water indoors?

3) Have you noticed odors in your home that you associate with gasoline vapors or a chemical smell and, if so, please describe how it smells to you? _____

4) Please give an idea of when and how often this occurs during a year. _____

5) Where in your home are the odors most noticeable? _____

6) If you have a basement, please describe how it was built and its condition (for example, depth, cement blocks, covered with plaster inside, waterproofed outside, if walls are cracked, sump pits, number of doors/windows and if they are operational, and number of floor drains and if they are kept covered).

7) Have you or any member of your family had health symptoms at the same time you experienced these odors? _____ If yes, please describe and indicate if anyone in your home/building has a respiratory disease, especially asthma:

Name (optional)	Age	Symptom	Respiratory disease?
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

8) Are you aware of any other buildings in Hartford that have (or have had) gasoline odors?

9) Are you aware of incidents other than vapor intrusion through the ground that have resulted in noticeable odors in and around your home?_____

10) Please list any specific health-related questions you have concerning vapor exposure in Hartford.

11) Please use the remaining space to list any other concerns, health issues, or experiences you would like to share about these matters._____

Thank you for your participation. If you have questions, please call Cathy Copley at 618-656-6680, extension 170. Please mail completed questionnaire, by September 20, 2002, to:

Illinois Department of Public Health
Environmental Toxicology Section
525 West Jefferson Street
Springfield, IL 62702-9986

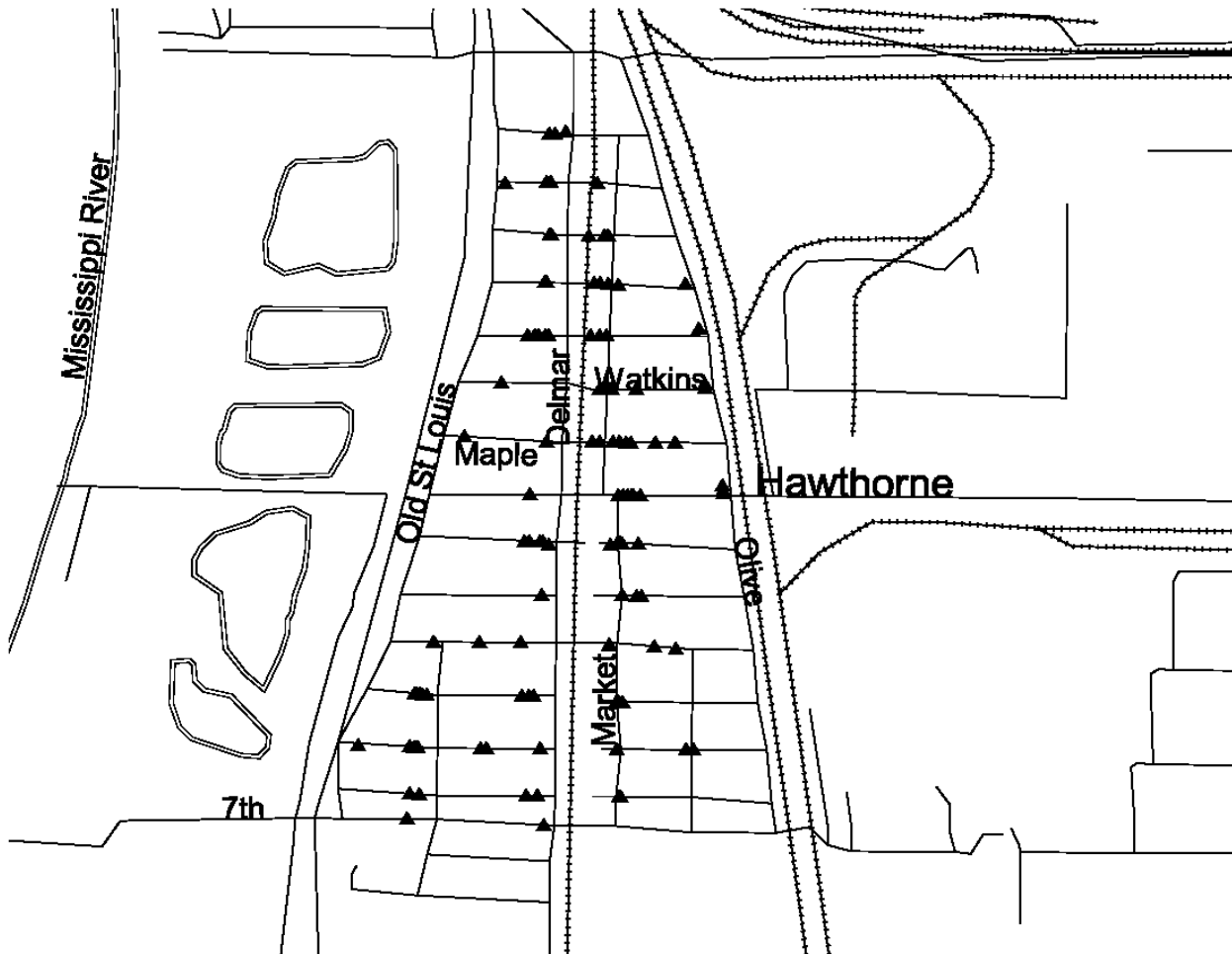
Comparison Values Used In Screening Contaminants for Further Evaluation

Environmental Media Evaluation Guides (EMEGs) are developed for chemicals based on their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. EMEGs are not action levels but are comparison values. They are developed without consideration for carcinogenic effects, chemical interactions, multiple route exposure, or exposure through other environmental media. EMEGs are very conservative concentration values designed to protect sensitive members of the population.

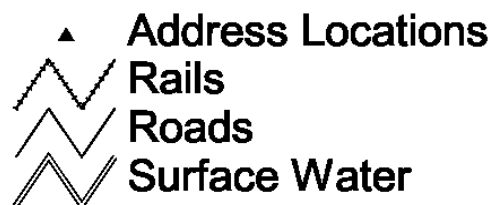
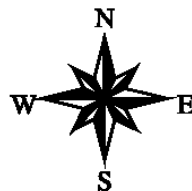
Reference Dose Media Evaluation Guides (RMEGs) are another type of comparison value. They are developed without consideration for carcinogenic effects, chemical interactions, multiple route exposure, or exposure through other environmental media. RMEGs are very conservative concentration values designed to protect sensitive members of the population.

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations that are based on a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime.

Approximate Location of All Returned Questionnaires



Locations have been skewed to maintain confidentiality.

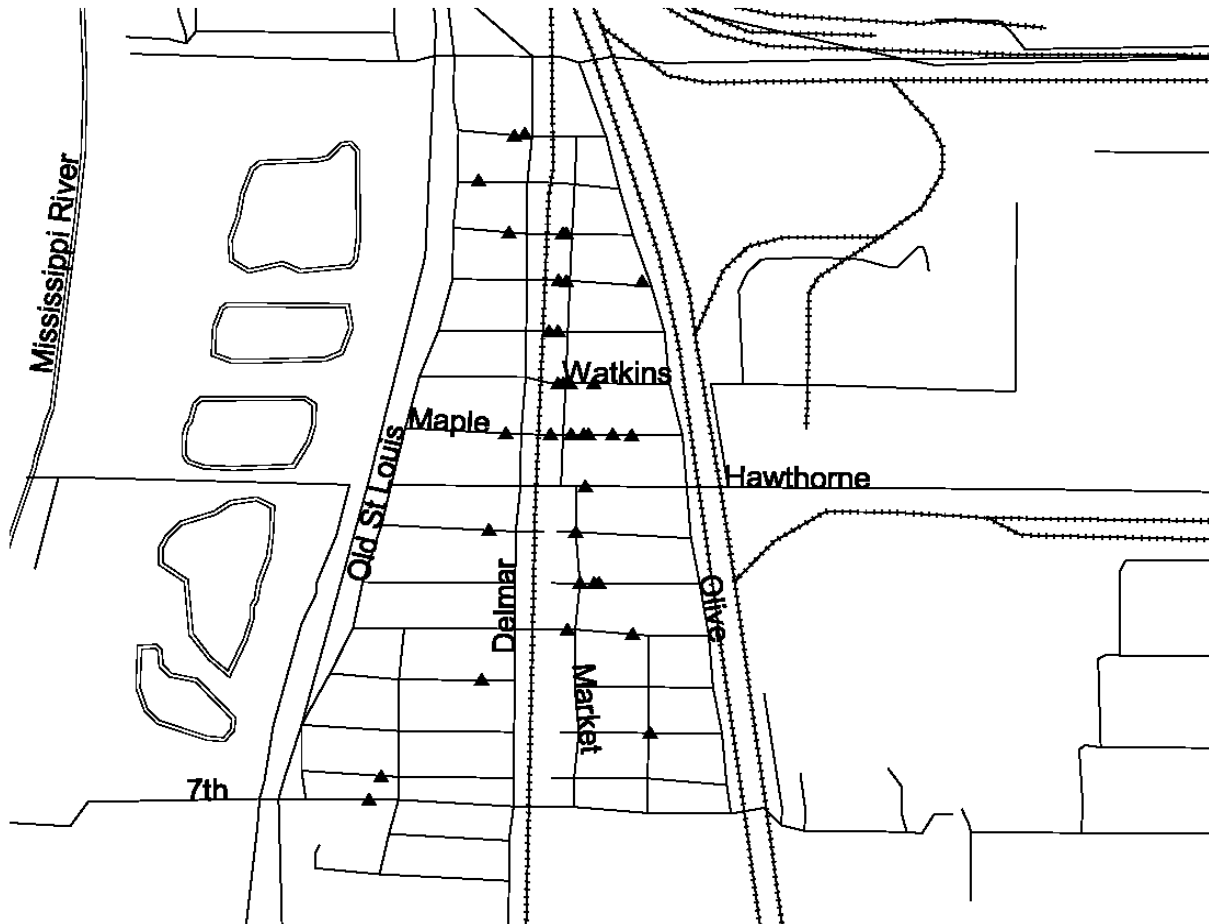


0.1 0 0.1 0.2 Miles

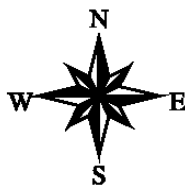


Source: IDPH Toxicology Section

Approximate Location of Gasoline/Fuel Odors



Locations have been skewed to maintain confidentiality.



- ▲ Address Locations
- Rails
- Roads
- ~ Surface Water

Source: IDPH Toxicology Section

0.1 0 0.1 0.2 Miles

Health Concerns and Exposure Issues on Questionnaires from the NE area of Hartford

Only health concerns and exposure issues are listed and grouped by topic. Duplicate and personally identifying comments have been removed. The NE area of Hartford averaged about three concerns or issues per returned questionnaire.

Exposure Issues

- C Concerned about the long-term exposure to benzene, toluene, and hexane.
- C How many years do you have to be exposed?
- C Odors and symptoms occur when it rains, especially when the water table is high.
- C This has been going on for 3 years. It is better now. I was told that Premcor put something under the highway to take care of the smell when the government got involved. I am not getting this bad smell now. I could even taste in my mouth before.
- C Concerned about heavy odors outside at different intervals—especially the water collected in small creek area at Hawthorne and Rt. #3 behind Veteran Memorial Park.
- C We have never experienced any problems in our house.
- C Sometimes you can't even sit outside because of the odor and heavy vapor.
- C Worried about what 27 years of exposure has done to my and my family's health.
- C I notice a different smell now. Smells like oil, gasoline, and an unusual chemical smell.
- C I would like our home to be tested for gas vapors.
- C We have a well in the front yard that was put there by EPA. In the well, they said the gasoline was 97 octane.
- C By the time I called someone out, it would be better. I had four different men from the refinery here. Then it would be better. They told me the machine they were using probably wasn't set up for the odor I had. I feel like I have had the run-around.
- C Clark has a smoke stack going high—mostly at night.
- C I want to know everything about the water table and what makes the air smell so bad. Also the gas underground.
- C I sometimes see a gasoline layer on top of leaves when water flows into my backyard due to the increased water table during heavy rains.
- C Smells like when I worked at Shell.

Cancer Concerns

- C I am concerned about cancer-causing agents.
- C Will vapor exposure cause lung cancer?
- C Worried long-term exposure from hydrocarbons might lead to cancer, leukemia, etc.

Respiratory Health Concerns

- C We have breathing problems and we are afraid that it will give us long-term health problems.
- C Do these vapors cause asthma or other problems with the lungs?
- C Does it cause sinus problems, sore throat, and allergy symptoms?
- C I can't breathe.

- C Many nights I wasn't getting 3 hours of sleep. I coughed continually and have to take cough drops every night. They released it at the same time every night and morning.
- C Am I at greater risk because of my diminished lung capacity?
- C I have a 4-year-old grandchild with asthma problems—will this affect them?
- C My husband died recently of respiratory disease.
- C A family member had a lung lobe removed.

Headache Concerns

- C We have had a lot of headaches and nausea—is that related to the odors?
- C I get headaches when the vapors are strong and they come into the house from outside.
- C My headaches started when I moved here.
- C My migraine headaches have become worse in the last 2 years.
- C Worries maybe his child's high fever and headaches are connected to the vapors.

General Health Concerns

- C Is this area safe? Is it healthy to live here?
- C What are the long-term health effects?
- C I believe these fumes in the house while I am trying to sleep have greatly affected my health.
- C Could the vapors cause heart problems or affect heart patients?
- C Will exposure to this affect my diabetes?
- C Should I leave because of these health concerns?
- C Can these vapors worsen our current health conditions?
- C Should I be concerned about relatives that stay with me sometimes?
- C Could it cause problems with the eyes? I've had eye irritation recently.
- C What health-related problems are associated with the vapors? What can be done about it?
- C Could it cause mental problems in children, adults, or the elderly?
- C Worried my life span is decreased.
- C Worried about the health of my grandchildren.
- C Can the effects be passed to future children? Can babies be born with problems?
- C Does it cause nerves or does it affect the nervous system?

Other Issues

- C Called Illinois EPA and USEPA, but nobody seems concerned.
- C What is going to be done about these problems?
- C My basement has blown up two different times. Worried my neighborhood will blow up.
- C I'm concerned about fires, explosions, and property values in Hartford.
- C Worried about whether using gas stoves could blow up their house.
- C Concerned about dispensing of released odors in the air outside. During the past 3 years the plant life has drastically changed in yard and garden. A powdery substance seems to be on plant leaves causing deterioration of plants.
- C In February, our cat died. She lived in the basement. Could it affect pets or wildlife?
- C Two weeks ago, my dog had a seizure.
- C We moved in 3 years ago. Last year we brought a rabbit in from outside and put it in the basement for the winter. Two months later we found him dead.
- C I thought all of this had been taken care of before I bought this house.
- C I was told that we can't sell because of liability.

- C Is the water safe?
- C Worried about lead.

Health Concerns and Exposure Issues on Questionnaires from areas other than NE Hartford

Only health concerns and exposure issues are listed and grouped by topic. Duplicate and personally identifying comments have been removed. The areas other than NE Hartford averaged about 1.5 concerns or issues per returned questionnaire.

Exposure Issues

- C How can benzene in our groundwater affect me?
- C I smell the gasoline out in the yard on rainy days.
- C Several years ago, a family member was hired to carry some type of gauge. He went to people's yards and tested their yards for underground gas. It was bad, especially on the east side of the railroad tracks from Delmar toward the oil refinery.
- C This has been an ongoing problem since at least 1970 when the school was closed due to gas fumes. Our school was condemned and torn down because of the odor.
- C We had a home on Birch and it had the gas. At one time they put a pipe outside to measure the gas. It is now sealed and blocked.
- C My main concern is the emissions from the refineries.
- C I grew up on East Watkins from the age of 1½ until I married. My brother was born on that street. This is not a new problem.
- C There is gasoline under the ground from Maple Street north to Rand Avenue.
- C I have lived in Hartford since 1943 and I have never had any problems with gas or odor in any place I have lived. I have heard about the homes in the northeast section of town.
- C My concern is the smell of antifreeze that happens several times a week—early morning and evenings mostly.
- C I have done better since I installed central air conditioning in my home.
- C The gasoline was around for years, long before they actually acknowledged it.
- C We have a fan for exhausting fumes out of the window.
- C I think the dust blowing off this stuff is harmful.
- C Have been using bottled water for years.
- C It is just now causing trouble again.

Cancer Concerns

- C Are the outdoor gas odors cancerous?
- C Is there a high rate of cancer or other diseases that might be related to gasoline?
- C I grew up on the north end of town and there have been 15 cancer-related deaths on my former street.
- C Odor was constantly on our minds because we had several [people] on our street who died of cancer.
- C Concerned about cancer-causing agents in the air they smell.

Respiratory Concerns

- C Both of us have had respiratory and sinus problems since moving here.

- C The smell and vapors are not good for people who have asthma and chronic obstructive pulmonary disease.
- C Some people have coughing spells a lot.
- C I am concerned about asthma attacks.
- C Can the vapors damage my lungs?
- C My family has always had sinus problems.
- C There is an increase in upper respiratory infections and asthma, and sinus conditions are poor.
- C What are the effects on the respiratory system?
- C Some of my children have bronchial asthma.
- C I get respiratory infections, but not when I smell the gasoline.
- C Is the incidence of respiratory problems higher in Hartford, especially for those who have lived here many years?
- C I don't know if my bronchitis is due to gas vapors.
- C Family member was diagnosed with emphysema and had part of a lung removed.

Headache Concerns

- C Can the vapors cause migraines?
- C Can this be related to our headaches—sometimes days at a time?
- C I know when we get the vapors, it gives me headaches and the smell is hard to deal with.

General Health Concerns

- C We have had our share of losing people in Hartford, but I don't know what they died of.
- C What are the long-term health effects?
- C Will vapors affect my young children?
- C Our health has decreased since moving here.
- C Can it cause immune system deficiency?
- C Can it cause bone or joint problems?
- C I have heart problems. Will this affect my heart—other than the stress?
- C Will it cause brain problems?
- C Will the vapors cause nose bleeds?
- C Could these fumes cause nervousness?
- C What effect does it have on older people and younger kids?
- C Is it safe for children to play outside when the odors are prevalent?
- C We frequently experienced nausea, fatigue, lethargic feeling, and we often recognized it on days that a chemical or sulfur-like smell, almost like a raw gas smell, was present.
- C We grew up with it and to my knowledge not one child or adult was affected by it. The adults lived to be old and many of us kids still live in Hartford.
- C We are tired of the nasty smell that is destroying our air and people's health.

Other Issues

- C I know people in the north half of the town who have problems.
- C What are you going to do if people's health gets bad from the smell?
- C Are people on oxygen at risk of an explosion?
- C Who will pay for our hospital visits or doctor bills?
- C Is my drinking water OK?
- C The safety of living this close to combustible materials is a concern.

- C No one is held accountable.
- C If you care about our health and our children's health, you will close this place down.
- C We would like to see this cleaned up so we can sit outside in the evening.
- C I am concerned about the "black mountain" at Premcor.
- C I am concerned that I will be unable to sell or even rent because of this.
- C My biggest concern is that they won't clean this up.
- C Some homes in the north half of town have had odors and on occasions have had fires because of it.
- C It seems that any time there is an incident, cleanup or repairs have been performed.
- C Have had a recurring problem with sewer back up.
- C Hartford has worked with the refineries to solve this problem.
- C The vapor and pollution falling in the village has settled on our home to the point that we wash it down every 2 weeks.
- C Emissions leave residues on our cars, house, and windows.
- C I have been concerned about these issues for years now.
- C We are concerned with the structure of our homes.
- C Tourism is also a concern.
- C Living in or around a city—airports, trains, and factories are the strength of the employment sector. No factory smells like a rose garden.
- C Worried that vapor could contaminate the soil.
- C We get brown splotches on our cars. They are greasy and difficult to remove. Sometimes our siding is affected as well. If the spots are not removed early, they leave a rusty spot like acid or something caustic.
- C No one in their right mind would want to buy this land. Media scared people away.
- C Premcor has been allowed to operate with this smell and pollution with no penalties. They let the refineries do anything for fear of losing jobs.
- C Could there be a buyout that could help make us debt free?
- C The village and the refineries worked diligently on this problem 20 to 25 years ago.
- C Our houses vibrate when they work on their problems.
- C We have replaced our entire sewer line to the street and installed a trap to prevent backups. The street drain is higher than my property so all the rainwater stays puddled in front of my house year round unless there is a drought.
- C When we get heavy rains it floods our basement with 3 feet of water. Last time there was an oily residue on the water and it smelled like a pilot light was out. All pilots were off.
- C Have lost carpets, clothing, and furniture and spent a fortune rebuilding walls that continue to crack, re-poured floors to keep them from lifting, and installed a sump pump and shut-off valves in every sink and stool.
- C Cracks in walls leak in heavy rains. There is a crack where the sewer pipe meets the floor. In heavy rain, water comes through like a faucet. Once had 1 foot of rain in my basement when drain plug wasn't in.

Public Comments Received

1. There appears to be a mapping problem with the locations designated in Attachments 4 and 5. I expected to see Attachment 5 to be a subset of the locations from Attachment 4. However, there are locations shown in Attachment 5 that are not shown in Attachment 4.

The mapping shown in the public comment version was incorrect for some locations. The maps have been revised to reflect the correct locations and to address this comment.

**INCIDENCE OF CANCER IN ZIP CODE 62048 OF
HARTFORD (MADISON COUNTY), ILLINOIS**

1990-1999

Prepared by the

Division of Epidemiologic Studies
Illinois Department of Public Health

September 2002

Background

The Illinois Department of Public Health, Division of Environmental Health, contacted the Division of Epidemiologic Studies, with a request to evaluate the cancer incidence in Hartford (Madison County). Residents of the area have had a continued exposure to petroleum vapors coming from a contaminated aquifer. Dr. Tiefu Shen, Chief of the Division of Epidemiologic Studies, initiated an evaluation of the cancer incidence.

Methods

The study area was defined as ZIP code area 62048 of Hartford. All cases of cancer diagnosed among residents of the study area for the most recent ten years of complete data at the time of the study, 1990 through 1999, were identified. The source for these data was the Illinois State Cancer Registry (ISCR). Identification of cancer cases in ISCR is dependent upon reporting by diagnostic and therapeutic facilities as mandated by state law.

In addition, ISCR has agreements with other central cancer registries to send back Illinois cancer data which are identified outside the state. These registries include Arkansas, California, Florida, Indiana, Iowa, Kentucky, Michigan, Mississippi, Missouri, North Carolina, Washington, Wisconsin, Wyoming, Barnes-Jewish Hospital in St. Louis, and the Mayo clinic in Minnesota. Completeness of out-of-state reporting depends upon the years of operation of these other central registries, the extent of their identification of out-of-state residents, and their standards of quality. Out-of-state diagnoses among residents of the study area accounted for 13 percent of the total number of cases reported and were included in the study. Completeness of reporting from all reporting sources, assessed using the NAACCR Standard,¹ is considered to be 96 percent complete for this time frame (1990-99).

All cancer cases from the study area were grouped by tumor site, sex, and age. These are referred to as the *observed* cases. Since the population for the study area is 98.5 percent white, age- and sex-specific rates for whites from a comparable population in Illinois were applied to each age group of the study population (all races) and to each tumor site to obtain an *expected* number of cases for the study area.² The comparable population was defined as an area with a similar population density and as the study area (13 Illinois counties with small urban populations). Population data for the study area were derived from the 1980 and 2000 U.S. Census, the most reliable sources for population counts by age, sex, and race for small areas. Age- and sex-specific population counts were interpolatively estimated using an exponential method for each year 1990-1999. The reason for using the 1980 and 2000 Census, rather than the 1990 and 2000 Census, as two anchoring points in estimating numbers in between was because the 1990 population count for Hartford (n=3771) was unreasonably higher than that of either the 1980 count (by 113 percent) or the 2000 count (by 150 percent), thus resulting in an overestimation in the expected number of cases. Age-, sex-, and race-specific population estimates for each year (1990-99) for the reference group were also obtained from the U.S. Census Bureau.

The observed number of cases was compared with the expected number of cases. Based on the Poisson model, a probability of 0.01 or less for an observed number of cancer cases that was higher or lower than the expected number was considered to be a statistically significant difference.³

When a significant excess was identified, and when appropriate for the site in question, other data elements and risk factor data, as reported to ISCR, were reviewed. These may include stage of disease at diagnosis, tobacco and alcohol use, occupational information, morphologic type of tumor, and location of residence within the study area.

When the observed number is small for a specific tumor site, the number is not mentioned in this report to protect the privacy of individuals. If possible, the cases are grouped with other sites within body organ systems, or when not possible, they are included in the *All Other Sites* category.

Results and Discussion

For all cancer sites combined, the incidence of cancer among males in the study area was 60 cases observed with 47 cases expected. In females, 47 cases were observed while 44 cases were expected. These differences were not statistically significant for either sex. The sites are grouped in the table to protect the privacy of individuals. Among females none of differences between observed and expected numbers of cases for each site group was statistically significant. Although the total number of cases in males was not significantly different from the expected numbers, a significant excess was noted for colorectal cancer with 14 cases observed and 6 cases expected. Most of the observed cases (n=8) concentrated in age group 75 years and older and half of them (n=7) had a smoking history. Other risk factors were not available to the study to be examined. None of the other specific sites of cancer in males had observed numbers of cases significantly different from the expected numbers.

Cancers of the colon and rectum are the third most common cancer in both males and females. About 90 percent of the cases occur after age 50. Known risk factors for colorectal cancer include; family history, physical inactivity, inflammatory bowel disease, obesity, consumption of red meat, smoking, alcohol usage (more than 1 drink/day). Many new cases of colorectal cancers are preventable with by improvements in nutrition and physical activity and by the timely use of existing screening tests and the removal of pre-cancerous polyps.^{4,5}

Although not presented in the table (due to small numbers), leukemias and lymphomas were separately examined. None of them revealed any significant elevations.

Analytical Considerations

In drawing conclusions from these data, two aspects of the statistical method need to be addressed. First, random fluctuations in disease occurrence cannot be completely ruled out in explaining differences between the observed and expected numbers, even when the difference is statistically significant.

The second aspect is the power of the statistical test, that is, the probability that a true departure from the expected number can be detected by significance testing. A non-significant difference sometimes reflects the low statistical power rather than the absence of differences. The power of a test varies with the number of cases expected.⁶ In the study area, the power of detecting a doubling was high in both sexes for the total cancer cases.

In addition, the latency between the time of exposure and the onset of clinically-recognizable disease for most adult cancers is between 10 and 20 years. Specific cancers may vary somewhat in the length of the latent period, but generally speaking, recent exposure, that is exposures in the last 10 years cannot be expected to be associated with current cancer incidence. The history of residency for cases included in the present study could not be assessed because this information is not collected by the cancer registry, nor is such information available for the general population in the area.

Additional Comments

Cancer is a common disease, sometimes more common than many people believe. In the U.S., one in two men have a lifetime risk of developing cancer. For women, the lifetime risk is one in three.⁵ The number of people with cancer is increasing in most communities because more people are living to the ages of greatest cancer occurrence.

Many people could reduce their chances of developing or dying from cancer by adopting a healthier lifestyle and by visiting their physician regularly for a cancer-related checkup. Screening examinations, conducted regularly by a health care professional, can result in the detection of cancers of the breast, tongue, mouth, colon, rectum, cervix, prostate, testis, and melanomas at earlier stages, when treatment is more likely to be successful. More than half of all new cancer cases occur in the nine screening-accessible cancer sites listed above.⁵

Current knowledge suggests that the leading preventable cause of cancer is cigarette smoking.⁷ Exposures to carcinogenic chemicals, ionizing radiation, and other agents produced by humans is responsible for less than five percent of human cancers.⁷ Generally speaking, any possible risk associated with the environment would most likely only have a small effect on cancer incidence relative to that of tobacco.⁵ The following table shows the best current estimates for the causes of cancer.

Causes of Cancer in the United States	Percent
smoking	30
adult diet and obesity	30
sedentary lifestyle	5
alcohol	3
reproductive factors	3
prenatal factors and growth	5
occupational factors	5
environmental pollution	2
ionizing and UV radiation	2
viruses and other biologic agents	5
prescription drugs and medical procedures	1
food additives and contaminants	1
family history of cancer	5
socioeconomic status	3

Source: Harvard School of Public Health. Harvard Report on Cancer Prevention Volume 1: Causes of Human Cancer. *Cancer Causes and Control*. London: Rapid Science Publishers; 1996:Vol 7.

References

1. Data Evaluation and Publication Committee. NAACCR Standard to Assess the Completeness of Case Ascertainment. Winter 1997 Newsletter. Sacramento, CA: North American Association of Central Cancer Registries, November 1996.
2. Mattson DE. *Statistics: Difficult Concepts, Understandable Explanations*. Oak Park, IL: Bolchazy-Carducci Publishers Inc; 1986:386-389.
3. Gustafson TL. *True Epistat Manual*. Richardson, TX: Epistat Services; 1987:6-19.
4. Schatzkin AG. Colon and Rectum .In Harris A (ed) *Cancer Rates and Risks*. Washington, DC: National Cancer Institute;1996. US Dept of Health and Human Services publication NIH 96-691.
5. American Cancer Society. *Cancer Facts and Figures - 2002*. New York, NY: American Cancer Society; 2002.
6. Selvin S. *Statistical Analysis of Epidemiological Data (Second Edition)*. New York, NY: Oxford University Press; 1996:83-102.
7. Lave L. Environmental regulation and policy making. In Schottenfeld D, Fraumeni JF (eds). *Cancer Epidemiology and Prevention*. Philadelphia: WB Saunders Co; 1996:1453-1470.

Illinois State Cancer Registry
Division of Epidemiologic Studies
Illinois Department of Public Health

Observed and Expected Numbers of Cancer Cases by Site and Sex
Residents of ZIP Code Area 62048 of Hartford, Illinois
1990-1999

Cancer Site Group	Males		Females	
	Obs.	Exp. ^a	Obs.	Exp. ^a
Colorectal	14 ^b	6	6	6
Other Digestive System	4	4	1	2
Lung and Bronchus	8	9	7	6
Females Breast (invasive & <i>in situ</i>)	-	-	12	15
Female Reproductive System	-	-	6	5
Prostate	17	14	-	-
All Other Sites	17	15	15	10
All Sites	60	47 ^c	47	44

SOURCE: Illinois State Cancer Registry, November 2001.

^a Expected numbers are based on the age-and sex-specific incidence rates in white persons in an area of Illinois with a similar population density as the study area.

^b Statistically significant difference at $p < .01$.

^c Numbers may not add to total due to rounding.