



Cancer Incidence Assessment near Sterigenics in Willowbrook, Illinois, 1995-2015

**Kyle Garner, MPH, Cancer Epidemiologist
Tiefu Shen, MD, PhD., Division Chief
Division of Epidemiologic Studies
Illinois Department of Public Health**

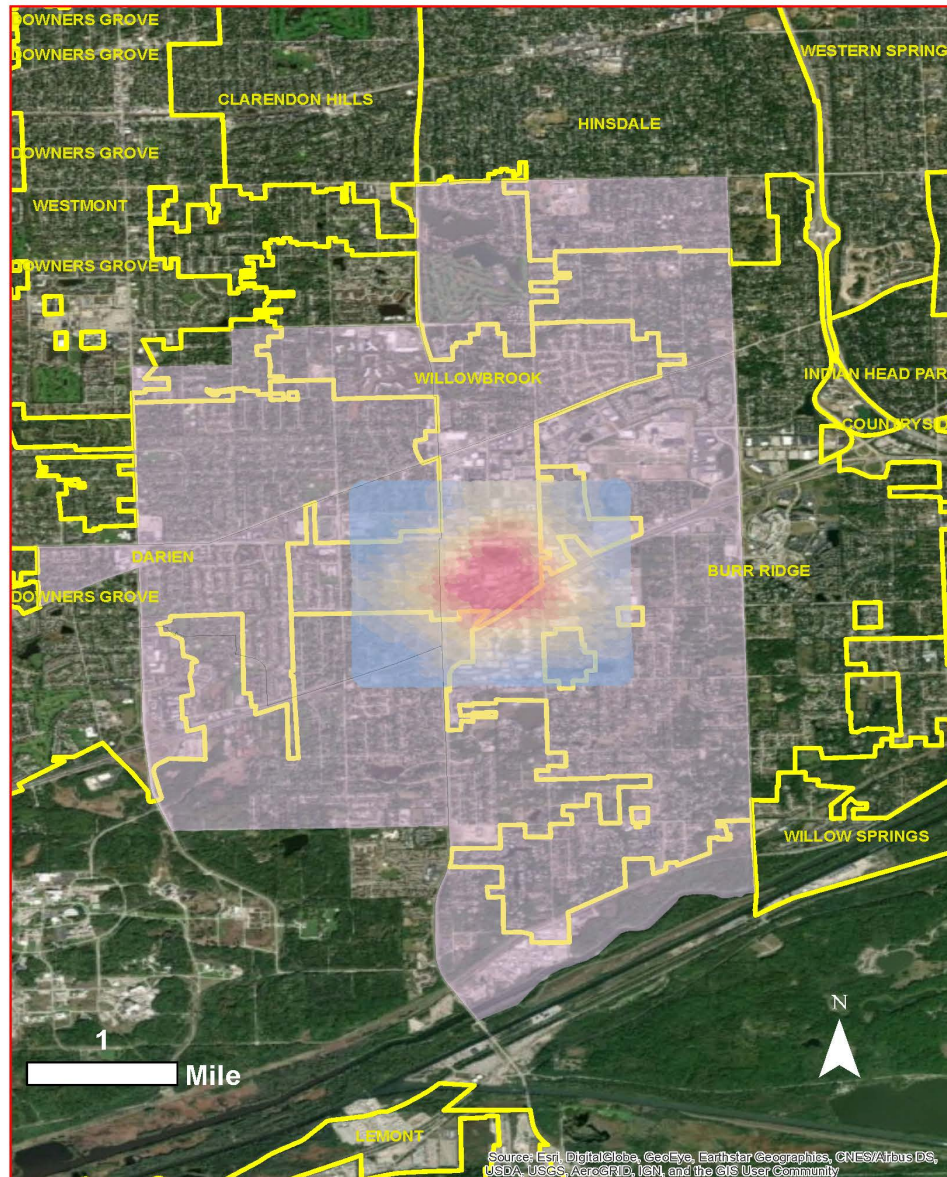
May 2019

Investigation question

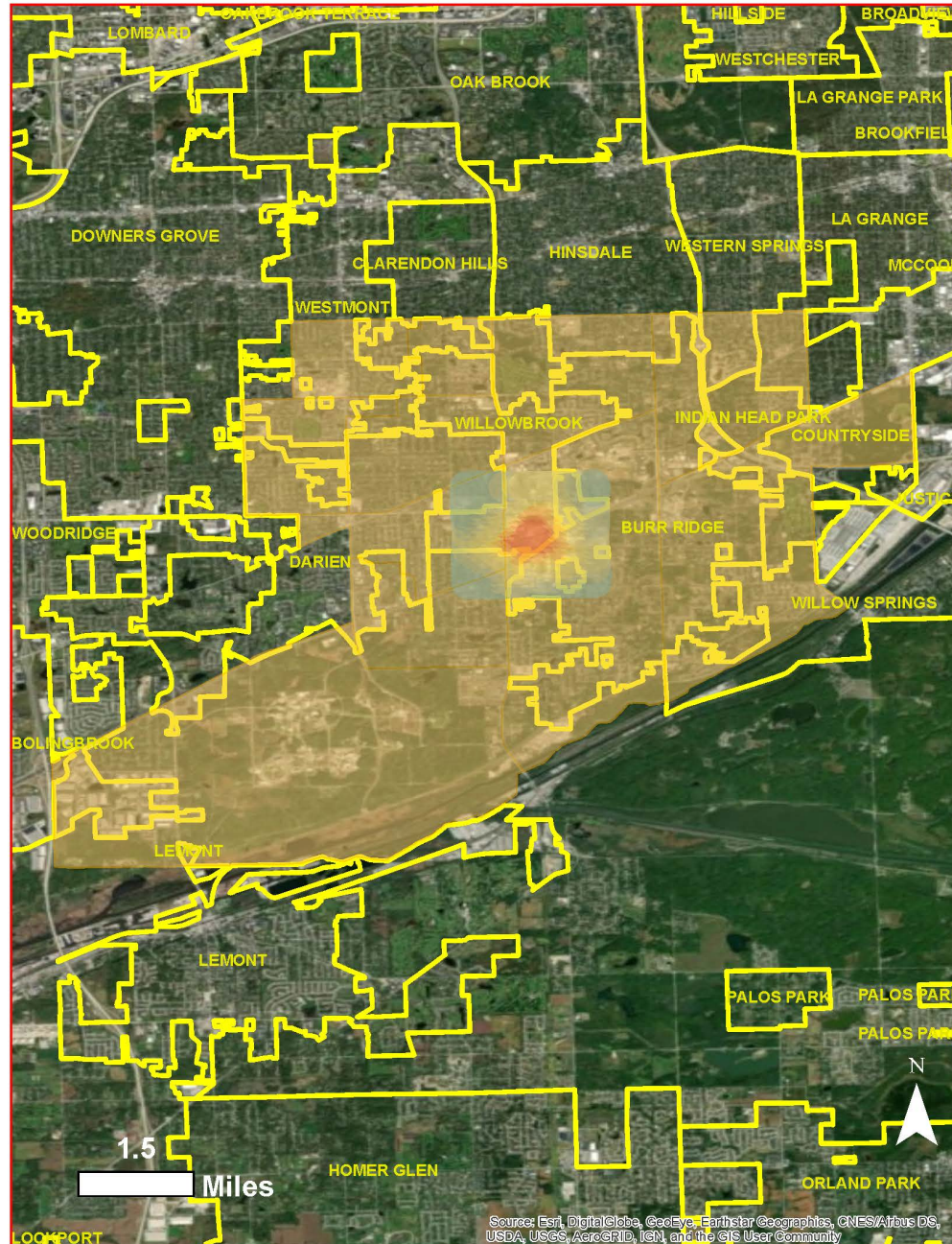
Is there evidence of increased cancer incidence in the area surrounding the Sterigenics facility?

Materials and Methods

Study Area 1 2010 Population 31,808



Study area 2 2010 Population 72,029



Data source

- **Illinois State Cancer Registry**
- **1995-2015**
- **Cases geocoded to the census tract level**
- **Study Area 1 4,534 cases**
- **Study Area 2 9,416 cases**
- **Cases stratified by age, sex and tumor site**

Sites examined

- Lymphohematopoietic cancers – Hodgkin's lymphoma, NHL, myeloma, and lymphocytic leukemia
- Female breast cancer
- 18 Common cancer sites
- Pediatric Cancers - leukemia, lymphomas, central nervous system tumors, neuroblastoma, retinoblastoma, renal tumors, hepatic tumors, bone, soft tissue, germ cell tumors, and all other sites

Standardized Incidence Ratios (SIR)

- **Study Area (observed) compared to Reference group (expected)**
 - State reference – Lake, McHenry, Kane, DuPage, Will
 - County reference – DuPage
- **Interpolated/extrapolated population counts for non-censal years**
- **Indirect age adjustment**
- **Observed/Expected comparison made for all age-, sex-, site-specific combinations**
- **Statistical significance set at $p < 0.05$**
- **Time trend: 1995-2001, 2002-2008, and 2009-2015 for EtO related sites**

RESULTS

SIR's for Lymphohematopoietic and female breast cancers by gender, study area and referent group, 1995-2015

	County Referent					State Referent				
	Obs.	Exp.	SIR	95% LCI	95% UCI	Obs.	Exp.	SIR	95% LCI	95% UCI
STUDY AREA 1										
<u>Males</u>										
Non-Hodgkin's Lymphoma	108	99.63	1.08	0.89	1.31	108	99.63	1.08	0.89	1.31
Hodgkin's Lymphoma	7	11.82	0.59	0.24	1.22	7	11.62	0.60	0.24	1.24
Myeloma	28	28.69	0.98	0.65	1.41	28	28.69	0.98	0.65	1.41
Lymphocytic Leukemia	34	31.52	1.08	0.75	1.51	34	31.52	1.08	0.75	1.51
<u>Females</u>										
Invasive Breast	747	710.76	1.05	0.98	1.13	747	680.60	1.10	1.02	1.18
Non-Hodgkin's Lymphoma	95	88.87	1.07	0.86	1.31	95	89.16	1.07	0.86	1.30
Hodgkin's Lymphoma	19	10.20	1.86	1.12	2.91	19	10.06	1.89	1.14	2.95
Myeloma	23	24.72	0.93	0.59	1.40	23	25.50	0.90	0.57	1.35
Lymphocytic Leukemia	19	24.01	0.79	0.48	1.24	19	22.71	0.84	0.50	1.31
STUDY AREA 2										
<u>Males</u>										
Non-Hodgkin's Lymphoma	222	205.91	1.08	0.94	1.23	222	204.71	1.10	0.95	1.24
Hodgkin's Lymphoma	19	24.90	0.76	0.46	1.19	19	24.45	0.78	0.47	1.21
Myeloma	62	59.08	1.05	0.80	1.35	62	58.89	1.10	0.81	1.35
Lymphocytic Leukemia	69	65.97	1.05	0.81	1.32	69	71.19	1.00	0.75	1.23
<u>Females</u>										
Invasive Breast	1,548	1,507.88	1.03	0.98	1.08	1,548	1,444.64	1.07	1.02	1.13
Non-Hodgkin's Lymphoma	208	190.61	1.09	0.95	1.25	208	191.11	1.09	0.95	1.25
Hodgkin's Lymphoma	30	23.32	1.29	0.87	1.84	30	22.86	1.31	0.89	1.87
Myeloma	58	52.97	1.09	0.83	1.42	58	54.53	1.06	0.81	1.37
Lymphocytic Leukemia	40	52.06	0.77	0.55	1.05	40	49.24	0.81	0.58	1.11

Results

Lymphohematopoietic Cancers

- No elevations seen in males
- Hodgkin's lymphoma significantly elevated among women in Study Area 1
 - Study area 1 compared to the county (SIR 1.86, 1.12-2.91) and state (SIR 1.89, 1.14-2.95)
 - Few prior studies focused on this site and EtO

Results

Female Breast Cancer

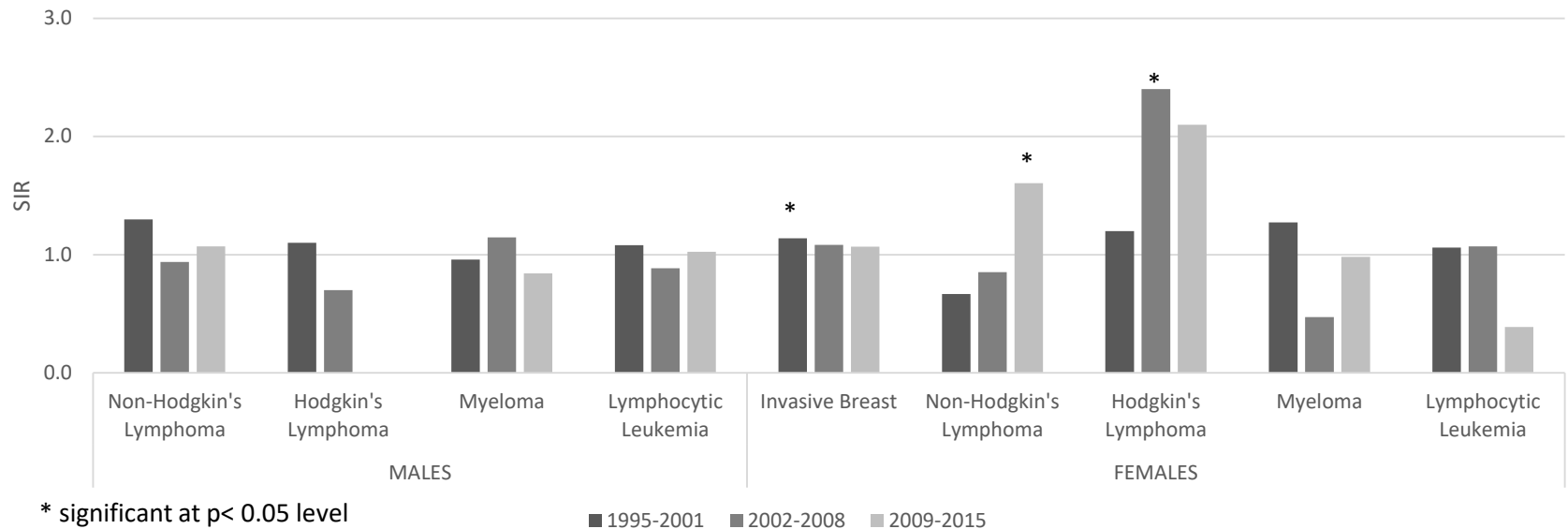
- Appeared to be elevated
- Compared to the five collar counties (SIR 1.1, 1.02-1.18)
- 10% higher (747 cases) than expected (681 cases) in Study Area 1
- 7% higher (1,548 cases) than expected (1,445 cases) in Study Area 2
- Not significantly higher when compared to the county.

Results

Trends

- NHL in females increased over time with sig. SIR in 2009-2015
 - Observed in both study areas

Figure 1: Temporal Trends in EtO Related SIR's by Gender and Site, Study Area 1, State Referent, 1995-2015



Results (cont.)

Other Cancer Sites

- **Males**
 - Prostate significantly elevated in both study areas compared to state and county ref. groups
 - Lung significantly lower in men of study area 2
- **Females**
 - Pancreas, ovary, and bladder elevated in study area 1
 - Pancreatic cancer elevated in study area 2
 - Leukemia significantly lower in study area 1
 - Lung cancer significantly lower in study area 2 compared to state reference

Results (cont.)

Pediatric Cancer

- Females

- Lymphomas elevated in both study area 1 and 2.

Table 7: Pediatric Cancer Standardized Incidence Ratios for Study Area 1 and 2 by Gender, State Referent Group*, <20 years old, 1995-2015

STATE REFERENT	Study Area 1					Study Area 2				
	Obs.	Exp.	SIR	95% LCI	95% UCI	Obs.	Exp.	SIR	95% LCI	95% UCI
<u>Females</u>										
Leukemia	5	3.20	1.56	0.50	3.64	5	7.29	0.69	0.22	1.60
Lymphomas	7	2.36	2.96	1.19	6.11	11	4.98	2.21	1.10	3.96
Central Nervous System	3	2.10	1.43	0.29	4.17	4	4.67	0.86	0.23	2.19
Neuroblastomas	0	0.53	0.00	---	---	0	1.25	0.00	---	---
Retinoblastoma	0	0.18	0.00	---	---	0	0.43	0.00	---	---
Renal Tumors	0	0.65	0.00	---	---	0	1.55	0.00	---	---
Hepatic Tumors	1	0.12	8.42	0.11	46.87	1	0.28	3.59	0.05	19.95
Bone	0	0.82	0.00	---	---	0	1.72	0.00	---	---
Soft tissue	3	0.98	3.07	0.62	8.96	3	2.11	1.42	0.29	4.15
Germ Cell Tumors	1	0.78	1.29	0.02	7.18	3	1.64	1.83	0.37	5.34
Other malignant melanomas	2	2.67	0.75	0.08	2.71	9	5.50	1.64	0.75	3.10
Other unspecified	0	0.03	0.00	---	---	0	0.06	0.00	---	---
Not Classified	0	0.01	0.00	---	---	0	0.02	0.00	---	---

Note: SIR's in bold indicate significance at the p<0.05 level

* State Referent group includes Lake, McHenry, Kane, DuPage, and Will counties.

Source: Illinois State Cancer Registry, data as of November 2017

Site/Histology Recode Based on International Classification of Childhood Cancer, third Edition (ICCC-3) Based on ICD-O-3 / WHO 2008

Conclusions

- Some cancers were observed to be elevated
 - Hodgkin's lymphoma and breast cancer in females
 - Treat with caution
 - Inconsistences across gender, study areas, and cancer sites
- Study Limitations
 - Multiple comparisons
 - Imprecise population figures
 - Residential history
 - Residing near facility a proxy for EtO exposure.
 - Some comparisons based on very small numbers (<10)
 - No data on other risk factors
 - Complex cancer etiology

Recommendations

- **Continue to monitor cancer incidence in Willowbrook, IL**
 - Data collection
 - Assessment of incidence following operational changes of EtO emitters in the area
- **Future studies**
 - Larger populations
 - Multiple EtO sites



THANK YOU!

QUESTIONS CAN BE SENT TO:

Ethyleneoxide-cancer@Illinois.gov

FOR THE FULL REPORT PLEASE VISIT:

<http://dph.illinois.gov/sites/default/files/publications/sterigenicswillowbrookcancer-investigation-final.pdf>