



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control  
and Prevention (CDC)  
Atlanta, GA 30333

February 2, 2010

Kenneth D. Koehler, Chairman  
McHenry County Board  
2200 N. Seminary Avenue  
Woodstock, IL 60098

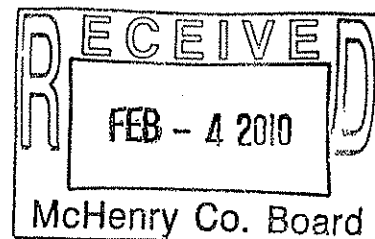
Dear Mr. Koehler,

Thank you for the opportunity to review documents related to the cancer investigation in the Village of McCullom Lake, Illinois. My staff and I reviewed the documents provided by the Illinois Department of Public Health which included data and statistical analysis. The analysis presented was comprehensive and correct analytically. Enclosed is an evaluation of the investigation, as described in the documents. For any additional information or questions about this evaluation, please contact Dr. Lauren Lewis at 770-488-3403.

Sincerely,

Michael A. McGeehin, PhD, MSPH  
Director,  
Division of Environmental Hazards and  
Health Effects  
National Center for Environmental Health  
Centers for Disease Control and Prevention

Cc: Tiefu Shen, Chief, Division of Epidemiologic Studies, IL Department of Public Health  
Melissa L. Bean, US Representative (IL-08), House of Representatives



# McCullom Lake, McHenry County cancer assessment: Epidemiological review

## I. Introduction

The Centers for Disease Control and Prevention received a request from the Illinois State (IL) Department of Public Health (DPH) to review an investigation report of a possible cancer cluster in McCullom Lake area in McHenry County, IL. This review is in response to their request.

## II. Background

In 2006, the McHenry County Department of Health (DOH) received a request from citizens of McCullom Lake to assess what they perceived an elevated number of brain cancer in their community. Specifically, they were concerned that local groundwater, their drinking water source, had been contaminated by a nearby chemical manufacturing facility.

In response, McHenry County DOH investigated cases of brain cancer in the McCullom Lake area. Thirty cancer cases were identified. Twenty-two cases were plaintiffs in a lawsuit and 8 cases were identified through newspaper articles. The demographic characteristics of McHenry County and the State of Illinois are presented in Table 1.

A chemical manufacturing facility is located near the lake and has been in operation since the 1940's. Historically, chemical waste from the facility was kept in a closed and capped landfill which was upgraded in 1987. Since 1978, the facility has disposed of its waste offsite. However, chemicals, such as trichloroethene, 1, 1-dichloroethylene, and vinyl chloride, all of which were used by the company, have been documented in the nearby groundwater.

## III. Methods

This investigation spanned three years and included investigations of data from the state cancer registry and a survey conducted by the McHenry County DOH. A synopsis of the various studies is presented below and in Tables 2-9.

The purpose of the cancer registry studies was to determine if there was a more than the expected number of all cancer cases and brain and central nervous system (CNS) cancer cases in McHenry County compared with the rest of the state. Studies using this data included calculating age-adjusted cancer incidence rates, standardized incidence rates (SIR), and time trends in cancer rates. Results are presented in Tables 2 and 5-9.

There are few methodological considerations. As McHenry County is 96% white (based on 2000 US census), the IL cancer rates used for comparison were limited to whites only. The cancer registry analysis included counts and population numbers of McHenry County in the counts and population number for the state of Illinois. So when comparing McHenry County to Illinois State rates, McHenry County numbers were in both rates. In addition, because low cancer counts cause rates to be unstable, county-level rates are not calculated for 1-year intervals but for 5 and 10 year intervals. When evaluating the statistical significance of SIRs, the IL State cancer registry sets their alpha at 0.01 to account for multiple comparisons.

In 2006, McHenry County DOH conducted a two-part study called the Village of McCullom Lake Brain Cancer Survey. The first part consisted of a short survey to determine how many McCullom Lake residences were diagnosed with brain cancer. The short survey comprised of demographic, residence, and diagnosis questions. Secondly, odds ratios (OR) were calculated using cancer registry data, comparing cancer rates in the zip-code for the area surrounding McCullom Lake to the rest of the county and comparing McHenry County rates to the rates for state of Illinois. These data are presented in Tables 3 and 4.

#### IV. Findings

A comprehensive investigation of a possible cluster of brain cancer cases was conducted by the McHenry County DOH with assistance from IL DPH and using data from the IL Cancer Registry. In general, the cancer registry data analysis did not find higher rates of types of brain cancers in McHenry County than in the rest of the state (Table 2). The SIR for oligodendroglioma cancer for the period 1997-2006 (Table 5) has a p-value of 0.02. IL state cancer registry sets SIR alpha at 0.01 to account for multiple comparisons, therefore the finding was not considered statistically significant. In addition, the SIR for glioblastoma multiforma is not significant (Tables 5 and 6). Known risk factors for oligodendroglioma are genetic and familial, and viral causes are suspect; there are no known chemical risk factors. No trends in cancer rates were observed (Tables 7-9). For CNS and specific brain cancer, this result is not unexpected given the large overlap in the time periods used for comparison (Tables 7a-c).

In addition to the cancer registry analyses, McHenry County DOH conducted the Village of McCullom Lake Brain Cancer Survey. This study did not have enough participants for statistical analysis: out of 400 surveys only 11 surveys were completed and returned. Four surveys were returned by people diagnosed with a form of brain cancer or brain tumor. The study notes two of the four respondents were likely diagnosed with metastatic brain tumors. However, these findings were not confirmed by medical record review. OR's calculated as part of this survey were not adjusted for race, age or sex and included all races and ages (Tables 3 and 4). The Village of McCullom Lake Brain Cancer Survey concluded that there was insufficient evidence to support the presence of a brain cancer cluster.

#### V. Summary

The analysis of available data conducted by McHenry County DOH with assistance from IL DPH and IL State Cancer Registry was thorough and scientifically appropriate. Analysis using cancer registry data was suitably used in an attempt to identify whether specific areas had higher than expected brain and CNS cancer rates and not to demonstrate causality. McHenry County rates were compared to Illinois State and SEER (Surveillance, Epidemiology and End Results) cancer data. There was an attempt to get detailed information using the Village of McCullom Lake Brain Cancer Survey. However, the number of participants was too small for further analysis.

Based on the data provided and additional analysis done by CDC, we concur with the conclusion of McHenry County DOH that brain and CNS cancer rates in the area around McCullom Lake are similar to those for McHenry County and those for the state of Illinois.

## Timeline & summary of findings

**Table 1: Demographic characteristics of Illinois state and McHenry county. 2000 US Census, US Census Bureau.**

	Illinois State	McHenry County
<b>Total population*</b>	12,419,293	260,077
<b>% White race</b>	73.5	93.9
<b>Median age</b>	34.7	34.2

\*Village of McCullom Lake is a small section of the lake with 1,038 residents. Cases are from across the area not just the village.

- In May 2006, age-adjusted glioblastoma and oligodendroglioma incidence rates were calculated using the Illinois state cancer registry data (Table 2).

**Table 2: Age adjusted\* glioblastoma and oligodendroglioma cancer incidence rates and 95% confidence interval per 100,000 both sexes, 1994-2003, McHenry County and Illinois State, Illinois State Cancer Registry.**

	McHenry County (All races)	Illinois State (White only)
<b>Glioblastoma</b>	2.7 (2.1, 3.6)	2.9 (2.8, 2.9)**
<b>Oligodendroglioma</b>	0.9 (0.6, 1.4)	0.6 (0.5, 0.6)

\*Age adjusted using 2000 U.S. standard population

\*\*All races

- In June 2006, McHenry County DOH conducted the Village of McCullom Lake Brain Cancer Survey (Table 3&4).

**Table 3: Odds ratio and chi-squared 95% confidence intervals (CI) comparing cancer incidence cases in McCullom Lake zip code and those in McHenry County by period. The time periods reflect how the data is periodically reported to the state. Data from McHenry County DPH, Village of McCullom Lake brain cancer study, McHenry County DOH.**

	Odds Ratio (95% CI)		
	1989-1993	1994-1998	1999-2003
<b>McCullom Lake v. McHenry County</b>			
<b>Brain &amp; nervous system cancer</b>	0.81 (0.35, 1.78)	0.56 (0.26, 1.16)	0.65 (0.35, 1.16)
<b>All cancer</b>	0.91 (0.83, 1.00)	0.89 (0.83, 0.97)	0.73 (0.68, 0.78)

**Table 4: Odds ratio and chi-squared 95% confidence intervals (CI) comparing cancer incidence cases in McHenry County and the State of Illinois by period. The time periods reflect how the data is periodically reported to the state. Data from McHenry County DOH, Village of McCullom Lake brain cancer study, McHenry County DOH.**

	Odds Ratio (95% CI)		
	1989-1993	1994-1998	1999-2003
<b>McHenry County v. Illinois State</b>			
<b>Brain &amp; nervous system cancer</b>	0.92 (0.69, 1.22)	1.18 (0.93, 1.50)	1.19 (0.97, 1.47)
<b>All cancer</b>	0.85 (0.82, 0.88)	0.98 (0.95, 1.01)	0.84 (0.82, 0.87)

- In August 2007, expected number of cases and Poisson p-values were calculated using Illinois state cancer registry data for McHenry County for the period, 1997-2006 and 2002-2006 (Table 5&6).

Table 5: Observed and expected number of cancer cases, Poisson p-value and standard incidence ratio (SIR) by cancer type, both sexes, 1997-2006, McHenry County. Illinois state cancer registry.

1997-2006	Observed	Expected	p-value	SIR
Glioblastoma	77	74.7	0.41	1.03
Oligodendroglioma	23	14.3	0.02†	1.61

†to account for multiple comparisons IL state cancer registry used a cut-off to determine statistical significance (alpha) of 0.01.

Table 6: Observed and expected number of cancer cases, Poisson p-value and standard incidence ratio (SIR) by cancer type, 2002-2006, McHenry County. Illinois state cancer registry.

2002-2006	Observed	Expected	p-value	SIR
Glioblastoma	53	44.2	0.11	1.20
Oligodendroglioma	8	5.6	0.21	1.43

- In December 2008, McHenry County age-adjusted cancer incidence rates were recalculated for the years 1994-2003, 1995-2004 and 1996-2005 and trends in cancer rates were examined, using cancer registry data (Table 7a&b).

Table 7a: Age-adjusted\* cancer incidence rates and 95% confidence interval (CI) per 100,000 over time, McHenry County. cancer registry.

	McHenry County (All races)		
	1994-2003	1995-2004	1996-2005
CNS	7.36 (6.26,8.60)	7.57 (6.47,8.80)	7.55 (6.47,8.76)
Oligodendroglioma	0.90 (0.57,1.36)	0.88 (0.56,1.32)	0.79 (0.49,1.21)
Glioblastoma	2.73 (2.06,3.55)	3.08 (2.37,3.94)	3.18 (2.47,4.03)

\*Age-adjusted using 2000 U.S. standard population

Table 7b: Age-adjusted\* cancer incidence rates and 95% confidence interval (CI) per 100,000 over time, Illinois state cancer registry.

	Illinois State (White only)		
	1994-2003	1995-2004	1996-2005
CNS	6.89 (6.73,7.05)	6.90 (6.74,7.07)	6.87 (6.71,7.03)
Oligodendroglioma	0.56 (0.52,0.61)	0.56 (0.51,0.60)	0.54 (0.50,0.59)
Glioblastoma	3.12 (3.01,3.23)	3.23 (3.12,3.34)	3.28 (3.17,3.39)

Table 7c: Age-adjusted\* cancer incidence rates and 95% confidence interval (CI) per 100,000 over time, SEER9 (Surveillance, Epidemiology and End Results) data.

	SEER9 (White only)		
	1994-2003	1995-2004	1996-2005
CNS	7.28 (7.17,7.4)	7.31 (7.19,7.43)	7.33 (7.21,7.44)
Oligodendroglioma	0.56 (0.52,0.61)	0.65 (0.62,0.69)	0.65 (0.62,0.69)
Glioblastoma	3.43 (3.35,3.51)	3.47 (3.39,3.56)	3.53 (3.45,3.61)

- In August 2009, IL state cancer registry calculated trend over time for McHenry County and Illinois state

**Table 8: Age-adjusted\* all cancer incidence rates per 100,000 and 95% confidence interval, both sexes, 1992-2006 Illinois state cancer registry.**

All cancers	1992-1996	1997-2001	2002-2006
<b>McHenry County (All races)</b>	479.4 (464.40, 494.73)	511.2 (496.73, 525.91)	494.6 (481.92, 507.48)
<b>Illinois State (White only)</b>	471.8 (469.92, 473.76)	486.1 (484.23, 488.06)	483.7 (481.81, 485.58)

\*Age-adjusted using 2000 US standard population

**Table 9: Age-adjusted\* brain and central nervous system (CNS) cancer incidence rates per 100,000 and 95% confidence interval, both sexes, 1992-2006. Illinois state cancer registry.**

Brain & CNS cancers	1992-1996	1997-2001	2002-2006
<b>McHenry County (All races)</b>	6.6 (5.03,8.45)	7.7 (6.11,9.54)	8.2 (6.70,9.87)
<b>Illinois State (White only)</b>	6.8 (6.55,7.01)	7.0 (6.72,7.18)	6.9 (6.26,7.15)

\*Age-adjusted using 2000 US standard population

†p-value for trend in McHenry County was p=0.28. Trend calculated using single year rates.

‡p-value for trend in Illinois State was p=0.24. Trend calculated using single year rates.