

**Assessment of Incidence and Prevalence of Select Diseases and Conditions
Neosho County, Kansas**

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Introduction

On December 3rd, 2009 a public meeting was held in Chanute, Kansas regarding the renewal of a permit to burn hazardous waste at the Ash Grove Cement Company. During the meeting several people voiced concerns about their health to representatives from the Agency for Toxic Substances and Disease Registry (ATSDR) and the Kansas Department of Health and Environment (KDHE). Due to the number of health concerns a separate community meeting was held on February 11th, 2010 in Chanute. Representatives from ATSDR, KDHE and the Environmental Protection Agency (EPA) hosted a public meeting to listen to resident's health concerns. This report summarizes the results of analyses conducted on the incidence of select cancers, prevalence of birth defects, fertility rates, child blood lead poisoning, and rate of hospital discharges for asthma in children.

Background

In 2006 the Ash Grove Cement Company (AGCC) in Chanute, Kansas applied for the renewal of its Resource Conservation and Recovery Act (RCRA) permit to continue to operate the hazardous waste storage and processing facility. The facility was originally permitted to store and process hazardous wastes in 1996; however, AGCC began burning hazardous waste in 1986 when cement plants were exempt from hazardous waste regulations if the waste had energy value and was burned as fuel for cement manufacturing.

During hazardous waste permit hearings for AGCC in 1996, Chanute residents expressed concern to the U.S. Environmental Protection Agency (EPA) that health problems they were experiencing in their community were related to emissions from the cement plant. At that time southeast Kansas had four hazardous waste burners in operation within a 25-mile radius representing the highest concentration of commercial hazardous waste burners in the country¹. In 1997, the EPA commissioned the Center for Environmental and Occupational Health at the University of Kansas Medical Center (KUMC) to conduct a Southeast Kansas Health Study (SEKSHS) to investigate possible links between health problems residents of Chanute, and three other communities, were experiencing and the operation of hazardous waste burners. The study focused on respiratory health problems and the incidence of cancer. The study concluded that the respiratory health of residents in the "case" cities, including Chanute, was not any different than the "control" city¹. Cancer incidence and mortality rates were calculated; there were no statistically significant increases in any cancer in the towns and counties exposed to incinerator combustion process¹. However, a follow-up study focusing on brain cancer, leukemia, and non-

Hodgkin's lymphoma in children was recommended, to allow for a longer time from the initiation of hazardous waste burning activities. Several residents of Chanute voiced concerns at a meeting hosted by KDHE and ATSDR on February 11th, 2010 regarding a wide variety of health concerns that they felt may be linked to emissions from Ash Grove Cement Plant or other industrial sources, including elevated rates of the following: cancer, asthma among children, infertility, birth defects, multiple sclerosis, and heavy metal toxicity. KDHE collects information on cancer, birth events and blood lead results. In addition, KDHE has access to hospital discharge data through a partnership with the Kansas Hospital Association. Using available data we were able to calculate the incidence of select cancers, prevalence of birth defects, fertility rates, proportion of child blood lead poisoning, and rate of hospital discharges for asthma in children. KDHE does not collect information on cases of multiple sclerosis.

The purpose of this study was to assess select health outcomes in Neosho County to determine if they are occurring above what would be expected in a community of similar size or above statewide reference rates.

Methods

Incidence of Select Cancers

The types of cancer selected for study were based on two criteria: 1) recommended follow-up by the SEKSHS; or 2) a cancer of concern for the community. Although the SEKSHS did not find any statistically significant increase in any cancer a follow-up cancer study in children for total cancer, brain cancer, leukemia and non-Hodgkin's lymphoma was recommended. In addition, a follow-up cancer study in adults for total cancer, soft tissue sarcoma and liver cancer was also recommended¹. The counties included in the study and subsequent follow-up include Montgomery, Neosho and Wilson. During the community meetings in Chanute in December, 2009 and February, 2010 the following cancers were raised as a concern: thyroid, prostate and bladder.

KDHE has designated the University of Kansas Medical Center to operate the Kansas Cancer Registry (KCR) to collect cancer case reports of all Kansans diagnosed with cancer (except carcinoma *in situ* of the cervix and basal and squamous cell carcinoma of the skin). Cancer is required to be reported to the Kansas Cancer Registry per Kansas Statute 65-1, 168-174 and Kansas Administrative Regulation 28-70-1 through 28-70-3. Kansas residents, who are diagnosed or treated with cancer in the neighboring states of Colorado, Missouri, Nebraska, and Oklahoma, as well as Texas and Washington, are also registered in the KCR. Personal identifiers are protected by Kansas Statute 65-102b. In order to prevent

identification of a person by their diagnosis, numbers of cancers are not released if there are six or less in a community for any given period of time.

The staff of the KCR performs data analysis for cancer cluster inquiries for KDHE. Cases of cancer from 1997-2006, the most recent year of complete data, were included in this analysis. The International Classification of Diseases for Oncology version three (ICD-O-3) codes were used to identify all cases in the registry of interest for analysis. The codes for specific cancers include the following; liver and biliary tree (C22.0-C22.1, C23.9, C24.0-C24.9), soft tissue (C47.0-C47.9, C49.0-C49.9), prostate (C61.9), bladder (C67.0-C67.9), brain (C71.0-C71.9), thyroid (C73.9), non-Hodgkins Lymphoma (M9590-M9596, M9670-M9719, M9727-M9729, M9823 and M9827), and leukemia (M9800-M9948).

Children were defined as a person less than 20 years of age. Adults were defined as a person 20 years of age and older. Indirect age-adjusted rates were calculated for specific cancers and compared to Iowa Surveillance Epidemiology and End Results (SEER) program data. An indirect age-adjustment allows comparison of the actual number of cancer cases to the number we would expect in a community with a similar population.

Prevalence of Birth Defects

KDHE's Bureau of Epidemiology and Public Health Informatics, Office of Vital Statistics maintains more than 10 million vital records, such as birth certificates. Information on the number of all birth defects was collected from birth certificates from 2001-2008. Rates for Neosho County were calculated per 1,000 live and still births and compared to the rate for the entire state of Kansas.

Elevated Blood Lead Levels among Children

KDHE's Healthy Homes and Lead Hazard Prevention Program (HHLHPP), within the Bureau of Environmental Health, tracks the incidence of elevated blood lead levels (lead poisoning) in Kansas. The Kansas HHLHPP receives blood lead test results from 18 laboratories, both public and private, and enters test results into the lead data surveillance system (STELLAR). Laboratories are required to report all blood lead test results to KDHE.

All children are recommended to be tested at 12 and 24 months of age. Children enrolled in Medicaid are required to receive a blood lead test at 12 and 24 months². A confirmed case of lead poisoning in a child is defined as one venous draw blood test of ≥ 10 ug/dL or two (capillary or filter paper) blood tests of 10 ug/dL within a 12 week period².

Data from 2001-2004 were used to calculate the proportion of children <36 months who were lead poisoned. The number of children lead poisoned in Neosho County was divided by the number of children tested in Neosho County to derive this proportion. This result was compared to the proportion of children who were lead poisoned in the entire state.

General Fertility Rate

KDHE's Office of Vital Statistics, within the Bureau of Epidemiology and Public Health Informatics, receives and preserves records for vital events (e.g. births, deaths, marriages, and divorces) which occur in Kansas. Data on all live births from 2004-2008 for Neosho County were obtained. The general fertility rate (number of live births per 1,000 females of childbearing age of 15-44 years) was calculated for Neosho County and compared to the state of Kansas. Mid-year population estimates for each year were used to calculate the denominator.

Hospital Discharges for Asthma among Children

Data on hospital discharges in Kansas are collected by the Kansas Hospital Association (KHA). Community hospitals voluntarily submit data to KHA which in turn compiles the dataset and provides it to KDHE. A primary diagnosis of asthma includes International Classification of Diseases, 9th Revision (ICD-9) codes 493.0-493.9. Data from 2003-2008 were obtained from KDHE's Kansas Information for Communities (KIC)³. Rates of asthma hospital discharges for residents of Neosho County less than fifteen years of age were compared to southeast Kansas (Allen, Anderson, Bourbon, Chautauqua, Cherokee, Coffey, Crawford, Elk, Greenwood, Labette, Linn, Lyon, Montgomery, Wilson, and Woodson counties) and the state of Kansas.

Results

Incidence of Select Cancers

In order to maintain confidentiality of individuals, case counts of six or less are not released.

Cancer in Children

From 1997-2006 the total number of all types of cancer in children in Neosho County was within the range of what would be expected (4-14.2 cases), as were Montgomery (10-24.9 cases) and Wilson (1.9-9.5 cases) counties.

Table 1. Cases of All Types of Cancer in Children, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	#	4.0	14.2
Montgomery	19	10.0	24.9
Wilson	#	1.9	9.5

No number displayed if less than 6 cases.

The number of cases of brain cancer in children from 1997-2006 was within the range of what would be expected for Neosho (0.3-4.3 cases), Montgomery (1.0-6.8 cases) counties, and lower than what is expected for Wilson (0.2-3.2 cases) county.

Table 2. Cases of Brain of Cancer in Children, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	#	0.3	4.3
Montgomery	#	1.0	6.8
Wilson	#	0.2	3.2

No number displayed if less than 6 cases.

The number of cases of leukemia in children from 1997-2006 was lower than what would be expected for Neosho County (0.5-5.0 cases) and within the range of what would be expected for Montgomery (1.4-8.1 cases) and Wilson (0.2-3.6 cases) counties.

Table 3. Cases of Leukemia in Children, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	#	0.5	5.0
Montgomery	#	1.4	8.1
Wilson	#	0.2	3.6

No number displayed if less than 6 cases.

The number of cases of non-Hodgkins lymphoma in children from 1997-2006 was lower than what would be expected for Neosho County (0.1-2.4 cases) and within the range of what would be expected for Montgomery (0.2-3.6 cases) and Wilson (0.1-1.8 cases) counties.

Table 4. Cases of Non-Hodgkins Lymphoma in Children, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	#	0.1	2.4
Montgomery	#	0.2	3.6
Wilson	#	0.1	1.8

No number displayed if less than 6 cases.

Cancer in Adults

From 1997-2006 there were a total of 993 cases of cancer in adults in Neosho County. This is within the range of what would be expected (940-1063 cases). Montgomery (2,232 cases) and Wilson (620 cases) Counties were also within the range of what would be expected.

Table 5. Cases of All Types of Cancer in Adults, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	993	940.4	1,063.4
Montgomery	2,232	2,115.9	2,299.03
Wilson	620	614.7	714.7

The number of cases of soft tissue sarcoma in adults was lower than what would be expected (2.2-10.2 cases per 10,000) in Neosho County and within the range of expected cases for Montgomery (6.1-18.2 cases) and Wilson (1.2-7.6 cases).

Table 6. Cases Soft Tissue Sarcoma in Adults, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	#	2.2	10.2
Montgomery	7	6.1	18.2
Wilson	#	1.2	7.6

No number displayed if less than 6 cases.

The number of cases of liver cancer in adults was within the range of what would be expected for Neosho County (8.6-22.6 cases) and less than what would be expected for Montgomery (22.5-43.7 cases) and Wilson (5.2-16.5 cases) counties.

Table 7. Cases of Liver Cancer in Adults, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	10	8.6	22.6
Montgomery	21	22.5	43.7
Wilson	#	5.2	16.5

No number displayed if less than 6 cases.

Cancers of Community Concern

There were a total of 16 cases of thyroid cancer for all ages in Neosho County from 1997-2006. This is within the range of what would be expected (9.0-23.2 cases).

Table 8. Cases of Thyroid Cancer, All Ages, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	16	9.0	23.2

There were a total of 163 cases of prostate cancer for all ages in Neosho County from 1997-2006. This is within the range of what would be expected (120-165 cases).

Table 9. Cases of Prostate Cancer, All Ages, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	163	119.6	165.3

There were a total of 46 cases of bladder cancer for all ages in Neosho County from 1997-2006. This is within the range of what would be expected (38-65 cases).

Table 10. Cases of Bladder Cancer, All Ages, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	46	37.7	64.5

There were a total of 16 cases of brain cancer for all ages in Neosho County from 1997-2006. This is within the range of what would be expected (8-21 cases).

Table 11. Cases of Brain Cancer, All Ages, 1997-2006.

County	Number of Cases	Lower Range of Expected Cases	Upper Range of Expected Cases
Neosho	16	7.7	21.1

Prevalence of Birth Defects

There were a total of 62 birth defects out of 1,940 live and still births in Neosho County from 2001-2008 reported to KDHE. This is a rate of 32 birth defects per 1,000 live and still births. There were a total of 11,794 birth defects out of 362,072 live and still births in the state of Kansas from 2001-2008. This is a rate of 33 birth defects per 1,000 live and still births. The rate of birth defects in Neosho County is similar to the rate for the state of Kansas.

Table 12. Rate of Birth Defects, 2001-2008.

	Number of Birth Defects	Number of Live and Still Births	Rate (per 1,000 live and still births)	Lower 95% CI*	Upper 95% CI*
Neosho County	62	1,940	32.0	24.0	40.0
State of Kansas	11,794	362,072	32.6	32.0	33.2

**Confidence Interval*

Elevated Blood Lead Levels among Children

From 2001-2004 the proportion of elevated blood lead levels among children less than 36 months of age for Neosho County was 5.40%. This is higher than the proportion for the entire state of Kansas at 3.39% although not statistically significant.

Table 13. Proportion of Children Tested with Elevated Blood Lead Levels (EBLL), 2001-2004.

	Proportion of Children Tested with EBLL (%)	Lower 95% CI*	Upper 95% CI*
Neosho County	5.40	3.72	7.08
State of Kansas	3.39	2.87	3.91

**Confidence Interval*

General Fertility Rate

There were 1,099 live births in Neosho County from 2004-2008. The general fertility rate in Neosho County was 58.33 live births per 1,000 females of childbearing age of 15-44 years. This is higher than the state of Kansas at 53.79 live births per 1,000 and is statistically significant.

Table 14. General Fertility Rate, 2004-2008.

	Number of Live Births	Population	General Fertility Rate (per 1,000)	Lower 95% CI*	Upper 95% CI*
Neosho County	1,099	18,842	58.33	54.88	61.78
State of Kansas	203,916	3,770,857	53.79	53.55	54.02

**Confidence Interval*

Hospital Discharges for Asthma among Children

From 2003-2008 there were a total of 48 hospitalizations for asthma in children < 15 years of age who were residents of Neosho County for a rate of 26.1 per 10,000. This is higher when compared to southeast Kansas (18.6 per 10,000) and the state of Kansas (19.1 per 10,000) and is statistically significant.

Table 15. Hospitalizations for Asthma, Children <15 years of age, 2003-2008.

	Number of Cases	Rate (per 10,000)	Lower 95% CI*	Upper 95% CI*
Neosho County	48	26.1	19.2	34.7
Southeast Kansas	530	18.6	17.0	20.3
State of Kansas	6,548	19.1	18.7	19.6

**Confidence Interval*

Discussion

Incidence of Select Cancers

In Kansas approximately 12,000 people will be diagnosed with cancer each year and nearly 5,000 individuals will die⁴. Unfortunately cancer frequently occurs in the population, affecting about one in four people in their lifetime. The term cancer refers not to a single disease, but a group of related yet different diseases. There are many risk factors for cancer, such as tobacco use; however the cause or origin of many types of cancer is unknown and likely determined by a combination of factors. A person may suspect that a cancer cluster exists when several loved ones, neighbors, or coworkers are diagnosed with cancer. We analyzed ten years (1997-2006) of cancer registry data and conclude that the number of cases of the selected cancers is within the range of expected cases for Neosho, Wilson and Montgomery counties.

Prevalence of Birth Defects

Birth defects are estimated to affect more than 120,000 children in the United States every year⁵. About 3% of babies, or 1 out of every 33, are born with a structural birth defect⁵. Most birth defects likely happen for many reasons, not just one reason. More research is needed to study the links

between environmental hazards and birth defects. We analyzed eight years (2001-2008) of birth defect data and conclude that the rate of birth defects in Neosho County is similar to the state of Kansas.

Elevated Blood Lead Levels among Children

There are approximately 310,000 children aged 1-5 years in the United States who are lead poisoned⁵. The main source of childhood lead poisoning is from lead-based paint and lead-contaminated dust in older homes⁵. Lead-based paints were banned for use in housing in 1978. Houses and other buildings built before 1978, especially those built before 1950, may contain lead-based paint. We analyzed childhood blood lead data from 2001-2004 and conclude that the proportion of children with blood lead poisoning in Neosho County is similar to the state of Kansas. This proportion is derived from the number of children who are screened for blood lead. This proportion may or may not be representative of a community based on the population of children screened. An example of this is a community that targets blood lead screening for children in high risk groups (e.g. children enrolled in Medicaid). This may show an increased proportion of children with elevated blood lead levels compared to a community that screens every child.

General Fertility Rate

According to data from the National Survey of Family Growth, 12% of U.S. couples had impaired fertility in 2002, up 20% from 1995⁵. Approximately 10% of problems with fertility are unknown. We calculated the general fertility rate for Neosho County from 2004-2008 and found a statistically significant higher rate compare to the state of Kansas.

Hospital Discharges for Asthma among Children

Asthma affects people of all ages, it often starts in childhood and is more common in children than adults⁴. Asthma is one of the most common long-term diseases of children⁶. In most cases the cause of asthma is unknown, however the conditions that can trigger an asthma attack are well documented. Important asthma triggers include secondhand cigarette smoke, dust mites, outdoor air pollution, pets, mold, strenuous physical exercise, bad weather (e.g. high humidity), some foods, and strong emotional states that can lead to hyperventilation and an asthma attack⁶.

Hospitalization data tends to represent more severe asthma attacks and do not include asthma among individuals who do not receive medical care, who are not hospitalized, or who are treated in outpatient settings. Hospital admission data cannot be used to determine the prevalence or cause of

asthma in a community, but is used to assess severe adverse health outcomes of those in the community with asthma.

We analyzed six years (2003-2008) of hospital discharge data for asthma in children less than 15 years of age. Neosho County has higher rates of hospital discharges when compared to southeast Kansas and the state. We are unable to draw conclusions regarding the cause of higher hospitalization rates at this time.

Study Limitations

This study was conducted to determine if there were higher than expected rates of adverse health events or outcomes in Neosho County that could potentially be related to environmental factors. Although certain health events, including cancer, birth defects, and lead poisoning, are required by law to be reported to KDHE, we may not capture all cases in a community for several reasons. First, a person must seek care from a healthcare provider and receive a diagnosis. Second, healthcare providers must report these events to KDHE in a timely manner. Third, someone may be unaware that they or their loved ones are at risk (e.g. lead poisoning from lead-based paint in their home).

Although prevalence of asthma in Kansas can be calculated based on response to the Behavioral Risk Factor Surveillance System (BRFSS) we were unable to calculate the prevalence of asthma among children in Neosho County due to the small sample size from this survey.

Recommendations

We recommend additional data analysis be performed on hospital discharges for asthma for residents of Neosho County to identify potential risk factors that may account for the higher rate of hospitalizations among children less than 15 years of age. In addition, analysis of emergency department data (if available) is recommended to try and capture information on those patients who receive outpatient care.

References

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