

Cancer and Amyotrophic Lateral Sclerosis in Livingston County, Illinois

A Report for the Livingston County Environmental Association

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Introduction

Livingston County, Illinois, is a county of about 40,000 people, and home to the nation's second busiest landfill. In 2004, the Department of Epidemiology at UIC's School of Public Health was approached by the Livingston County Environmental Association, a citizens' group concerned about a possible cluster of disease in their area. In particular, the group was concerned about several cases of amyotrophic lateral sclerosis (ALS) and a number of cancers (soft tissue sarcomas, cutaneous T-cell lymphomas, brain cancer, breast cancer, and leukemia), and they were concerned that exposures from the landfill may be causing an excess of these diseases. As a first step toward addressing these concerns, we were asked to determine whether there is in fact an elevated rate of these diseases in Livingston County. The following report is the summary of a study designed to explore these questions.

For cancer, we were asked to address the following questions:

- What is the absolute risk of death by cancer type in Livingston County?
- What is the relative risk of death by cancer type, comparing Livingston County to the state of Illinois?
- What are the most common cancers in Livingston County?
- What is known about the risk factors for those cancers?

Similarly, for ALS, we were asked to address the following questions:

- What is the risk of dying of ALS in Livingston County?
- Does this rate differ significantly from the rate for Illinois or the U.S. as a whole?
- What is known about the risk factors for ALS?

Methods

Cancer

To measure rates of cancer, we used the public data files of the Illinois State Cancer Registry (ISCR) provided by the Illinois Department of Public Health for the years 1988 – 2002. Of the variables included in the dataset, we used age (in 8 categories), sex, race (in 2 categories), cancer site (in 24 categories), and year of diagnosis (grouped into 5-year blocks). Population estimates for each county were provided by the IDPH and based on US Census Intercensal Population Estimates.

ALS

While there is no centralized registry of ALS cases in Illinois, given the universal mortality of the disease, the death registry collected by the IDPH Dept. of Vital Statistics provides a good estimate of disease incidence. The death registry used was the Compressed Mortality File provided by the National Center for Health Statistics, which reports only the underlying cause of death.

A parallel study undertaken by the same investigators examined the Multiple Cause of Death registry, which includes other contributing causes of death. Over the five-year period 1999 - 2003, 88.63% of total ALS deaths in the US were reported as the underlying cause of death vs. other contributing causes. We used this proportion to estimate the number of true ALS deaths in Livingston County, the state of Illinois, and the United States as a whole. Statistical analysis was performed using the statistical program SAS 8.02, and graphs were created using Microsoft Excel XP.

In the following pages, several measures of association are used which rely on a basic knowledge of statistics. They include the following:

- Incidence Rate (also the absolute risk) =
$$\frac{\text{\# of new cases observed}}{\text{total population being observed per unit time}}$$
- Relative Risk or Rate Ratio (RR) =
$$\frac{\text{rate in Livingston County}}{\text{rate in reference population (Illinois)}}$$

(A RR > 1 signifies an excess risk; a RR < 1 signifies a lower risk)
- 95% Confidence Interval (95% CI): A range of values that is 95% likely to contain the true value of the population parameter; in other words, we are 95% sure that the true value of the relative risk lies between these two numbers.
- *p* value: The probability of obtaining a finding at least as positive as that obtained by chance alone. The higher the *p* value, the higher the probability that the finding is simply the result of chance (i.e., a false positive association).

Results

Demographics

Figure 1 highlights the difference in the respective age distributions of Livingston County and the state of Illinois. In general, the population of Livingston County is older than that of the state of Illinois. Given the older population of Livingston County, adjusting for age is particularly important when comparing the relative frequencies of various age-related diseases.

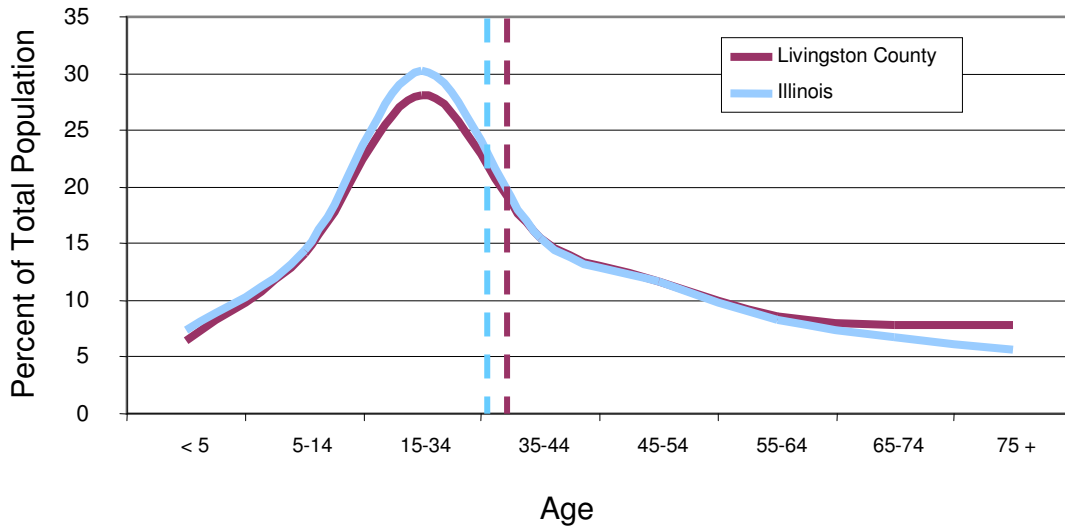


Figure 1: Age distribution of Livingston County and Illinois (from US Census Data)
 Median age for Livingston County: 37.3
 Median age for Illinois: 34.7

* * *

Cancer

During the period 1988 – 2002, 825,196 cases of cancer were reported in Illinois, of which 3,045 cases of cancer were reported in Livingston County. For all cancer sites during this period, comparing Livingston County to Illinois, the crude relative risk for cancer is 1.12 [95% CI = 1.076, 1.156], $p < 0.001$. After adjusting for age, sex, and race, the adjusted relative risk of all types of cancer is 0.963 [0.930, 0.998], $p = 0.0391$.

Twenty four cancer types were examined in the ISCR dataset. Of those, the majority were equally common in Livingston County and the state of Illinois (lung, NHL, HL, endometrial, melanoma, kidney, oral cavity, pancreas, ovarian, stomach, CNS, cervical, esophageal, and testicular cancer), four were less common in Livingston County (invasive and *in situ* breast, liver, prostate, and colorectal cancer), and four were more common in Livingston County (bladder, leukemia, myeloma, and bone cancer). Table 1 summarizes the absolute, crude, and adjusted relative risks of each cancer type studied for Livingston County and Illinois, and Figure 2 displays the same information graphically.

As is the case nationally, the most common cancers were lung, breast, prostate, and colorectal. These four together comprised 55% of all cancers in Livingston County during the period studied. In the following pages, we summarize the epidemiologically salient features of the four most common cancers, as well as the four that were more common in Livingston County than the remainder of the state.

| | Livingston County | | Illinois | | Crude RR | Adjusted RR (MH)* | 95% CI | p |
|----------------------------|-------------------|-------------------|----------|-------------------|----------|-------------------|--------------|-------|
| | Cases | Cases per 100,000 | Cases | Cases per 100,000 | | | | |
| lung | 457 | 76.87 | 121758 | 67.75 | 1.13 | 0.98 | (0.89, 1.07) | 0.64 |
| breast-invasive | 424 | 71.31 | 123143 | 68.52 | 1.04 | 0.91 | (0.83, 1.01) | 0.06 |
| prostate | 378 | 63.58 | 110890 | 61.71 | 1.03 | 0.89 | (0.81, 0.99) | 0.03 |
| colorectal | 368 | 61.90 | 102729 | 57.16 | 1.08 | 0.90 | (0.81, 0.99) | 0.04 |
| all other sites | 281 | 47.26 | 75342 | 41.92 | 1.13 | 0.99 | (0.88, 1.11) | 0.87 |
| bladder | 181 | 30.44 | 36489 | 20.30 | 1.50 | 1.17 | (1.01, 1.36) | 0.03 |
| NHL | 114 | 19.17 | 30662 | 17.06 | 1.12 | 0.93 | (0.77, 1.11) | 0.41 |
| leukemias | 112 | 18.84 | 20701 | 11.52 | 1.64 | 1.37 | (1.14, 1.65) | 0.001 |
| endometrial | 96 | 16.15 | 23688 | 13.18 | 1.22 | 1.04 | (0.85, 1.27) | 0.68 |
| melanoma | 81 | 13.62 | 17067 | 9.50 | 1.43 | 1.19 | (0.96, 1.48) | 0.12 |
| kidney | 67 | 11.27 | 20323 | 11.31 | 1.00 | 0.86 | (0.68, 1.09) | 0.21 |
| oral cavity | 66 | 11.10 | 18310 | 10.19 | 1.09 | 1.00 | (0.79, 1.27) | 1.00 |
| pancreas | 58 | 9.76 | 19005 | 10.58 | 0.92 | 0.79 | (0.61, 1.02) | 0.07 |
| ovary | 58 | 9.76 | 13962 | 7.77 | 1.26 | 1.08 | (0.83, 1.40) | 0.57 |
| breast - in situ | 49 | 8.24 | 19618 | 10.92 | 0.75 | 0.68 | (0.52, 0.90) | 0.007 |
| myelomas | 46 | 7.74 | 9464 | 5.27 | 1.47 | 1.38 | (1.03, 1.84) | 0.03 |
| stomach | 43 | 7.23 | 14353 | 7.99 | 0.91 | 0.83 | (0.61, 1.12) | 0.22 |
| nervous system | 41 | 6.90 | 11134 | 6.20 | 1.11 | 0.97 | (0.71, 1.32) | 0.84 |
| cervix - invasive | 35 | 5.89 | 10532 | 5.86 | 1.00 | 1.09 | (0.78, 1.52) | 0.60 |
| esophagus | 29 | 4.88 | 9036 | 5.03 | 0.97 | 0.92 | (0.64, 1.32) | 0.65 |
| Hodgkin's lymphomas | 21 | 3.53 | 5059 | 2.82 | 1.25 | 1.21 | (0.79, 1.86) | 0.38 |
| testis | 19 | 3.20 | 4374 | 2.43 | 1.31 | 1.25 | (0.80, 1.96) | 0.33 |
| liver | 11 | 1.85 | 6076 | 3.38 | 0.55 | 0.52 | (0.29, 0.95) | 0.03 |
| bone | 10 | 1.68 | 1481 | 0.82 | 2.04 | 1.91 | (1.03, 3.56) | 0.04 |

Table 1: Absolute, Crude, and Adjusted Relative Risks of cancer in Livingston County and Illinois between 1988 and 2002

* RR adjusted for age, sex, and race

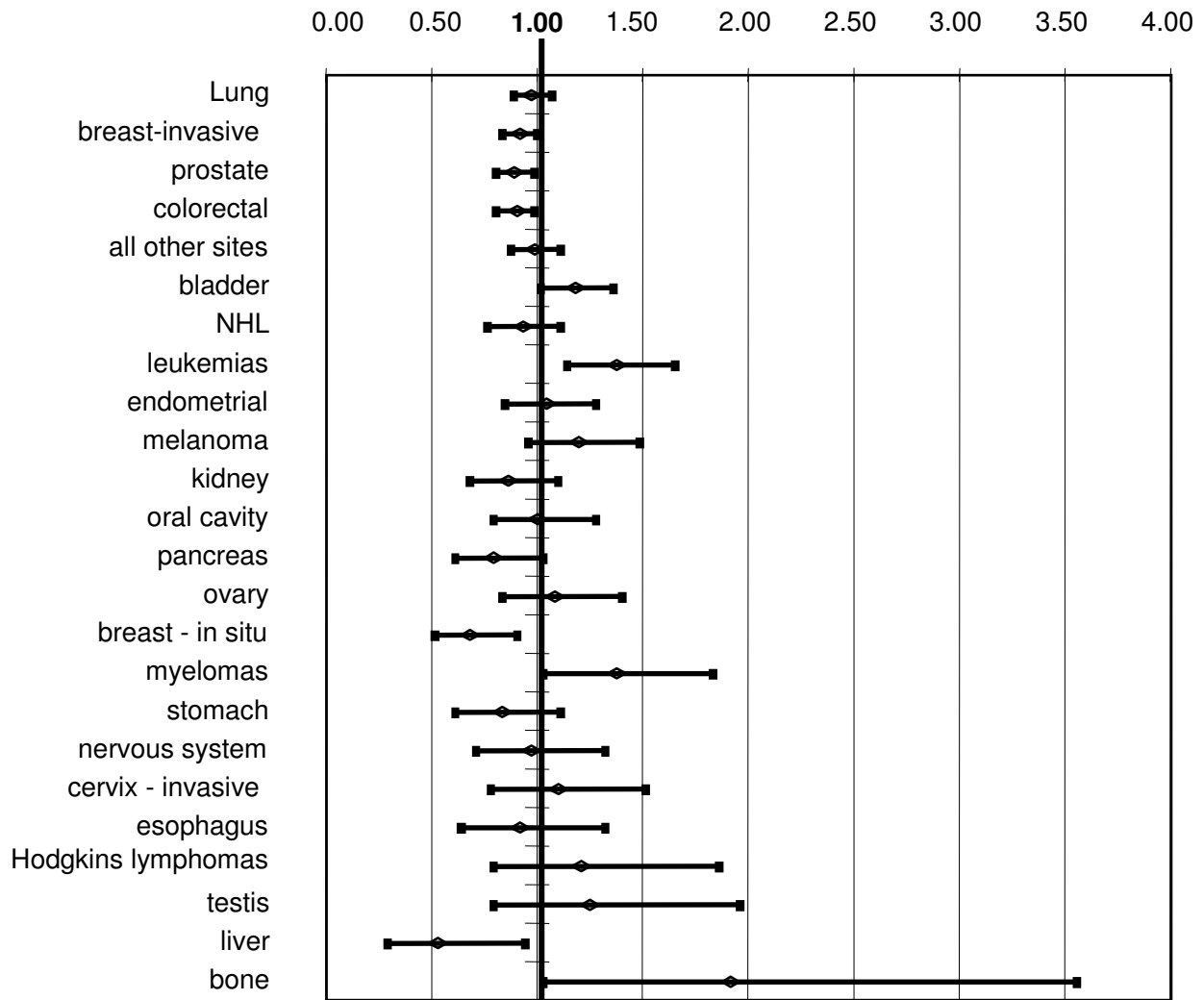


Figure 2
Adjusted Relative Risk (adjusted for age, sex, and race) of cancer incidence for Livingston County vs. Illinois

Lung Cancer

The average annual incidence over the fifteen year period studied was 30.5 cases per year, making lung cancer the most common cancer diagnosed in Livingston County. Compared to the rest of Illinois, residents of Livingston County were equally likely to be diagnosed with lung cancer (Adjusted RR = 0.98 [0.89, 1.07], $p = 0.64$). Analysis of the ISCR data revealed that those with the highest risk of lung cancer were men and individuals age 65 and older.

Established risk factors for lung cancer include smoking (including secondhand smoke), exposure to radon, silica, cadmium, hexavalent chromium, formaldehyde, and asbestos.¹

Breast Cancer

Breast cancer was the most common cancer among women in Livingston County, with an average of 3.3 cases of *in situ* breast cancer diagnosed each per year and an average of 28.3 cases of invasive breast cancer per year. Each of these rates was less than that of the remainder of Illinois. For invasive breast cancer, the Adjusted RR = 0.91 [0.83, 1.01], $p = 0.06$; while for *in situ* breast cancer, the Adjusted RR = 0.68 [0.52, 0.90], $p = 0.007$. In Livingston County, the highest risk groups for *in situ* cancer were women age 45 – 64, and for invasive cancer were women age 75 and older.

Several risk factors for breast cancer have been well established, including the following, according to the National Cancer Institute:²

- *Age*: 77% of cases occur in women over 50 years of age, with an average age at diagnosis of 64 years.
- *Age at menarche*: women who reach menarche before age 11 have a 20% increased risk of breast cancer compared with their counterparts who reach menarche after age 14.
- *Late first live birth*: women who deliver their first child younger than age 20 have half the risk of nulliparous women or those whose first live birth is after age 35
- *Family history (first-degree relatives with breast cancer)*: risk increases with the number of affected first-degree relatives (mother, sister, or daughter).
- *History of abnormal breast biopsies*: previous breast biopsies with atypical hyperplasia increase the risk of breast cancer.
- *Race*: black women have an overall lower incidence than white women, but tend to present at a more advanced stage and have increased mortality.

Prostate cancer

Prostate cancer is the most common cancer among men nationwide. While its relative mortality is low compared to other cancers, given its high prevalence, prostate cancer has a major impact on morbidity and mortality in men. The average annual incidence in Livingston County over the fifteen year period studied was 25.2 cases per year. Compared to the rest of Illinois, men in Livingston County were 11% less likely to develop prostate cancer (Adjusted RR = 0.89 [0.81, 0.99], $p = 0.03$). The highest risk groups were men age 65 and older and those with white race.

Established risk factors in the epidemiologic literature include older age (75% of men over 85 have latent prostate cancer), family history, ethnic origin (W>B>Asians), and high intake of α -linolenic acid (a polyunsaturated fatty acid in vegetables and dairy products) and calcium. Protective factors include the isoflavonoid genistein, cruciferous vegetables that contain isothiocyanate sulfuraphane, and retinoids such as lycopene (in pizza and tomatoes).³

Colorectal Cancer

The fourth most common cancer nationally is colorectal cancer, and is becoming increasingly recognized as an important threat to older adults. The average annual incidence of colorectal cancer in Livingston County over the fifteen year period studied was 24.5 cases per year. Compared to the rest of Illinois, residents of Livingston County were 10% less likely to be

diagnosed with colorectal cancer (Adjusted RR = 0.90 [0.81, 0.99], p = 0.04). The highest risk groups in Livingston County were white adults age 75 and greater. Men and women were at equal risk.

Several risk factors are well established, including dietary factors (high calorie, low fiber, refined carbohydrates, red meat) and family history of colorectal cancer.¹

Bladder Cancer

The average annual incidence of bladder cancer over the fifteen year period studied was 12.1 cases per year. Compared to the rest of Illinois, residents of Livingston County were 17% more likely to be diagnosed with bladder cancer (Adjusted RR = 1.17 [1.01, 1.36], p = 0.03). The highest risk groups were those older than 75 and men (RR = 2.9).

Established risk factors from the literature include the following:

- Cigarette smoking (50-80% of cases among men are associated with smoking)
- Industrial exposure to aryl amine dyes
- Schistosoma haematobium infections
- Long-term use of analgesics
- Long-term exposure to cyclophosphamide
- History of exposure to radiation¹

Leukemias

Leukemias, malignancies of white blood cells, exist in many different forms, depending on the white blood cell line in which the cancer-causing mutation takes place. Taken together, the average annual incidence of all leukemias over the fifteen year period studied was 7.5 cases per year. Compared to the rest of Illinois, residents of Livingston County were 37% more likely to be diagnosed with leukemia (Adjusted RR = 1.37 [1.14, 1.65], p = 0.001).

While there is a small peak in very young children (age <5), the preponderance of cases is in those greater than age 75. The excess cases appear to cluster in two groups:

- Age 55 – 64: RR = 2.41 [1.61, 3.60]
- Age 75+: RR = 1.40 [1.05, 1.883]

Established risk factors for leukemia include the following:

- prior chemotherapy or radiotherapy for cancer, radiation exposure,
- benzene (AML)
- ethylene oxide
- immunosuppression
- HTLV-1, EBV (ALL)
- Smoking (AML)⁴

Multiple Myeloma

Multiple myeloma, a cancer of the bone marrow, had an average annual incidence over the fifteen year period studied of 3.1 cases per year. Compared to the rest of Illinois, residents of Livingston County were 38% more likely to be diagnosed with multiple myeloma, with an Adjusted RR = 1.38 [1.03, 1.84], $p = 0.03$.

Those at highest risk in Livingston County were the elderly (risk increases with each age group). Men and women were equally at risk.

Established risk factors in epidemiologic literature include radiation exposure (e.g., atomic bomb survivors, nuclear plant workers) and occupational exposures (herbicides and insecticides, organic solvents).⁵

Bone Cancer

While in absolute numbers, bone cancer is one of the rarest cancers in Livingston County, (average annual incidence of 0.7 cases per year), compared to the rest of Illinois, residents of Livingston County were almost twice as likely to be diagnosed with bone cancer (Adjusted RR = 1.91 [1.03, 3.56], $p = 0.04$). The highest risk group was individuals age 15 – 34, with a smaller second peak between the ages of 65 and 74. Men were equally likely to develop bone cancer as women.

Bone cancer exists in two major forms. *Osteosarcoma* is the most common primary malignant tumor of bone. It has a bimodal age distribution, and 75% of cases occur in patients younger than age 20. A smaller second peak occurs in the elderly, who more frequently have illnesses that predispose individuals to the development of osteosarcoma – Paget’s disease, bone infarcts, and prior irradiation. Men are at higher risk than women, as are those with previous osseous disease/implants, genetic defects in DNA repair, and exposure to chemotherapeutic agents or ionizing radiation.

The second most common group of bone sarcomas in children is *Ewing’s sarcoma*. Most patients are 10 to 15 years old, and approximately 80% are younger than age 20 years. Boys are affected slightly more frequently than girls, and whites more frequently than blacks. Other risk factors include parental occupation (herbicide, pesticide and fertilizer exposure), maternal obstetric history, and parental smoking.⁶

Other cancers

Unfortunately, the publicly available datasets only collapse cancers into 24 broad categories, making it impossible to examine rare cancers in detail. Two rare cancers in particular were of interest to certain residents of Livingston County, cutaneous T-cell lymphoma and soft tissue sarcomas. When looking at the categories into which these cancers would be classified, no increased risk was observed. Cutaneous T-cell lymphoma would be included in the category of non-Hodgkin’s lymphoma, which when compared with the state of Illinois, had an adjusted RR = 0.93 [0.77, 1.11] ($p=0.41$). Soft tissue sarcomas are classified under “all other types,” which had an adjusted RR = 0.99 [0.88, 1.11] ($p = 0.87$).

In other words, while the data are insufficiently detailed to allow precise estimation of the relative risk of rare cancers, the categories into which they fall do not show evidence of increased risk.

Conclusions

Given the limitations of the publicly available cancer data, the following major themes emerge from the data analysis:

- First, the four most common cancers (lung, breast, prostate, and colon) comprise 55% of all cancers in Livingston County. If cancer is to be reduced in Livingston County, prevention efforts must begin with these cancers.
- Second, most cancers examined are equally common in Livingston County and the state (cancers of the lung, endometrial, kidney, oral cavity, pancreas, ovary, esophagus, stomach, central nervous system, testes, cervix; non-Hodgkin's lymphoma, Hodgkin's lymphoma, melanoma).
- Third, some cancers are less common in Livingston County than in the rest of Illinois (breast cancer, both invasive and in situ; liver cancer, prostate cancer, colorectal cancer).
- Fourth, some cancers are more common in Livingston County than in the rest of Illinois (bladder cancer, leukemia, multiple myeloma, and bone cancer).

It is important to realize that for some cancers (especially leukemia and bone cancer), the known risk factors differ for the various histologic subtypes. For example, the risk factors for acute myeloblastic leukemia are different from the risk factors for acute lymphoblastic leukemia; merely recognizing a difference between aggregate rates is insufficient to draw a conclusion regarding potential etiologies of this difference. If further investigation is to be done to explore these differences, the data must specify particular histologic subtypes of cancer. On the other hand, once rare cancers are further subdivided into smaller categories, the numbers of cases in each category become so small that meaningful analysis is difficult.

Several other important constraints limited this study:

- Lack of address information makes a true cluster investigation impossible. In other words, with these data, it is impossible to determine whether those who live closer to the landfill are at higher risk than those living further away; the data only provide an aggregate picture of cancer in Livingston County.
- The nature of cancer registries is such that an analysis of current Livingston residents gives rise to incomplete ascertainment of cancer cases in Livingston natives living elsewhere during diagnosis.
- As noted above, the small population of Livingston County provides relatively low statistical power for detection subtle differences in rare disease rates.

Given the findings of this study, we believe that the key to fighting cancer in Livingston County is prevention and early detection of the most common cancers. *Primary prevention*, which is defined as prevention of occurrence of disease, is clearly the best strategy where possible. For example, not smoking is clearly a protective factor against lung cancer. In some cases, where little is known about primary prevention, *secondary prevention*, or early detection and treatment

of cancer, often prolongs survival. Mammography to detect early stage breast cancer is an example of such a strategy.

Tobacco-related cancers

According to the Illinois Behavioral Risk Factor Surveillance System (BRFSS), a county-based survey administered by the Illinois Department of Public Health in 2002, about 25% of Livingston adult residents are current smokers, with another 22% former smokers. Another three percent use smokeless tobacco.⁷ As noted by the most recent Surgeon General's Report on the Health Effects of Smoking (5/2004),⁸ strong evidence exists to implicate tobacco smoking as a major cause of lung cancer, oral/pharyngeal/laryngeal cancers, esophageal cancer, pancreatic cancer, cervical cancer, bladder and kidney cancers, stomach cancer, and acute myeloid leukemia. In addition to its carcinogenic potential, smoking has been established as a major risk factor in many respiratory illnesses (both acute and chronic), cardiovascular disease, peripheral vascular disease, and cerebrovascular disease.

Smoking harms virtually every organ system in the body, and it remains the leading preventable cause of death and disease in the United States. While those who never smoke have the lowest risk of smoking-related diseases, those who quit smoking substantially reduce their risk of death and disease. No consensus exists regarding screening current or former smokers as a strategy for secondary prevention of tobacco-related cancers; instead, public health efforts focus on primary prevention through smoking cessation.

Breast cancer

The U.S. Preventive Services Task Force (USPSTF) recommends screening mammography, with or without clinical breast examination, every 1-2 years for women aged 40 and older. Older women are at highest risk for invasive breast cancer, and while nearly 98% of Livingston women age 45-54 have had a mammogram, only 82% of women age 65 and older have ever had a mammogram. Of the older women who have had a mammogram, 15% have not had one in the past year.

Prostate cancer

Little direct evidence exists regarding strategies for primary prevention of prostate cancer, though some dietary risk factors have been described (see above). In addition, secondary prevention of prostate cancer using prostate specific antigen (PSA) testing or digital rectal examination (DRE) is a controversial subject about which little consensus exists. The U.S. Preventive Services Task Force concludes that the evidence is insufficient to recommend for or against routine screening for prostate cancer.

Colorectal cancer

As noted above, one of the best established risk factors for colon cancer is a low-fiber diet rich in red meats. According to the BRFSS, 41% of Livingston residents consume less than three servings of fruits or vegetables each day, with only 19% consuming five or more servings daily.

The U.S. Preventive Services Task Force recommends that all adults age 50 or older be screened for colorectal cancer. Several established methods of screening exist (fecal occult blood testing, flexible sigmoidoscopy, colonoscopy), and little evidence exists establishing the superiority of

one method over the other. According to the BRFSS, the majority of Livingston residents for whom screening is appropriate have not been screened (only 42% of adults older than age 50 have ever had a sigmoidoscopy, and only 33% have had a fecal occult blood test).

Cervical cancer

Cervical cancer is almost entirely caused by infection with the human papillomavirus (HPV), a sexually transmitted disease. As such, the best method of primary prevention is monogamy, abstinence, or barrier contraception. Secondary prevention via the Papanicolaou (Pap) smear has been singularly effective in reducing progression to cervical cancer, and the USPSTF strongly recommends screening for cervical cancer in women who have been sexually active and have a cervix. Women in Livingston County have excellent rates of screening (99% of women age 25-44 have had a Pap smear), though some women report that more than a year has elapsed since their last test (13% of women age 25-44 and 18% of women age 45-64).

* * *

Amyotrophic Lateral Sclerosis (ALS)

As noted above, we examined the death rate of ALS in Livingston County for the period 1979 – 2002 using the Compressed Mortality File from the National Center for Health Statistics. During the period 1979 – 2002, there were 18 ALS deaths in Livingston County, yielding a crude death rate of 1.874 per 100,000 persons and an age-adjusted death rate of 1.607 per 100,000 persons (see Table 2). All ALS deaths observed were in individuals age 45 or older.

| | Number of Deaths | Total Population | Crude Death Rate | Age-adjusted Death Rate* |
|-------------------|------------------|------------------|------------------|--------------------------|
| Livingston County | 18 | 960,390 | 1.874 | 1.607 |
| Illinois | 3,969 | 282,587,493 | 1.405 | 1.420 |
| USA | 90,934 | 6,095,041,280 | 1.492 | 1.491 |

Table 2: Total ALS Deaths in Livingston County, Illinois, and USA from 1979 – 2002.

* Age-Adjusted to the 1990 US population

While the rate of ALS appears marginally greater in Livingston County, when formally compared with the state and the country using statistical testing, no significant difference was observed (see Table 3).

| Comparison Groups | Age-adjusted Relative Risk* | 95% Confidence Interval | P |
|--------------------------------|-----------------------------|-------------------------|--------|
| Livingston County vs. Illinois | 1.1316 | (0.6550, 1.9551) | 0.6574 |
| Livingston County vs. USA | 1.0778 | (0.6243, 1.8605) | 0.7880 |

Table 3: Age-adjusted relative risks for ALS Deaths in Livingston County vs. Illinois and USA from 1979 – 2002

* Age-Adjusted to the 1990 US population

Conclusions

Since ALS is a rare disease, it is difficult to draw conclusions regarding relative risks based on small samples (sampling either a few years or a small population). For this reason, we examined the rate of ALS over a 24-year period. The risk of ALS increases with age; because Livingston County has a relatively older population (see Figure 1), the crude ALS death rate appears high compared to rest of Illinois and the US. After adjusting for age, part of this apparent elevation disappears. Testing for a statistically significant difference between Livingston and Illinois/US rates reveals no significant difference between Livingston County and the reference populations.

One of the authors (PPM) has prepared a summary of the literature regarding the risk factors for ALS; please refer to that document for a full discussion of the epidemiology, genetic, and environmental risk factors for ALS. The authors are also currently conducting a study to explore the relationship between large-scale environmental contaminants and ALS rates across the United States.

* * *

Many questions remain unanswered regarding the causes of both cancer and ALS, questions that are especially poignant to those who have experienced the disease themselves or the loss of a loved one. While this study cannot address questions regarding risk factors for diseases, it is an important first step in understanding the diseases that affect the residents of Livingston County. As these questions continue to be explored, we recommend that public health efforts focus on prevention, both primary and secondary, as well as support of patients and their families.

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