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# *CANCER IN JEFFERSON COUNTY: A SUMMARY*

***A Collaborative Research Project with Primary Research and Funding by:***

Health Department Jefferson County

Kentucky Cancer Program

Alliant Health System

The mission of the Jefferson County Health Department is *to promote, preserve, and protect the health, environment, and well-being of the people of Jefferson County*. The Louisville and Jefferson County Board of Health and the Jefferson County Health Department is committed to improving community health through both primary prevention and active community participation. To assist in this effort, the Board of Health has a committee, the Health Status Assessment/Strategic Planning Committee (HSA/SPC), charged with assessing the health status of the people of Jefferson County and developing strategies for improving the health and well-being of the people of Jefferson County.

This study was initiated as a result of concerns voiced by some residents in the western part of the county. The residents believed that their area of the county had an unusually high death rate from cancer, and were worried that chemicals associated with local industries may be causing the higher rate. For this reason, the HSA/SP Committee of the Board of Health, convened an expert technical panel comprised of professionals from the Health Department, Kentucky Cancer Registry, Kentucky Cancer Program, Alliant Health System, University of Louisville, Jefferson County Department of Planning and Environmental Management, City of Louisville Office of Health and Environment, and other participants.

This study was undertaken to investigate differences, if any, between the cancer mortality rates and incidence rates across Jefferson County geographic boundaries. Overall, we did this analysis to answer two questions. First, is the cancer death rate higher in *West* County than in the rest of Jefferson County? Second, if the cancer death rate is higher, why?

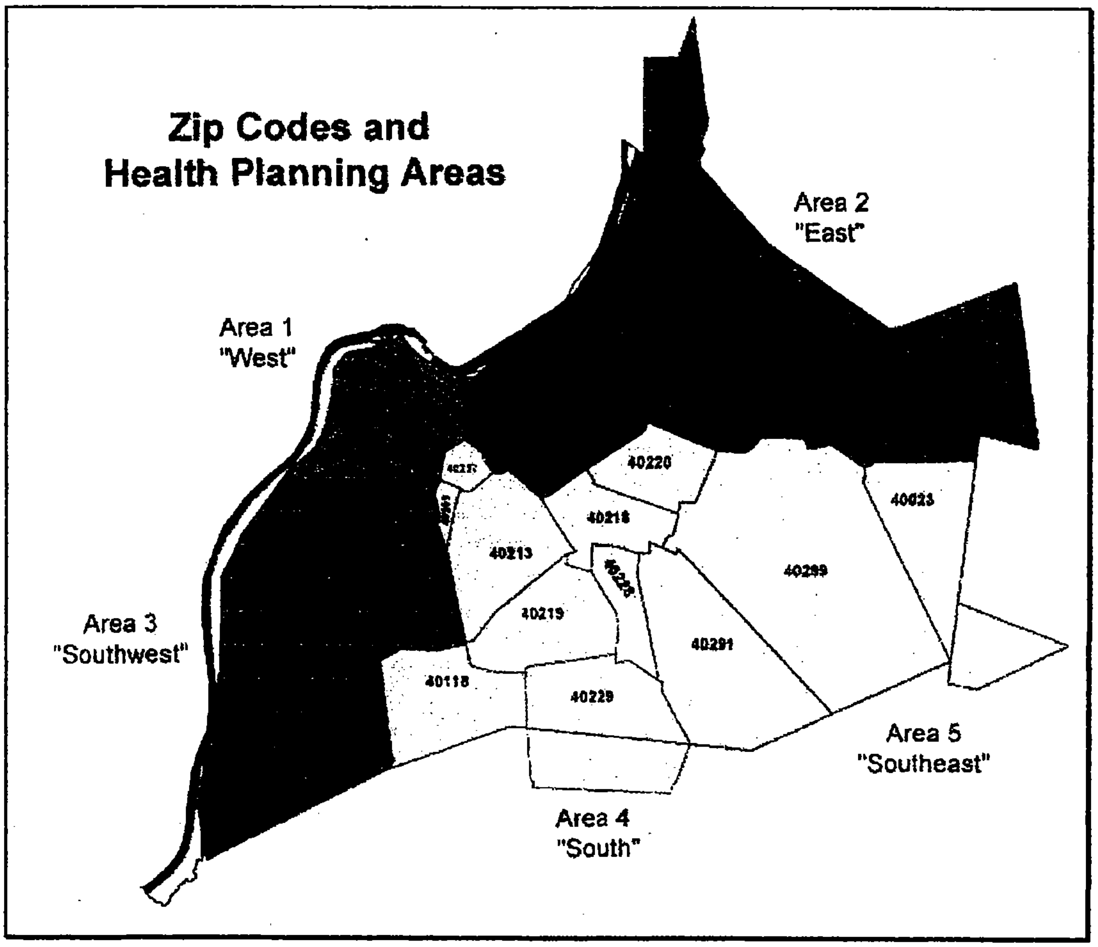
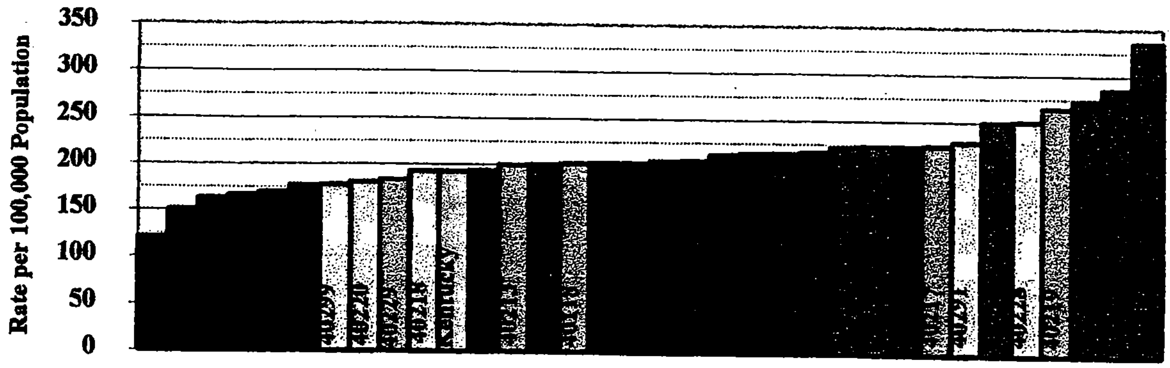


**Figure 1.** Age adjusted death rates by zip code, 1992 to 1994 average.




## What geographic boundaries were used?

The level of analysis was at the zip code level. However, the county was divided into five Health Planning Areas of comparable population size to evaluate the incidence and mortality within the county. The Health Planning Areas were grouped using zip code information from the 1990 Census including racial makeup, percent in poverty, median household income, percent age 65 and above, percent of children in poverty, median house value and percent high school graduates. These areas are shown on the map on the next page and labeled *West, Southwest, South, Southeast,* and *East.*

Comparisons were made by geographic area within the County for 15 types of cancer using vital statistics death files from the Health Department and incidence data from the Kentucky Cancer Registry. These rates were age adjusted to the 1970 population, which is standard practice and means that we took into account differences in the age distribution of the population, so that differences in rates are not simply due to one area having an older population than another. However, the high rate in zip code 40202 may be misleading due to the smaller population in that zip code and the higher percentage of elderly living in that area.

## Is the cancer death rate higher in western part of the county?

Yes. When looking at this area as a whole, people who live in *West* are more likely to die from cancer than people who live in other parts of Jefferson County. Persons who live in *West* County (highest rate) are 1.5 times more likely to die from cancer than persons in *ast* County (lowest rate).

Each year about 60 people die from cancer in *West* County who would not have died if the cancer death rate were the same as the rest of Jefferson County.[1] Age-adjusted death rates from 32 zip codes in this study are shown in **Figure 1** above.[2]

Most *West* County zip codes have cancer incidence rates[3] near the Jefferson County rate as shown in **Figure 2** on the next page.[4] But, compared to people who live in other parts of Jefferson County, people who live in *West* County are a lot more likely to die from their cancer. This was the major finding of the research.

## Why is the cancer death rate higher in *West* County?

There seem to be two reasons. Compared to the rest of Jefferson County, residents of *West* County: 1) find out about their cancer later, and 2) get cancers that tend to be diagnosed later.

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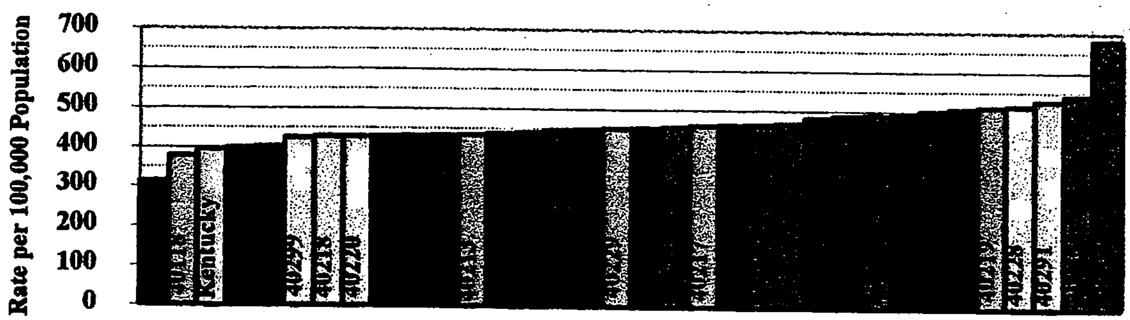
[1] The age-adjusted death rate in *West* County was 251 deaths per year per 100,000 population, compared to 194 for other planning areas in Jefferson County. That is a difference in rates of 57 per 100,000. The population of Planning Area #1 is about 105,000. Multiplying 57 x 1.05 gives the estimated 60 additional cancer deaths per year.

[2] Rates by health planning areas were as follows: West - 251.3; Southwest - 203.9; South - 213.6; Southeast - 193.3; East - 173.3.

[3] "Incidence" is the rate of newly diagnosed disease, and includes all persons diagnosed with cancer -- not just those who died from cancer.

[4] Rates by health planning areas were as follows: West - 481.0; Southwest - 451.6; South - 457.3; Southeast - 445.0; East - 424.4.

**Figure 2.** Age adjusted rate of new cancers by zip code, 1992 to 1994 average.




**Residents of *West* County find out about their cancer later than the residents of the rest of Jefferson County do.**

When cancer is diagnosed, it is classified ("staged") by how much it has spread. Cancers in *West* County are diagnosed at later stages of the disease as shown in **Figure 3** on the next page.[5] Overall 53% of cancer cases in *West* County are not diagnosed until later stages of the disease, compared to 45% in the rest of Jefferson County.

We also examined individual types of cancer, and -- for almost every type -- cancer is diagnosed later in *West* County. For example, in *West* County 41% of breast cancer is not diagnosed until later stages, compared to 31% in the rest of the county.

Some types of cancer are more treatable if they are found early instead of late in the disease. Part of the reason for the higher cancer death rate in *West* County seems to be later detection.

**The residents of *West* County have a higher proportion of those cancers that tend to be diagnosed later.**

Cancer is not one disease. It is many diseases. The types of cancer differ in their cause, differ in how difficult they are to detect, and differ in what they do to the person with the cancer. Regardless of where you live, some cancers are diagnosed later than other cancers.[6] *West* County has a different mix of cancers from the rest of Jefferson County. Unfortunately, many of these cancers are types that tend to be diagnosed late and have a high death rate. Lung and colon cancer are two examples of these types of cancers. Furthermore, earlier detection of lung cancer does not currently improve survival rates.

The difference in mix is part of the reason that cancers are diagnosed later in *West* County.

## What is the bottom line?

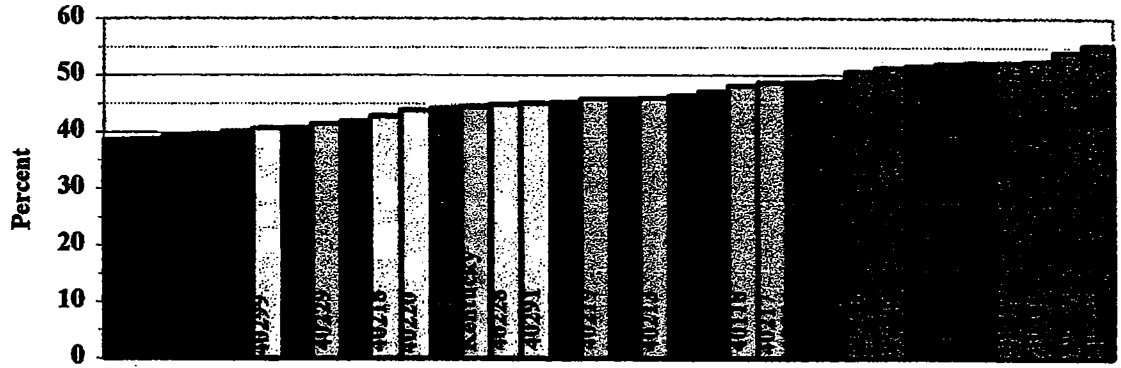
Compared to people living in other parts of the county, people who live in *West* County:

- are 1.5 times more likely to die from cancer, but only 1.1 times more likely to get cancer (comparing highest to lowest rate)
- have their cancer longer before it is diagnosed,
- have cancers that tend to be diagnosed later.

[5] Percentages by health planning areas were as follows: West - 3.0%; Southwest - 49.0%; South - 46.0%; Southeast - 43.4%; ast - 42.5%.

[6] Later stage at diagnosis. Cancers diagnosed at regional or distant stages were counted as later stages for this analysis. Given the pattern of cancers in *West* County, 49% would be expected to be diagnosed at a later stage, compared to 45% in the rest of Jefferson County. In other words, part of the reason for the later stage at diagnosis in *West* County is that the cancers that occur there are cancers that are usually diagnosed later regardless of where the person lives.

**Figure 3.** Percent of cancer cases that were diagnosed at later stages by zip code, 1992 to 1994 average.




### Do these findings point to the industry in *West* County as a cause of cancer?

Our analysis cannot answer the question. We do not know who has been exposed to industrial substances or how much exposure they have had. The impact of environmental causes is not clear in this study. We have no way of knowing which cancer came from exposure to industrial substances and which came from other exposures or from individual behaviors such as smoking or poor diet. Behavioral risk factors related to cancer risk such as smoking and alcohol use are not known for specific areas of the county. Further efforts to study the association of environmental pollutants and cancer in Jefferson County are needed.

### What now?

These findings tell us we must accomplish at least two things: earlier detection and better prevention. If we do only one of these, we will solve only part of the problem.

**Earlier detection**

Almost every type of cancer is detected later in *West* County than it is in the rest of the county. We can find cancers earlier by:

- teaching people to spot the warning signs of cancer
- encouraging people to be faster about seeing a physician
- making sure that cancer screening is widely available
- making sure people have a physician to go to for information and testing.

**Better prevention**

We need to continue to work on "primary prevention." It is not enough to detect cancers earlier. We must prevent cancers from occurring in the first place.

If we could do a better job of prevention in *West* County, there would be fewer new cases of cancer and fewer deaths. To reduce cancer we have to do a better job at prevention: stopping smoking, eating healthier food, reducing alcohol consumption, and cleaning up the environment. We need to target prevention toward cancers that are found late and are hard to treat.

**If you live in Jefferson County, this means you.**

Finally, notice that if you compare Jefferson County to the state of Kentucky, you find differences that are similar to those we found when comparing *West* County to the rest of Jefferson County. The things we need to do in *West* County are things we need to do in all of Jefferson County.

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For a copy of the entire study, please contact: Jefferson County Health Department, Office of Community Health Planning, 400 East Gray Street, Louisville, Kentucky 40202 or call 502/574-6532.

# Summary of Results

## INTRODUCTION

The last step of EPA's national-scale assessment is to characterize the quantitative estimates of risk posed by 32 common air toxics identified by the EPA's Integrated Urban Air Toxics Strategy. (The 33rd air toxic in this assessment, diesel particulate matter, is discussed separately in a more qualitative fashion. Learn more about the risk from diesel particulate matter.) These air toxics were chosen because they pose the greatest potential risks to public health in urban areas. For a general description of risk characterization, see the web page on this topic.

This risk characterization considers the risk of both cancer and noncancer effects from inhalation of these air toxics nationwide, in both urban and rural areas. The purpose of this national-scale assessment is to understand these cancer risks and noncancer health effects to help the EPA identify pollutants and source categories of greatest potential concern, and to set priorities for the collection of additional information to improve future assessments. The national-scale assessment is not designed to characterize risks sufficiently for regulatory action.

The assessment is also designed to be a "snapshot" for measuring progress in reducing risks from exposure to air toxics. For this reason, the national-scale risk assessment is based on a 1996 inventory of air toxics emissions. It then assumes individuals spend their entire lifetimes exposed to these air toxics. Therefore, it does not account for the reductions in emissions that have occurred since 1996 or those that will happen in the near future due to new regulations for mobile and industrial sources (see further details in the Air Toxics Reduction section of the website). The EPA plans to update this assessment every three years. The next assessment, due in 2003, will focus on emissions, concentrations, and risks using information on emissions in 1999.

Given its broad scope, this risk characterization is subject to a number of limitations due to gaps in data or in the state of the science for assessing risk. For example, the current assessment does not yet include results for dioxins, compounds that may contribute substantially to risks. In addition, the EPA is reassessing the health effects of 16 carcinogens and 15 noncarcinogens considered in this study. These assessments are all scheduled to be completed in the next two years. For more details about the limitations in the risk characterization, refer to the Limitations section on the website.

The risk characterization performed here was designed to answer 7 questions:

1. Which air toxics pose the greatest potential risk of cancer or adverse noncancer effects across the entire United States?

2. Which air toxics pose the greatest potential risk of cancer or adverse noncancer effects in some areas of the United States?

3. Which air toxics pose lesser, but still significant, potential risk of cancer or adverse noncancer effects across the entire United States?

4. When risks from all air toxics are combined, how many people have the potential for a cancer risk greater than 10 in a million?

5. When potential adverse respiratory effects from all air toxics are combined, how many people have the potential for exposures that exceed reference levels intended to protect against adverse effects (i.e., a hazard index greater than 1)?

6. What is the cancer risk from mobile sources?

7. What is the cancer risk from background sources?

**SUMMARY OF RESULTS**

Based on a comparison of the cancer and noncancer risks estimated for the 32 air toxics quantified by the national-scale assessment, it is possible to determine which air toxics pose the greatest potential risk in the United States. Some of these findings are reported below. Cancer risks in this assessment are presented as lifetime risks, meaning the risk of developing cancer as a result of exposure to each air toxics compound over a normal lifetime of 70 years. Noncancer risks are presented in terms of the ratio between the exposure and a reference concentration. This ratio is called the hazard quotient. The risk characterization summary below focuses on results at the national level, where the EPA believes the results are most meaningful. To understand the results, five points should be considered:

- EPA has classified 29 of the 32 air toxics in the assessment as carcinogens. Six are classified as known human carcinogens, five as probable carcinogens on the basis of incomplete human data, sixteen as probable carcinogens on the basis of adequate animal data, and two as possible carcinogens on the basis of incomplete animal data. Separate risk characterizations are described for air toxics compounds that are known carcinogens and those that are probable carcinogens. Additionally, the EPA and other regulatory agencies have developed assessments for adverse health effects other than cancer for 27 of the 32 air toxics in the assessment.

- For cancer and noncancer results, the EPA looked for pollutants whose risks were above specified cancer risk and noncancer hazard levels (e.g., cancer risks exceeding 1 in a million or hazard quotients greater than 1.0). The levels chosen are not regulatory levels. They are provided here simply to help in judging the relative importance of different pollutants with regard to their potential to cause adverse health effects. For example, those air toxics compounds producing a cancer risk larger than 1 in a million are likely to be of more concern than those producing a cancer risk of less than 1 in a million. The determination of what is an acceptable or unacceptable risk depends on additional factors and more refined information; this larger issue is not addressed in this risk characterization.

- Because many reference concentrations incorporate protective assumptions designed to provide a margin of safety, a hazard quotient greater than one does not necessarily suggest a likelihood of adverse effects. A hazard quotient less than one, however, suggests that exposures are likely to be without an appreciable risk of noncancer effects during a lifetime. Furthermore, the hazard quotient cannot be translated into a probability that an adverse effects will occur, and is not likely to be proportional to risk. A hazard quotient greater than one can be best described as only indicating that a potential may exist for adverse health effects.

- Model-to-monitor comparisons for seven air toxics suggested a general tendency for ASPEN to underestimate measured ambient levels. On average, modeled concentrations ranged from 93% of monitored levels for benzene to 15% for chromium. Thus, the model to monitor comparison results suggest that the ASPEN model may systematically underestimate ambient concentrations for the 7 pollutants that were evaluated. Given that air monitoring data are usually more reflective of actual ambient conditions and given the apparent tendency of the ASPEN model to underestimate ambient concentrations, it is possible that ambient concentrations for other pollutants are underestimated as well. As a result, risk estimates based on the ASPEN model may be underestimated. Further, the relative importance of these compounds with respect to cumulative risk (classification as national cancer risk driver or regional cancer risk driver) may be underestimated.

- The cancer risk estimates are considered "upper bound," meaning they are an upper estimate of risks from a given exposure level. For several of the more important hazardous air pollutants, the cancer risk estimates are based on the statistical best fit to human data, and are therefore less conservative than estimates based on statistical upper confidence limits developed from animal data. Because the EPA estimated exposures to typical individuals in each census tract, the risk estimates can be best interpreted as upper estimates of risk to typical individuals (if we assume that exposures are not underestimated). Therefore, most individuals are likely to have actual risks that are either equal to or less than the risks estimated by this study, but some individuals may have actual risks that are greater.

**The following conclusions on individual air toxics compounds were drawn from the risk characterization:**

*National cancer risk drivers:* The EPA identified air toxics compounds posing an estimated upper-bound lifetime cancer risk exceeding 10 in a million to more than 25 million people (i.e., more than 10% of the U.S. population lives in census tracts where upper-bound lifetime cancer risks from these air toxics compounds exceed 10 in a million). For known carcinogens this comparison shows the greatest risks for benzene and chromium. For probable carcinogens this comparison shows the greatest risk for formaldehyde.

*Regional cancer risk drivers:* The EPA identified air toxics compounds posing an estimated upper-bound lifetime cancer risk exceeding either (a) 10 in a million to more than 1 million people or (b) 100 in a million to more than 10,000 people. Pollutants already identified as national risk drivers above were not re-listed as regional risk drivers. For known carcinogens this comparison shows the greatest risks for arsenic and coke oven emissions. For probable carcinogens this comparison shows the greatest risks for 1,3-butadiene and polycyclic organic matter (POM).