STATE OF ALABAMA DEPARTMENT OF
PUBLIC HEALTH
Donald E. Williamson, MD
State Health Officer

October 2, 2007

RECEIVED
OCT 2007
ADEM
ADMINISTRATION

Onis "Trey" Glenn, III
Director
Alabama Department of Environmental Management
Post Office Box 301463
1400 Coliseum Boulevard
Montgomery, AL 36130-1463

Dear Mr. Glenn:

Subject: Questions Posed by EMC to the Cancer Risk Advisory Panel

I am pleased to provide the Alabama Department of Public Health's responses to selected questions provided to the Cancer Risk Advisory Panel pertinent to water quality criteria. You will note the Department has compiled the responses according to logical subject headings and omitted certain questions for which we did not have expertise.

Thank you for the opportunity to comment. Please call me if I can provide additional information.

Sincerely,

Donald E. Williamson, M.D.
State Health Officer

DEW:CHW:sf
Enclosure

The RSA Tower • 201 Monroe Street • Montgomery, AL 36104
P.O. Box 303017, Montgomery, AL 36130-3017

Alabama Department of Public Health Response to Selected Questions of the EMC Cancer Risk Advisory Panel October 2007

State Health Official's Opinion about Changing the Cancer Risk Factor

Question 4 As a health official, in your opinion do the weight and fish consumption factors warrant a change at this time and please provide supporting documents as to the opinion rendered.

Response: These two parameters (namely, human weight and fish consumption rate) are important in the formulae utilized by the Alabama Department of Emergency Management (ADEM) to calculate levels of water contaminants. Given their importance in the formulae and the fact that the fish consumption factor was based on studies conducted approximately 15 years ago (see question 12), it might be appropriate for ADEM to undertake efforts to update the values for these parameters, if it chooses to utilize the same formulae.

Question 2 Do you have an opinion/recommendation to offer as to whether or not the EMC should change the Cancer Risk factor used in the equation and should we change the cancer risk level used in our formula from 10^{-5} to 10^{-6} and will this cause a reduction of cancer deaths in Alabama? **(Question 17)**

Response: Based on the information reviewed by the Alabama Department of Public Health, it is not possible to demonstrate a reduction in cancer would occur if the cancer risk factor were changed to 10^{-6}. All other factors being equal, changing the cancer risk factor to 10^{-6} would offer theoretical protection by reducing the projected likelihood of cancer occurrence.

It should also be noted that the Alabama Department of Public Health issues fish consumption advisories based on concentrations of contaminants detected in fish tissue. These advisories are based on a 10^{-6} acceptable risk level. If fish tissue concentrations are high enough to result in a consumption advisory, ADPH understands that ADEM views the water body as impaired, which requires corrective action. ADPH cannot predict the effect that altering water criteria (e.g., lowering the cancer risk factor from 10^{-5} to 10^{-6}) would have on resultant fish tissue concentrations of contaminants and hence the number of fish consumption advisories.

Frequency of Cancer Occurrence

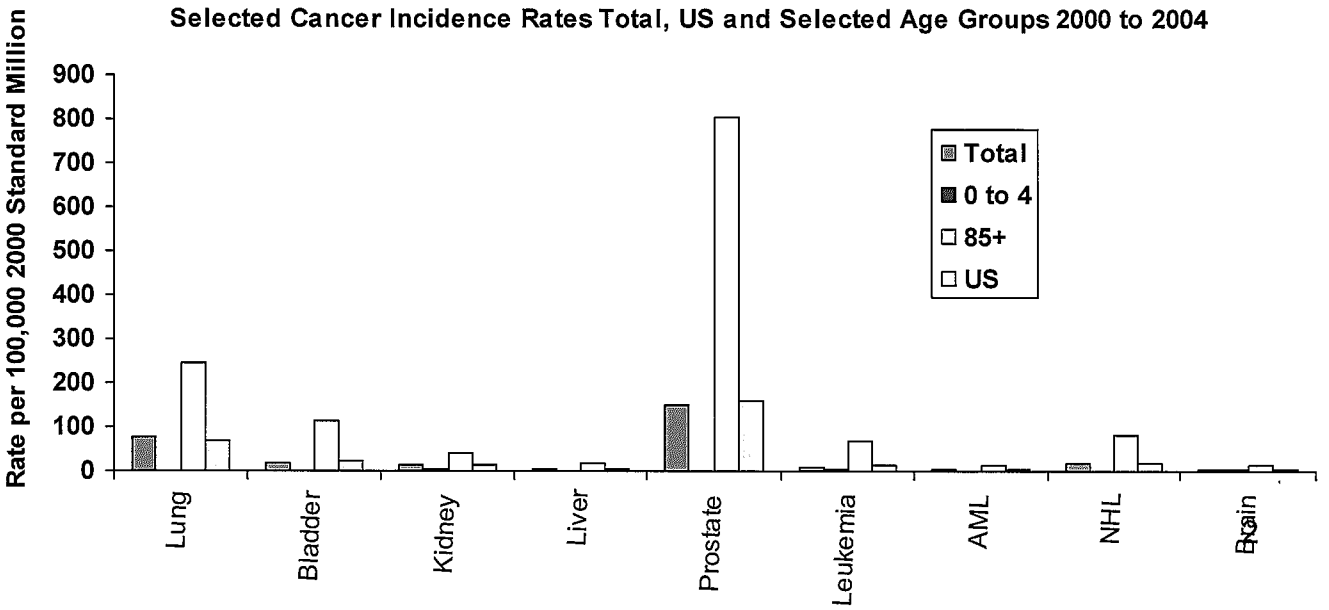
Question 7 Please provide documentation of cancer types associated with each of the 58 carcinogens potentially impacted by the change and incidence rates of these cancers in the State of Alabama; particularly in, but not limited to, the very young and very old.

Response: The Report on Carcinogens (RoC) an informational and scientific document that identifies and discusses agents, substances and mixtures that may pose a hazard to human health due to their ability to cause cancer was used in preparing this response. According to the RoC, the criteria for listing an agent, substance, mixture or exposure circumstance are those a) known to be human carcinogens, and b) reasonably anticipated to be human carcinogens. The probability of developing cancer depends on the intensity, route and duration of exposure to a carcinogen. Only a few instances allow a risk for cancer to be estimated with complete confidence. We are presenting data for substances that are known to be human carcinogens according to the RoC findings that correspond to the 58 carcinogens of the EMC Cancer Risk Advisory Panel. (http://ntp.niehs.nih.gov/index.cfm?objectid=32BA9724-F1F6-975E-7FCE50709CB4C932)

These substances are: Arsenic, Benzene, Benzidine, Dioxin, and Vinyl Chloride.

The cancer sites associated with the known human carcinogens are:
Arsenic: lung, bladder, kidney, liver, prostate
Benzene: acute myelogenous leukemia (AML)
Benzidine: bladder
Dioxin: lung, non-Hodgkin's lymphoma (NHL), and all sites
Vinyl Chloride: liver, brain, lung, leukemia

Since the cancers associated with these known human carcinogens overlap, this report will be focusing on nine cancers: lung, bladder, kidney, liver, prostate, leukemia, acute myelogenous leukemia (AML), non-Hodgkin's lymphoma (NHL), and brain. All data are for 2000 to 2004 and were obtained from the Alabama Statewide Cancer Registry (ASCR) of the Alabama Department of Public Health.



AL 2000-2004 0-4 Year Olds		
Cancer Site	Rate	Count
Brain	2.9	43
Bladder	0	0
Kidney	2.6	38
Leukemia	6.2	92
Acute Myeloid Leukemia	1.1	17
Liver	0.4	6
Lung and Bronchus	0.1	2
Non-Hodgkin Lymphoma	0.5	7
Prostate	0.1	1

Rates are per 100,000.
Rates based on less than 6 cases are unreliable.

US 2000-2004 0-4 Year Olds		
Cancer Site	Rate	Count
Brain	3.44	2758
Bladder	0.06	48
Kidney	1.95	1566
Leukemia	7.63	6166
Acute Myeloid Leukemia	0.92	737
Liver	0.62	496
Lung and Bronchus	0.06	45
Non-Hodgkin Lymphoma	0.56	446
Prostate	0.07	30

Rates are per 100,000.

AL 2000-2004 Age 85+		
Cancer Site	Rate	Count
Brain	11.5	39
Bladder	112.8	381
Kidney	41.2	139
Leukemia	67.5	228
Acute Myeloid Leukemia	15.4	52
Liver	18.9	64
Lung and Bronchus	243.4	822
Non-Hodgkin Lymphoma	81.4	275
Prostate	806.8	752

Rates are per 100,000.

US 2000-2004 Age 85+		
Cancer Site	Rate	Count
Brain	16.2	3043
Bladder	153.73	28770
Kidney	46.83	8794
Leukemia	82.88	15565
Acute Myeloid Leukemia	21.03	3949
Liver	19.6	3680
Lung and Bronchus	287.37	53965
Non-Hodgkin Lymphoma	98.57	18510
Prostate	685.57	38943

Rates are per 100,000.

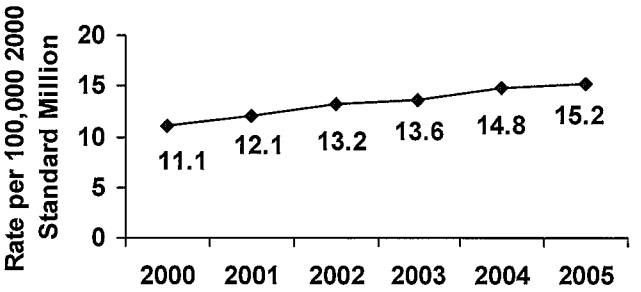
a. Please provide documentation as to whether these incidence rates have generally risen or generally fallen over the course of the last ten years and, if possible, reasons for the rise or fall.

Response: The ASCR has been collecting data since 1996. In 2001, the registry achieved 95% completeness in reporting of cases, a gold standard for registries. Years prior to 2000 are not presented in trend analyses due to the number of cases missing from the registry. As seen in Appendix A, Percent Change (PC) and Annual Percent Change (APC) are both presented for the nine cancers. All nine cancers show an increase in the incidence rate from 2000 to 2004 and the average annual change (APC) is statistically significant meaning it is greater than what might have occurred by chance. Two cancers increased by more than 30 percent over the five year period: kidney (33.1%) and AML (31.8%). The lowest PC was for lung cancer (3.9%). Lung cancer is strongly related to tobacco use and radon. Without changes in those risk factors or an effective screening tool, the rates for lung cancer incidence may not fluctuate.

Researchers have noted the increase in incidence rates for kidney cancer. Smoking, obesity and high blood pressure are risk factors for the disease. According to the American Cancer Society (http://www.cancer.org) AML is linked primarily to smoking and the industrial chemical benzene. Both kidney cancer

and AML are also diseases of older people with AML rare before the age of 40 and kidney cancer incidence highest between the ages of 55 and 84. As our population ages, the incidence rates of these diseases are likely to increase reflecting the demographics of the state. A trend analysis for kidney cancer for Alabama for 6 years is provided in this section of the response. Further trend analyses will follow in *Question 15.*

Kidney Cancer Incidence Rates
Total Alabama 2000 to 2005



b. Please provide supporting documentation from current literature (preferably within, but not limited to, the last 5 years) for a **link** or **potential link** between any case of these types of cancers in Alabama and the discharge of these 58 carcinogens. "Cancer cluster" reports and documentation are acceptable.

Response: Geocoding the location of each case for each of these nine cancers would be needed to generate a cancer cluster study.

c. Where **geographically** in the State are these cancer types most often located?

Response: Maps for lung, bladder, kidney, liver, prostate, leukemia, AML, NHL, and brain cancer for all races and sexes combined have been provided based on county of residence at the time of diagnosis. Data were omitted in counties where there were fewer than six cases over the five year period because the rates would be unreliable. These counties were indicated with a striped pattern (See Appendix B).

Lung cancer shows higher rates across the northern part of the state and in the extreme lower region of the state on the Gulf of Mexico and adjacent to Florida. Bladder cancer also affects the northern region of the state and a six county area bordering Tuscaloosa county. Mobile and Baldwin Counties are also higher incidence counties. The kidney cancer map is similar to the bladder cancer map with the northern region having higher rates, a section near Tuscaloosa county and Mobile and Baldwin. Interestingly Autauga and Chilton Counties have higher incidence rates of kidney cancer. They may have an older population. Mobile,

Baldwin, and Escambia have higher incidence rates for liver cancer as do Chambers, Lee, Macon and Russell. Many counties had too few cases to map.

Prostate cancer incidence follows an expected pattern for the known higher risk factor of African American race. The southern region of the state has higher incidence rates with the exception of those counties along the Florida border. Both leukemia and AML show higher rates in public health areas one, two and three in the northwest region of the state and in Mobile, Baldwin and Escambia counties. Incidence rates for NHL are higher in the northern half of the state and along the border with Florida and the Gulf of Mexico. The pattern for brain cancer shows very few cases in the southern half of the state.

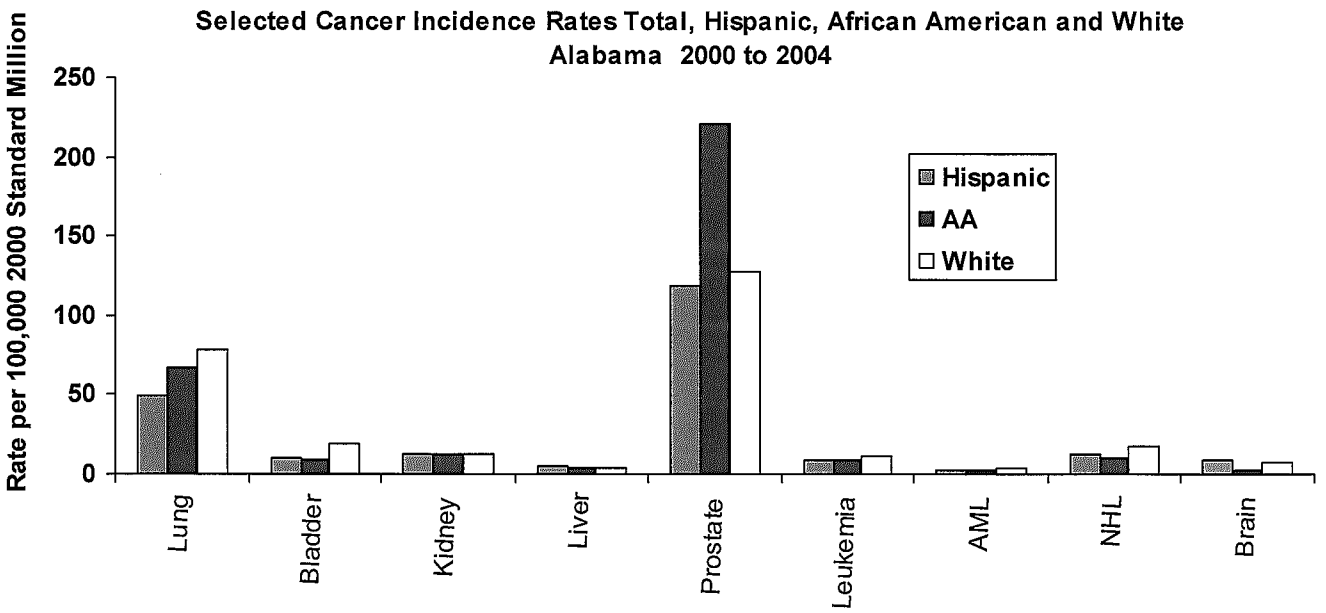
An overlay of major highways and of rivers was examined with the state maps. For the river overlay, kidney cancer is the most interesting map with many areas of high incidence also being areas with rivers. For both the highways and the rivers, any visual relationship may be spurious due to the fact that people settle near routes of transportation and sources of water. The most promising overlay was one showing Alabamians aged 55 and older. This map corresponds with many areas with high incidences of cancer, unsurprising since many of the selected cancers' onsets are typically not before age 50.

d. In which ethnic subpopulation (White, Hispanic, African-American, Asian, etc.) are these cancer types most often seen?

Response: Of the nine cancers, in Alabama for 2000 to 2004, African Americans have a significantly lower incidence rates compared to Whites for brain, bladder, leukemia, lung, and NHL (probability less than 0.05). African Americans have a 36 percent lower risk of being diagnosed with brain cancer compared to Whites. African Americans have a 59 percent lower risk of being diagnosed with bladder cancer compared to Whites. African Americans have a 24 percent lower risk of being diagnosed with leukemia compared to Whites. African Americans have a 16 percent lower risk of being diagnosed with lung cancer compared to Whites. African Americans have a 43 percent lower risk of being diagnosed with NHL compared to Whites.

On the other hand, African Americans have a 67 percent higher risk of being diagnosed with prostate cancer compared to Whites.

The risk is equivalent between African Americans and Whites for kidney and liver cancer and AML. (See Appendix D). Cancer incidence is too infrequent or the base population is too small to calculate stable rates for Hispanic or other subpopulations for individual cancers. A graph showing total Hispanic, African American and White incidence rates is provided.



Question 15 Please provide incidence rate trends in cancers associated with the 58 carcinogens affected in Region 4 states currently using a cancer risk factor of 10^{-6}.

Response: Appendix C contains graphs, along with the corresponding tables, of 5 year trends for each of the states for which data were available using a cancer risk factor of 10^{-6} (Florida, Georgia, Kentucky, South Carolina and the US for comparison). Data from two states, North Carolina and Mississippi, were not available. As noted earlier the discussion will cover the following cancers: lung, bladder, kidney, liver, prostate, leukemia, acute myelogenous leukemia (AML), non-Hodgkin's lymphoma (NHL), and brain. Graphs showing incidence rates over time are the easiest way to notice extremes; however, five years will not divulge the type of long term trends that one might see over a period of 20 years. Generally speaking, Alabama incidence rates fall below or in the middle of the rest of the states over the five year time span.

For lung cancer, all states follow a flat trend. Alabama and the other states are higher than the nation and Kentucky is noticeably higher. Given the link between tobacco use and lung cancer, Kentucky's rates are not surprising. Bladder cancer rates are also fairly flat; Alabama has had a rate lower than the comparison states except for a rate similar to South Carolina in 2004. The kidney cancer graph demonstrates the previously discussed rise in the incidence rates except for South Carolina. Alabama's liver cancer rates fall in the middle of the comparison areas. Florida and the US show higher and steadily increasing liver cancer rates over time. Prostate cancer rates have declined for all the comparison regions. Alabama's rates have fluctuated with a slight overall increase for this cancer. For the most part, Alabama's incidence rates for leukemia, NLH and AML remain lower than the comparison regions. US rates are flat or decrease slightly. Brain cancer rates are tightly clustered around the same

rates for each year showing flat trend lines. Alabama has a noticeable increase from 2003 to 2004. Finally a bar chart shows all cancers for all states and the US for the year 2004. The prostate and lung cancers depicted by the dark blue bars demonstrate the striking impact these two cancers have on each state and the nation. Bladder cancer and NHL are the cancers with the next highest rates.

Question 20 What are the prevalent types of cancer that are present in Alabama, what are the statistical levels and what is the current state of the science on understanding the most probable factors that cause these different types of cancer?

Response: Cancer occurs when the orderly process of cell division goes wrong, such that new cells grow when they should not and old cells do not die when they should. The result is excess cells forming a mass of tissue called a tumor. According to the National Cancer Institute (NCI) that provides a very concise explanation of the causes of cancer, (http://www.cancer.gov/cancertopics/wyntk/overview/allpages), these are the most common risk factors for cancer:

- Growing older
- Tobacco
- Sunlight
- *Ionizing radiation*
- Certain chemicals and other substances
- Some *viruses* and *bacteria*
- Certain *hormones*
- Family history of cancer
- Alcohol
- Poor diet, lack of physical activity, or being overweight

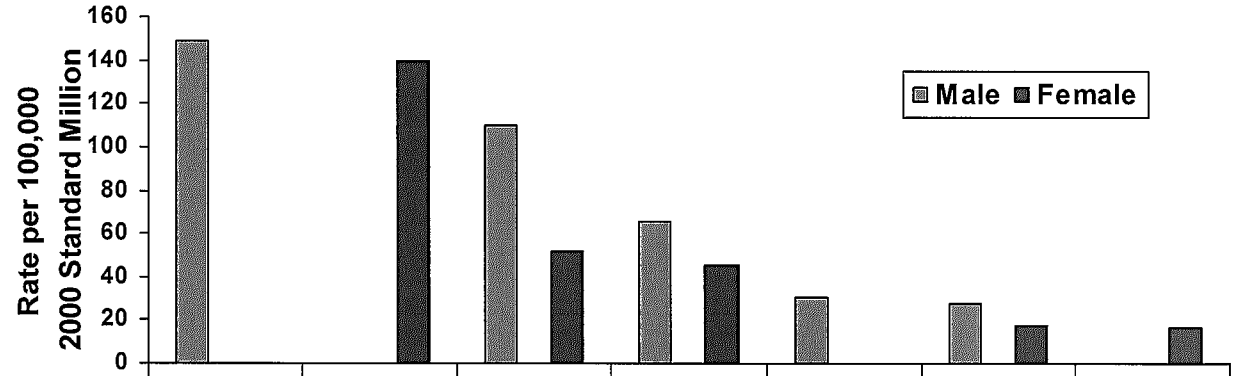
According to NCI "the most important risk factor for cancer is growing older.... Tobacco use is the most preventable cause of death. Each year, more than 180,000 Americans die from cancer that is related to tobacco use. Using tobacco products or regularly being around tobacco smoke (environmental or secondhand smoke) increases the risk of cancer.

Smokers are more likely than nonsmokers to develop cancer of the lung, larynx (voice box), mouth, esophagus, bladder, kidney, throat, stomach, pancreas, or cervix. They also are more likely to develop acute myeloid leukemia (cancer that starts in blood cells).... Ultraviolet (UV) radiation comes from the sun, sunlamps, and tanning booths. It causes early aging of the skin and skin damage that can lead to skin cancer.... Ionizing radiation can cause cell damage that leads to cancer. This kind of radiation comes from rays that enter the Earth's atmosphere from outer space, radioactive fallout, radon gas, x-rays, and other sources. Radioactive fallout can come from accidents at nuclear power plants or from the production, testing, or use of atomic weapons. People exposed to fallout may have an increased risk of cancer, especially leukemia and cancers of the thyroid, breast, lung, and stomach. Radon is a radioactive gas that you cannot see,

smell, or taste. It forms in soil and rocks. People who work in mines may be exposed to radon. In some parts of the country, radon is found in houses. People exposed to radon are at increased risk of lung cancer. Medical procedures are a common source of radiation.... People who have certain jobs (such as painters, construction workers, and those in the chemical industry) have an increased risk of cancer. Many studies have shown that exposure to asbestos, benzene, benzidine, cadmium, nickel, or vinyl chloride in the workplace can cause cancer.... It is uncommon for cancer to run in a family. However, certain types of cancer do occur more often in some families than in the rest of the population. For example, melanoma and cancers of the breast, ovary, prostate, and colon sometimes run in families.... Studies suggest that people whose diet is high in fat have an increased risk of cancers of the colon, uterus, and prostate. Lack of physical activity and being overweight are risk factors for cancers of the breast, colon, esophagus, kidney, and uterus."
(http://www.cancer.gov/cancertopics/wyntk/overview/allpages)

The five leading cancers in the ASCR for males and females are shown below in the graph. Bladder cancer is not one of the top five cancers for females. Males have higher rates than females for lung, colorectal and melanoma of the skin.

Cancers with highest incidence rates in Alabama 2000 to 2004



	Prostate	Breast	Lung and Bronchus	Colorectal	Urinary Bladder	Melanoma	Corpus Uteri
Male	148.5		110.2	66.1	30.3	28	
Female		140.1	51.7	45		17.7	16.2

Prostate cancer risk factors: The chance for having prostate cancer rises rapidly after age 50 and two-thirds of prostate cancers are found in men over the age of 65 making age the strongest risk factor according to the American Cancer Society (ACS). (http://americancancersociety.org) Prostate cancer seems to run in families and there may be an inherited gene associated with it. African American men are twice as likely to die of prostate cancer as other races. According to the ACS, prostate cancer occurs less often in Asian-American and Latino men than non-Hispanic whites. Obesity and high-fat dairy products are linked to prostate cancer.

Breast cancer risk factors: According to the ACS, aging is a risk factor for breast cancer. Five to 10 percent of cases are hereditary resulting from gene mutations of the BRCA1 and BRCA2 genes. Women with these genes have an 80% chance of developing breast cancer and at a younger age and are also at risk for ovarian cancer. A few other mutations of genes are also associated with breast cancer. Breast cancer risk is higher among those who have a close relative with breast cancer. Long-term use of hormone replacement therapy, particularly estrogen and progesterone combined increases the risk for breast cancer. Obesity is a breast cancer risk factor. Having more fatty tissue after menopause can increase estrogen levels, and thus, increase the risk of breast cancer.

Lung cancer risk factors: According to CDC the risk factors for lung cancer are smoking and being around other's smoke, radon gas, and having a family history of lung cancer. (http://www.cdc.gov/cancer/lung/basic_info/) Interestingly, one study published in the January 26, 2006, New England Journal of Medicine found that both African Americans and Native Hawaiians had significantly greater risks of lung cancer related to smoking compared with whites, Hispanics, and Japanese Americans after controlling for other factors.

Colorectal cancer risk factors: A small percentage of colorectal cancers are caused by a gene called APC that is normally responsible for slowing the growth of cells. If a person inherits changes in this gene, the control on cell growth is turned off and hundreds of polyps grow in the colon. Over time some of these polyps will develop into cancer. Other genes repairs damaged cells and if these four repairing genes allow DNA errors to go uncorrected, cancer can develop. A family history of colorectal cancer is an important risk factor. Other risk factors are being of Eastern European Jewish descent, being African American, a high fat diet from animal sources (red meat), physical inactivity, obesity, smoking, heavy use of alcohol, and diabetes. People with diabetes have a 30% increased risk of developing colorectal cancer. (http://americancancersociety.org)

Bladder cancer risk factors: The cause of bladder cancer is not clearly defined. The following risk factors have been linked to bladder cancer: smoking, work exposure, white race, increasing age, male gender, chronic bladder inflammation, family history, arsenic in drinking water, and failure to drink enough fluids. Under work exposure, chemicals used in making dye are linked to bladder cancer. Those workers at risk would be painters, hairdressers, machinists, printers and truck drivers. People who work with aromatic amines may have a higher risk of bladder cancer. These chemicals are used in making rubber, leather, printing materials, textiles and paint products. An article in the journal *Cancer* by Maurice P.A. Zeegers found people who smoked 20 or more cigarettes per day had a risk of developing urinary tract cancers more than three times the risk of nonsmokers. (http://www.cancer.org)

Melanoma risk factors: Sunlight is the major risk factor for most melanomas. The source of ultraviolet radiation (UV), the sun damages the genes in our skin. Tanning booths and sum lamps also emits UV radiation. The consistency of exposure may play a factor with melanomas of the head and neck different from

those on the arms and legs typically from sunburns during childhood. A person who has many moles is more likely to develop melanoma. The risk for white is ten times greater than for African Americans. Red haired people are at the highest risk. While melanoma is likely to occur in older people, it is one of the most common cancers found in people under the age of 30. Males are more likely to be diagnosed with melanoma than females. In some families with inherited melanoma, gene mutations increasing the risk of melanoma are passed from one generation to the next. The gene mutations prevent the genes from doing their job of controlling the growth of cells. (http://www.cancer.org)

Uterine cancer risk factors: According to the National Cancer Institute (NCI), (http://www.cancer.gov/cancertopics/wyntk/uterus/allpages) two types of uterine cancer are endometrial cancer (cancer that begins in cells lining the uterus) and uterine sarcoma (a rare cancer that begins in muscle or other tissues in the uterus). Risk factors for uterine sarcoma include the following: Past treatment with radiation therapy to the pelvis and treatment with tamoxifen for breast cancer.

"For endometrial cancer, studies have found the following risk factors: Cancer of the uterus occurs mostly in women over age 50. The risk of uterine cancer is higher if a woman has endometrial hyperplasia. Hormone replacement therapy (HRT) is also a risk factor. Women who use estrogen without progesterone have an increased risk of uterine cancer. Long-term use and large doses of estrogen seem to increase this risk. Women who use a combination of estrogen and progesterone have a lower risk of uterine cancer than women who use estrogen alone. The progesterone protects the uterus. Obesity is related to endometrial cancer. The body makes some of its estrogen in fatty tissue. That is why obese women are more likely than thin women to have higher levels of estrogen in their bodies. High levels of estrogen may be the reason that obese women have an increased risk of developing uterine cancer.

Women taking the drug tamoxifen to prevent or treat breast cancer have an increased risk of uterine cancer. This risk appears to be related to the estrogen-like effect of this drug on the uterus. White women are more likely than African-American women to get uterine cancer. Finally, women who have had an inherited form of colorectal cancer have a higher risk of developing uterine cancer than other women."
(http://www.cancer.gov/cancertopics/wyntk/uterus/allpages)

Relation between Cancer and Environmental Exposures

Question 21 Is there a clear cause and effect for cancer that can be attributed to environmental factors other than the water quality standards in the guidelines?

Response: According to the National Cancer Institute, most cases of cancer are linked to environmental causes. In a news release dated June 17, 2004, Dr. Arron Blair, the chief of the Occupational Epidemiology Branch in the National Cancer Institute's Division of Cancer Epidemiology and Genetics, stated that most epidemiologists and cancer researchers would agree that the relative contribution from the environment for cancer risk was about 80-90 percent. Dr. Blair clarified the word "environmental" by stating that he was including lifestyle factors such as **tobacco**, diet, and alcohol, as well as radiation, infectious agents, and substances in the air, water, and soil. Dr. Blair commented that there were two categories about which there was certainty for the estimates for cancer risk which were tobacco and ionizing radiation. Dr. Blair referred to previous estimates of cancer risk generated by Drs. Doll and Peto in the early 1980s, which Dr. Blair indicated he considered to be reasonable. In that report, the proportion of cancer deaths caused by different avoidable cancers due to pollution of air, water, and food combined was between less than 1 percent up to 5 percent. Dr. Blair acknowledged that since that time, new information about infectious causes such as human papillovirus and H. pylori, had emerged, but further work is needed on pollutants in air and water.

Question 22 If there are other environmental factors that attribute to cancer in the citizens of Alabama, how do we determine the relative improvement in risk to the population by changing only one factor such as water quality standards?

Response: The projected cancer burden may be too small to assess the relative improvement in risk for any of the three environmental pollution factors listed above. According to Dr. Blair from the National Cancer Institute, the area of environmental pollution exposures is difficult to make the proper assessments of risk, and there is a lot of research needed for this important area. Dr. Blair makes the point that not all of the potential factors including those in water pollution may have been identified. He also points out that characterization of a person's diet over time, especially for food eaten in the past, makes dietary assessment of exposure difficult. If the assumption is that up to 5% of cancer cases are caused by the three environmental pollution factors with equal effect, then approximately as much as 1.83% of all cancers might be due to water pollution. Alternatively, if less than 1% of cancers are due to environmental pollution, than only 0.34% might be due to water pollution. Dr. Blair indicated that Doll and Peto had very little data to back up these estimates of the pollutant-related cancers when they formulated their assessment of environmental pollution, so this approximation has very little specific data to back it up.

Question 28 Is there any evidence of cancer incidence attributed to the consumption of fish or raw water from Alabama streams?

Response: The incidence for cancers which could be attributable to exposure from water sources is reflected in the cancer incidence data presented for 2000 to 2004 from the Alabama Statewide Cancer Registry. None of the cancers, with the exception of kidney cancer show any significant increasing incidence trends. Further, for kidney cancer, the Alabama rate is below the United States rate and the increasing incidence for kidney cancer in Alabama parallels a similar increasing rate for kidney cancer in the U.S. Specific cancer data from which to determine any cancer incidence rates for those who regularly consume fish or raw water from Alabama streams is not available.

Cancer-Related Economic Costs

Question 16 Total yearly costs for health care of cancer patients and, if possible, estimates of cost in time out of work for care givers in the family as well.

Response: The National Cancer Institute has a report which lists average Medicare payments for individuals in the first year following a diagnosis of cancer. The report addresses in 2004 dollars the 15 cancers which accounted for 86% of all cancers. The lowest expenditure was for melanoma at $4,800. The next higher costs were for breast and prostate cancer which were tied at $11,000 each and the highest cost was $36,800 for cancer of the ovary. The Alabama Statewide Cancer Registry reported 23,918 cases of cancer for 2004, with 1,168 being melanoma. If one eliminates the melanoma cases and uses a mean figure of $20,000 annual costs for a cancer case, based on the Medicare payments information, the total annual cost of cancer in Alabama in 2004 dollars on would be estimated to be $455,000,000.

A study published in Support Care Cancer, in November 2006, reported that among a group of Canada care givers, 35.8% of patients reported they needed other persons to take time off from work to help provide some of their care. This time off was taken mostly by persons under age 65. The care giving group reported a mean number of 7 lost work days for the previous 30 days. The researchers made the point that approximately 36% of their care giver sample had to use one third of the working days in any given month to provide this care.

Question 6 Is there a way to reconcile the fact that many states in Region 4 report to use a cancer risk factor of 10^{-6} but their resulting criteria does not seem to reflect a value calculated using the 'formula' with a 10^{-6} so that we have an idea of where Alabama ranks among the other Region 4 states on this issue? *[ADEM will provide the table we generated showing the comparison of the states]*

Response: The Alabama Department of Public Health is not privy to how other states calculate their water criteria and suggests the Alabama Department of Environmental Management obtain this information from other sources.

Question 12 Please provide a review of current literature (preferably within, but not limited to, the last 5 years) for daily per capita ***freshwater fish consumption*** by Alabama anglers. Recreational vs. sustenance fisherman would be of particular interest.

Response: The relevance of extant data is questionable. There have been two surveys conducted in Alabama.

The Alabama Department of Public Health conducted a fish consumption survey from July to October 1991. This was a telephone survey conducted by members of county health departments and had a 98% rate of successful completion of the surveys (534 households.) The data from this survey indicate that the average consumption of freshwater fish from all respondents was 0.9 meals/wk with an average meal size of 174.6 grams/meal (6.16-oz/meal.) This equates to a daily consumption level of 8.4 gm/day (0.29-oz./day).

A second study was conducted by the Alabama Department of Environmental Management, by contract through Auburn University, between August 1992 and July 1993. This study was performed as an interview with anglers on-site at the conclusion of their fishing trips. In this study, it was assumed that meal size was 113.4 gms (4-oz.) The daily *per capita* consumption level was calculated 43 gm/day (1.54-oz.)

These surveys were undertaken attempting to determine the fish consumption habits of recreational fisherpersons. There are no known subsistence populations in the state of Alabama. A subsistence fisherman is one who would derive 70% of his/her annualized protein intake from a single source, i.e., native-caught fish.

Question 19 Are the assumptions used for the variables in the formulas used to calculate the standards appropriate and accurate for our state and our citizens?

Response: The question of whether any of the assumptions used in calculating risk is philosophical. There have been two federal standards that have been

applied to the calculation of risk, and each of these has been subjected to much scrutiny and debate.

In the methodology utilized by the Food and Drug Administration, data obtained from exposure studies, animal or human, is extrapolated using safety factors. In other words, the highest dose found without causing an adverse health effect is examined, based upon the species or number of species, and a set safety factor, e.g., 100-fold, 1000-fold, etc. is applied to that dose. If it is found that x is that dose, above which some observable and reproducible health effect occurs, and this effect was seen in two species of rodent (rat and mouse), then a 100-fold safety factor is applied. If the species is canine, a 1000-fold factor is applied; for non-human primates, a 2000-fold factor is applied. This results in a significant level of protection for target populations.

The method used by the Environmental Protection Agency again uses the data from exposure studies. These data are modified using uncertainty factors in an attempt to normalize the data based upon possible questions involving the way in which the human may react to exposure to the compound in question as compared to the way in which the animal species might react. The uncertainty factors utilized include an attempt to adjust for potential intraspecies variation in sensitivity to the test compound; a factor to adjust for potential synergy with other compounds; a factor to adjust for differences in exposure route, e.g., inhalation vs transcutaneous vs oral; and a factor to adjust for interspecies variation in sensitivity. Each of these factors is arbitrarily given a number from one to ten, this being at the discretion of the individual conducting the assessment. Adjustments may also be made for other questions involving the quality of the data used in the assessment, such as the quality of the animal study or the quality of the epidemiology study.

The selection of a method for the conduct of a risk assessment will not/should not be impacted by jurisdictional boundaries. The assessment is a means of determining whether exposure to a compound of interest may or may not constitute a hazard to human health, regardless of the state in which the individual may located.

It should also be stated that risk assessments are conducted for other outcomes in addition to cancer. It is performed for any health effect resulting from exposure in any population. As an example, there is no clear connection between exposure to mercury, in any of its forms, and the development of cancer. The results of investigations into this correlation have been inconclusive. However, the more sensitive indicator of the health impact of exposure to mercury is on brain development and resultant lower I.Q, increased behavioral problems, and some learning disabilities, in children who have been exposed *in utero* and in early childhood (up to 15 years of age.) Therefore, mercury is regulated and consumption advisories issued for the sensitive populations, women of childbearing age, pregnant women, and children.

Question 29 What is the estimated size of the population at risk to carcinogens transmitted through the consumption of fish or untreated water from Alabama streams?

Response: The size of the population of Alabama that consumes native-caught fish, freshwater or marine, is not known. However, with the exception of levels of mercury in fish, the values used for determination of the fish consumption advisories are the levels set by the Food and Drug Administration for fish sold in interstate commerce. These levels have always been set using an acceptable risk level of 10^{-6}. If the presence of a carcinogen were found in fish tested, comparison of the level in the fish tested with the allowable level for that material in fish would enable the development and issuance of an advisory regarding consumption of that species from that location on that waterbody.

Fish Consumption Advisories

Question 30 How does the ADEM fish tissue sampling system support the Alabama Health Department stream notification system?
[ADEM will provide a summary of the Department's thoughts on this issue]

Response: The Fish Tissue Monitoring Program is conducted principally by the ADEM with input from ADPH. Fish are sampled, collected and analyzed by ADEM and the data are presented to ADPH for a determination of whether consumption of a given species of fish from a specific location on a specific waterbody would constitute a potential hazard to human health. If such a determination is made, an advisory is issued. Since 2006, this advisory is issued by the State Health Officer jointly with the Director, ADEM and the Commissioner, Alabama Department of Conservation and Natural Resources.

Question 31 Is there any correlation between the Department of Public Health fish consumption advisories and the location of facilities holding carcinogen related NPDES permits?

Response: The ADPH accepts and evaluates data produced through the Fish Tissue Monitoring Program conducted by the ADEM. The sites at which fish are collected are selected through a joint discussion process between ADEM, ADCNR and ADPH. The sites are selected, on a rotating basis, from the five major basins into which the state has been divided. This selection process also considers sites where it is known that recreational fishing occurs as well as sites suggested/requested by citizens of Alabama. If it is found that fish taken from a site are violative (have a contaminant level in excess of the allowable level), that site will be resampled in subsequent years to determine whether the finding was a fluke, or the trend of contaminant content was increasing, decreasing or remaining constant. The relationship between site selection and NPDES permitted locations falls under the purview of ADEM and ADPH does not consider these as a rationale for sampling at that location.

If a fish tissue consumption advisory is issued on all or part of a waterbody, this location is considered to be impaired. As such, the site is entered into the 303d list and work is begun to establish Total Maximum Daily Load (TMDL) for that contaminant on that waterbody. Again, this is falls under the jurisdiction of ADEM.

Question 32 When the Alabama Department of Public Health issues a fish consumption advisory, please explain the criteria that establish the need for the advisory.

Response: The need for the issuance of a fish consumption advisory is contingent upon the detection of the presence of a hazardous material, the level of that material in fish, and the effect of that material on/in a sensitive population, e.g., children, the elderly, those women who are or might become pregnant,

those with impaired immune systems, etc. The levels at which advisories are listed is that level for which established federal or state guidance has been issued, or for which a preponderance of valid and acceptable data indicate that the consumption of fish containing the material in question may pose a risk to health.

Relation between Cancer Risk Factor and Cancer Occurrence

Question 27 Is there any correlation between the magnitude of the two risk factors and the incidence or mortality rates for cancer?

Response: No. Comparing cancer occurrence among Southeastern states that use different cancer risk factors, the Alabama Department of Public Health was not able to demonstrate that different cancer risk factors influenced the rates of occurrence of cancers associated with the five environmental contaminants labeled as known human carcinogens over the five-year study period.

Question 33 Is there any scientific evidence to link a lowering of the cancer risk level to 10^{-6} to a corresponding lowering of cancer incidence?

Response: No. There have been no data generated to adequately document that a reduction in the acceptable cancer risk level from 10^{-5} to 10^{-6} would lower the potential number of cases of cancer in a lifetime. The incidence of cancer from environmental exposures is contingent upon many variables, including specific contaminant, length of exposure, quantity of material taken into the body, pharmacokinetic distribution to target organ, metabolism of the contaminant, individual susceptibility, etc. The mere reduction in the risk level may have an impact, but this might be unmeasureable due to the effects of all of the other factors involved in the etiology and development of cancer.

APPENDIX A

APPENDIX A

Bladder Cancer

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	9.0			
2000-2004 APC	1.7	0.3	-2.8	6.5
2000 Rate	15.5	0.6	14.4	16.7
2001 Rate	16.8	0.6	15.6	18.0
2002 Rate	17.7	0.6	16.5	19.0
2003 Rate	16.9	0.6	15.8	18.1
2004 Rate	16.9	0.6	15.8	18.1

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Brain Cancer

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	17.8			
2000-2004 APC	2.8	0.4	-5.2	11.5
2000 Rate	6.0	0.4	5.3	6.7
2001 Rate	6.1	0.4	5.4	6.9
2002 Rate	6.1	0.4	5.4	6.9
2003 Rate	5.6	0.3	5.0	6.4
2004 Rate	7.0	0.4	6.3	7.8

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Kidney Cancer

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	33.1			
2000-2004 APC	7.2*	0.0	5.5	8.8
2000 Rate	11.1	0.5	10.2	12.2
2001 Rate	12.1	0.5	11.1	13.1
2002 Rate	13.2	0.5	12.2	14.3
2003 Rate	13.6	0.5	12.6	14.7
2004 Rate	14.8	0.6	13.8	16.0

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Leukemia

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	13.3			
2000-2004 APC	1.5	0.5	-5.2	8.5
2000 Rate	9.5	0.5	8.6	10.5
2001 Rate	10.8	0.5	9.9	11.8
2002 Rate	10.9	0.5	9.9	11.9
2003 Rate	9.8	0.5	8.9	10.7
2004 Rate	10.8	0.5	9.9	11.8

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Acute Myeloid Leukemia

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	31.8			
2000-2004 APC	4.3	0.3	-5.2	14.9
2000 Rate	2.6	0.2	2.1	3.1
2001 Rate	3.4	0.3	2.9	4.0
2002 Rate	3.2	0.3	2.7	3.7
2003 Rate	3.1	0.3	2.6	3.7
2004 Rate	3.4	0.3	2.9	4.0

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Liver Cancer

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	16.7			
2000-2004 APC	3.7	0.3	-6.1	14.6
2000 Rate	3.8	0.3	3.3	4.4
2001 Rate	3.6	0.3	3.1	4.2
2002 Rate	4.5	0.3	3.9	5.1
2003 Rate	3.8	0.3	3.2	4.4
2004 Rate	4.5	0.3	3.9	5.1

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Lung Cancer

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	3.9			
2000-2004 APC	0.3	0.8	-2.3	2.9
2000 Rate	74.4	1.3	71.9	76.9
2001 Rate	77.9	1.3	75.4	80.5
2002 Rate	76.5	1.3	74.1	79.1
2003 Rate	74.1	1.2	71.7	76.6
2004 Rate	77.3	1.3	74.9	79.8

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Non-Hodgkin Lymphoma

	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	14.5			
2000-2004 APC	2.7	0.1	-1.4	6.9
2000 Rate	15.4	0.6	14.3	16.6
2001 Rate	16.3	0.6	15.2	17.5
2002 Rate	17.3	0.6	16.1	18.5
2003 Rate	16.2	0.6	15.1	17.4
2004 Rate	17.7	0.6	16.5	18.9

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

Prostate Cancer

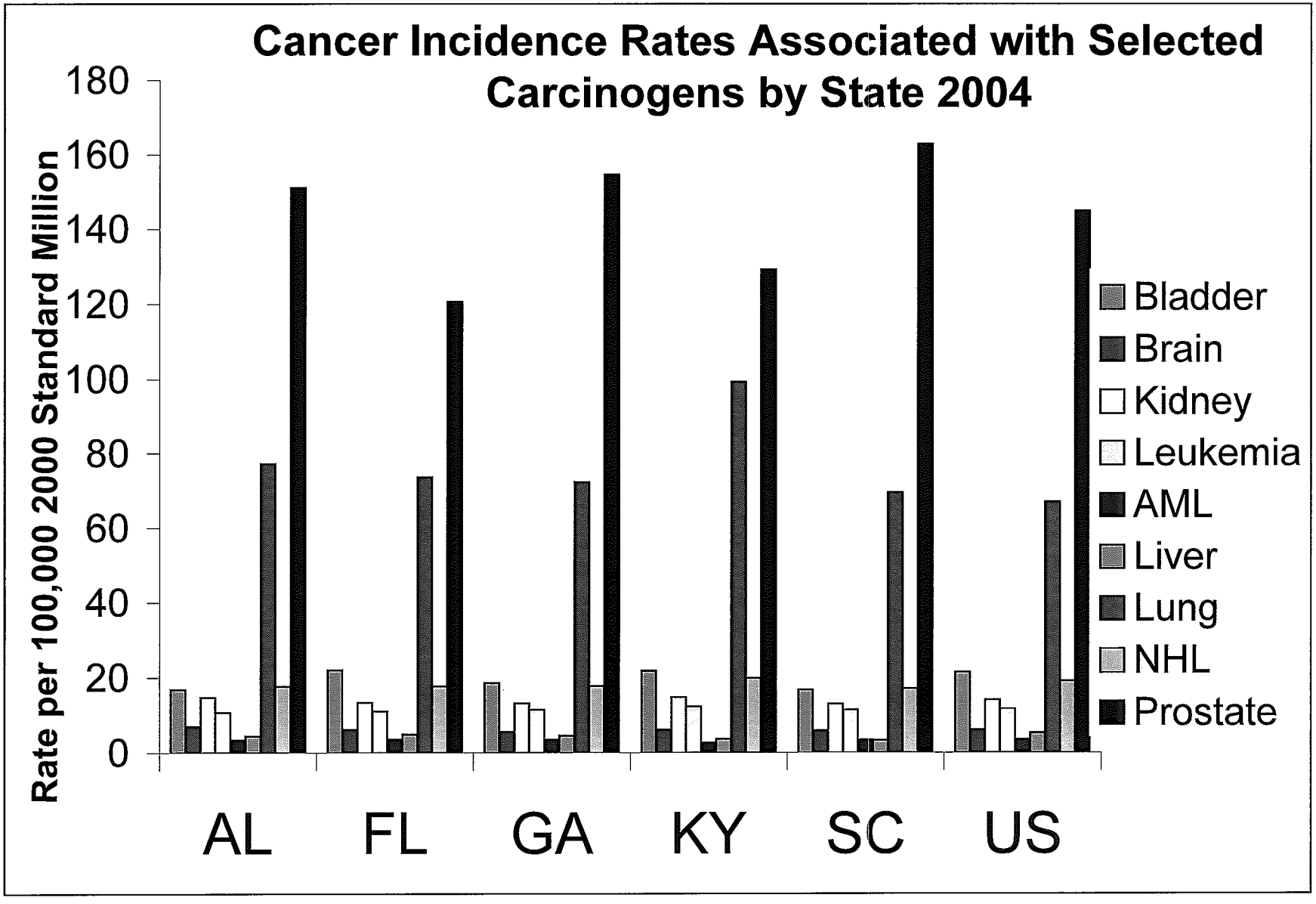
	Rate/Trend	SE/P-Value	Lower CI	Upper CI
2000-2004 PC	7.2			
2000-2004 APC	0.8	0.5	-2.7	4.5
2000 Rate	141.0	2.7	135.7	146.5
2001 Rate	154.1	2.8	148.6	159.8
2002 Rate	149.2	2.8	143.9	154.8
2003 Rate	146.8	2.7	141.5	152.2
2004 Rate	151.2	2.7	145.9	156.7

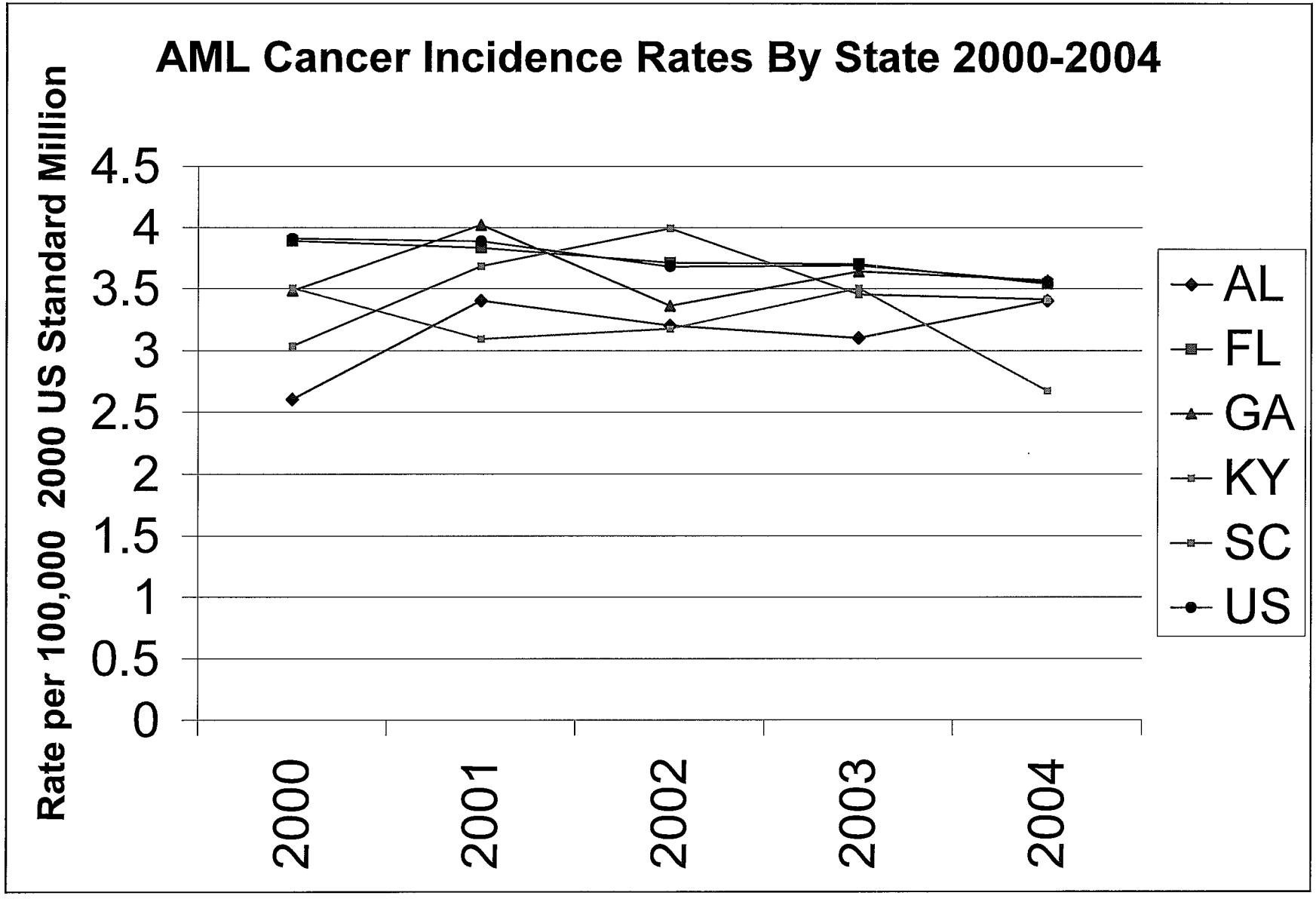
Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and trends.

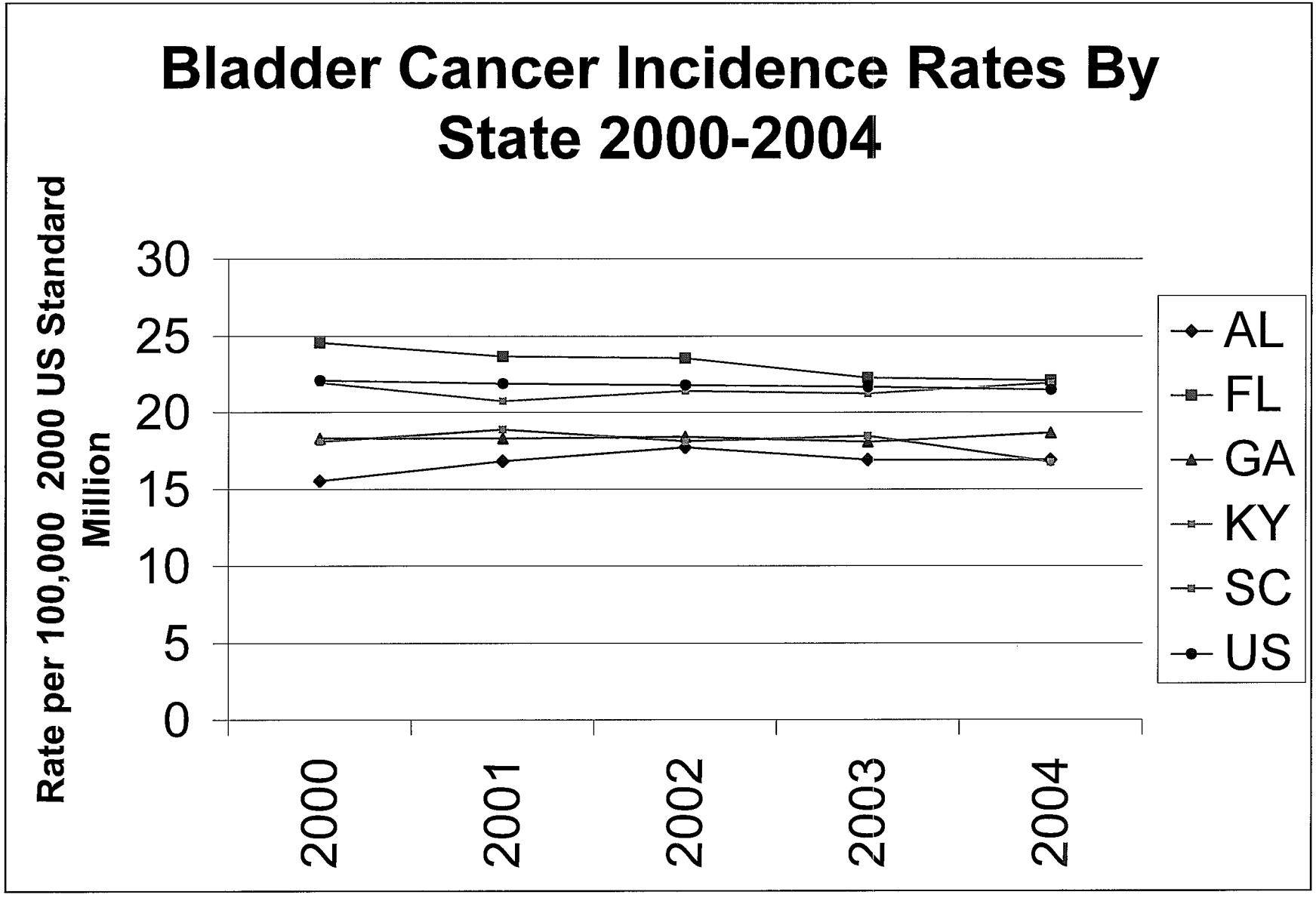
Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

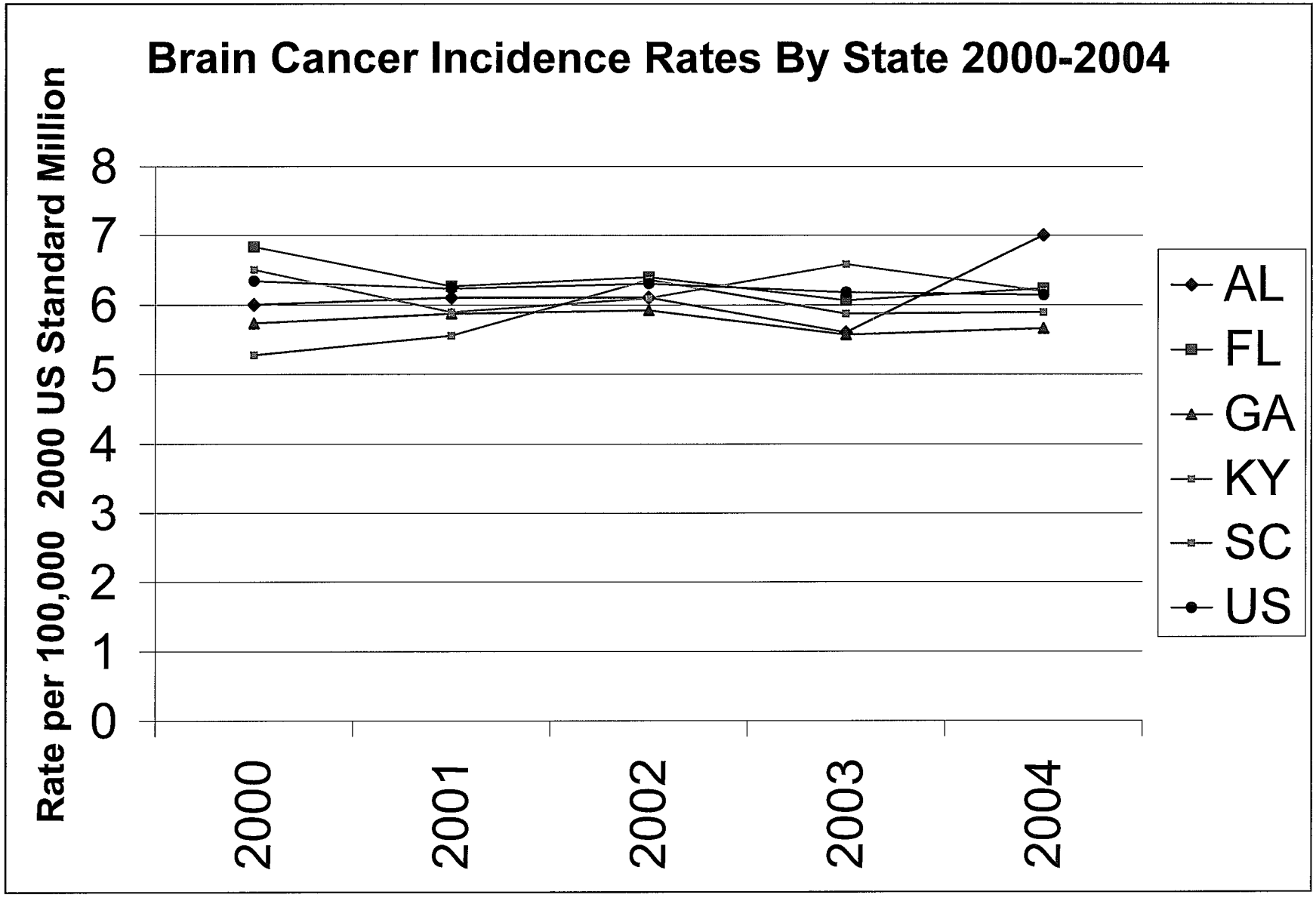
* The APC is significantly different from zero ($p<0.05$). See P-Value in the APC row.

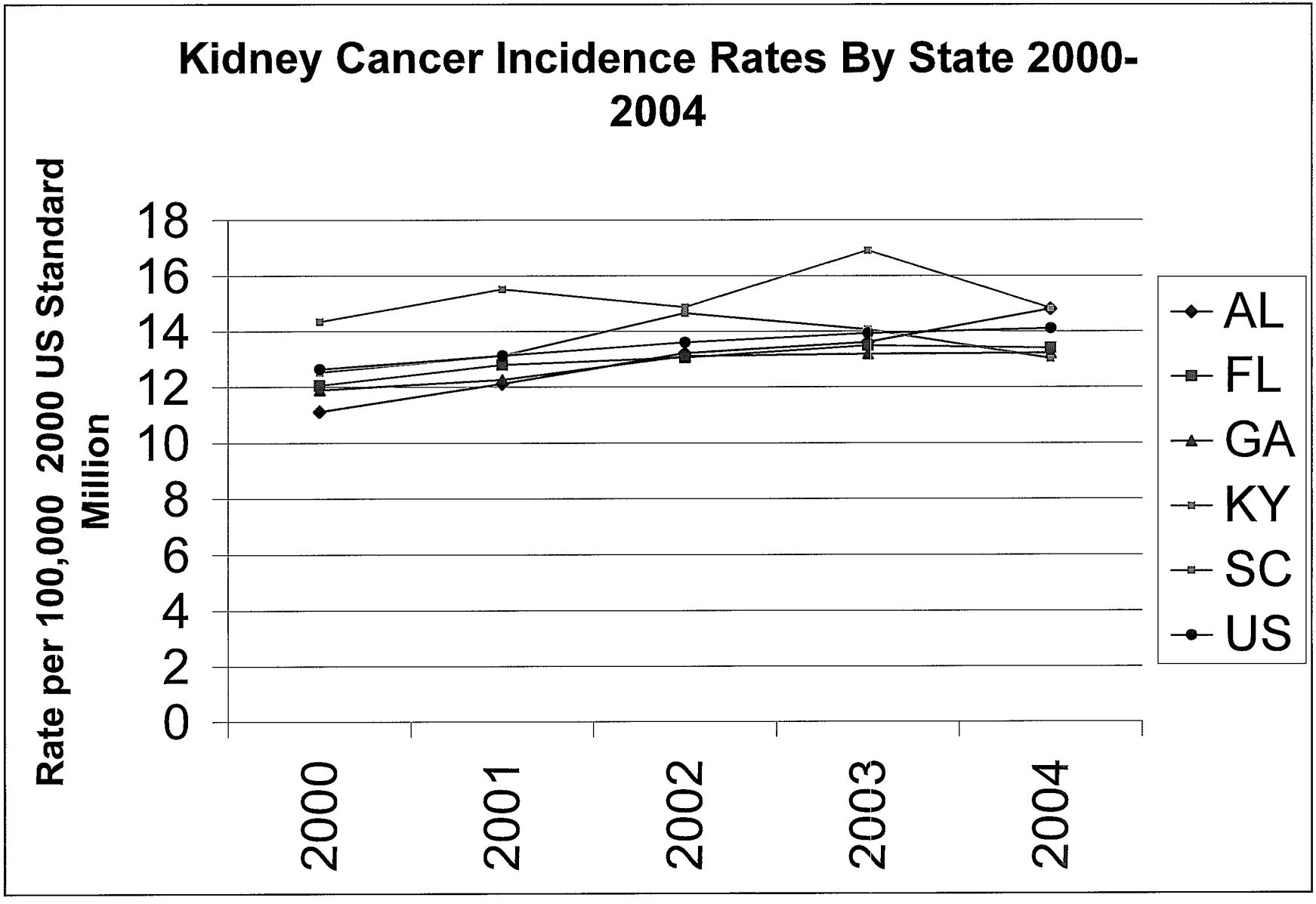
APPENDIX B
MAPS AND CHARTS

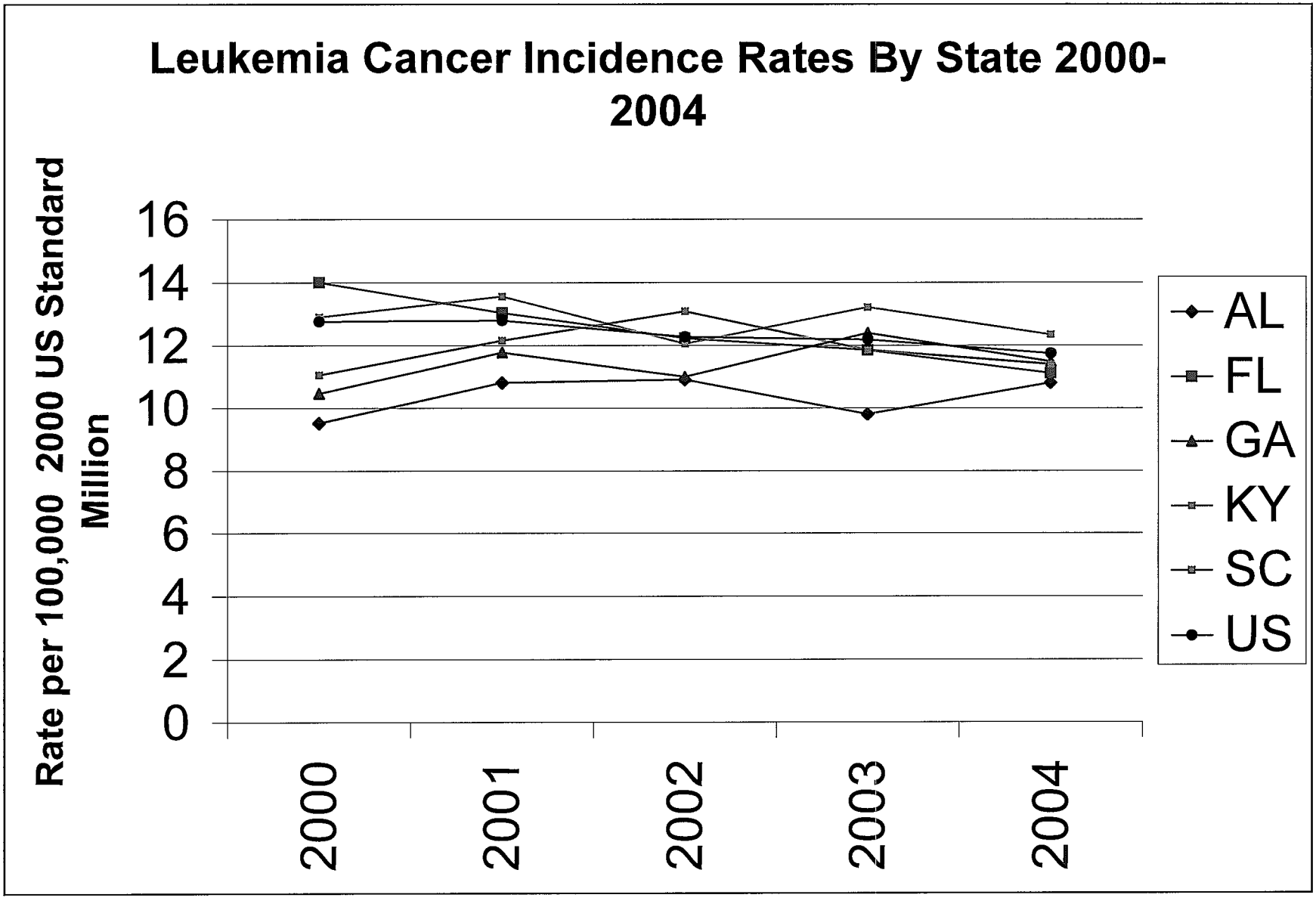

Cancer Incidence Rates Associated with Selected Carcinogens by State 2004
Rate per 100,000 2000 Standard Million
180
160
140
120
100
80
60
40
20
0
AL
FL
GA
KY
SC
US
Bladder
Brain
Kidney
Leukemia
AML
Liver
Lung
NHL
Prostate

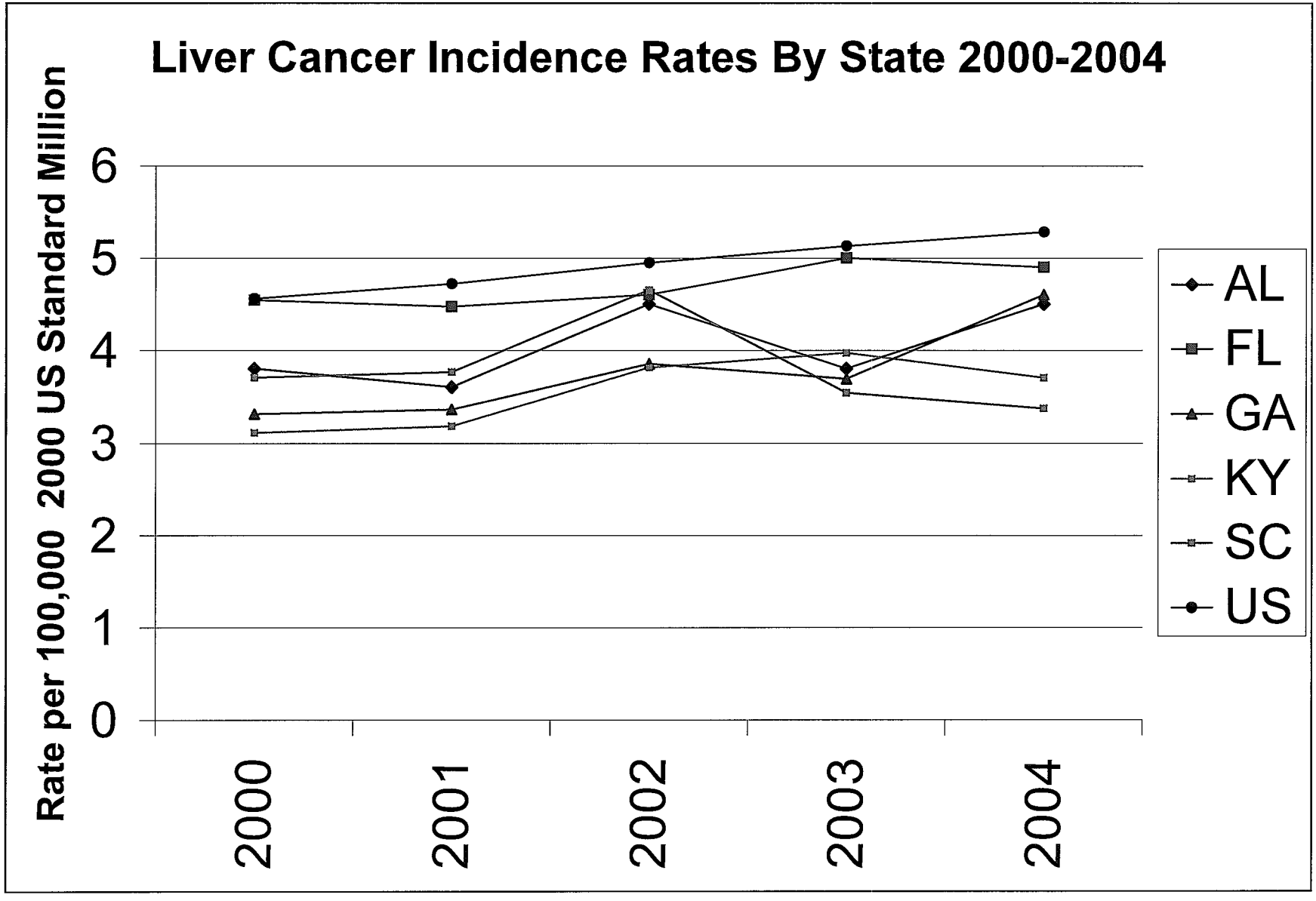

AML Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US

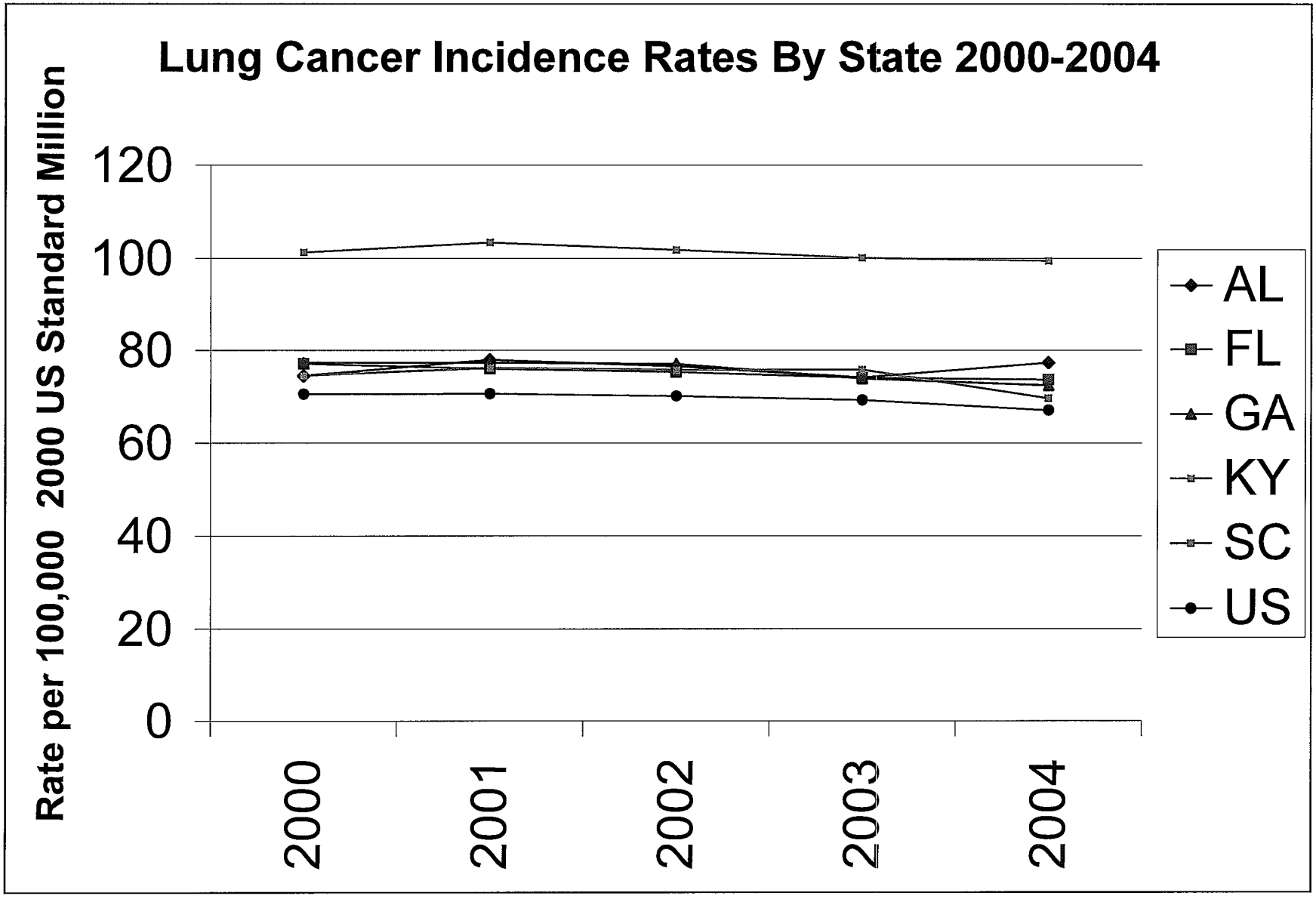

Bladder Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
30
25
20
15
10
5
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US

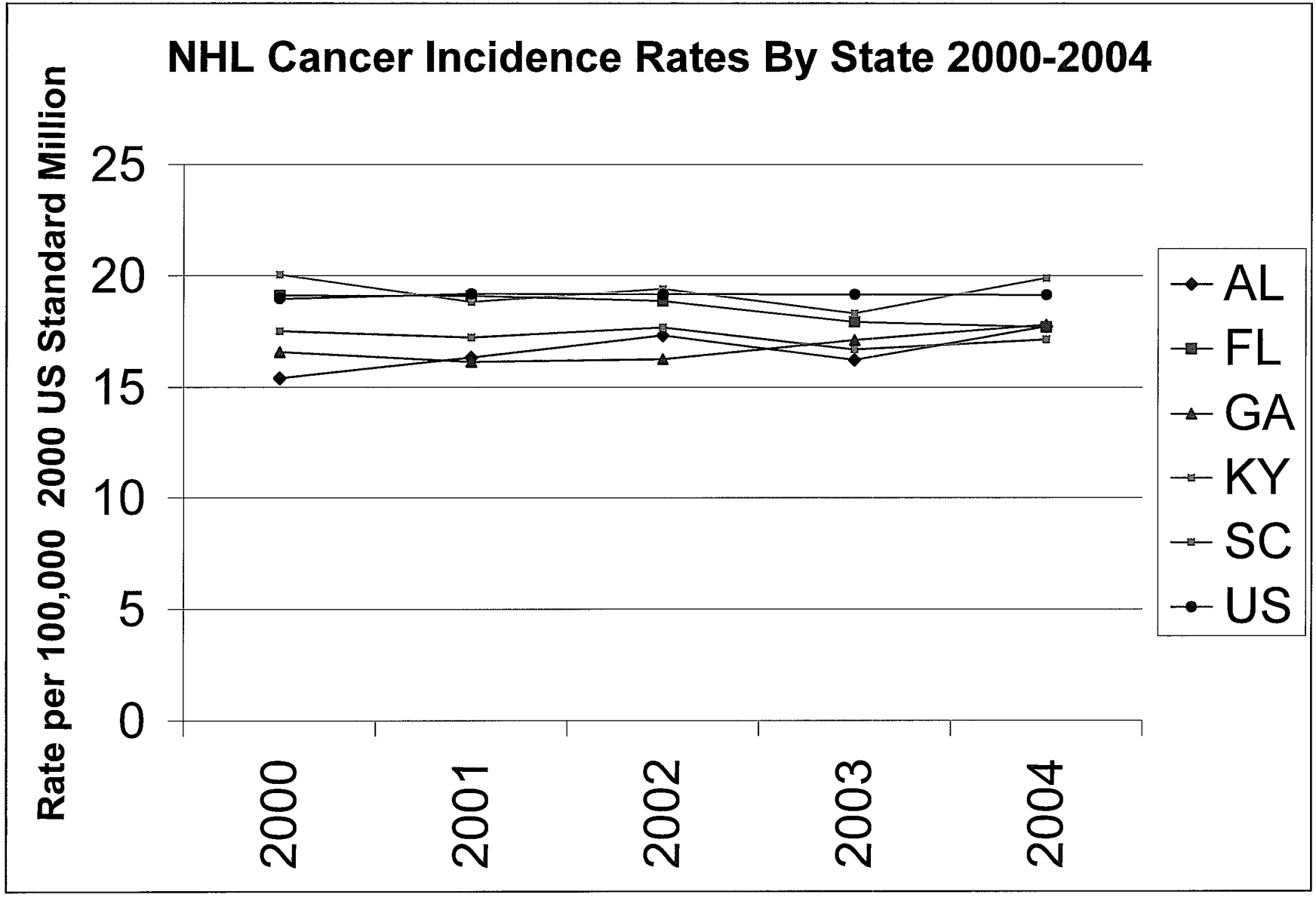

Brain Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
8
7
6
5
4
3
2
1
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US

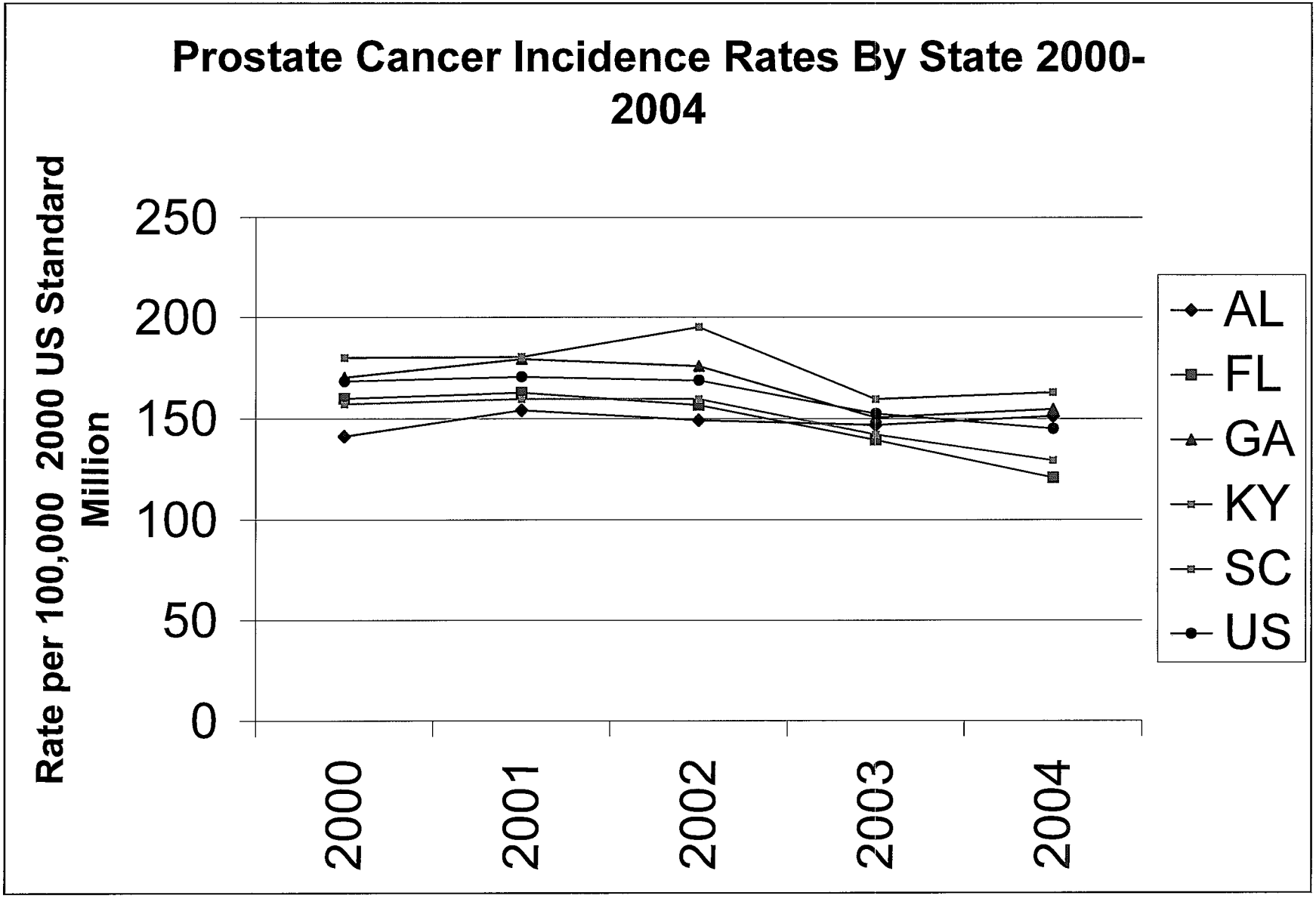

Kidney Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
18
16
14
12
10
8
6
4
2
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US


Leukemia Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
16
14
12
10
8
6
4
2
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US

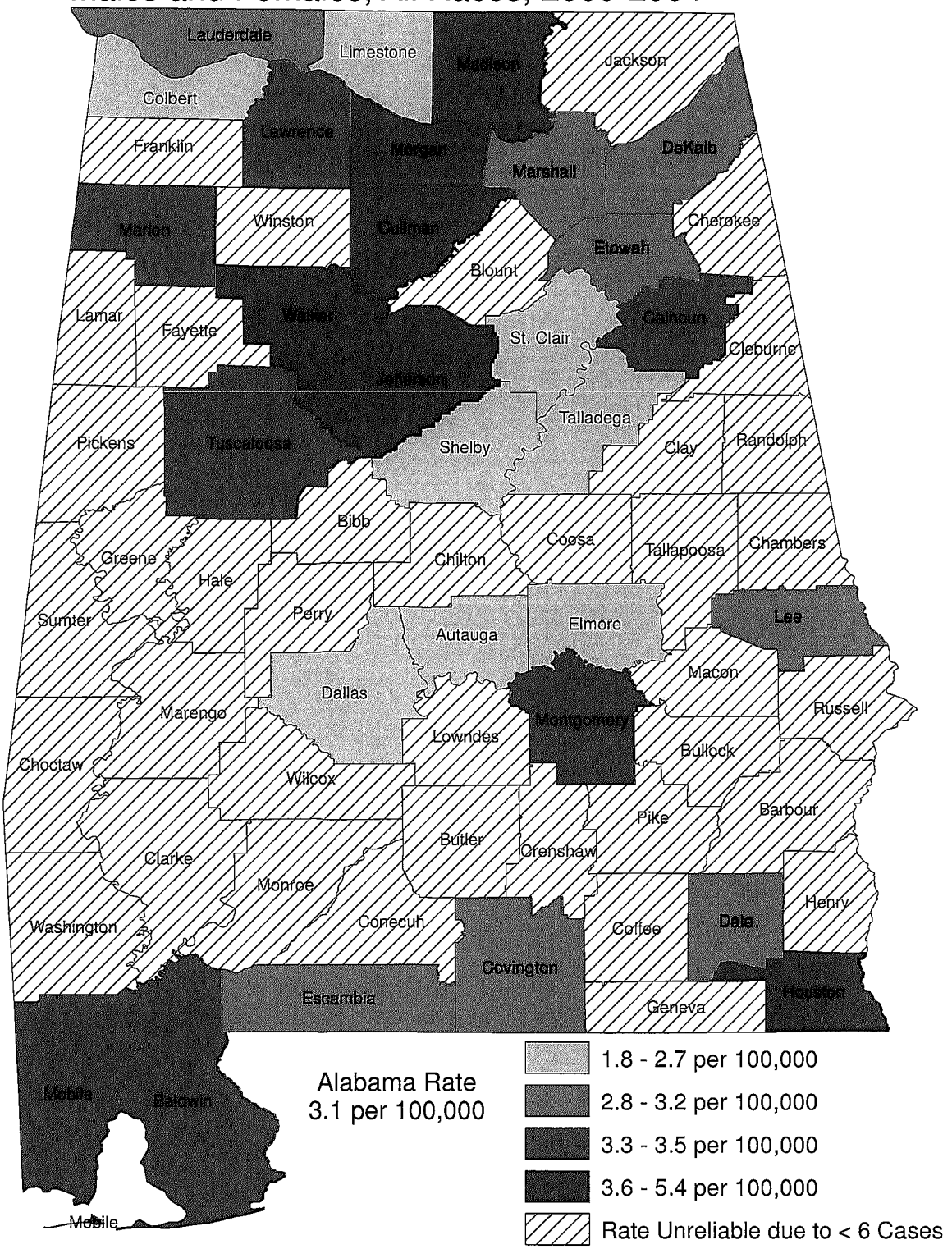

Liver Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
6
5
4
3
2
1
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US


Lung Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US


NHL Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
25
20
15
10
5
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US

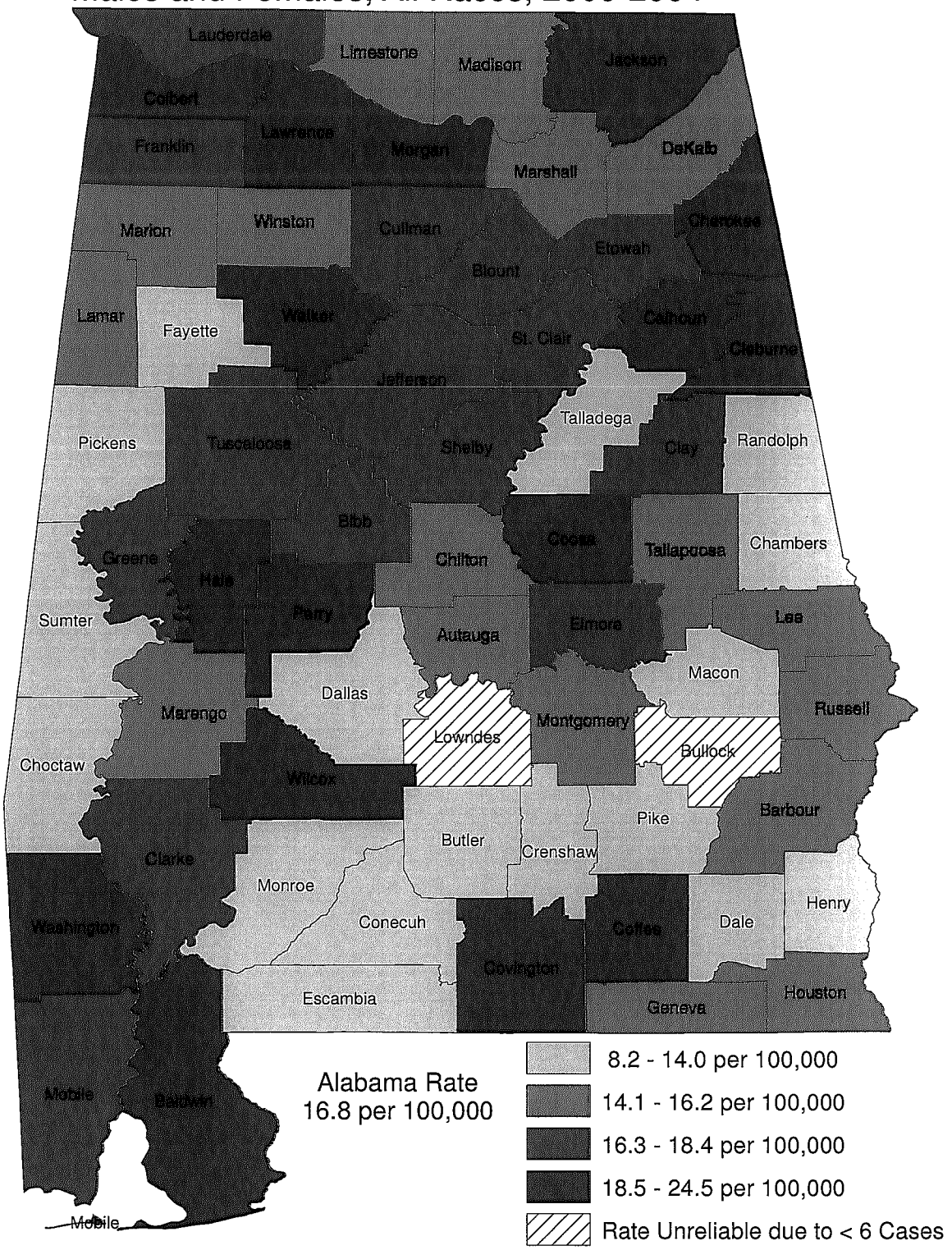

Prostate Cancer Incidence Rates By State 2000-2004
Rate per 100,000 2000 US Standard Million
250
200
150
100
50
0
2000
2001
2002
2003
2004
AL
FL
GA
KY
SC
US

Alabama Cancer Incidence Rates AML
Males and Females, All Races, 2000-2004



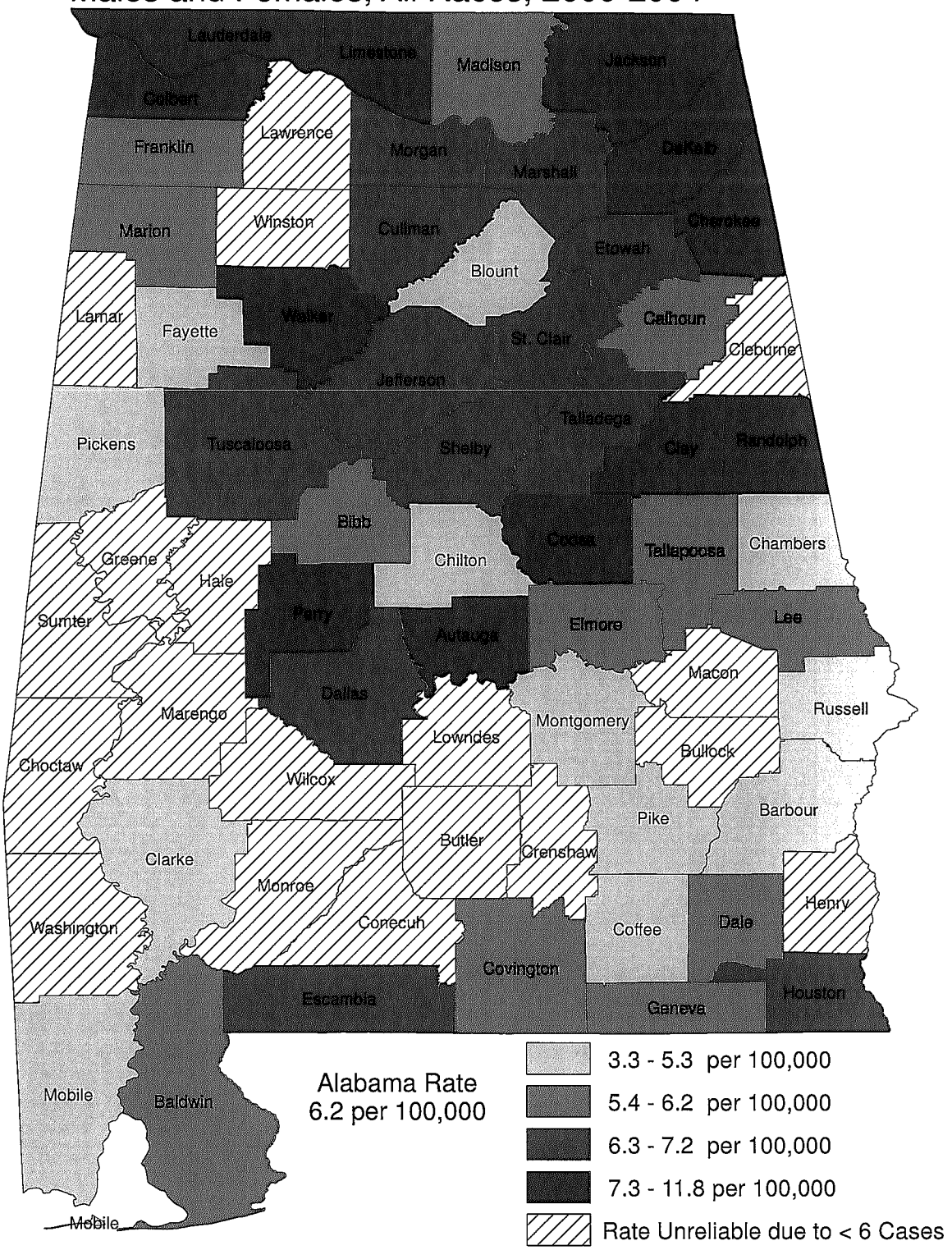
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Bladder Cancer
Males and Females, All Races, 2000-2004



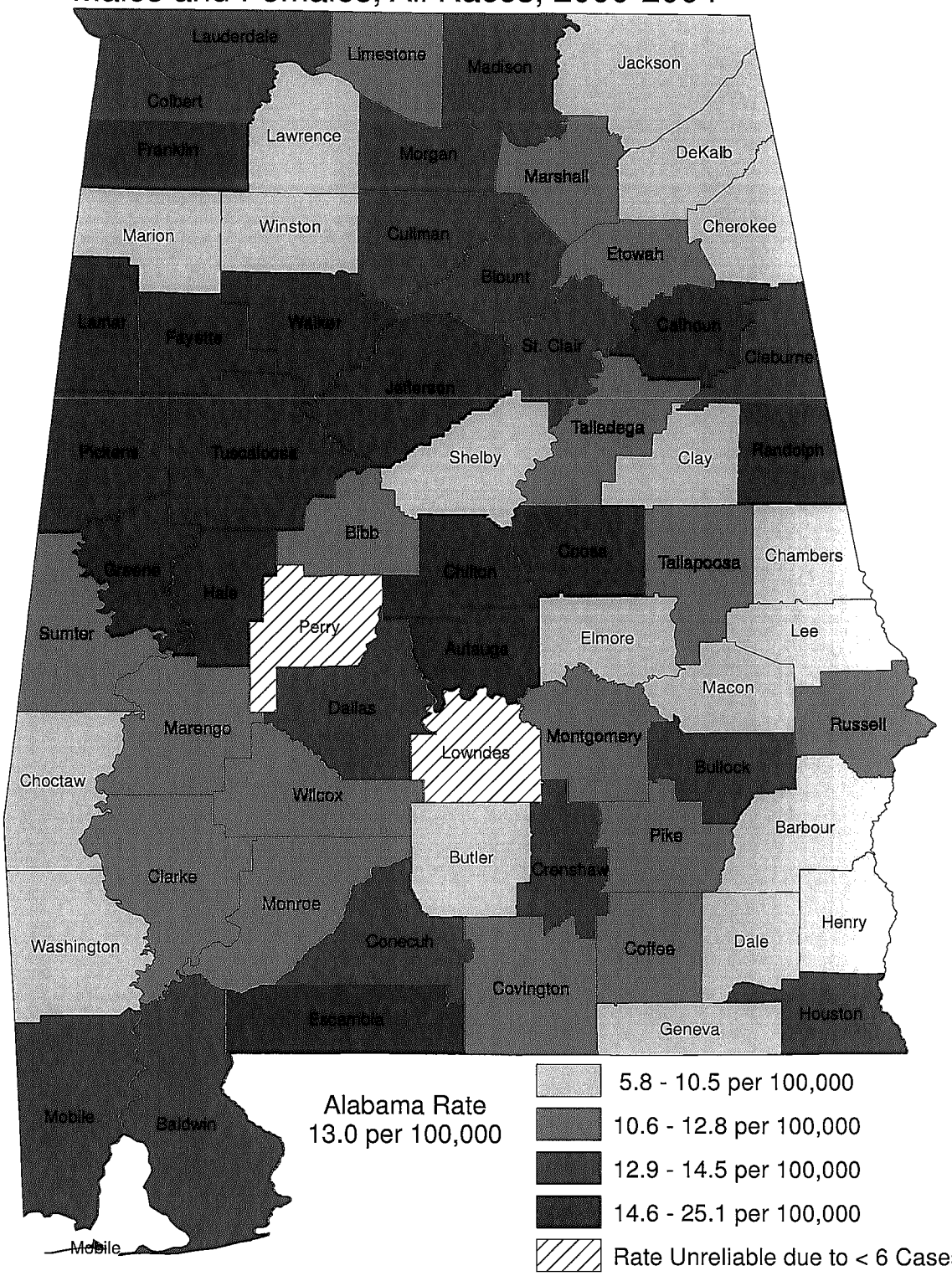
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Brain Cancer Males and Females, All Races, 2000-2004



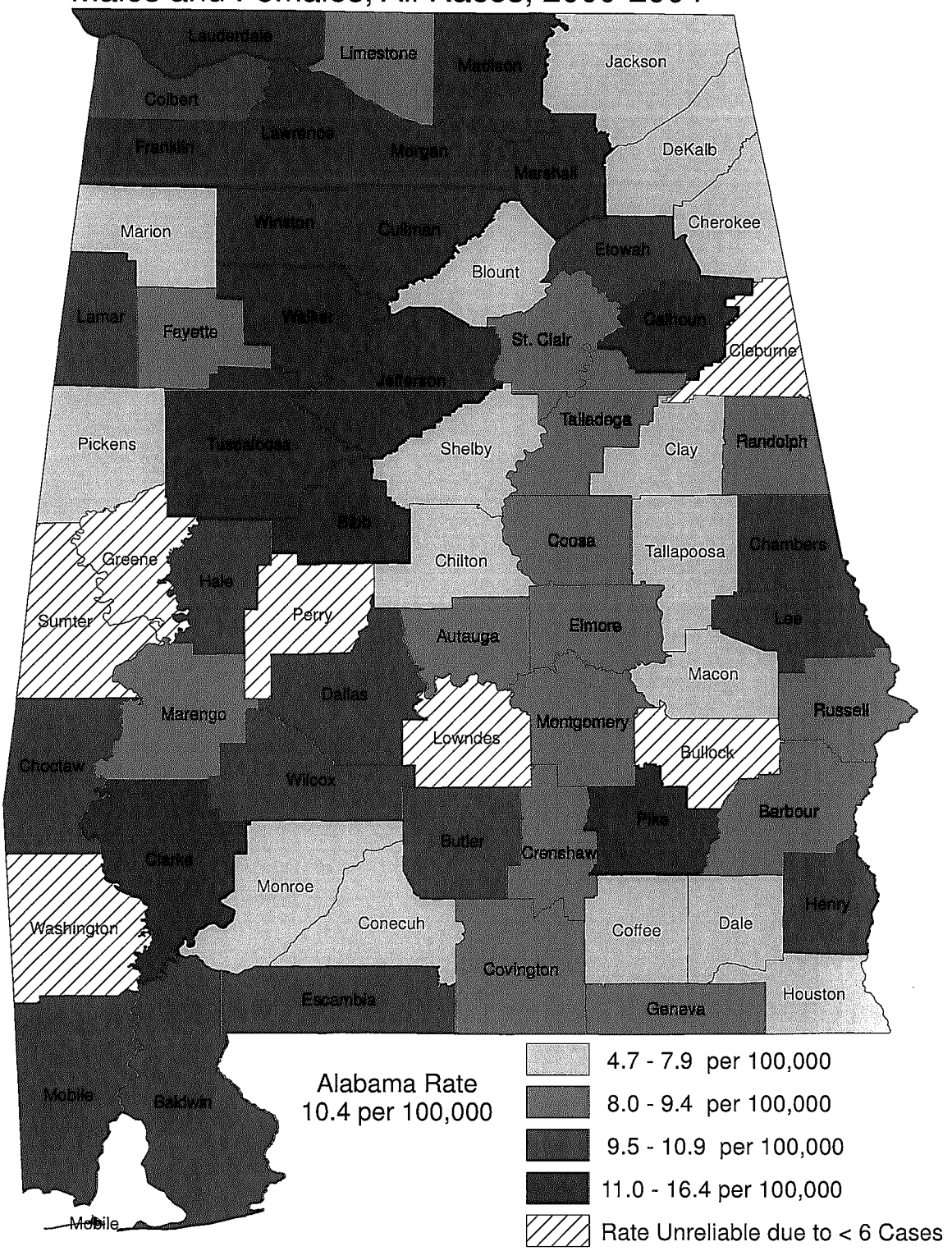
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Kidney Cancer Males and Females, All Races, 2000-2004



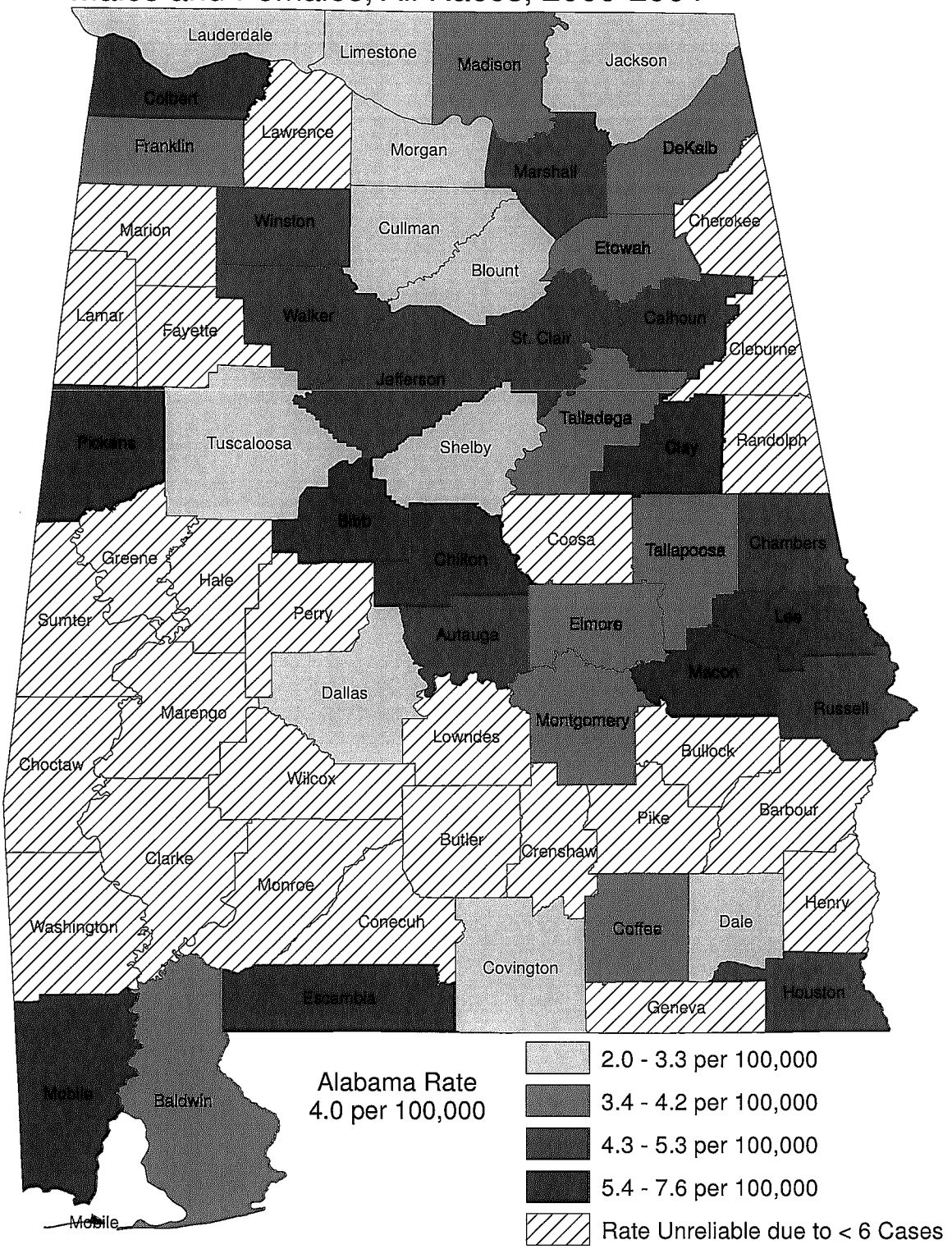
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Leukemia Males and Females, All Races, 2000-2004



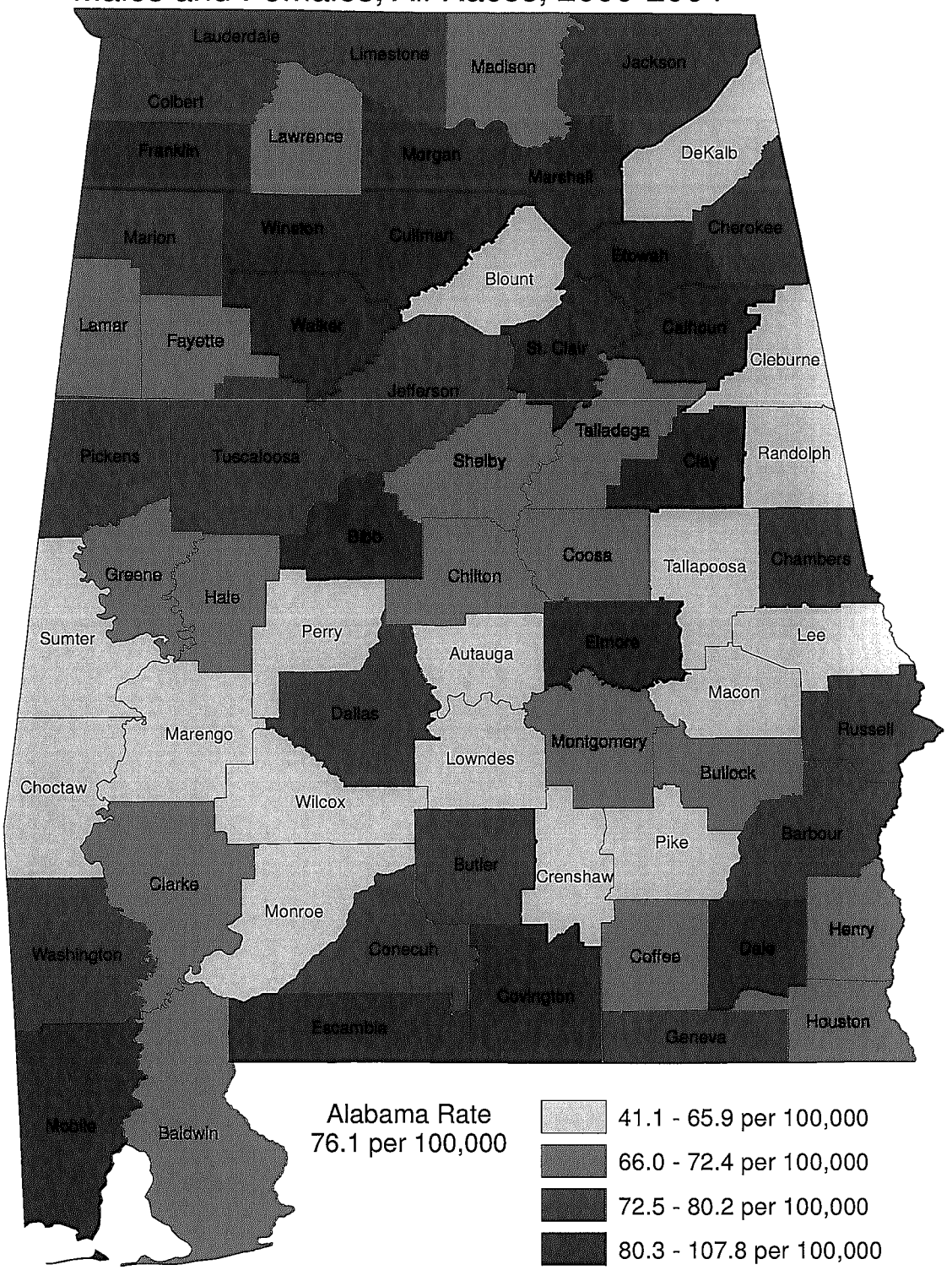
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Liver Cancer Males and Females, All Races, 2000-2004



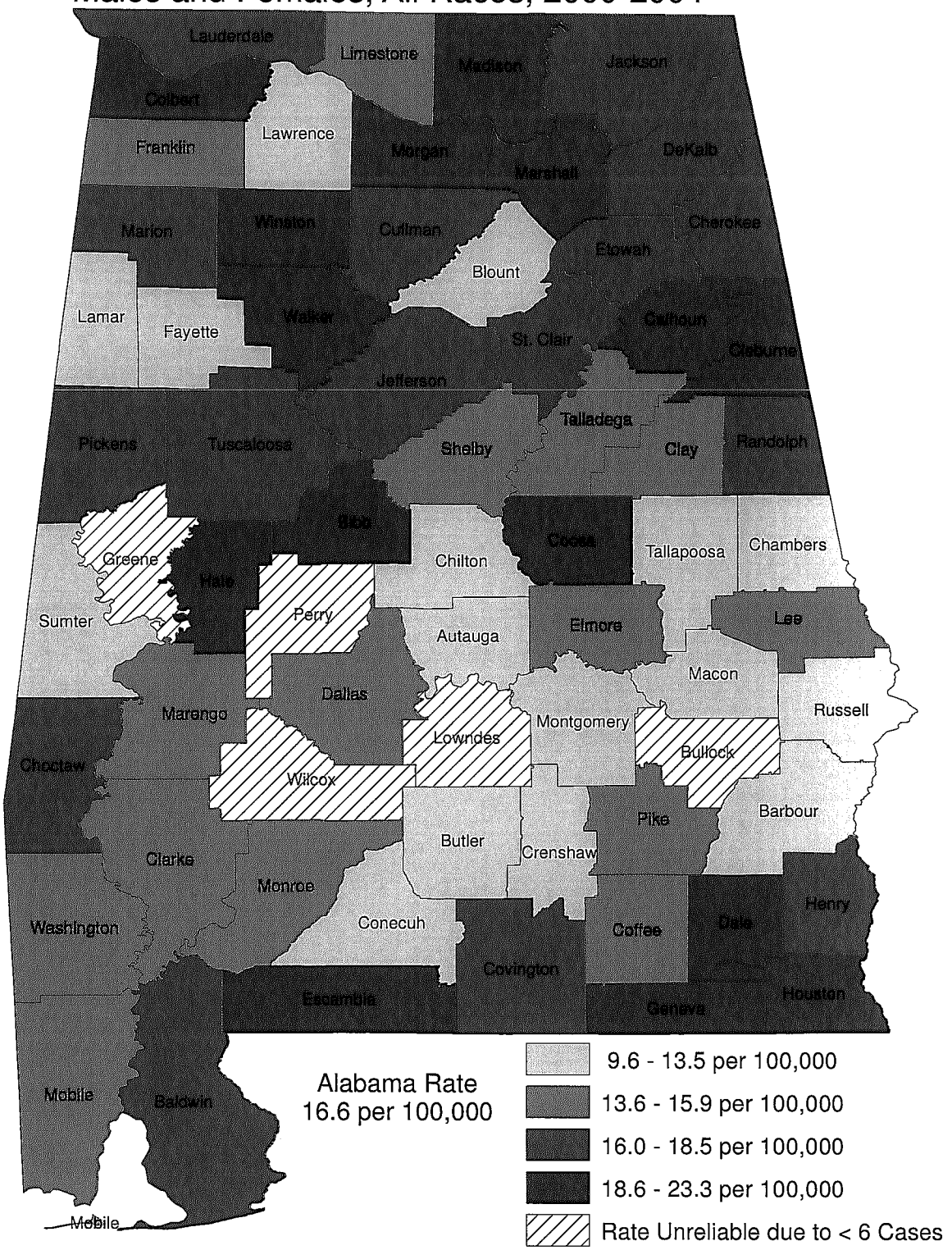
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Lung Cancer Males and Females, All Races, 2000-2004



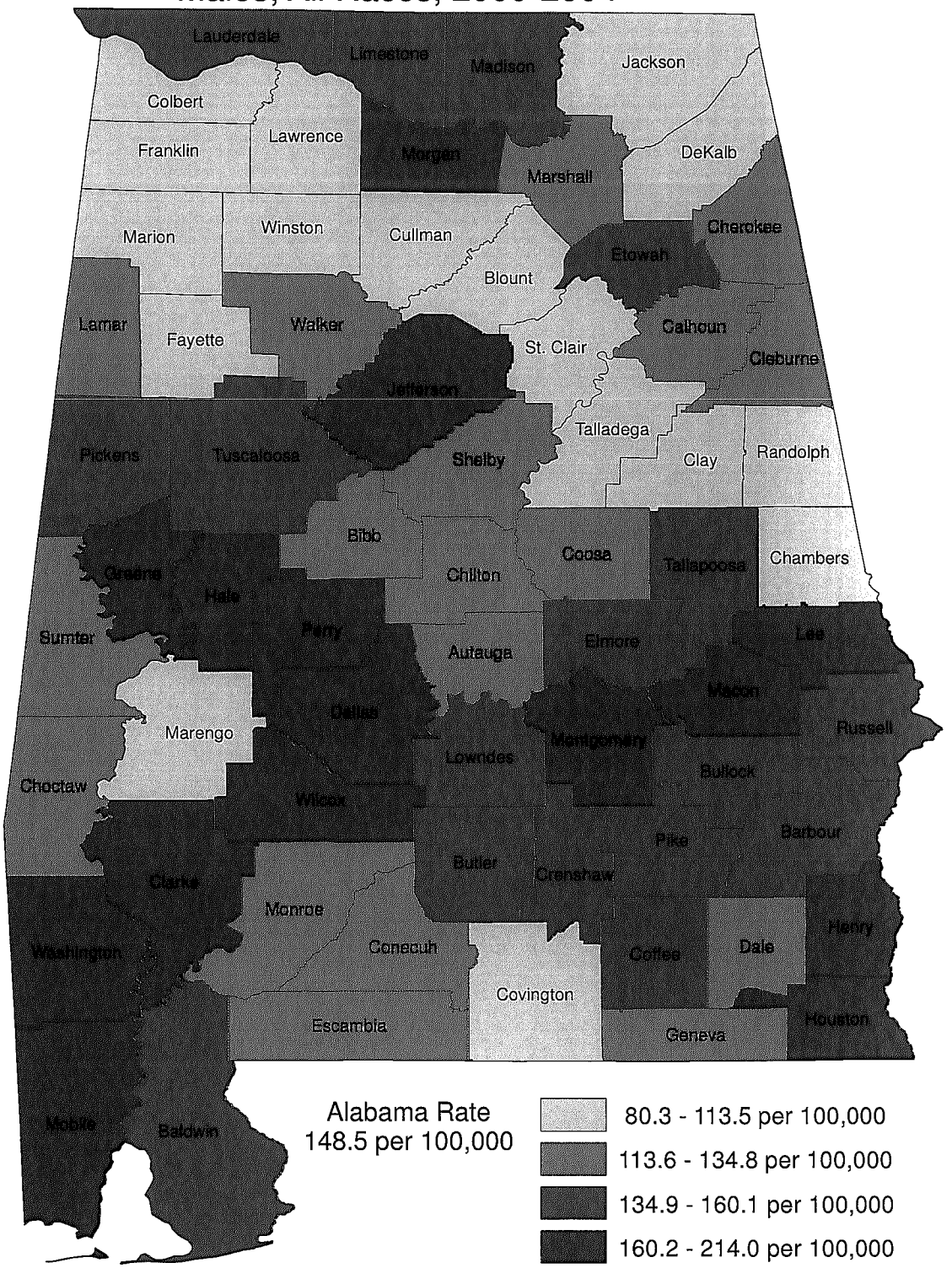
All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Non-Hodgkin Lymphoma
Males and Females, All Races, 2000-2004



All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

Alabama Cancer Incidence Rates Prostate Cancer
Males, All Races, 2000-2004



All rates are per 100,000 and are age-adjusted to the 2000 U.S. (19-age group) standard
County groupings were determined using standard quartiles.

APPENDIX C

APPENDIX C

Bladder, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	3938	16.8	25145	23.19	6368	18.33	4442	21.41	3680	18.02	256094	21.77
2000	712	15.5	5143	24.56	1206	18.27	892	21.91	708	18.07	50325	22.07
2001	776	16.8	5013	23.64	1241	18.27	845	20.71	754	18.85	50578	21.88
2002	832	17.7	5089	23.53	1276	18.4	882	21.37	733	18.09	51215	21.78
2003	801	16.9	4919	22.25	1287	18.06	892	21.21	767	18.44	51788	21.67
2004	817	16.9	4981	22.08	1358	18.65	931	21.9	718	16.74	52188	21.49

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Brain, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	1419	6.2	6013	6.35	2252	5.75	1296	6.25	1198	5.79	73486	6.23
2000	270	6	1246	6.83	426	5.73	265	6.5	211	5.27	14531	6.34
2001	280	6.1	1164	6.26	445	5.87	240	5.89	226	5.55	14473	6.23
2002	279	6.1	1208	6.39	462	5.92	251	6.09	261	6.35	14824	6.3
2003	263	5.6	1167	6.06	453	5.57	276	6.58	246	5.87	14763	6.18
2004	327	7	1228	6.23	466	5.66	264	6.19	254	5.89	14895	6.14

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Kidney, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	3064	13	13224	12.96	4728	12.74	3214	15.28	2819	13.48	159327	13.49
2000	512	11.1	2386	12.04	835	11.87	587	14.33	501	12.51	28849	12.64
2001	560	12.1	2544	12.78	883	12.25	641	15.5	534	13.11	30412	13.12
2002	622	13.2	2650	13.05	968	13.1	622	14.86	612	14.64	32088	13.6
2003	649	13.6	2800	13.48	1005	13.17	721	16.9	599	14.05	33471	13.93
2004	721	14.8	2844	13.39	1037	13.21	643	14.82	573	13.01	34507	14.11

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Leukemia, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	2396	10.4	12622	12.41	4208	11.43	2625	12.79	2413	11.9	145315	12.34
2000	431	9.5	2769	14	740	10.46	518	12.89	433	11.04	29161	12.76
2001	492	10.8	2596	13.02	843	11.77	550	13.55	481	12.15	29638	12.79
2002	501	10.9	2484	12.22	805	10.99	491	12.04	530	13.07	28865	12.27
2003	457	9.8	2442	11.84	932	12.39	549	13.2	488	11.84	29144	12.18
2004	515	10.8	2331	11.11	888	11.48	517	12.34	481	11.4	28507	11.74

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Acute Myeloid Leukemia, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	723	3.1	3804	3.73	1331	3.61	654	3.18	712	3.52	44074	3.74
2000	117	2.6	772	3.89	247	3.48	141	3.5	120	3.03	8934	3.91
2001	153	3.4	760	3.83	287	4.02	127	3.09	146	3.68	9027	3.89
2002	146	3.2	760	3.71	247	3.36	129	3.17	161	3.99	8657	3.68
2003	145	3.1	767	3.7	273	3.64	146	3.5	143	3.45	8820	3.69
2004	162	3.4	745	3.54	277	3.57	111	2.67	142	3.41	8636	3.56

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Liver, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	946	4	4751	4.71	1397	3.78	745	3.56	790	3.81	58401	4.93
2000	175	3.8	887	4.54	232	3.31	127	3.11	147	3.7	10402	4.56
2001	166	3.6	883	4.47	238	3.36	131	3.18	152	3.76	10953	4.72
2002	208	4.5	924	4.6	286	3.85	159	3.81	193	4.65	11692	4.95
2003	179	3.8	1024	5	280	3.69	170	3.97	150	3.54	12366	5.13
2004	218	4.5	1033	4.9	361	4.6	158	3.7	148	3.37	12988	5.28

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Lung, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	18061	76.1	79887	75.14	26880	75.5	21238	101.11	15489	74.3	816327	69.48
2000	3441	74.4	15811	77.01	5232	77.29	4142	101.21	2979	74.47	160770	70.52
2001	3645	77.9	15812	75.96	5342	77.3	4267	103.32	3094	76.17	163128	70.64
2002	3627	76.5	15993	75.25	5493	77.08	4260	101.73	3144	75.7	164582	70.12
2003	3563	74.1	15987	74.05	5402	73.91	4261	100.01	3228	75.75	165339	69.29
2004	3785	77.3	16284	73.64	5411	72.42	4308	99.38	3044	69.63	162508	67.06

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Non-Hodgkin Lymphoma, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	3878	16.6	18753	18.5	6199	16.78	4016	19.27	3545	17.21	225418	19.11
2000	704	15.4	3728	19.1	1163	16.55	817	20.04	690	17.49	43318	18.96
2001	753	16.3	3788	19.07	1164	16.12	769	18.8	694	17.2	44474	19.18
2002	804	17.3	3813	18.84	1202	16.23	809	19.39	723	17.65	45158	19.16
2003	766	16.2	3686	17.9	1295	17.09	772	18.29	703	16.67	45885	19.15
2004	851	17.7	3738	17.67	1375	17.78	849	19.88	735	17.12	46583	19.13

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

Prostate, 2000-2004

Year	Alabama Cases	Alabama Rate	Florida Cases	Florida Rate	Georgia Cases	Georgia Rate	Kentucky Cases	Kentucky Rate	South Carolina Cases	South Carolina Rate	United States Cases	United States Rate
2000-2004	15133	148.5	71064	147.39	25728	165.7	13537	149.2	15978	175.1	831323	160.83
2000	2761	141	14902	159.67	4912	170.15	2730	156.91	3079	179.75	166803	168.36
2001	3080	154.1	15368	162.76	5337	179.24	2822	159.54	3179	180.37	172247	170.67
2002	3049	149.2	15033	156.52	5465	175.8	2886	159.61	3513	195.07	174427	168.84
2003	3042	146.8	13635	139.24	4849	150.47	2624	141.94	3017	159.38	161088	152.55
2004	3201	151.2	12126	120.65	5165	154.72	2475	129.24	3190	162.9	156758	144.96

All Rates are per 100,000 and are age-adjusted to the 2000 US Standard Million (19 age groups).

APPENDIX D

APPENDIX D

Alabama 2000-2004

		Rate	SE	Lower CI	Upper CI	Count	Rate Ratio	Ratio Lower CI	Ratio Upper CI	Ratio P-Value
Brain	White	7.1	0.2	6.7	7.5	1,240				
	Black	3.1#	0.2	2.7	3.7	166	0.4418	0.3725	0.5219	0.0000
Bladder	White	18.8	0.3	18.2	19.4	3,521				
	Black	8.5#	0.4	7.7	9.4	391	0.4512	0.4052	0.5014	0.0000
Kidney	White	13	0.3	12.5	13.5	2,401				
	Black	13.2	0.5	12.1	14.2	638	1.0142	0.9273	1.1081	0.7698
Leukemia	White	10.9	0.2	10.4	11.4	1,942				
	Black	8.4#	0.4	7.6	9.2	417	0.7698	0.6898	0.8577	0.0000
Acute Myeloid Leukemia	White	3.2	0.1	2.9	3.4	568				
	Black	2.9	0.2	2.4	3.4	148	0.9112	0.7528	1.0982	0.3520
Liver	White	3.8	0.1	3.6	4.1	716				
	Black	4.2	0.3	3.7	4.9	209	1.1078	0.9435	1.2967	0.2140
Lung and Bronchus	White	78.5	0.6	77.2	79.7	14,865				
	Black	66.3#	1.2	63.9	68.7	3,091	0.8446	0.812	0.8782	0.0000
Non-Hodgkin Lymphoma	White	18.1	0.3	17.5	18.7	3,323				
	Black	10.3#	0.5	9.4	11.2	507	0.5687	0.5165	0.6253	0.0000
Prostate	White	127.1	1.3	124.7	129.6	10,584				
	Black	220.5#	3.6	213.6	227.5	4,018	1.7343	1.6706	1.8001	0.0000

Rates are per 100,000 and age-adjusted to the 2000 U.S. (19 age groups) standard; Confidence intervals are 95% for rates and ratios.

The rate ratio indicates that the rate is significantly different than the rate for White ($p<0.05$).