State Health Registry of Iowa

Cancer in Iowa 2010

The University of Iowa

In 2010, an estimated 6,400 Iowans will die from cancer, 14 times the number caused by auto fatalities. Cancer is becoming the leading cause of death in Iowa. These projections are based upon mortality data the State Health Registry of Iowa receives from the Iowa Department of Public Health. The Registry has been recording the occurrence of cancer in Iowa since 1973, and is one of fourteen population-based registries and three supplementary registries nationwide providing data to the National Cancer Institute. With 2010 Cancer in Iowa the Registry makes a general report to the public on the status of cancer. This report will focus on:

- a description of the Registry and its goals;
- cancer estimates for 2010
- a special section on leading causes of death in the state of Iowa
- brief summaries of recent/ongoing research projects
- a selected list of publications from 2009

THE STATE HEALTH REGISTRY OF IOWA

Cancer is a reportable disease as stated in the Iowa Administrative Code. Cancer data are collected by the State Health Registry of Iowa, located at The University of Iowa in the College of Public Health's Department of Epidemiology. The staff includes more than 50 people. Half of them, situated throughout the state, regularly visit hospitals, clinics, and medical laboratories in Iowa and neighboring states to collect cancer data. A follow-up program tracks more than 99 percent of the cancer survivors diagnosed since 1973. This program provides regular updates for follow-up and survival. The Registry maintains the confidentiality of the patients, physicians, and hospitals providing data.

In 2010 data will be collected on an estimated 16,400 new cancers among Iowa residents. In situ cases of bladder cancer are included in the estimates for bladder cancer, to be in agreement with the definition of reportable cases of the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute.

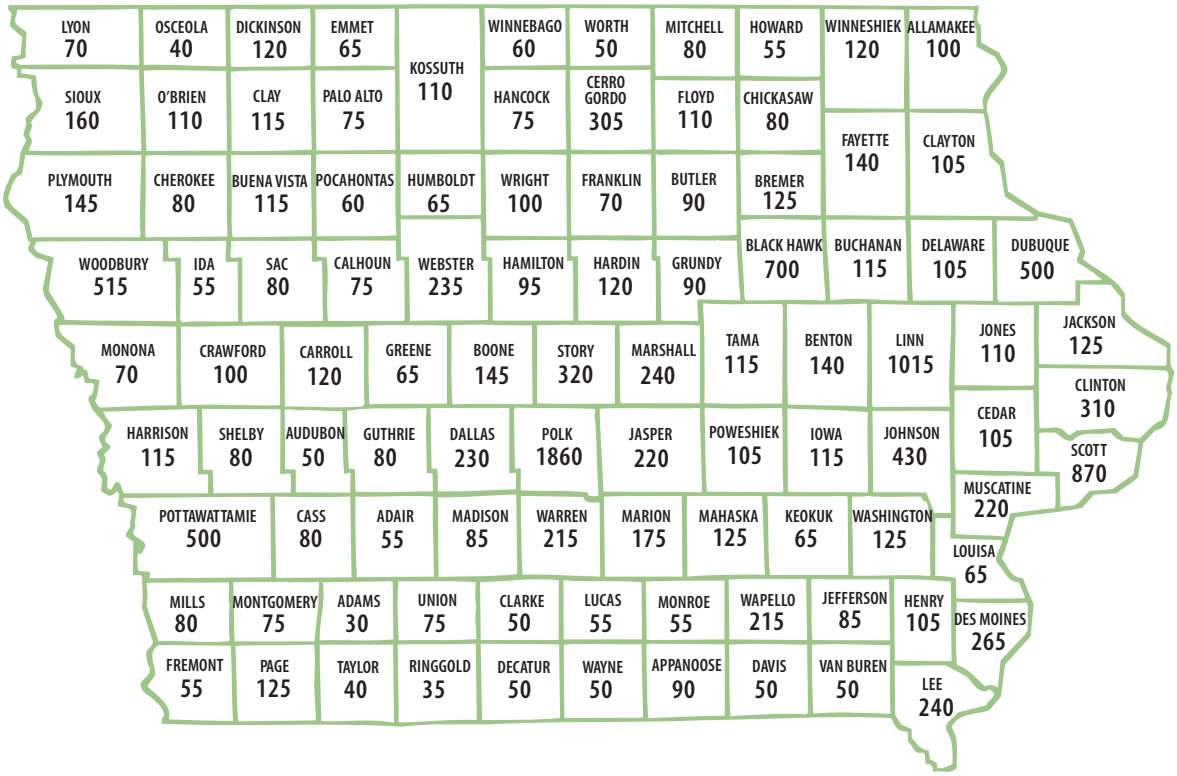
Since 1973 the Iowa Registry has been funded by the SEER Program of the National Cancer Institute. Iowa represents rural and Midwestern populations and provides data included in many NCI publications. Beginning in 1990 about 5-10 percent of the Registry's annual operating budget has been provided by the state of Iowa. Beginning in 2003, the University of Iowa has also been providing cost-sharing funds. The Registry also receives funding through grants and contracts with university, state, and national researchers investigating cancer-related topics.

THE GOALS OF THE REGISTRY ARE TO:

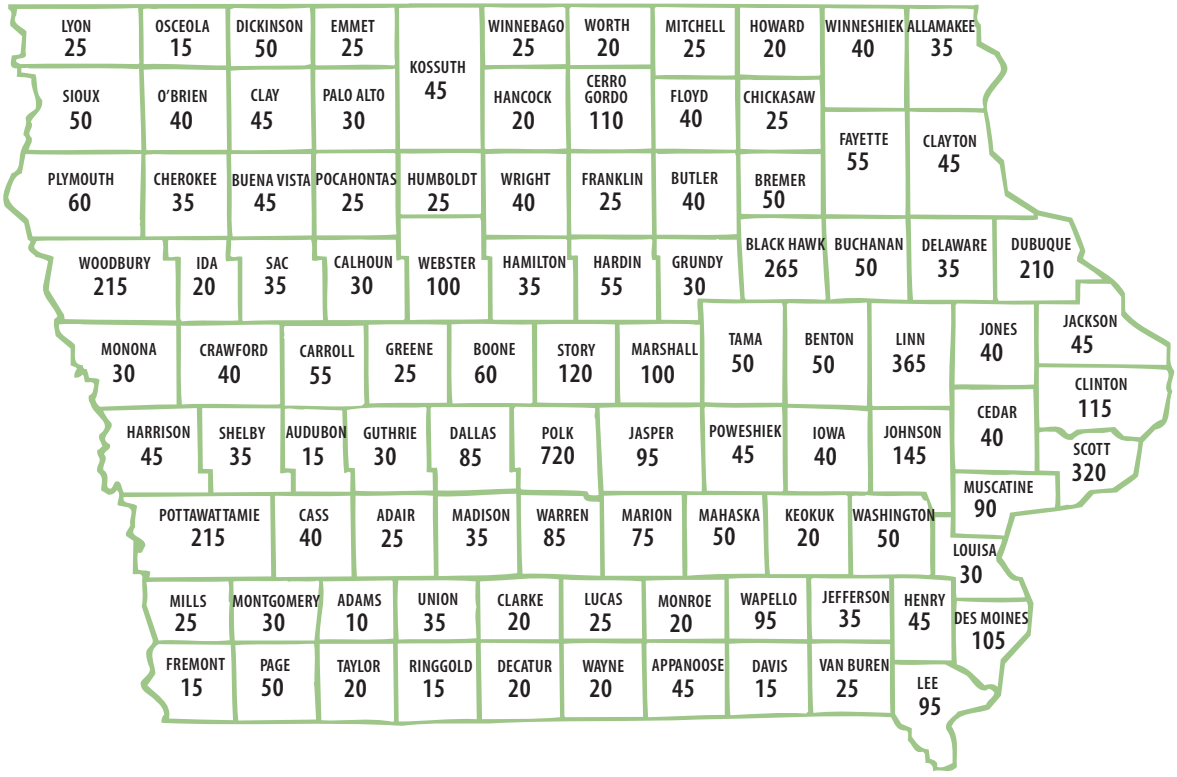
- assemble and report measurements of cancer incidence, survival and mortality among Iowans;
- provide information on changes over time in the extent of disease at diagnosis, therapy, and patient survival;
- promote and conduct studies designed to identify factors relating to cancer etiology, prevention and control;
- respond to requests from individuals and organizations in the state of Iowa for cancer data and analyses;
- provide data and expertise for cancer research activities and educational opportunities.

CANCER PREDICTIONS FOR 2010

ESTIMATED NUMBER OF NEW CANCERS IN IOWA FOR 2010



ESTIMATED NUMBER OF CANCER DEATHS IN IOWA FOR 2010



TOP TEN TYPES OF CANCER IN IOWA ESTIMATED FOR 2010

NEW CANCERS IN FEMALES

Type	# of Cancers	% of Total
Breast	2200	27.5
Lung	1000	12.5
Colon & Rectum	900	11.2
Uterus	500	6.2
Non-Hodgkin Lymphoma	350	4.4
Skin Melanoma	300	3.8
Ovary	250	3.1
Kidney & Renal Pelvis	230	2.9
Thyroid	220	2.8
Leukemia	210	2.6
All Others	1840	23.0
Total	**8000**	

CANCER DEATHS IN FEMALES

Type	# of Cancers	% of Total
Lung	780	25.1
Breast	440	14.2
Colon & Rectum	320	10.3
Pancreas	190	6.1
Ovary	180	5.8
Non-Hodgkin Lymphoma	120	3.9
Leukemia	120	3.9
Uterus	100	3.2
Brain	70	2.3
Kidney & Renal Pelvis	70	2.3
All Others	710	22.9
Total	**3100**	

NEW CANCERS IN MALES

Type	# of Cancers	% of Total
Prostate	2200	26.2
Lung	1300	15.5
Colon & Rectum	830	9.9
Bladder (invasive and noninvasive)	620	7.4
Non-Hodgkin Lymphoma	400	4.8
Skin Melanoma	350	4.1
Kidney & Renal Pelvis	350	4.1
Leukemia	250	3.0
Oral Cavity	220	2.6
Pancreas	190	2.3
All Others	1690	20.1
Total	**8400**	

CANCER DEATHS IN MALES

Type	# of Cancers	% of Total
Lung	1020	30.9
Prostate	350	10.6
Colon & Rectum	290	8.8
Pancreas	180	5.5
Leukemia	150	4.6
Bladder	150	4.6
Esophagus	140	4.2
Non-Hodgkin Lymphoma	130	3.9
Kidney & Renal Pelvis	120	3.6
Brain	100	3.0
All Others	670	20.3
Total	**3300**	

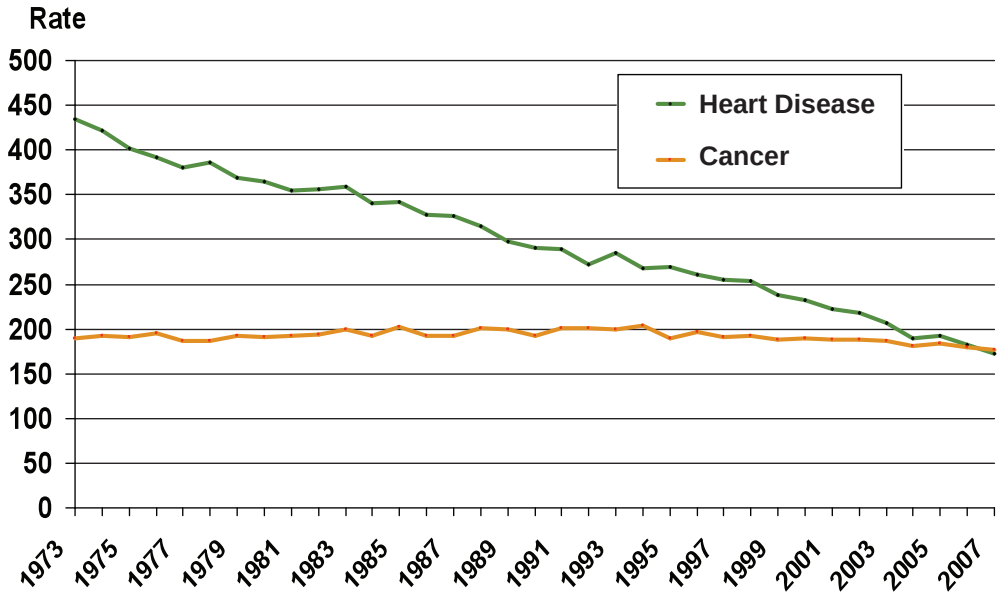
CANCER BECOMES NUMBER ONE CAUSE OF AGE-ADJUSTED DEATH

Cause of death has been examined for many years as a means of monitoring public health. Mortality rates can be created for heart disease by expressing the number of heart disease deaths per 100,000 population. The same can be done for cancer deaths. There are three common ways these rates are presented: 1) age-specific rates, 2) crude rates, and 3) age-adjusted rates. Age-specific rates are calculated by taking the total number of deaths of a specific cause divided by the total population count at the time of the deaths across a specified age group, for example, 80 to 84 years of age. A crude rate is the weighted average of the individual age-specific rates, with the weights being the proportion of the actual population in each category.

An age-adjusted rate is also a weighted average of the individual age-specific rates, but here the weights used are the proportion of a standard population in each category. The standard being used today in the U.S. is the 2000 U.S. population. Researchers prefer using age-adjusted rates because they can compare these rates with the assurance that the underlying age-specific population weights are exactly the same, and consequently, differences in these rates will be due to differences in the age-specific rates.

When using age-adjusted rates, it is important to remember that they should only be compared when the same standard population is being applied. For this reason, U.S. government agencies are currently required to use the 2000 U.S. population as their standard.

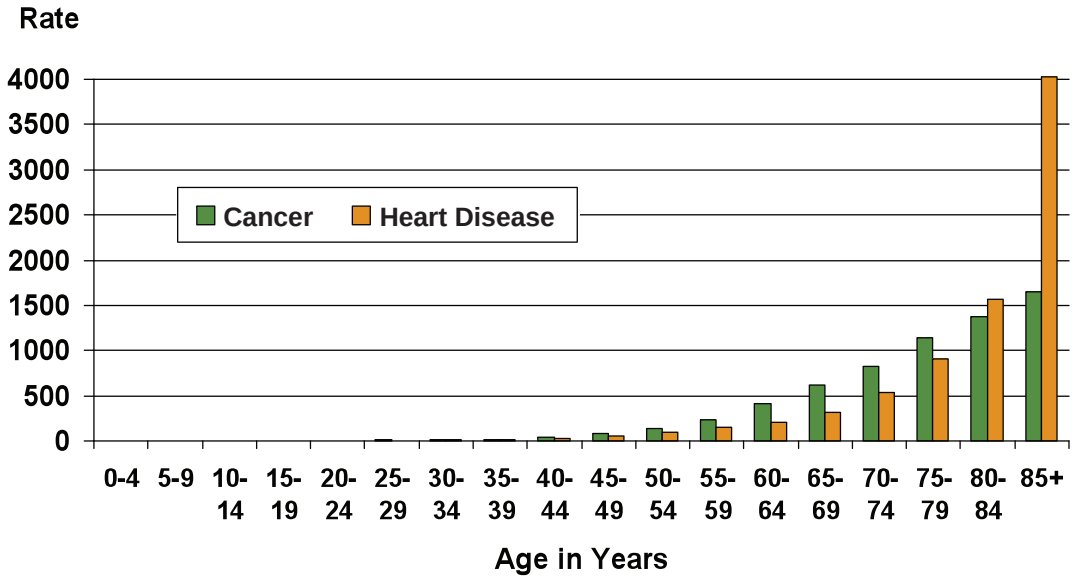
Figure 1. Heart Disease Deaths versus Cancer Deaths, Iowa, 1973-2007
(Rates are age-adjusted to 2000 U.S. population and expressed per 100,000 population)



The cancer age-adjusted rate exceeded the heart disease rate for the first time in 2007.

Figure 2. Average Annual Age-Specific Mortality Rates in Iowa, Cancer vs. Heart Disease, 2007

(Rates expressed per 100,000 population)



Annual age-adjusted death rates, using the 2000 U.S. population as the standard, are presented for cancer and heart disease for a 35-year period in Figure 1. One important observation in looking at this figure is that in 2007, cancer replaced heart disease as the number one cause of death in Iowa for the very first time. Prior to this heart disease has always been the number one cause of age-adjusted death and in the 1970s these heart disease rates were over twice as high as the cancer rates.

Since 1994 in Iowa, age-adjusted death rates have been declining for both cancer and heart disease (Figure 1). Between 1994 and 2007, these rates declined 13% for cancer and 35% for heart disease. The decline for heart disease has been greater, which explains why cancer became the number one cause of age-adjusted death in 2007. Reasons for the declines in both diseases include decreasing frequency of risk factors, such as the rate of smoking, earlier detection of people with these diseases, when they are more treatable, through screening and other programs, and improved treatments for the disease. Risk factors usually affect disease development over the long term rather than the short term, so education and prevention efforts begun decades ago are reflected in the current decreased rates for both diseases.

Given the increasing rates of obesity in the state of Iowa, diabetes has been increasingly diagnosed. Since diabetes and obesity are risk factors for heart disease, it is possible that the number one cause of age-adjusted death could fluctuate in Iowa over the next few years.

For decades, cancer and heart disease have combined to account for nearly 50% or more of all causes of death in Iowa. In 1994 they accounted for 57% of all deaths; in 2007, 49% of all deaths. The declining percent is a reflection of the trend of decreasing annual rates that each of these leading causes of death has been experiencing (Figure 1).

When evaluating age-specific mortality rates in 2007 for both sexes combined, both cancer and heart disease were relatively rare under 55 years of age (Figure 2). Between

Table 1. Cancer vs. Heart Disease Mortality Rates in Iowa, 2007

	CANCER		HEART DISEASE	
	Number	Rate*	Number	Rate*
Iowa	6,358	177	6,843	173
Gender				
Male	3,265	216	3,374	224
Female	3,093	151	3,469	134
Race**				
White	6,216	177	6,734	173
Black	102	252	84	196
Other	37	114	22	92
County Groups				
< 10,000 population	445	170	608	190
10,000 - 20,000 population	1,328	169	1,631	177
> 20,000 population	1,468	179	1,691	187
Metropolitan statistical area	3,117	182	2,913	161

* Age-adjusted to 2000 U.S. population and expressed per 100,000 population
** Numbers do not sum to total because of unknown race

55 and 79 years of age, cancer was the leading cause of death in both sexes. In the two oldest age groups, heart disease remained the number one cause.

When these age-adjusted rates are stratified by sex, female cancer death rates have exceeded female heart disease death rates since 2004 (data not shown). In 2007, female cancer death rates exceeded heart disease death rates by 17 per 100,000 population (151/100,000 vs. 134/100,000). On the other hand, as of 2007, male cancer death rates have not yet exceeded heart disease death rates (216/100,000 vs. 224/100,000), but the gap is narrowing (Table 1).

In 2007, age-adjusted mortality rates for cancer exceeded those for heart disease among whites, blacks, and other racial groups (Table 1). After dividing Iowa's 99 counties into four groups based on population, as was done in the 2009 Iowa Health Fact Book (see http://www.public-health.uiowa.edu/factbook/, Introduction, page 3), age-adjusted cancer mortality rates exceeded heart disease rates only in counties classified as part of metropolitan statistical areas (MSA). These counties are defined by the U.S. Census Bureau as having a central city along with counties economically and socially connected to it. An MSA must have a central city with at least 50,000 inhabitants or a census-defined urbanized area with a total metropolitan population of at least 100,000.

In Table 2, both crude and age-adjusted mortality rates have been calculated for the U.S., Iowa, and its surrounding states for the year 2006, the most recent year for which these data are readily available. Minnesota was the only adjacent state where cancer mortality rates exceeded heart disease mortality rates for both crude and adjusted rates; this first occurred in the year 2000. In Nebraska and Wisconsin, the 2006 adjusted cancer mortality rates were exceeding their corresponding

heart disease rates for the first time, but the crude rates have yet to do this. In all the other surrounding states as well as Iowa and the entire United States, in 2006 neither the age-adjusted nor crude cancer mortality rates have yet exceeded the heart disease mortality rates. Nevertheless, the trend in all these areas shows the gap to be narrowing between these rates similar to what is shown in Figure 1. The primary reason the crude rates have not yet exceeded the age-adjusted rates is that the 2006 populations in these states have a greater percentage of their respective populations over the age of 79 than the 2000 U.S. standard population. For example in 2006, 4.9% of Iowa's population and only 3.3% of the 2000 U.S. standard population was 80 years of age and older.

The 13% decrease in age-adjusted cancer mortality rates between 1994 and 2007 (203.2 per 100,000 and 177.1 per 100,000, respectively) has primarily been the result of decreases in prostate, female breast, colorectal, and lung cancers. During this same time period, the rate declines for these sites have been 37%, 34%, 29%, and 5%, respectively.

The decline in prostate cancer mortality is primarily attributed to better treatment and increasing application of effective treatment. In 2009 two separate clinical trials evaluating prostate specific antigen (PSA) did not show this test to be effective in reducing prostate cancer mortality for the 10-year period following diagnosis. For female breast cancer, research results support mammography screening and improved treatments as having equally contributed to fewer women dying from breast cancer. Declines in colorectal cancer death rates are consistent with a relatively large contribution from screening and with a smaller but demonstrable impact from risk factor reduction and improved treatments. The declines in lung cancer deaths can be attributed to declines in tobacco use, particularly cigarette use among males.

Table 2. Cancer vs. Heart Disease Mortality Rates for the U.S. and Selected States, 2006

	CANCER			HEART DISEASE		
	Number	Adjusted Rate*	Crude Rate**	Number	Adjusted Rate*	Crude Rate**
United States	559,880	181	187	631,596	200	211
South Dakota	1,570	170	199	1,757	174	223
Minnesota	9,079	172	176	7,525	133	146
Nebraska	3,430	177	194	3,445	164	195
Iowa	**6,359**	**180**	**214**	**7,172**	**183**	**241**
Wisconsin	10,925	181	196	11,451	179	205
Illinois	24,083	188	188	27,006	204	211
Missouri	12,519	196	214	14,749	223	253

* Age-adjusted to 2000 U.S. population and expressed per 100,000 population
** Per 100,000 population

RESEARCH PROJECTS DURING 2010

The State Health Registry of Iowa is participating in around seven dozen funded studies during 2010. Brief descriptions of a few of these studies are provided.

AGRICULTURAL HEALTH STUDY

The Agricultural Health Study is a long-term study of agricultural exposures (including pesticides) and chronic disease (especially cancer) among commercial or private pesticide applicators (and their spouses, if married) in Iowa and North Carolina. The study is funded primarily by the National Cancer Institute. We are in the 18th year of the study, which received renewed funding at the end of 2003 for continuation into 2010.

In the first five years, 89,658 subjects (58,564 in Iowa and 31,094 in North Carolina) were enrolled in the study. This total for Iowa included 31,877 private applicators, 21,771 spouses of private applicators, and 4,916 commercial applicators. Enrollment consisted of completing questionnaires about past exposures and health. The second phase of the study for private applicators and their spouses was completed at the end of 2003. It involved a telephone interview, a mailed dietary questionnaire, and collection of a cheek cell sample from all consenting cohort members. The telephone interview asked about pesticide use since enrollment, current farming and work practices, and health changes. The dietary health questionnaire asked about cooking practices and types of foods eaten. Cooking practices and diet may play a role in cancer and other health conditions. The cheek cells are being used to understand possible links between genetics, exposures, and disease. For commercial applicators, the second phase of the study was completed at the end of 2005. The study's third phase began in 2005, involves updating information about exposures and health, and will be completed this year. Plans for a fourth phase of the study are being developed.

Since 1997, cohort members have been linked annually to mortality and cancer registry incidence databases in both states. In addition, mortality data on the cohort are being obtained from the National Death Index. More information about recent results from this study, the study background, frequently asked questions, other resources (internet & telephone) for agricultural health information, references for publications to date, and information for scientific collaborators can be found at the website, www.aghealth.org. The abstracts for the publications are available at this website. The cancer-related references for 2009 publications are provided in the last section of this report.

IOWA WOMEN'S HEALTH STUDY

This is a population-based cohort of 41,837 Iowa women, aged 55-69 in 1986, who were recruited to determine whether diet, body fat distribution and other risk factors were related to cancer incidence. Exposure and lifestyle information was collected in a baseline mailed survey and subsequently in several follow-up mailed surveys. Mortality and cancer incidence have been ascertained since 1986 through annual linkage to the State Health Registry of Iowa databases and the National Death Index. The project has been extremely productive with over 200 publications, some of which occurred in 2009 and are listed in the references provided in the last section of this report.

NON-HODGKIN LYMPHOMA (NHL) CASE-CONTROL STUDY

The State Health Registry of Iowa (SHRI) with researchers at the Mayo Clinic participated in a collaborative, population-based case-control study of NHL involving researchers at the National Cancer Institute and three other Surveillance, Epidemiology, and End Results (SEER) registries. The main objective of the study was to better characterize risk factors for NHL. In Iowa, 364 live patients newly diagnosed with NHL between July 1, 1998 and June 30,

2000 were enrolled. A similar number of population controls participated. Blood samples were sought from study participants. The SHRI also coordinated the acquisition of pathology reports, slides and tissue blocks from all SEER centers. The slides were reviewed to determine the reliability of NHL pathologic classification. More recently, we are collaborating with researchers at the Mayo Clinic to investigate whether genes with functional, common variant polymorphisms involved in immune function and regulation are associated with overall survival from NHL among these patients. To achieve this aim, medical record reviews were performed to obtain more detailed information on the treatment received for NHL. These research activities resulted in several publications during 2009. The references for these are provided in the last section of this report.

PATTERNS OF CARE STUDIES

SEER Patterns of Care Studies are conducted to satisfy a U.S. Congressional directive to the National Cancer Institute to "assess the incorporation of state-of-the-art cancer treatment into clinical practice and the extent to which cancer patients receive such treatments." This year's Patterns of Care Study will involve prostate cancer, non-Hodgkin lymphoma, chronic lymphocytic leukemia, and gastrointestinal stromal tumors (sarcoma) in adults diagnosed between January 1, 2008 and December 31, 2008. The objectives of the SEER Patterns of Care Study are to: 1) describe the use of adjuvant therapy, which has been verified with the treating physician, in a community setting, 2) characterize the practice patterns in different communities, 3) describe more completely the use of surgery in the treatment of specific cancers, 4) compare the patterns of treatment for cancer over time, 5) compare patterns of care by age and race/ethnicity, 6) describe the effect of co-morbid conditions on treatment, and 7) describe treatment by hospital characteristics: i.e. for profit vs. not for profit, teaching vs. non-teaching, disproportionate share status, etc. The SHRI has been involved with these types of studies over the past 20 years. During 2009, they have resulted in a couple of publications, which are provided in the last section of this report.

POOLED ANALYSES

Today, researchers are increasingly looking to combine their study data with that of other studies evaluating similar exposures and outcomes. During 2009 these activities resulted in a couple of publications, which are listed in the last section of this report, involving pancreatic cancer and non-Hodgkin lymphoma.

SECOND CANCER STUDIES

Over the past two decades, the State Health Registry of Iowa has participated in several second cancer studies. These have consisted of cohorts with a first cancer of the cervix, ovary, testis, uterus, female breast, non-Hodgkin lymphoma, or Hodgkin disease. They have been conducted primarily in collaboration with the Radiation Epidemiology Branch at the National Cancer Institute and other registries in North America and Europe. Generally these studies evaluate the treatment received for the first cancer and the risk it places on the patient for development of a second cancer. They typically involve medical record review and pathology material retrieval.

The WECARE (Women's Environmental Cancer and Radiation Epidemiology) Study is another example of a second cancer study. This study is designed to examine gene carrier status, demographic and lifestyle factors as well as environmental and treatment factors reported to be associated with breast cancer as they relate to the development of a second breast cancer in the opposite breast. Data collection not only involved medical record review, but also participant interviews and blood sample collection. This year, we are going back into the field to add more participants to this study to enable a genome-wide association

study to be conducted to learn more about how genetic, environmental, and lifestyle factors work together to influence whether a woman with breast cancer will develop a second breast cancer in the opposite breast.

Results from the second cancer studies have provided important medical information and will continue to do so in the future. A few publications during 2009 involving second cancers are provided in the last section of this report.

SEER-MEDICARE

In the early 1990s, the cancer incidence and survival data from the State Health Registry of Iowa were combined with other SEER Registry data and linked to Medicare data. This linked data set has been updated on several occasions since and has become an important data resource for cancer research regarding epidemiologic and health services research related to the diagnosis, treatment and procedures, costs, and survival of cancer patients. Over the years many publications have resulted from this linked data set including several during 2009, a selected subset of which are provided in the last section of this report.

STUDIES OF CANCER SURVIVORS

A few years ago, two studies were funded by the American Cancer Society (ACS) with the specific aims to: 1) describe the unmet needs of cancer survivors, with a particular focus on their psychosocial adjustment and quality of life; 2) identify factors that determine good quality of life and successful survivorship; 3) provide a database to use in assessing the relevance and effectiveness of ACS programs intended to meet the needs of cancer survivors; and 4) examine factors that relate to the development and possible prevention of late effects, including second cancers. Several hundred Iowa patients were enrolled in these studies and they have been responding to mailed questionnaires received around 1, 2, 5, and 10 years after diagnosis. These data are now being analyzed and have resulted in a couple of 2009 publications that are listed in the last section of this report.

The Adolescent and Young Adult Health Outcomes and Patient Experience (AYA HOPE) Study is another ongoing example of a cancer survivor study. This study is an initial step in addressing potential factors related to gaps in research, care and outcomes for AYA cancer patients. At seven SEER Registries across the United States, 530 patients (40 in Iowa), 15-39 years old at diagnosis between July 1, 2007 and October 31, 2008 have been enrolled with any of the following cancers: ovarian or testicular cancer, Hodgkin lymphoma, non-Hodgkin lymphoma, acute lymphoblastic leukemia, or selected types of sarcoma. This year these patients are being recontacted to obtain additional follow-up information regarding their cancer survivorship experience. Reports will be forthcoming regarding factors related to access to care, treatment and follow-up care, and impact of cancer on physical and psychosocial functioning.

COOPERATIVE AGREEMENTS AND OTHER REGISTRIES

The SHRI maintains cooperative agreements with several hospital cancer registries and other agencies/entities. Some of the latter include:

- Iowa Department of Public Health
- Iowa Cancer Consortium
- The University of Iowa
    - Center for Health Effects of Environmental Contamination
    - Center for Public Health Statistics
    - Environmental Health Sciences Research Center
    - Health Effectiveness Research Center
    - Holden Comprehensive Cancer Center
    - Iowa Center for Agricultural Safety and Health
    - Iowa Registry for Congenital and Inherited Disorders
    - Injury Prevention Research Center
    - Preventive Intervention Center
    - Reproductive Molecular Epidemiology Research & Education Program

SELECTED 2009 PUBLICATIONS

AGRICULTURAL HEALTH STUDY

1. Andreotti, G., Freeman, L. E., Hou, L., Coble, J., Rusiecki, J., Hoppin, J. A., Silverman, D. T., and Alavanja, M. C. Agricultural pesticide use and pancreatic cancer risk in the Agricultural Health Study Cohort. Int J Cancer, 124: 2495-500, 2009.

2. Bakke, B., De Roos, A. J., Barr, D. B., Stewart, P. A., Blair, A., Freeman, L. B., Lynch, C. F., Allen, R. H., Alavanja, M. C., and Vermeulen, R. Exposure to atrazine and selected non-persistent pesticides among corn farmers during a growing season. J Expo Sci Environ Epidemiol, 19: 544-54, 2009.

3. Delancey, J. O., Alavanja, M. C., Coble, J., Blair, A., Hoppin, J. A., Austin, H. D., and Beane Freeman, L. E. Occupational exposure to metribuzin and the incidence of cancer in the Agricultural Health Study. Ann Epidemiol, 19: 388-95, 2009.

4. Koutros, S., Berndt, S. I., Sinha, R., Ma, X., Chatterjee, N., Alavanja, M. C., Zheng, T., Huang, W. Y., Hayes, R. B., and Cross, A. J. Xenobiotic metabolizing gene variants, dietary heterocyclic amine intake, and risk of prostate cancer. Cancer Res, 69: 1877-84, 2009.

5. Koutros, S., Lynch, C. F., Ma, X., Lee, W. J., Hoppin, J. A., Christensen, C. H., Andreotti, G., Freeman, L. B., Rusiecki, J. A., Hou, L., Sandler, D. P., and Alavanja, M. C. Heterocyclic aromatic amine pesticide use and human cancer risk: results from the U.S. Agricultural Health Study. Int J Cancer, 124: 1206-12, 2009.

6. Landgren, O., Kyle, R. A., Hoppin, J. A., Beane Freeman, L. E., Cerhan, J. R., Katzmann, J. A., Rajkumar, S. V., and Alavanja, M. C. Pesticide exposure and risk of monoclonal gammopathy of undetermined significance in the Agricultural Health Study. Blood, 113: 6386-91, 2009.

7. Lynch, S. M., Mahajan, R., Beane Freeman, L. E., Hoppin, J. A., and Alavanja, M. C. Cancer incidence among pesticide applicators exposed to butylate in the Agricultural Health Study (AHS). Environ Res, 109: 860-8, 2009.

8. Mills, K. T., Blair, A., Freeman, L. E., Sandler, D. P., and Hoppin, J. A. Pesticides and myocardial infarction incidence and mortality among male pesticide applicators in the Agricultural Health Study. Am J Epidemiol, 170: 892-900, 2009.

9. Park, S. K., Kang, D., Beane-Freeman, L., Blair, A., Hoppin, J. A., Sandler, D. P., Lynch, C. F., Knott, C., Gwak, J., and Alavanja, M. Cancer incidence among paraquat exposed applicators in the agricultural health study: prospective cohort study. Int J Occup Environ Health, 15: 274-81, 2009.

10. Rusiecki, J. A., Patel, R., Koutros, S., Beane-Freeman, L., Landgren, O., Bonner, M. R., Coble, J., Lubin, J., Blair, A., Hoppin, J. A., and Alavanja, M. C. Cancer incidence among pesticide applicators exposed to permethrin in the Agricultural Health Study. Environ Health Perspect, 117: 581-6, 2009.

11. Slager, R. E., Poole, J. A., LeVan, T. D., Sandler, D. P., Alavanja, M. C., and Hoppin, J. A. Rhinitis associated with pesticide exposure among commercial pesticide applicators in the Agricultural Health Study. Occup Environ Med, 66: 718-24, 2009.

IOWA WOMEN'S HEALTH STUDY

1. Lutsey, P. L., Steffen, L. M., Virnig, B. A., and Folsom, A. R. Diet and incident venous thromboembolism: the Iowa Women's Health Study. Am Heart J, 157: 1081-7, 2009.

2. Thompson, C. A., Habermann, T. M., Wang, A. H., Vierkant, R. A., Folsom, A. R., Ross, J. A., and Cerhan, J. R. Antioxidant intake from fruits, vegetables and other sources and risk of non-Hodgkin's lymphoma: the Iowa Women's Health Study. Int J Cancer, 126: 992-1003, 2009.

NHL CASE-CONTROL STUDY

1. Colt, J. S., Rothman, N., Severson, R. K., Hartge, P., Cerhan, J. R., Chatterjee, N., Cozen, W., Morton, L. M., De Roos, A. J., Davis, S., Chanock, S., and Wang, S. S. Organochlorine exposure, immune gene variation, and risk of non-Hodgkin lymphoma. Blood, 113: 1899-905, 2009.

2. Lan, Q., Morton, L. M., Armstrong, B., Hartge, P., Menashe, I., Zheng, T., Purdue, M. P., Cerhan, J. R., Zhang, Y., Grulich, A., Cozen, W., Yeager, M., Holford, T. R., Vajdic, C. M., Davis, S., Leaderer, B., Kricker, A., Schenk, M., Zahm, S. H., Chatterjee, N., Chanock, S. J., Rothman, N., and Wang, S. S. Genetic variation in caspase genes and risk of non-Hodgkin lymphoma: a pooled analysis of 3 population-based case-control studies. Blood, 114: 264-7, 2009.

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The State Health Registry of Iowa is the best statewide resource for determining the burden of cancer on the Iowa population and assessing trends in the occurrence of cancer over time.

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