The University of Iowa
College of Public Health

STATE HEALTH REGISTRY OF IOWA

2014 CANCER IN IOWA

In 2014, an estimated 6,400 Iowans will die from cancer, 16 times the number caused by auto fatalities. Cancer and heart disease are the leading causes 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 *2014 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 2014;**
- **a special section on human papillomavirus (HPV);**
- **brief summaries of recent/ongoing research projects;**
- **a selected list of publications from 2013.**

The State Health Registry of Iowa

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.

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 2014 data will be collected on an estimated 17,400 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.

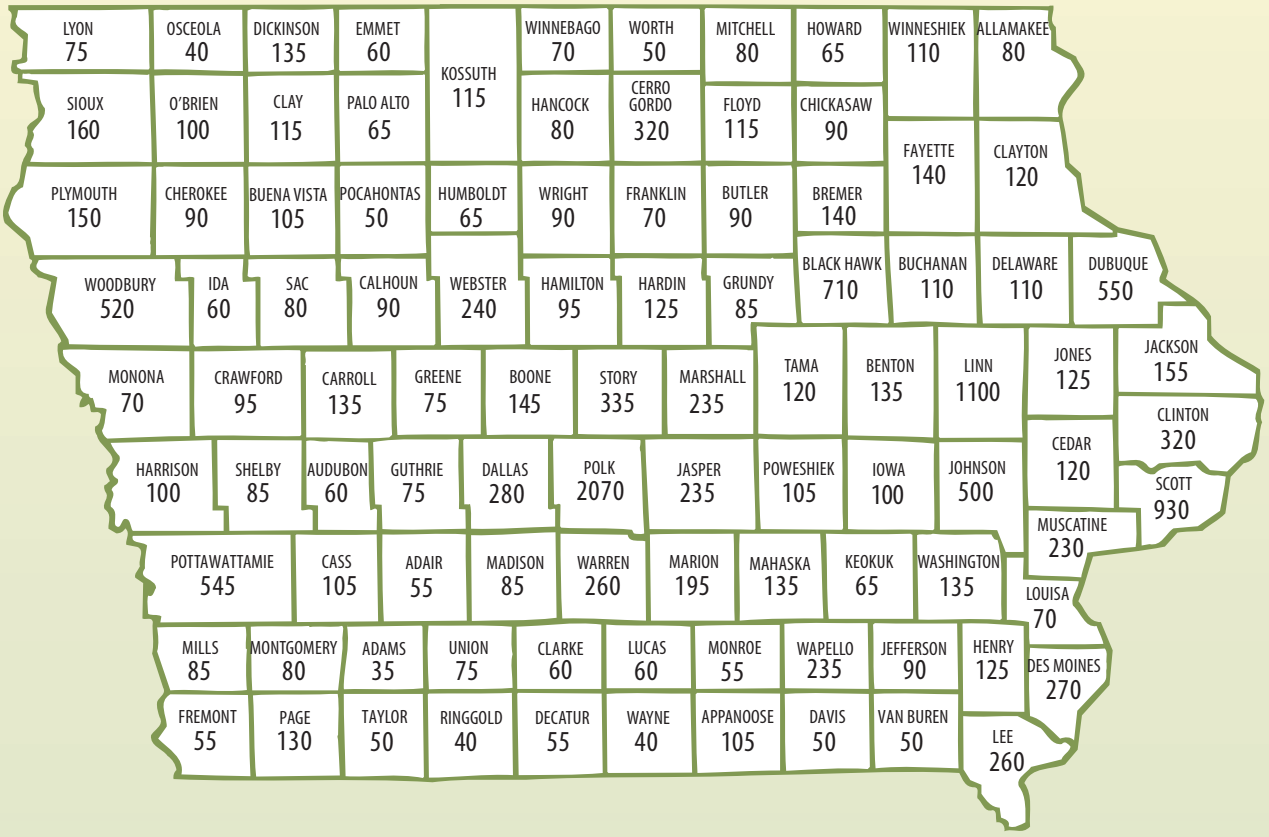
Since 1973 the Iowa Registry has been funded by the SEER Program of the National Cancer Institute. Iowa represents rural and Midwestern populations and provides data included in many NCI publications. Beginning in 1990 about 5-10 percent of the Registry's annual operating budget has been provided by 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:

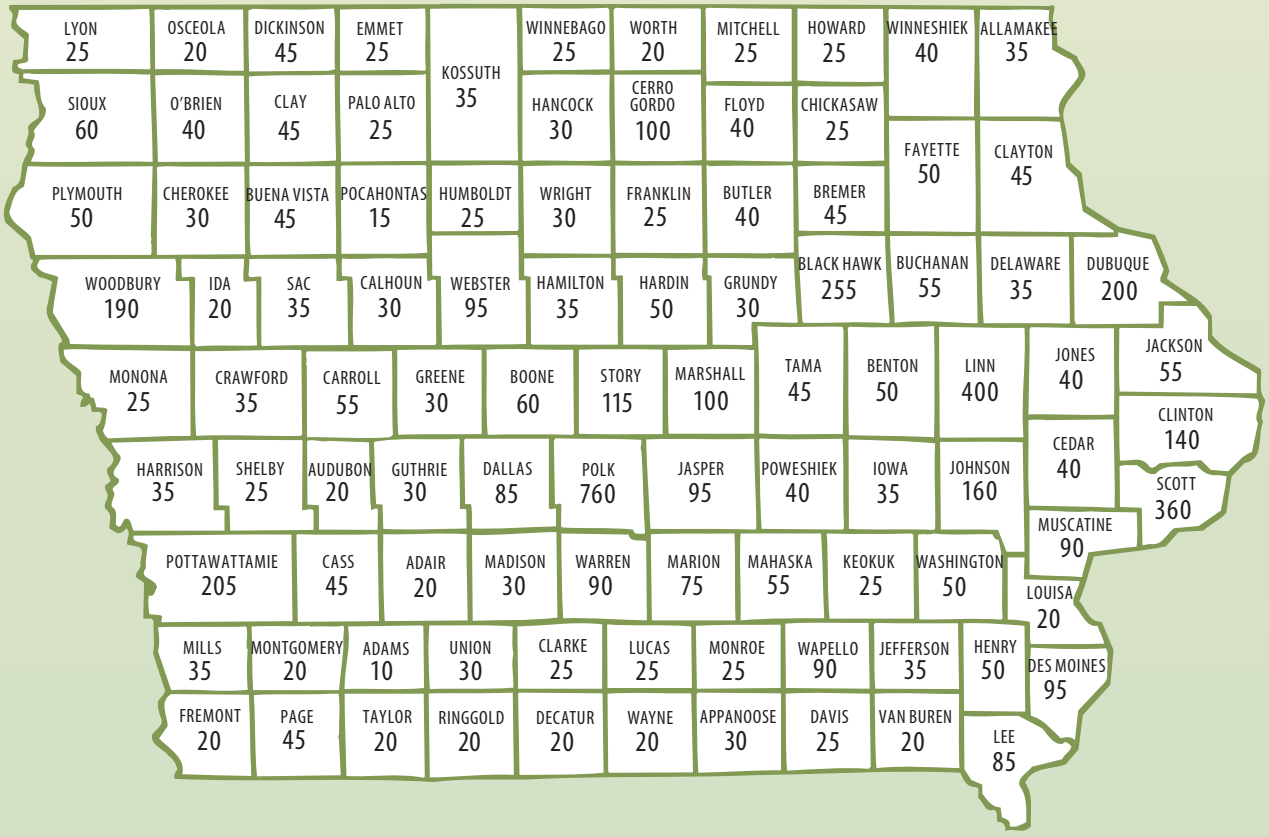
- assemble and report measurements of cancer incidence, survival and mortality among Iowans;
- provide information on changes over time in the extent of disease at diagnosis, therapy, and patient survival;
- promote and conduct studies designed to identify factors relating to cancer etiology, prevention 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 Projections for 2014

Projected Number of New Cancers in Iowa for 2014



Projected Number of Cancer Deaths in Iowa for 2014



Top 10 Types of Cancer in Iowa Estimated for 2014

NEW CANCERS IN FEMALES

TYPE	# OF CANCERS	% OF TOTAL
Breast	2350	28.0
Lung	1000	11.9
Colon & Rectum	780	9.3
Uterus	580	6.9
Skin Melanoma	380	4.5
Non-Hodgkin Lymphoma	370	4.4
Thyroid	300	3.6
Leukemia	240	2.9
Kidney & Renal Pelvis	230	2.7
Ovary	230	2.7
All Others	1940	23.1
TOTAL	**8400**	

CANCER DEATHS IN FEMALES

TYPE	# OF CANCERS	% OF TOTAL
Lung	740	24.7
Breast	400	13.3
Colon & Rectum	290	9.7
Pancreas	210	7.0
Ovary	170	5.7
Non-Hodgkin Lymphoma	120	4.0
Leukemia	120	4.0
Uterus	110	3.7
Brain	70	2.3
Kidney & Renal Pelvis	70	2.3
All Others	700	23.3
TOTAL	**3000**	

NEW CANCERS IN MALES

TYPE	# OF CANCERS	% OF TOTAL
Prostate	2200	24.4
Lung	1290	14.3
Colon & Rectum	860	9.6
Bladder (invasive and noninvasive)	630	7.0
Skin Melanoma	460	5.1
Non-Hodgkin Lymphoma	420	4.7
Kidney & Renal Pelvis	390	4.3
Leukemia	330	3.7
Oral Cavity	300	3.3
Pancreas	230	2.6
All Others	1890	21.0
TOTAL	**9000**	

CANCER DEATHS IN MALES

TYPE	# OF CANCERS	% OF TOTAL
Lung	950	28.0
Prostate	330	9.7
Colon & Rectum	300	8.8
Pancreas	210	6.2
Leukemia	160	4.7
Esophagus	150	4.4
Non-Hodgkin Lymphoma	140	4.1
Bladder	120	3.5
Kidney & Renal Pelvis	120	3.5
Brain	100	3.0
All Others	820	24.1
TOTAL	**3400**	

Fortunately for Iowans, the chances of being diagnosed with many types of cancer can be reduced through positive health practices such as smoking cessation, physical exercise, healthful dietary habits, and alcohol consumption in moderation. Early detection through self-examination and regular health checkups can improve cancer survival.

Human Papillomavirus (HPV) Related Cancers

Most people who become infected with HPV do not know they have it.

HPV-related cancers are defined as cancers at specific anatomic sites with specific cellular types in which HPV DNA is frequently found.

Human papillomavirus (HPV) is one of the most common sexually transmitted infections worldwide. There are more than 130 HPV types that have been divided into low-risk and high-risk types based on their potential to cause cancer. HPV types 16 (HPV-16) and 18 (HPV-18) account for most HPV-related cancers. Other high-risk types include HPV-31, -33, -35, -39, -45, -51, -52, -56, -58, -59, -66, and -68. HPV-16 infection has been shown to be the single most common high-risk type in most regions of the world, including the United States. HPVs are small double-stranded DNA viruses that infect epithelial cells. These cells cover the inside and outside surfaces of the body, including the head and neck and anogenital areas. Most people who become infected with HPV do not know they have it. Based on data involving cervical HPV infection, HPV is cleared from the body in 90% of infected individuals within two years and consequently does not cause health problems. The remaining 10% have persistent infection and, within 30 years, about half of these develop cancer.

HPV-related cancers are defined as cancers at specific anatomic sites with specific cellular types in which HPV DNA is frequently found. The association between HPV and cervical cancer is well established, and HPV infection is strongly implicated in cancers of the vagina, vulva, and penis. Over 90% of cervical cancers, more than 70% of vaginal cancers and over 60% of vulvar and penile cancers are likely caused by HPV infection (Table 1). In addition, over 90% of anal cancers and more than 70% of certain subsites of oropharyngeal cancers (including the base of the tongue, lingual and palatine tonsils, oropharynx, pharynx, and Waldeyer ring) are also probably caused by HPV infection (Table 1).

HPV infection has been shown to be strongly related to sexual practices, including multiple sexual partners, oral sex, and anal intercourse. HPV causes an epidemiologically and clinically distinct form of oropharyngeal squamous cell carcinoma (OPSCC). HPV-positive OPSCCs have risk factors related to sexual behavior, whereas HPV-negative OPSCCs are strongly related to tobacco and alcohol use. Patients with HPV-positive OPSCCs have improved survival compared with HPV-negative OPSCC patients despite often presenting with more extensive cancers. Also, patients with HPV-positive tumors who have been tobacco smokers appear to have a shortened survival relative to patients with just HPV-positive OPSCCs. The reasons for an improved outcome and response to therapy in patients with HPV-positive OPSCC are unclear.

In Iowa between 2006 and 2011, there were a total of 2,107 cancers at HPV-related sites among men and women (811 and 1,296, respectively) (Table 1). They accounted for 2.2% of all microscopically-confirmed, invasive cancers during this period. Cervical cancer alone represented 46% of all HPV-related cancer among women and 29% of all HPV-related cancers; OPSCC accounted for 79% of HPV-related cancer among men (Table 1). Applying the percents probably caused by HPV infection (Table 1) to the total number of cases in Iowa between 2006 and 2011 suggests that 1,576 of the 2,107 HPV-related cancers (75%) were likely caused by HPV infection.

Table 1.
Age-adjusted incidence rates* (number of cases) of HPV-related cancers‡ by sex, year and age of diagnoses, Iowa, 1988-2011

	Male			Female				
Year and Age of Diagnoses	Anus	Oropharynx**	Penis	Cervix	Vagina	Vulva	Anus	Oropharynx**
1988-93								
<60	0.3 (15)	1.8 (103)	0.3 (19)	9.3 (593)	0.1 (7)	0.8 (48)	0.3 (16)	0.5 (32)
60+	1.0 (14)	11.4 (164)	4.2 (57)	15.0 (289)	1.9 (39)	7.9 (159)	3.4 (66)	4.3 (82)
1994-99								
<60	0.4 (26)	1.9 (123)	0.3 (22)	8.2 (560)	0.1 (7)	1.1 (71)	0.6 (42)	0.5 (36)
60+	1.7 (24)	9.7 (139)	2.9 (38)	11.2+ (216)	1.8 (36)	8.6 (179)	2.8 (54)	3.2 (62)
2000-05								
<60	0.3 (25)	3.2+ (246)	0.2 (15)	6.9+ (478)	0.1 (11)	1.2 (87)	0.9+ (70)	0.8 (63)
60+	2.3 (34)	13.0 (191)	4.4 (62)	9.6+ (183)	1.7 (38)	6.6 (139)	3.3 (63)	3.0 (58)
2006-11								
<60	0.6+ (50)	4.2+ (367)	0.2 (19)	6.4+ (448)	0.2 (13)	1.5+ (117)	1.3+ (105)	0.7 (59)
60+	2.0 (32)	16.7+ (274)	4.5 (69)	7.8+ (154)	1.5 (31)	8.1 (176)	5.2 (105)	4.4 (88)
Probably caused by HPV†	**91%^**	**72%^**	**63%**	**91%**	**75%**	**69%**	**91%^**	**72%^**

* Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population.

‡ HPV-related cancers are defined as cancers at specific anatomic sites with specific cellular types in which HPV DNA is frequently found. Cases are invasive, microscopically-confirmed, squamous cell carcinomas except for cervical cancer where adenocarcinomas are also included.

** Oropharynx subsites include base of tongue, tonsil, lingual and palatine tonsils, oropharynx, pharynx, and Waldeyer ring.

+ Rate is significantly different ($p < 0.05$) from corresponding 1988-93 rate.

† Data source: http://www.cdc.gov/cancer/hpv/statistics/cases.htm

^ Percent is for males and females combined.

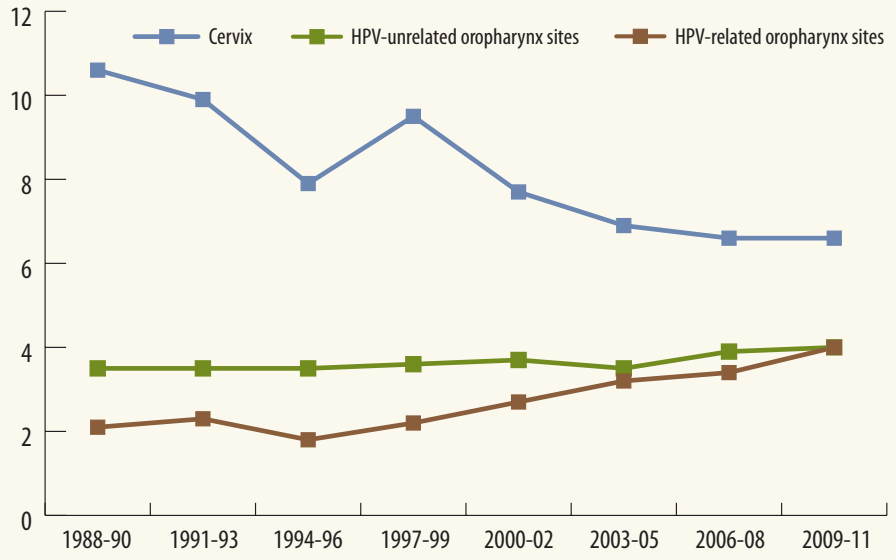
In 2009 in the United States, a total of 34,788 HPV-related cancers occurred among men and women. These cancers accounted for 3.3 percent of all invasive cancers diagnosed in 2009. Similar to the Iowa percent, cervical cancer alone represented 53% of all HPV-related cancer among United States' women and 33% of all HPV-related cancers, whereas OPSCC accounted for 78% of HPV-related cancer among men.

Looking back over 24 years (1988-2011) in Iowa, incidence rates under age 60 years at least doubled for anal cancer in both genders, vulvar cancer in women, and HPV-related OPSCC in men when comparing 1988-93 rates with 2006-11 rates (Table 1). Similarly, HPV-related OPSCC also significantly increased in males 60+ years old (Table 1). HPV-16 generally accounts for most of these cases. In Iowa the overall rise in OPSCC is largely explained by the increasing incidence at HPV-related cancer sites, whereas the incidence at non-HPV-related cancer sites has remained stable (Figure 1). This increasing incidence of HPV-related OPSCC perhaps arises from increased oral sex and oral HPV exposure over past decades particularly among men under the age of 60. In contrast over this same period, cervical cancer incidence rates decreased for Iowa women, likely due to earlier treatment of precancerous disease as a result

Over 90% of cervical cancers, more than 70% of vaginal cancers and over 60% of vulvar and penile cancers are likely caused by HPV infection.

With current trends in Iowa and nationally, by 2020 the number of HPV-related OPSCCs is expected to surpass the number of cervical cancers, which have been the focus of HPV vaccination.

Figure 1. Incidence rates for selected HPV-related cancers, Iowa, 1988-2011
(Rates are per 100,000 population and age-adjusted to the U.S. 2000 population.)



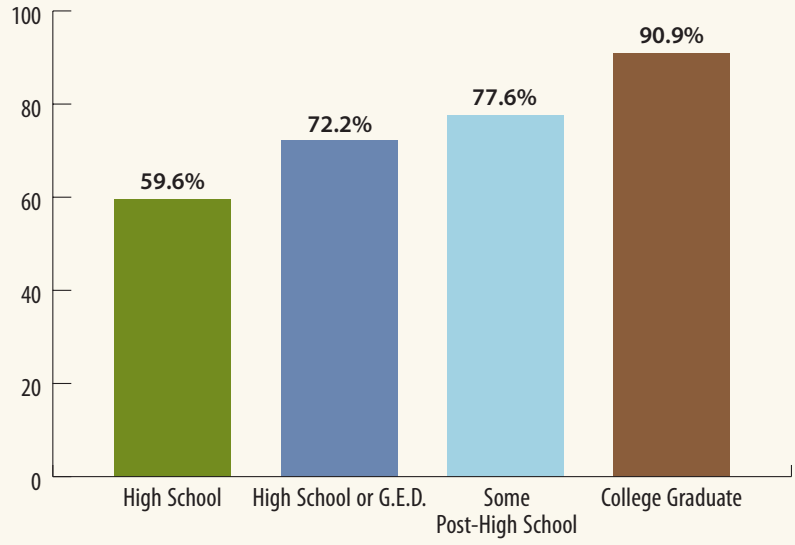
of Pap testing. With current trends in Iowa and nationally, by 2020 the number of HPV-related OPSCCs is expected to surpass the number of cervical cancers, which have been the focus of HPV vaccination.

Since 2006, HPV vaccines have been available in the United States. Currently two HPV vaccines are available to protect against HPV-16 and HPV-18. Both vaccines are approved for the prevention of cervical cancers caused by these two HPV types. Since the vaccines prevent infection with HPV types that can also cause oropharyngeal cancers, it is highly likely the vaccines can prevent cancers occurring at these oral sites, as well, but studies have not yet been done to confirm this. One of the vaccines also protects against HPV types 6 and 11, which cause 90% of genital warts, and has also been approved for prevention of vaginal, vulvar, and anal cancers.

The Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination for girls ages 11 or 12 with three doses of either of the two available HPV vaccines and routine vaccination of boys ages 11 or 12 with three doses of the vaccine that also covers HPV types 6 and 11. Vaccination is also recommended for females ages 13 through 26 and males ages 13 through 21 who were not vaccinated previously. Males ages 22 through 26 may also receive three doses of the vaccine. For men who have sex with men and for immunocompromised males, ACIP recommends routine vaccination with the vaccine that also covers HPV types 6 and 11 as stated above for all males, and vaccination through age 26 years for those who have not been vaccinated previously or who have not completed the 3-dose series.

In 2012, data collected in the CDC's National Immunization Survey-Teen showed that slightly more than half (54%) of adolescent girls ages 13 through 17 nationwide had received one or more doses of HPV vaccine,

Figure 2. Percent of female population who have had a Pap test within the past three years by education level, Iowa, 2012
(Data source: http://apps.nccd.cdc.gov/brfss/)



Since HPV vaccination does not protect against all cancer-causing types of HPV, vaccinated and unvaccinated women should still be screened for cervical cancer via the Pap test.

and one in three (33%) had received the recommended three doses, which is much lower than the coverage reported in neighboring countries and in many European nations. In Healthy People 2020 the United States target for HPV vaccination coverage among adolescent females is 80% for the recommended three doses. State-level HPV vaccination coverage levels for one or more doses varied widely in 2012 from 39% of adolescent girls in Florida to 74% in Rhode Island. Iowa's percent was 58%. In 2012, this same survey showed that 21% of adolescent boys ages 13 through 17 nationwide and 19% in Iowa had received one or more doses of HPV vaccine.

While HPV vaccination, containing HPV types 16 and 18, can protect against 70% of cervical cancers and significant percents of HPV-related cancers at other sites, it does not protect against all cancer-causing types of HPV, which means cervical cancer can develop in women who have been vaccinated. Vaccinated and unvaccinated women should still be screened for cervical cancer via the Pap test. In Iowa and nationally in 2012, 78% of women 18+ years of age received a Pap test during the previous three years per CDC's Behavioral Risk Factor Surveillance System (BRFSS) data. In Iowa, the highest percent was 93% among women in the 25-34 age group. The Iowa data also show that Pap testing varies substantially by education level with only 60% of those with less than high school education receiving Pap testing compared with 91% among college graduates (Figure 2). This may relate to lack of health insurance or a consistent source of medical care. The United States Preventive Services Task Force recommends screening for cervical cancer in women ages 21 to 65 years with cytology (Pap smear) every 3 years or, for women ages 30 to 65 years who want to lengthen the screening interval, screening with a combination of cytology and HPV testing every 5 years.

Research Projects During 2014

The State Health Registry of Iowa is participating in over 60 active studies approved by the University of Iowa Human Subjects Office during 2014. Brief descriptions of a few of these studies are provided.

AGRICULTURAL HEALTH STUDY

The Agricultural Health Study (AHS) 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 through the National Cancer Institute and involves several federal agencies. We are in the 22nd year of the study.

In the first five years, 89,658 subjects (58,564 in Iowa and 31,094 in North Carolina) were enrolled in the study. The 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, since 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 and ended in 2010. It involved updating information about exposures and health. The fourth phase of the study began in the fall of 2011 and for the University of Iowa research team primarily involves collection of blood and urine samples from a select subgroup of AHS male participants and collection of buccal cells from AHS participants diagnosed with cancer.

Since 1997, cohort members have been linked annually or biennially 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 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, http://aghealth.nci.nih.gov/. The titles for over 190 publications from this study linked to PubMed are available at the website. The cancer-related references for 2013 publications are provided in the last section of this report.

AYA HOPE STUDY

The Adolescent and Young Adult (AYA) Health Outcomes and Patient Experience (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. From 7 SEER Registries across the United States, 525 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. Those who responded were representative of all AYA cancer survivors during this

time period. 91% of the 525 have completed a subsequent survey 8 to 17 months after the initial survey to obtain additional follow-up information regarding their cancer survivorship experience. During 2013, additional publications that have reported findings from this study 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, who were recruited in 1986 to determine whether diet, body fat distribution and other risk factors are 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. In 2010 the study was refunded for its 25th through 29th years. This study's data have also been pooled with data from other cohort studies and analyzed as international collaborative activities. Over time, this has led to over 250 cancer-related publications, some of which occurred in 2013 and are listed in the references provided in the last section of this report.

LUNG CANCER CARE OUTCOMES/SURVEILLANCE CONSORTIUM

This study involves a statistical coordinating center, the State Health Registry of Iowa, and five other primary data collection and research sites around the United States. Across these sites, we conducted population-based research in the areas of access to care and patterns of care for lung and colorectal cancer. We are evaluating the reasons for particular care decisions by patients and their physicians, including variation in disseminations of modern care protocols and practices in different geographic areas. We are also evaluating the effects of these decisions and practices on patient outcomes, including quality of life. In Iowa, this study was limited to lung cancer patients. Over 1,000 newly diagnosed lung cancer patients were enrolled between June 2003 and March 2005. Thereafter, these patients provided consent for medical record abstraction and participated in follow-up interviews. Several publications have resulted from the findings and those that occurred in 2013 are provided in the last section of this report.

NON-HODGKIN LYMPHOMA (NHL) CASE-CONTROL STUDY

The State Health Registry of Iowa (SHRI) with other investigators 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 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 collaborated with researchers 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. This study's data have also been pooled with data from other NHL case-control studies and analyzed as part of the InterLymph Consortium, a group of international investigators who discuss and undertake research activities with these data. All of these research activities resulted in several publications during 2013. The references for these are provided in the last section of this report.

SECOND CANCER STUDIES INCLUDING THE WECARE STUDY

Over the past three 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 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. Currently, we are evaluating esophagus, pancreas, and stomach as second cancer sites in several of these cohorts, mentioned above, with a first cancer.

The WECARE

(Women's Environmental Cancer and Radiation Epidemiology) Study is an 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 an initial breast cancer as they relate to the development of a second breast cancer in the opposite breast. Eligible cases were diagnosed with a first breast cancer between 1985 and 2009 that did not spread beyond the regional lymph nodes at diagnosis and a second primary contralateral breast cancer diagnosed at least one year after the first breast cancer diagnosis. Eligible controls were women with unilateral breast cancer who were individually matched to cases on year of birth, year of diagnosis, registry region, and race. The controls must have survived without any subsequent diagnosis of cancer and with an intact contralateral breast during the interval that elapsed between their matched case's first and second breast cancer diagnoses. Data collection not only involved medical record review, but also participant interviews and biosample collection, either cheek cells or blood. The WECARE staff is collecting mammographic film data for its research subjects in 2014 to evaluate breast density as another risk factor for a subsequent diagnosis of invasive breast cancer in the contralateral breast. A listing of publications during 2013 from second cancer studies, including the WECARE Study, is 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 was 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 involving epidemiologic and health services research related to the diagnosis and treatment procedures, costs, and survival of cancer patients. Over the years many publications have resulted from this linked data set including several during 2013, which are listed at http://healthservices.cancer.gov/seermedicare/overview/publications.html.

STUDIES INVOLVING TISSUE

Today, researchers are increasingly looking to obtain tissue to study molecular characteristics of cancers. Several studies that involve the State Health Registry of Iowa have included tissue. During 2013, several articles involving tissue from Iowans were published, the references for which are provided in the last section of this report.

TRANSPLANT CANCER MATCH STUDY

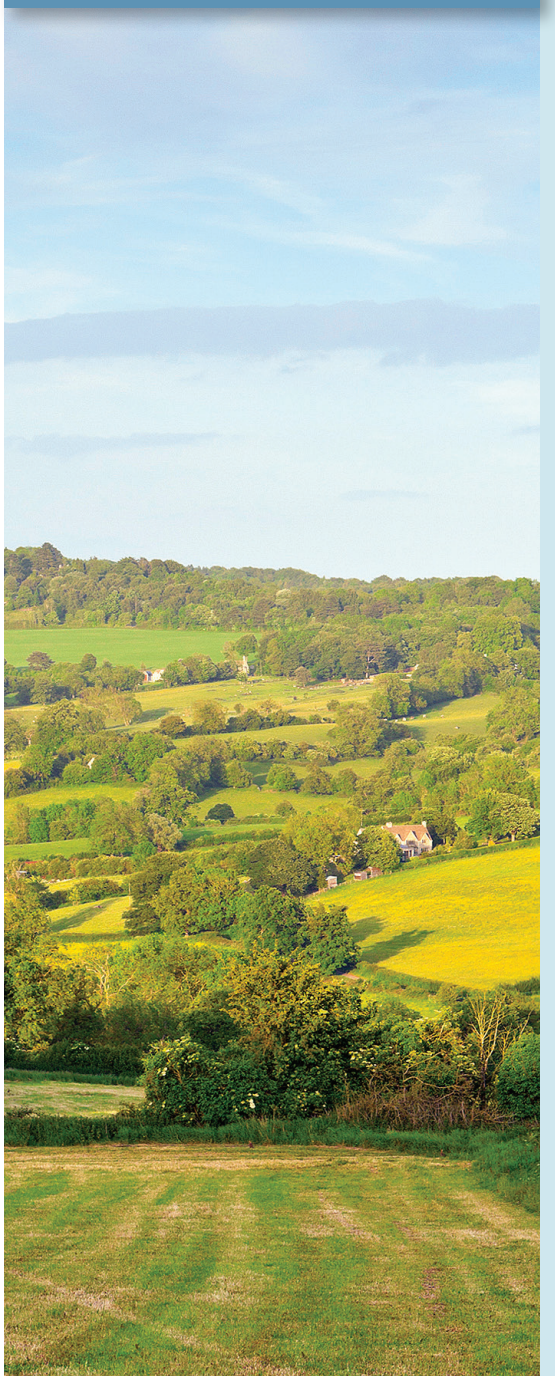
Solid organ transplantation provides life-saving treatment for end-stage organ disease but is associated with substantially elevated cancer risk, largely due to the need to maintain long-term immunosuppression. Important questions remain concerning the role of immunosuppression and other factors in causing cancer in this setting. Staff at two federal agencies, the National Cancer Institute (NCI) and the Health Resources and Services Administration (HRSA), are creating a database through linkage of information during 1987-2009 on 207,889 U.S. transplant recipients, wait list candidates (119,287 in addition to those who were subsequently transplanted), and donors (60,297 deceased donors, 49,054 living donors) with information on cancer from 15 U.S. cancer registries, including the State Health Registry of Iowa. These data are being used to conduct research concerning the spectrum of cancer risk in transplant recipients. The data will also be used by HRSA in its public health role overseeing the U.S. solid organ transplant network to maintain and improve safety of organ transplantation, and will allow NCI to better characterize the burden of cancer in this population and discover additional factors associated with cancer among this population.

COOPERATIVE AGREEMENTS AND OTHER REGISTRIES

In the Midwest, the SHRI maintains cooperative agreements with several states, 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 Health Policy and Research
  - 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 Center for Education and Research on Therapeutics (Iowa CERT)
  - Injury Prevention Research Center
  - Nutrition Center
  - Preventive Intervention Center
  - Reproductive Molecular Epidemiology Research & Education Program

Selected 2013 Publications



AGRICULTURAL HEALTH STUDY

Alavanja MC, Ross MK, Bonner MR. Increased cancer burden among pesticide applicators and others due to pesticide exposure. CA Cancer J Clin. 2013 Mar-Apr;63(2):120-42.

Hou L, Andreotti G, Baccarelli AA, et al. Lifetime pesticide use and telomere shortening among male pesticide applicators in the agricultural health study. Environ Health Perspect. 2013 Aug;121(8):919-24.

Karami S, Andreotti G, Koutros S, et al. Pesticide exposure and inherited variants in vitamin d pathway genes in relation to prostate cancer. Cancer Epidemiol Biomarkers Prev. 2013 Sep;22(9):1557-66.

Koutros S, Beane Freeman LE, Lubin JH, et al. Risk of total and aggressive prostate cancer and pesticide use in the agricultural health study. Am J Epidemiol. 2013 Jan 1;177(1):59-74.

Koutros S, Berndt SI, Hughes Barry K, et al. Genetic susceptibility loci, pesticide exposure and prostate cancer risk. PLoS One. 2013 Apr 4;8(4):e58195.

AYA HOPE STUDY

Kent EE, Smith AW, Keegan TH, et al. Talking about cancer and meeting peer survivors: Social information needs of adolescents and young adults diagnosed with cancer. J Adolesc Young Adult Oncol. 2013 Jun;2(2):44-52.

Smith AW, Bellizzi KM, Keegan TH, et al. Health-related quality of life of adolescent and young adult patients with cancer in the United States: The adolescent and young adult health outcomes and patient experience study. J Clin Oncol. 2013 Jun 10;31(17):2136-45.

Smith AW, Parsons HM, Kent EE, et al. Unmet support service needs and health-related quality of life among adolescents and young adults with cancer: The AYA HOPE study. Front Oncol. 2013 Apr 8;3:75.

IOWA WOMEN'S HEALTH STUDY

Berndt SI, Skibola CF, Joseph V, et al. Genome-wide association study identifies multiple risk loci for chronic lymphocytic leukemia. Nat Genet. 2013 Aug;45(8):868-76.

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