Special Section: Rare Cancers in Adults

Introduction

Any cancer diagnosis is difficult, but rare cancers can be especially challenging for patients, their caregivers, and even clinicians. For many rare cancers, research to identify causes or develop strategies for prevention or early detection is extremely difficult. In addition, rare cancers can be extremely challenging to diagnose, often resulting in numerous physician visits, misdiagnoses, and substantial delays in diagnosis. After diagnosis, patients and caregivers often have a hard time finding information about their cancer, and treatment options are usually more limited and less effective than for more common cancers. This is partly because there are fewer clinical trials for rare cancers, and they are often limited to select, high-volume cancer centers. Consequently, rare cancers are an area of priority for researchers and public health advocates.[1]

Table S1. Statistics for Select Rare Cancers, Ages 20+ Years

	Incidence				Mortality		Relative survival
	Rate* 2009-2013	Male: female rate ratio	Trend (APC) 2004-2013	% local stage 2009-2013	Rate* 2010-2014	Trend (APC) 2005-2014	5-year (%) 2006-2012
Oral cavity & pharynx							
Lip	0.8	3.4	-2.4†	83	<0.1	-3.4†	89
Tongue	4.7	2.8	1.9†	33	0.9	-0.3†	65
Salivary gland	1.7	1.8	0.3†	43	0.3	1.0†	72
Floor of mouth	0.8	2.5	-3.2†	44	<0.1	-8.1†	52
Gum & other mouth	2.2	1.5	-0.2	40	0.5	-0.2	59
Nasopharynx‡	0.7	2.7	-0.9†	9	0.3	-1.4†	60
Tonsil	2.9	4.9	3.1†	12	0.3	1.3†	73
Oropharynx	0.7	3.6	1.3†	14	0.3	2.5†	43
Hypopharynx	0.9	4.7	-2.6†	17	0.1	-1.3	33
Digestive system							
Small intestine	3.2	1.3	1.7†	32	0.5	0.1	67
Anus, anal canal, & anorectum	2.5	0.7	1.6†	47	0.3	3.0†	66
Gallbladder	1.6	0.6	-0.6†	10	0.9	-0.7†	19
Retroperitoneum	0.5	1.1	-0.2	43	0.1	-3.4†	53
Peritoneum, omentum, & mesentery	0.8	0.1	-2.3†	18	0.4	0.0	33
Respiratory system							
Nose, nasal cavity, & middle ear	0.9	1.8	-0.6†	27	0.2	-2.0†	56
Larynx	5.0	4.5	-2.5†	53	1.4	-2.1†	61
Trachea, mediastinum	0.2	2.5	-1.3†	30	0.1	-3.8†	46
Genitourinary system							
Vagina	1.0	–	-0.9†	32	0.3	-1.3†	47
Vulva	3.6	–	0.5†	60	0.7	0.6	72
Penis	1.2	–	-0.1	57	0.2	-0.6†	69
Testis	7.2	–	0.2	68	0.3	-0.4†	95
Ureter	0.8	2.2	-1.5	45	0.2	-0.7†	47
Other rare cancers							
Male breast cancer	1.9	–	0.2	47	0.4	-1.1†	84
Bones & joints	1.0	1.4	-0.2†	40	0.5	-0.4†	66
Soft tissue, including heart	4.2	1.5	0.4	58	1.8	0.5†	64
Eye & orbit	1.0	1.4	-0.7	73	0.1	1.5	80
Mesothelioma	1.4	4.3	-1.8†	9	1.1	-1.4†	10
Kaposi sarcoma	0.5	9.6	-3.4†	56	<0.1	1.3	73

APC= annual percent change. *Rate per 100,000 population. †Indicates APC significantly different from zero, p<0.05. ‡Nasopharygeal cancers are classified with oral cavity/pharynx here, consistent with SEER coding, but are described in the section on respiratory cancers in the text because the nasopharynx is technically part of the respiratory system. Note: All male:female incidence rate ratios are significantly different from 1.0, p<0.05.

Sources: Data for overall incidence rate, male: female rate ratio, and percent local stage are from the North American Association for Central Cancer Registries (NAACCR) and include information from all states and DC, except MN, NM, and NV. Incidence trends are based on NAACCR data from 1995 to 2013 from 26 states, representing 67% of the US population. Data for 5-year relative survival are from the Surveillance, Epidemiology, and End Results (SEER) program, 18 SEER registries, covering approximately 28% of the US population. Mortality data for rates and trends cover the entire US and are from the National Center for Health Statistics.

In this report, we provide incidence and mortality rates and trends, stage at diagnosis, and survival for 28 rare cancers in adults ages 20 and older in the United States, as well as an overview of symptoms and risk factors for a subset of these cancers, to inform policy makers, researchers, and the general public. Childhood cancers are described briefly on page 12 and were the topic of the *Cancer Facts & Figures* Special Section in 2014 (cancer.org/statistics).

What is a rare cancer?

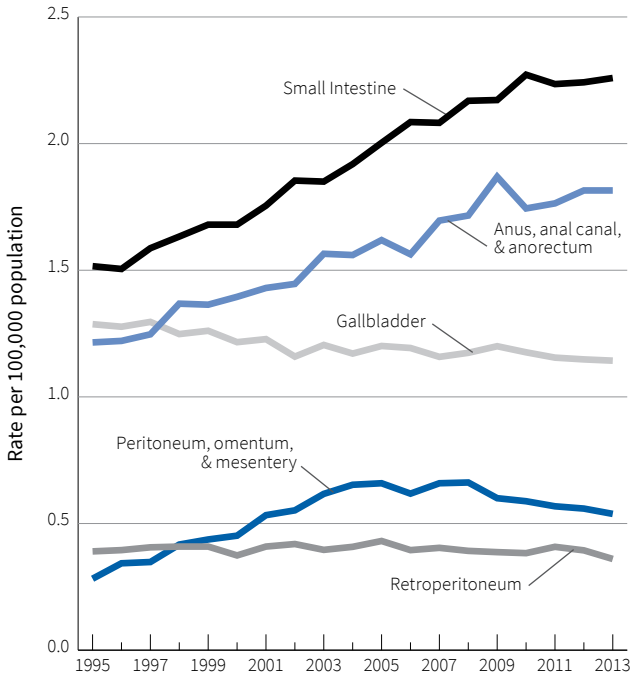
There is no universally adopted definition for rare cancers. The National Cancer Institute definition is fewer than 15 cases per 100,000 people per year. More recently, a consortium from the European Union (RARECARE)[2] defined rare cancers as those with fewer than 6 cases per 100,000 people per year, which is the definition we use in this report. To put this in perspective, the incidence rate for both breast and prostate cancer, the most common cancers in women and men, respectively, is currently about 123 cases per 100,000.

Historically, cancers have been categorized by the location in the body (anatomic site) and type of tissue (histology) from which they originate. Today, genetic information is increasingly used to group cancers according to a tumor's biological makeup (i.e., molecular subtype), resulting in the subdivision of some more common cancers into a collection of rarer cancers. However, given the limited data on molecular subtypes available from cancer registries, the cancers described herein are primarily defined by site of origin. Although the incidence rate for testicular cancer (7.2 per 100,000) is slightly higher than the threshold for our definition, we included it because it is often considered a rare cancer. Most leukemia subtypes and Hodgkin lymphoma are rare by definition, but are not included here because they are described in detail elsewhere (pages 16 and 19), as are cancers of the oral cavity and pharynx (page 20).

How many rare cancers are expected to be diagnosed in adults in 2017?

Nearly 13% (1 in 8) of all cancers diagnosed in adults ages 20 and older are rare based on our definition, the equivalent of approximately 208,000 new cases in 2017. (This does not include the 8,850 cases of testicular cancer.)

Figure S1. Trends in Incidence Rates for Select Rare Cancers of the Digestive System, Adults 20+, 1995-2013



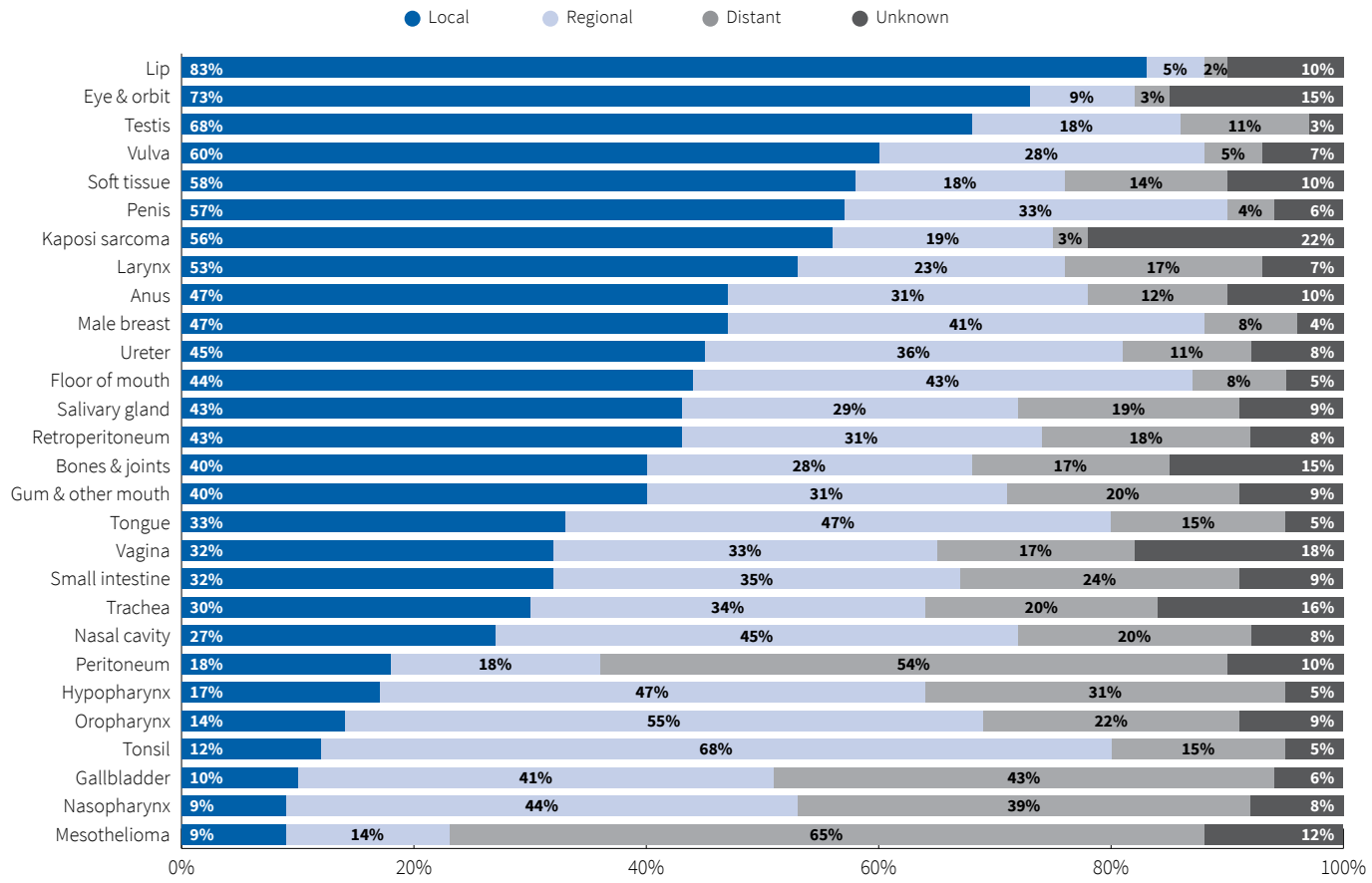
Source: NAACCR, 2016.

Selected rare cancers

Digestive system

The most common of the rare cancers of the digestive system is cancer of the small intestine (Table S1). The small intestine is a long coiled tube connecting the stomach to the colon, and consists of three main parts: the duodenum, jejunum, and ileum. Although the small intestine comprises 75% of the length and 90% of the mucosal lining of the gastrointestinal system, only about 4% of gastrointestinal cancers occur there.[3] Cancers of the small intestine most commonly arise in the duodenum, the uppermost portion of the small intestine that connects to the stomach. The four main types of cancer that occur in the small intestine are carcinoid tumors (48%), which arise from neuroendocrine cells and secrete hormones; adenocarcinomas (28%), which arise from the glandular cells that line the small intestine; lymphomas (13%), which arise from lymphoid tissue; and sarcomas (9%), most of which are stromal tumors. Risk factors for small intestine cancers include a personal history of colorectal cancer, Crohn disease, or celiac disease, as well as hereditary

Figure S2. Stage Distribution for Select Rare Cancers, Adults 20+, 2009-2013

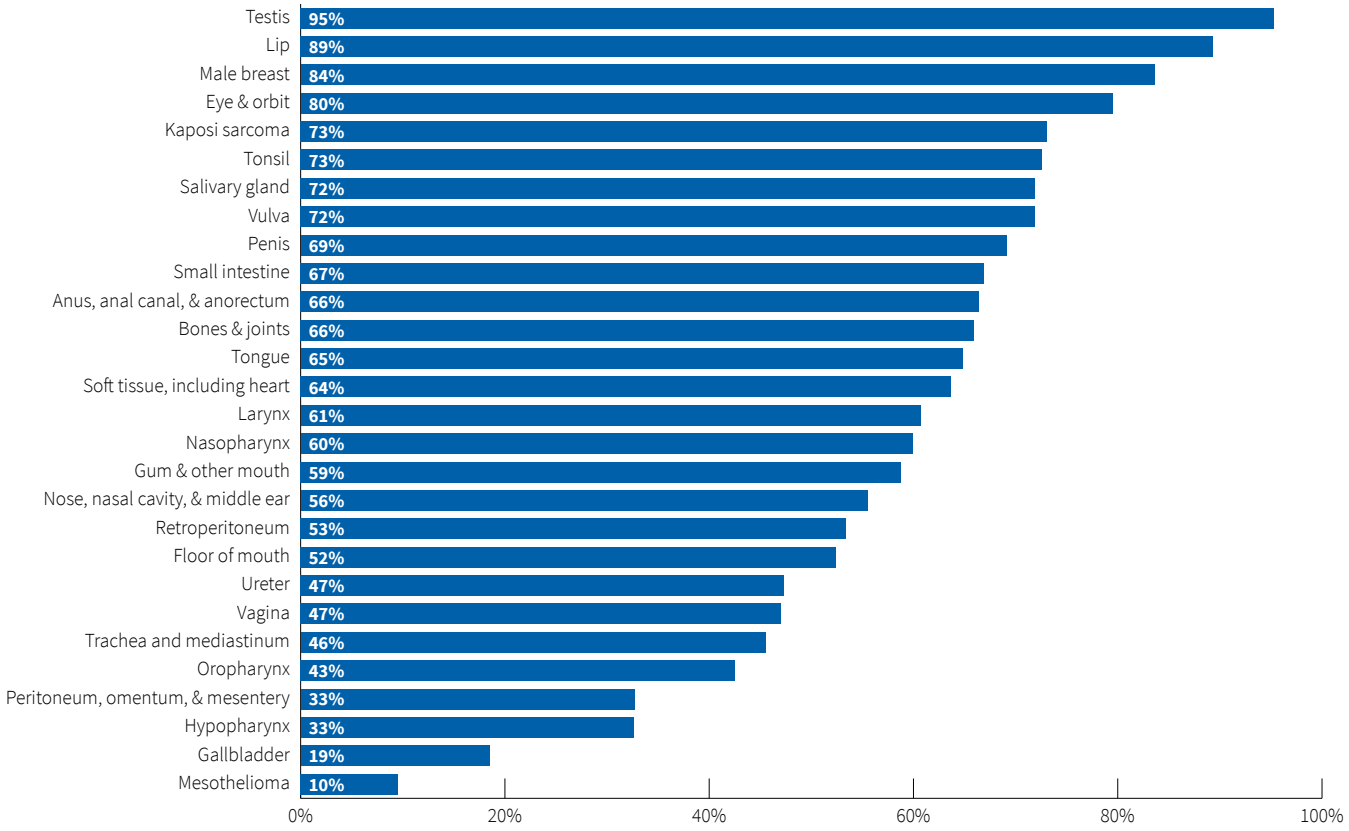


Source: NAACCR, 2016.

conditions such as Lynch syndrome and familial adenomatous polyposis.[4] Some studies suggest that cancers of the small intestine may share risk factors with colorectal cancer, such as obesity and alcohol consumption.[5-7] Consistent with colorectal cancer, small intestine cancers are slightly (1.3 times) more common among men than women and the highest rates are in blacks (5.1 per 100,000 versus 3.1 in non-Hispanic whites) (Table S2, page 34). Incidence rates for cancers of the small intestine increased sharply by 2.8% per year from 1995 to 2010, but then were stable through 2013 (Figure S1, page 31). The leveling off of rates in recent years may in part reflect reporting delays rather than reduced occurrence. Similar to colorectal cancer, signs of small intestine cancer usually don't occur until the tumor is advanced and are non-specific, such as abdominal pain and unintended weight loss. More than half (59%) of small intestine cancers are diagnosed at regional or distant stages (Figure S2). Five-year relative survival rates for cancers of the small intestine by stage at diagnosis are 83%, 73%, and 43% for cancers diagnosed at local, regional, and distant stages, respectively.

The anus is the second most common rare cancer site within the digestive system. The anus, anal canal, and anorectum comprise the final three centimeters of the gastrointestinal tract, from which solid waste passed from the rectum is expelled. More than 90% of anal cancers are caused by human papillomavirus (HPV) infection.[8] Anal cancer is one of the few cancers more common in women than in men overall;[9] however, the pattern varies by race/ethnicity and age. Overall, non-Hispanic white women and black men have the highest rates in the US (3.3 and 2.8 per 100,000, respectively). Among whites, rates are higher in women than men in every age group. However, black men have higher rates

Figure S3. Five-year Relative Survival for Select Rare Cancers, Adults 20+, 2006-2012*



*Survival based on patients diagnosed during 2006-2012 and followed through 2013.
Source: SEER 18, 2016.

than black women before age 60, but the reverse is true among older blacks.[3] Anal cancer incidence rates increased by 1.6% per year from 2004-2013 (Figure S1, page 31). Anal cancer death rates also increased sharply by 3.0% per year from 1998 to 2014. The risk of anal cancer is 32 times higher in persons infected with the human immunodeficiency virus (HIV) compared to the general population.[10] The growth and aging of the HIV-infected population is believed to have contributed to the increased anal cancer burden in the US.[11] Bleeding is usually the first sign of anal cancer, and nearly half of patients are diagnosed at a localized stage, for which the 5-year relative survival rate is 81%. The overall 5-year relative survival rate for anal cancer is 66% (Figure S3).

The gallbladder is a small organ under the liver that concentrates and stores bile to aid digestion. Gallbladder cancer is unique in that incidence rates are about 66% higher in women than in men. Risk factors for gallbladder cancer include gallstones (cholelithiasis) and excess body weight (particularly in women).[12, 13] A recent study found that a 5 kg/m^2 increase in body mass index was associated with a 31% higher risk of gallbladder cancer.[14] Hispanics (2.8 per 100,000) and blacks (2.4 per 100,000) have the highest rates, about 1.5-2 times higher than those in non-Hispanic whites (1.3 per 100,000). However, some studies have shown that rates are even higher among Native Americans in the Southwest and Alaska Natives.[15] Incidence and death rates for gallbladder cancer decreased over the past decade, by 0.6% and 0.7% per year, respectively. Gallbladder cancers usually do not cause symptoms until the disease is advanced. As a result, only 10% of the cancers are diagnosed at a local stage, and overall 5-year survival is just 19% (Table S1, page 30).

Table S2. Incidence Rates* for Rare Cancers for Both Sexes Combined by Race/ethnicity, Ages 20+, 2009-2013

	Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian/ Pacific Islander
Oral cavity & pharynx				
Lip	1.0	0.1	0.4	0.1
Tongue	5.4	2.9	2.7	2.5
Salivary gland	1.8	1.5	1.3	1.3
Floor of mouth	0.9	0.8	0.5	0.3
Gum & other mouth	2.2	1.9	1.6	1.8
Nasopharynx†	0.5	0.9	0.5	3.1
Tonsil	3.3	2.2	1.6	0.7
Oropharynx	0.7	1.0	0.4	0.2
Hypopharynx	0.9	1.4	0.7	0.5
Digestive system				
Small Intestine	3.1	5.1	2.4	1.5
Anus, anal canal, & anorectum	2.7	2.6	1.9	0.7
Gallbladder	1.3	2.4	2.8	1.8
Retroperitoneum	0.5	0.5	0.5	0.4
Peritoneum, omentum, & mesentery	0.9	0.6	0.6	0.5
Respiratory system				
Nose, nasal cavity, & middle ear	0.9	0.9	0.9	0.7
Larynx	5.1	6.7	3.6	1.6
Trachea & mediastinum	0.2	0.2	0.2	0.2
Genitourinary system				
Vagina	0.9	1.3	1.0	0.6
Vulva	4.0	2.6	2.4	1.1
Penis	1.1	1.4	1.9	0.6
Testis	9.1	2.0	5.6	2.3
Ureter	0.9	0.4	0.4	0.7
Other rare cancers				
Male breast	1.9	2.7	1.1	0.8
Bones & joints	1.0	0.8	0.9	0.6
Soft tissue, including heart	4.2	4.4	3.7	2.9
Eye & orbit	1.2	0.2	0.6	0.2
Mesothelioma	1.5	0.7	1.0	0.5
Kaposi sarcoma	0.3	1.2	0.9	0.2

*Per 100,000 population. †Nasopharygeal cancers are included in the text with other cancers of the respiratory system.

Source: NAACCR, 2016.

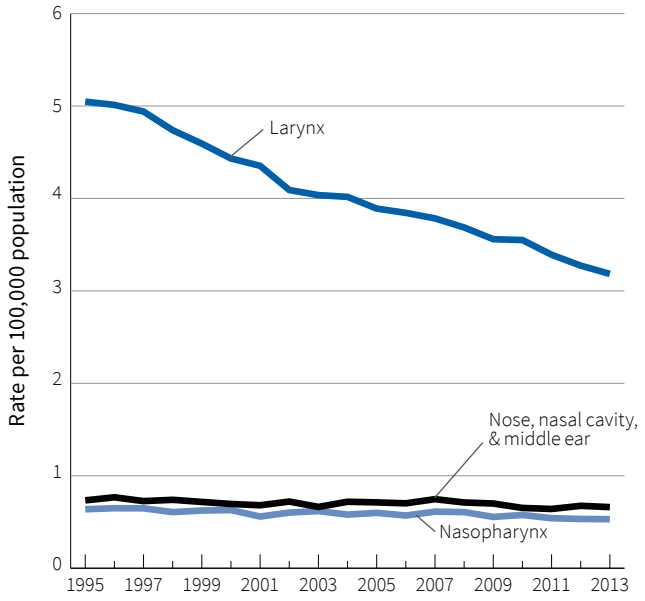
Respiratory system

The most common rare cancers of the respiratory system occur in the larynx, nasopharynx, and nose and nasal cavity. The larynx is the part of the throat between the base of the tongue and the trachea (windpipe); it is also called the voice box because it contains the vocal cords. The major risk factors for laryngeal cancer are tobacco use and alcohol consumption.[16-17] Studies suggest that approximately 20% of all laryngeal cancers are associated with HPV infection.[18] Laryngeal cancer rates are 4-5 times higher in males than females. The highest incidence rates are in blacks (6.7 per 100,000), and the lowest are in Asians/Pacific Islanders (1.6 per 100,000) (Table S2). Incidence and death rates for laryngeal cancer have decreased sharply, by more than 2% per year over the past decade (Figure S4), largely due to declines in smoking prevalence. Nearly half (48%) of laryngeal cancers arise from the vocal cords (glottis). These cancers are often (79%) diagnosed at a local stage because they cause voice changes or hoarseness early in the course of disease. Cancers that arise in other parts of the larynx typically cause non-specific symptoms, such as a persistent sore throat or cough, and are less likely to be diagnosed early. The overall 5-year relative survival rate for laryngeal cancer is 61%.

The nasopharynx is the upper part of the throat, behind the nose. Risk factors for nasopharyngeal cancers include Epstein-Barr virus infection, consumption of salted, preserved fish, and a family history of the disease.[19] In the United States, the incidence rate in Asians/Pacific Islanders (3.1 per 100,000) is more than six times higher than that in whites and Hispanics (both 0.5 per 100,000) and about 3.5 times higher than that in blacks (0.9 per 100,000). Similarly, incidence is particularly high among some Asian populations, particularly in southern China and southeastern Asia.[19-21] Relatively high rates of nasopharyngeal cancer have also been noted in Alaska Natives.[22] Over the past decade, nasopharyngeal cancer incidence and death rates declined by 0.9% per year and 1.4% per year, respectively. Most (83%) nasopharyngeal cancers are diagnosed at regional or distant stages (Figure S2, page 32). The overall 5-year relative survival rate is 60% (Figure S3, page 33).

Some cancers of the nose, nasal cavity, and middle ear are associated with workplace exposures, including dusts from wood and leather related to furniture and cabinet making and shoe manufacturing,[23-25] while others are linked to HPV infection.[26] These cancers occur nearly twice as often in men than women. Since the 1990s, incidence rates have decreased by 0.6% per year (Figure S4) and death rates have decreased by 2.0% per year.

Figure S4. Trends in Incidence Rates for Select Rare Cancers of the Respiratory System, Adults 20+, 1995-2013



Source: NAACCR, 2016.

Overall 5-year relative survival for nose, nasal cavity, and middle ear cancer is 56%. More than half (65%) of these cancers are diagnosed at a regional or distant stage, for which the 5-year survival is 49% and 37%, respectively.

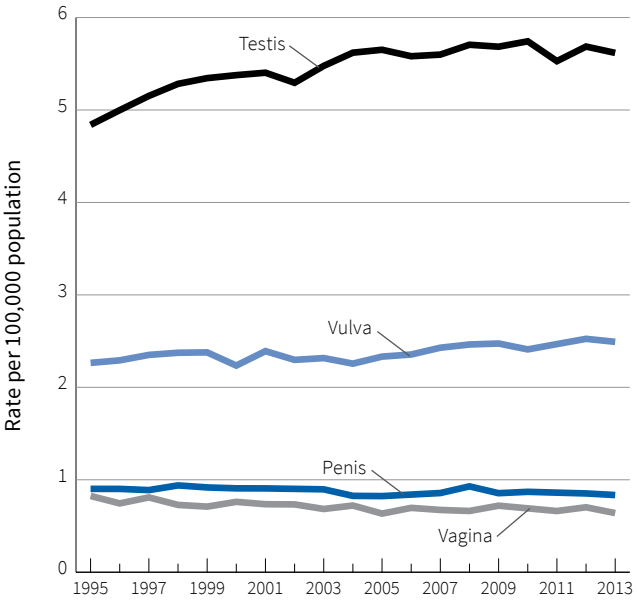
Genitourinary system

Rare cancers of the genitourinary system include cancers of the vulva, vagina, penis, and testis. The vagina is a 3- to 4-inch tube, sometimes referred to as the birth canal, that extends from the cervix to the vulva (the outer part of female genitals). Similar to cervical cancer, persistent HPV infection and smoking are major risk factors for vaginal and vulvar cancers.[27,28] A recent analysis estimated that 75% of vaginal cancers and 69% of vulvar cancers diagnosed during 2008-2012 in the US were attributable to HPV infections.[8] However, in contrast to cervical cancer, for which incidence peaks in women in their 30s and 40s, incidence rates continually increase with age for both vaginal and vulvar cancers. Among the four broad racial/ethnic groups, incidence rates are highest in non-Hispanic white women for vulvar cancer and in black women for vaginal cancer (Table S2). Since the 1990s, incidence and death rates decreased by about 1% per year for vaginal cancer, and were stable or slightly increasing for vulvar cancer (Figure S5, page 36). Most women with vaginal or vulvar cancers have early symptoms. For vaginal cancer, these include abnormal bleeding, discharge, or pain during intercourse. Vulvar cancer can present as a lump or bump, persistent itching, pain, or soreness. Vulvar cancers are more likely than vaginal cancers to be diagnosed at a localized stage (60% versus 32%), which is reflected in the overall 5-year relative survival rates of 72% versus 47%, respectively.

Similar to female genital cancers, most (63%) penile cancers are associated with HPV infection.[8,29] Smoking is associated with more than a 4-fold increased risk for penile cancer, while circumcision decreases risk.[30] Incidence rates for penile cancers are highest in Hispanic men (1.9 per 100,000), followed by black (1.4 per 100,000), white (1.1 per 100,000), and Asian/Pacific Islander (0.6 per 100,000) men. Incidence rates for penile cancers were relatively stable from 2004-2013, while death rates declined slightly by 0.6% per year (Table S1, page 30). Penile cancer often presents as a change in color or thickening of the skin, or as a growth, sore, or rash. More than half (57%) of penile cancers are diagnosed at a localized stage, for which 5-year relative survival is 81%.

Testicular cancer is the most commonly diagnosed cancer among men between the ages of 15 and 44. Most (97%) testicular cancers are testicular germ cell tumors (TGCT), which arise from cells that normally develop into sperm cells.[3] The two main types of TGCT are seminomas and non-seminomas. Seminomas are slow-growing tumors usually diagnosed in men in their late 20s to late 40s. Non-seminomas generally occur in men in their late teens to early 40s and tend to be more aggressive. The main risk factors for testicular cancer are cryptorchidism (undescended testicle), a personal or family history of testicular cancer (particularly a brother), and Northern European ancestry.[31] Research also suggests that men who are employed as firefighters or airplane mechanics, or who are exposed to organochlorine pesticides, are at increased risk.[31] Incidence rates are highest in white men (9.1 per 100,000) followed by Hispanic men (5.6 per 100,000), and are much lower in black (2.0 per 100,000) and Asian/

Figure S5. Trends in Incidence Rates for Select Rare Cancers of the Genitourinary System, Adults 20+, 1995-2013



Source: NAACCR, 2016.

Pacific Islander (2.3 per 100,000) men. Racial variation in the US reflects differences worldwide, with the highest testicular cancer rates in Scandinavian countries and the lowest rates in African and Asian countries.[31] Testicular cancer incidence rates have increased in the US and in many western countries over the past 40 years.[32] In contrast, death rates have slowly declined by 0.4% per year from 1990 to 2014. A lump on the testicle is usually the first sign and often leads to diagnosis at an early stage; approximately 68% of testicular cancers are diagnosed at a localized stage. Prognosis for testicular cancer is generally very good. Overall 5-year relative survival is 95% (Figure S3, page 33). Even cancers diagnosed at a distant stage are often successfully treated, with a 5-year relative survival of 73%.

Other rare cancers

Bone and joint

The two main types of bone and joint cancer in adults are chondrosarcoma (35%), which arises in the cartilage, and osteosarcoma (22%), which usually arises from the growing end of long bones. Risk factors for bone cancer include previous radiation treatment, especially at a young age and/or with higher doses, and certain inherited conditions (e.g., Li-Fraumeni syndrome, retinoblastoma).[33] Early signs of bone cancer include pain and swelling around the affected bone. Incidence and death rates for bone cancer have declined slightly (0.2% to 0.4% per year) since 1995. Approximately 40% of bone cancers are diagnosed at a localized stage, for which the 5-year relative survival is 85%. The overall 5-year relative survival for adult bone cancer is 66%, but is higher for chondrosarcoma (80%) than osteosarcoma (54%).[34]

Soft tissue

Soft tissue sarcomas are a diverse group of cancers, including those comprised of cells that resemble adipose (fat) tissue (liposarcoma), skeletal muscle (rhabdomyosarcoma), smooth muscle (leiomyosarcoma), and the linings of blood and lymph vessels (angiosarcoma). Soft tissue sarcoma can also affect more than one type of body tissue, or have no clear origin. There are more than 70 different types of soft tissue sarcoma. Most arise in the arms or legs, but they can be found in any part of the body, including the trunk, head and neck, internal organs, and in the area behind the abdominal cavity (retroperitoneum). The rarity and variety of this cancer make it very difficult to study. Little is known about what causes soft tissue sarcomas, but similar to bone cancer, radiation and certain inherited conditions (neurofibromatosis, Gardner syndrome, and Li-Fraumeni syndrome) are associated with increased risk.[35] Overall incidence rates for soft tissue sarcomas are highest in blacks and lowest in Asians/Pacific Islanders (Table S2, page 34). Incidence rates for soft tissue cancers increased 1.3% per year from 1995 to 2009, and subsequently leveled off (Figure S6). Death rates increased slightly (0.5% per year) from 2001 to 2014. Soft tissue sarcomas often begin as a painless lump, sometimes facilitating early diagnosis; 58% are diagnosed at a localized stage. The prognosis of soft tissue sarcoma varies widely by subtype. Overall 5-year relative survival is 64%, but increases to 80% when cancers are diagnosed at a local stage.

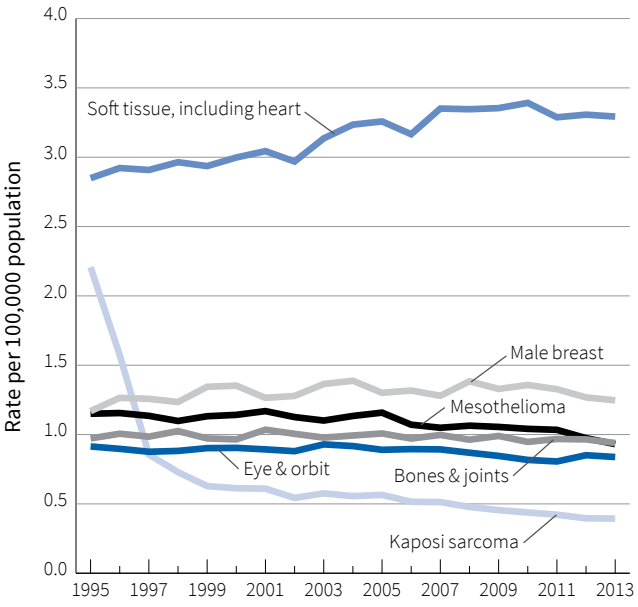
Eye and orbit

Most cancers of the eye and orbit are ocular melanomas. (Lymphoma can occur in the eye, but these are classified as lymphomas). Similar to melanoma of the skin, the risk of ocular melanoma is highest in whites, particularly those with fair skin and light eyes. However, it is not clear if exposure to sunlight or ultraviolet light increases risk.[36,37] Incidence rates for eye and orbit cancer have been relatively stable, whereas death rates declined sharply (2.8% per year) from 1990 to 2004, and subsequently leveled off. Symptoms of eye and orbit cancers include changes in vision or in the shape of the eye, which may be discovered during an ophthalmologic exam. Nearly three-quarters of eye and orbit cancers are diagnosed at a localized stage (Figure S2, page 32), for which the 5-year relative survival rate is 85%.

Male breast

Although breast cancer is commonly thought of as a woman's disease, it also occurs in men. Obesity, gynecomastia (swelling of breast tissue caused by a hormone imbalance), diabetes, and Klinefelter syndrome are independent risk factors for male breast cancer.[38]

Figure S6. Trends in Incidence Rates for Other Select Rare Cancers, Adults 20+, 1995-2013



Source: NAACCR, 2016.

Radiation exposure, *BRCA1/2* gene mutations, and a family history of male or female breast cancer are also associated with increased risk.[39] The highest rates of male breast cancer are in black (2.7 per 100,000) and white (1.9 per 100,000) men (Table S2, page 34). Male breast cancer rates were stable from 1995 to 2013, while death rates decreased by 1.2% per year since 1993. A lump in the breast is usually the first sign of breast cancer in men. Breast cancers in men are more likely than those in women to be diagnosed at an advanced stage, in part because men are not screened for breast cancer and because of lack of awareness. Breast cancer survival in males and females is similar for each stage at diagnosis. However, because men are more likely to be diagnosed with advanced disease, the overall 5-year survival in men is 84%, compared to 90% in women.

Mesothelioma

Mesothelioma is named for mesothelial cells, which line certain body cavities and from which the cancer arises. Most cases (81%) occur in the pleura (the lining of the lungs and chest cavity) or the peritoneum (the lining of the abdomen) (9%). The main risk factor for mesothelioma is asbestos exposure, particularly in the workplace.[40] Government safety regulations and new workplace practices have reduced the risk for some workers. Other environmental exposures, including some naturally occurring mineral fibers, are also thought to contribute to the occurrence of mesothelioma, particularly those in the peritoneum.[41] Rates of mesothelioma are four times higher in men than in women, reflecting occupational exposures. Incidence rates are twice as high in non-Hispanic whites (1.5 per 100,000) as in blacks (0.7 per 100,000) (Table S2, page 34). Mesothelioma incidence rates increased until the mid-1990s, remained level for several years, and began to decline in 2005 (Figure S6). From 2005 to 2013, incidence rates remained stable in women, while declining (2.6% per year) in men, reflecting the reduction in workplace exposure to asbestos. Similarly, mesothelioma death rates declined in men (1.5% per year from 1999-2014), but were stable in women. Symptoms of mesothelioma can include shortness of breath, wheezing or hoarseness, a persistent cough, and pain in the chest or lower back. People who have been exposed to asbestos should be familiar with these symptoms and seek care if

they occur. There is usually a delay of 20 to 50 years between exposure to asbestos and a mesothelioma diagnosis. Five-year relative survival for mesothelioma is only 10% because the disease is often diagnosed at an advanced stage and it is difficult to treat.

Kaposi sarcoma (KS)

There are 4 types of Kaposi sarcoma. Classic KS occurs primarily in older people of Mediterranean or Jewish descent; endemic KS occurs in people living in Equatorial Africa, often in those younger than 40; iatrogenic KS, which is associated with immune suppression drug therapy given to transplant recipients; and AIDS-related KS, also called epidemic Kaposi sarcoma. KS is caused by infection with KS-associated herpesvirus, and most cases in the US occur in people with AIDS.[42] Combined antiretroviral therapy reduces the risk of both AIDS and KS in people infected with HIV. KS rates in the US are nearly 10 times higher in men than women and are higher for blacks and Hispanics than other groups (Table S2, page 34), reflecting sex and racial/ethnic differences in rates of HIV infection.[43] Rates for KS peaked in the early 1990s, corresponding to the peak of the AIDS epidemic in the US, and since have been declining rapidly (Figure S6, page 37). From 1998 to 2013, incidence rates declined by 3.4% per year. Skin lesions (which may be purple, red, or brown) are typically the first signs of KS. Lesions can also appear on mucous membranes, such as the linings of the mouth or throat, or in other parts of the body, such as the lungs, stomach, or intestines. People with HIV should be examined regularly by a health care provider experienced with recognizing KS and other HIV-related diseases. People with KS often die from other AIDS-related diseases; 5-year relative survival for KS is 73%.

Conclusion

In this report we have provided an overview of the burden of rare cancers in US adults. Approximately 208,000 rare cancers will be diagnosed in adults in 2017, not to mention those diagnosed with a rare subtype of a more common cancer. In large part because of historically limited attention and investment, much less is known about this diverse group of cancers. In recent years, national and international collaborations have formed to address some of the challenges associated with rare diseases. In Europe, the RARECARE project was initiated to define the burden of rare cancers, and subsequently transitioned to RARECAREnet to increase awareness, provide information, and improve outcomes for rare cancers. In the US, in 2013, the National Cancer Institute launched the Rare Tumors Initiative, a collaboration of scientists, advocates, and industry experts with the goal of advancing research and treatment for rare cancers. In addition, one of the goals of the 2014 transformation of the National Cancer Institute's clinical trial program (National Clinical Trials Network) is to improve the care of patients with rare and molecularly defined cancers. Continued efforts are needed to diagnose rare cancers earlier and improve survival. Discoveries for rare cancers can further knowledge for all cancers.

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