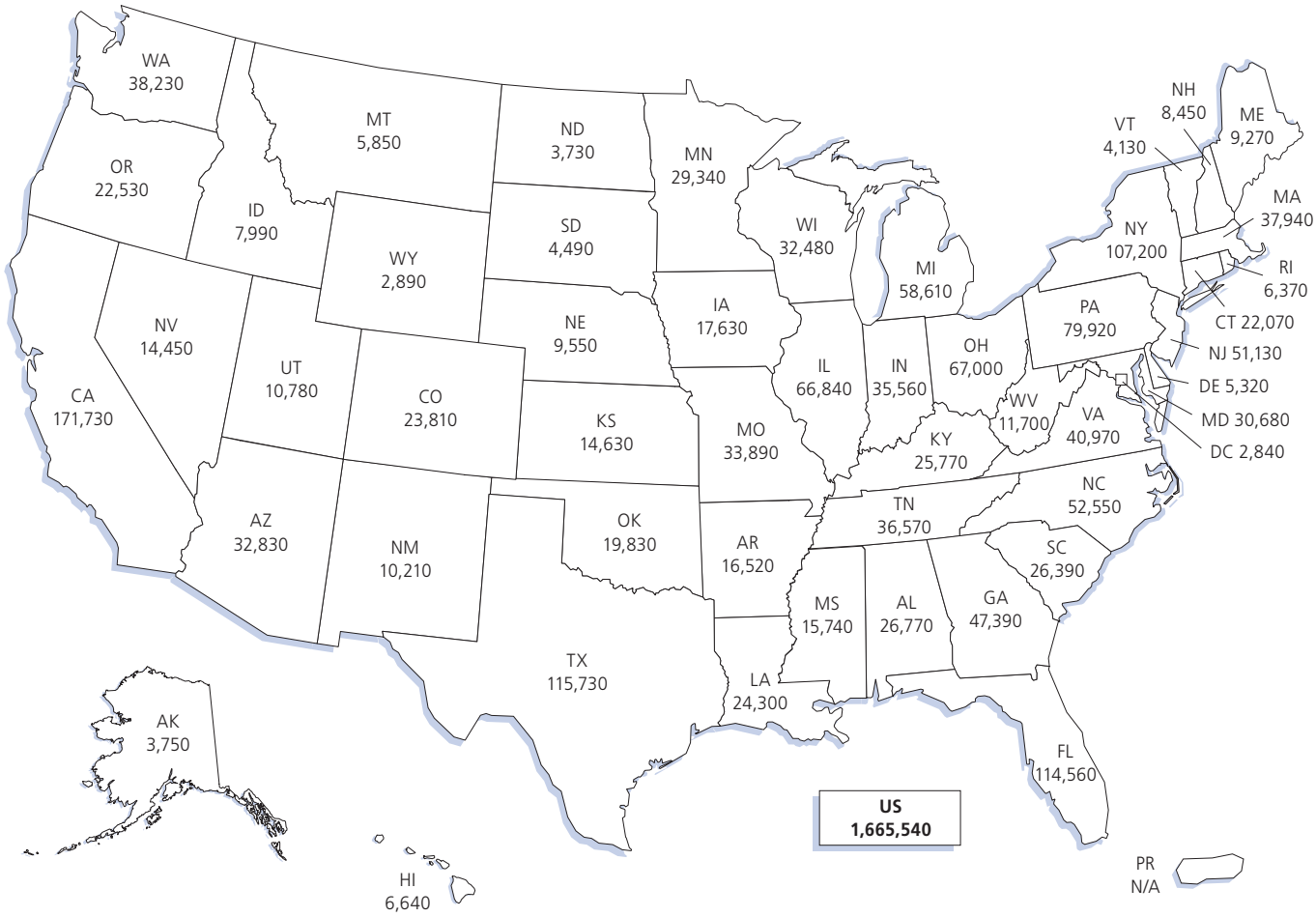
Cancer Facts & Figures 2014



Estimated numbers of new cancer cases for 2014, excluding basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder.
Note: State estimates are offered as a rough guide and should be interpreted with caution. State estimates may not add to US total due to rounding.

Special Section:
Childhood & Adolescent Cancers
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Basic Cancer Facts

What Is Cancer?

Cancer is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death. Cancer is caused by both external factors (tobacco, infectious organisms, chemicals, and radiation) and internal factors (inherited mutations, hormones, immune conditions, and mutations that occur from metabolism). These causal factors may act together or in sequence to initiate or promote the development of cancer. Ten or more years often pass between exposure to external factors and detectable cancer. Cancer is treated with surgery, radiation, chemotherapy, hormone therapy, immune therapy, and targeted therapy.

Can Cancer Be Prevented?

A substantial proportion of cancers could be prevented. All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. In 2014, almost 176,000 of the estimated 585,720 cancer deaths will be caused by tobacco use. In addition, the World Cancer Research Fund has estimated that up to one-third of the cancer cases that occur in economically developed countries like the US are related to overweight or obesity, physical inactivity, and/or poor nutrition, and thus could also be prevented. Certain cancers are related to infectious agents, such as human papillomavirus (HPV), hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and *Helicobacter pylori (H. pylori)*. Many of these cancers could be prevented through behavioral changes or the use of protective vaccinations or antibiotic treatments. Many of the more than 3 million skin cancer cases that are diagnosed annually could be prevented by protecting skin from excessive sun exposure and avoiding indoor tanning.

Screening offers the ability for secondary prevention by detecting cancer early, before symptoms appear. Early detection usually results in less extensive treatment and better outcomes. Screening is known to reduce mortality for cancers of the breast, colon, rectum, cervix, and lung (among heavy smokers). A heightened awareness of changes in the breast, skin, or testicles may also result in detection of tumors at earlier stages. Screening for colorectal and cervical cancers can actually prevent cancer by allowing for the detection and removal of pre-cancerous lesions. For complete cancer screening guidelines, see page 68.

Who Is at Risk of Developing Cancer?

Anyone can develop cancer. Since the risk of being diagnosed with cancer increases with age, most cases occur in adults who are middle aged or older. About 77% of all cancers are diagnosed in people 55 years of age and older. Cancer researchers use the word "risk" in different ways, most commonly expressing risk as lifetime risk or relative risk. In this publication, lifetime risk refers to the probability that an individual will develop or die from cancer over the course of a lifetime. In the US, men have slightly less than a 1 in 2 lifetime risk of developing cancer; for women, the risk is a little more than 1 in 3. It is important to note that these probabilities are estimated based on the overall experience of the general population. Individuals within the population may have higher or lower risk because of differences in exposures (e.g., smoking), and/or genetic susceptibility.

Relative risk is a measure of the strength of the relationship between a risk factor and cancer. It compares the risk of developing cancer in people with a certain exposure or trait to the risk in people who do not have this characteristic. For example, male smokers are about 23 times more likely to develop lung cancer than nonsmokers, so their relative risk is 23. Most relative risks are not this large. For example, women who have a first-degree relative (mother, sister, or daughter) with a history of breast cancer are about twice as likely to develop breast cancer as women who do not have this family history.

All cancers involve the malfunction of genes that control cell growth and division. Only a small proportion of cancers are strongly hereditary, in that an inherited genetic alteration confers a very high risk for developing cancer. Inherited factors play a larger role in determining risk for some cancers (e.g., colorectal, breast, and prostate) than for others. It is now thought that many familial cancers arise from the interplay between common gene variations and lifestyle/environmental risk factors. However, most cancers do not result from inherited genes but from damage to genes occurring during a person's lifetime. Genetic damage may result from internal factors, such as hormones or the metabolism of nutrients within cells, or external factors, such as tobacco, or excessive exposure to chemicals, sunlight, or ionizing radiation.

How Many People Alive Today Have Ever Had Cancer?

Approximately 13.7 million Americans with a history of cancer were alive on January 1, 2012. Some of these individuals were cancer free, while others still had evidence of cancer and may have been undergoing treatment.

How Many New Cases Are Expected to Occur This Year?

About 1,665,540 new cancer cases are expected to be diagnosed in 2014. This estimate does not include carcinoma in situ (noninvasive cancer) of any site except urinary bladder, nor does it include basal cell or squamous cell skin cancers, which are not required to be reported to cancer registries.

How Many People Are Expected to Die of Cancer This Year?

In 2014, about 585,720 Americans are expected to die of cancer, almost 1,600 people per day. Cancer is the second most common cause of death in the US, exceeded only by heart disease, accounting for nearly 1 of every 4 deaths.

What Percentage of People Survive Cancer?

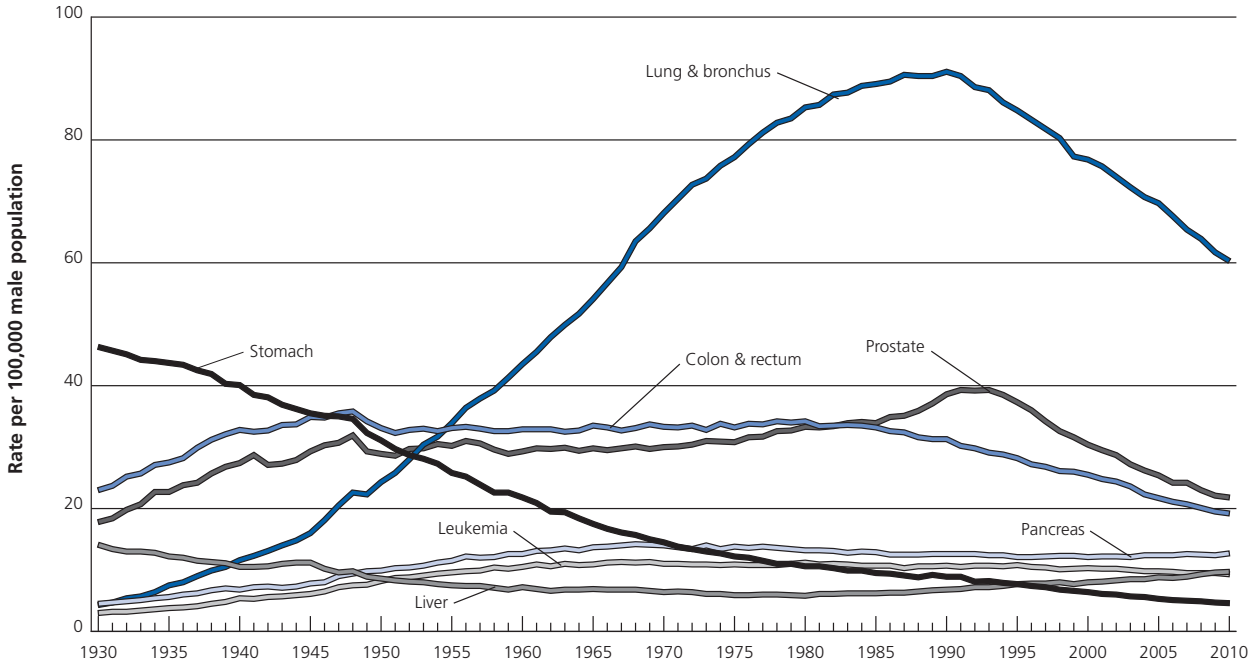
The 5-year relative survival rate for all cancers diagnosed between 2003 and 2009 is 68%, up from 49% in 1975-1977 (see page 17). The improvement in survival reflects both progress in diagnosing certain cancers at an earlier stage and improvements in treatment. Survival statistics vary greatly by cancer type and stage at diagnosis. Relative survival compares survival among cancer patients to that of people not diagnosed with cancer who are the same age, race, and sex. It represents the percentage of cancer patients who are alive after some designated time period (usually 5 years) relative to people without cancer. It does not distinguish between patients who are cancer-free and those who have relapsed or are still in treatment. While 5-year relative survival is useful in monitoring progress in the early detection and treatment of cancer, it does not represent the proportion of people who are cured because cancer deaths can occur beyond 5 years after diagnosis.

Although relative survival for specific cancer types provides some indication about the average survival experience of cancer patients in a given population, it may not predict individual prognosis and should be interpreted with caution. First, 5-year relative survival rates for the most recent time period are based on patients who were diagnosed from 2003 to 2009 and thus do not reflect the most recent advances in detection and treatment. Second, factors that influence survival, such as treatment protocols, other illnesses, and biological or behavioral differences in individual cancers or people, cannot be taken into account in the estimation of relative survival rates. For more information about survival rates, see Sources of Statistics on page 66.

How Is Cancer Staged?

Staging describes the extent or spread of cancer at the time of diagnosis. Proper staging is essential in determining the choice of therapy and in assessing prognosis. A cancer's stage is based on the size or extent of the primary (main) tumor and whether it has spread to nearby lymph nodes or other areas of the body. A number of different staging systems are used to classify cancer. A system of summary staging is used for descriptive and statistical analysis of tumor registry data. If cancer cells are present only in the layer of cells where they developed and have not spread, the stage is in situ. If cancer cells have penetrated beyond

Age-adjusted Cancer Death Rates*, Males by Site, US, 1930-2010



*Per 100,000, age adjusted to the 2000 US standard population.

Note: Due to changes in ICD coding, numerator information has changed over time. Rates for cancer of the liver, lung and bronchus, and colon and rectum are affected by these coding changes.

Source: US Mortality Volumes 1930 to 1959 and US Mortality Data 1960 to 2010, National Center for Health Statistics, Centers for Disease Control and Prevention.

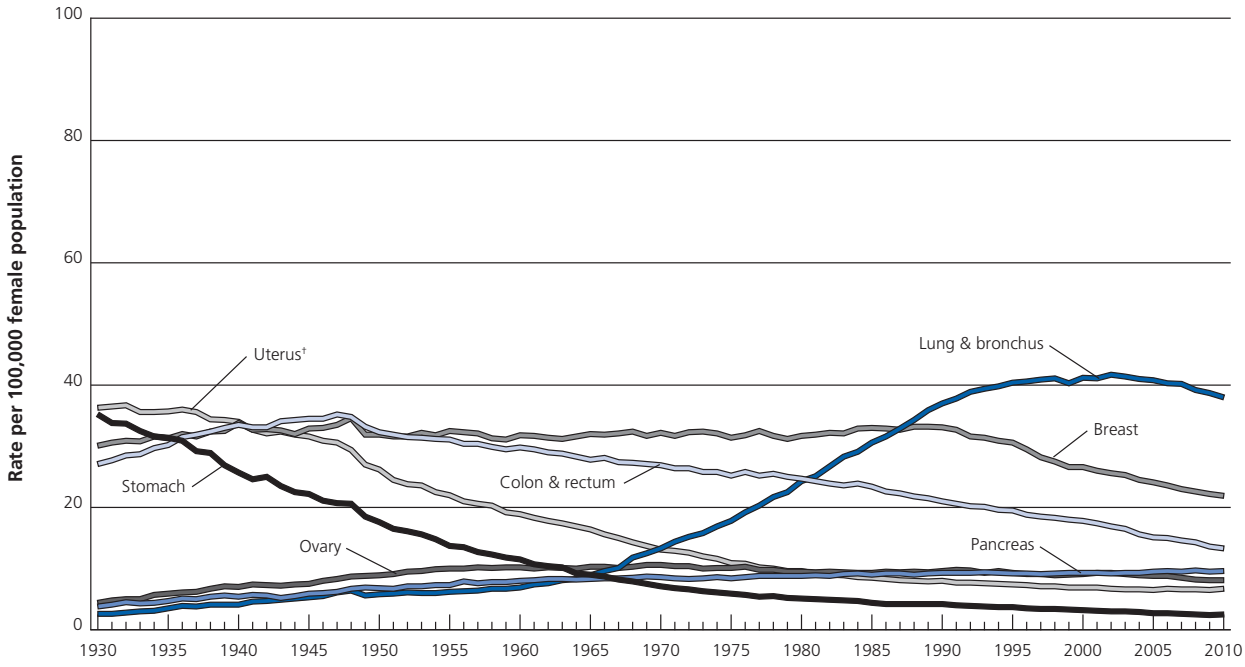
the original layer of tissue, the cancer has become invasive and is categorized as local, regional, or distant stage based on the extent of spread. (For a more detailed description of these categories, see the footnotes in the table Five-year Relative Survival Rates (%) by Stage at Diagnosis, 2003-2009 on page 17.) For most cancers, clinicians use a different staging system called TNM, which assesses cancer growth and spread in three ways: extent of the primary tumor (T), absence or presence of regional lymph node involvement (N), and absence or presence of distant metastases (M). Once the T, N, and M categories are determined, a stage of 0, I, II, III, or IV is assigned, with stage 0 being in situ, stage I being early, and so on, with stage IV being the most advanced disease. Some cancers (e.g., lymphoma) have alternative staging systems. As the molecular properties of cancer have become better understood, tumor biological markers and genetic features have been incorporated into prognostic models, treatment plans, and/or stage for some cancer sites.

What Are the Costs of Cancer?

The National Institutes of Health (NIH) estimates that the overall costs of cancer in 2009 were $216.6 billion: $86.6 billion for direct medical costs (total of all health expenditures) and $130.0 billion for indirect mortality costs (cost of lost productivity due to premature death). PLEASE NOTE: These numbers are not comparable to those published in *Cancer Facts & Figures* prior to 2012 because in 2011, the NIH began calculating these estimates using a different data source: the Medical Expenditure Panel Survey (MEPS) of the Agency for Healthcare Research and Quality. The MEPS estimates are based on more current, nationally representative data and are used extensively in scientific publications. As a result, direct and indirect costs will no longer be projected to the current year, and estimates of indirect morbidity costs have been discontinued. For more information, visit nhlbi.nih.gov/about/factpdf.htm.

Lack of health insurance and other barriers prevent many Americans from receiving optimal health care. According to the US Census Bureau, approximately 48.6 million Americans (15.7%) were uninsured in 2011, including one in three Hispanics and one in 10 children (18 years of age and younger). Uninsured patients and those from ethnic minorities are substantially more likely to be diagnosed with cancer at a later stage, when treatment can be more extensive and more costly. The Affordable Care Act is expected to substantially reduce the number of people who are uninsured and improve the health care system for cancer patients. For more information on the relationship between health insurance and cancer, see *Cancer Facts & Figures 2008*, Special Section, available online at cancer.org/statistics.

Age-adjusted Cancer Death Rates*, Females by Site, US, 1930-2010



*Per 100,000, age adjusted to the 2000 US standard population. †Uterus refers to uterine cervix and uterine corpus combined.

Note: Due to changes in ICD coding, numerator information has changed over time. Rates for cancer of the lung and bronchus, colon and rectum, and ovary are affected by these coding changes.

Source: US Mortality Volumes 1930 to 1959 and US Mortality Data 1960 to 2010, National Center for Health Statistics, Centers for Disease Control and Prevention.

Estimated Number* of New Cancer Cases and Deaths by Sex, US, 2014

	Estimated New Cases			Estimated Deaths		
	Both Sexes	**Male**	**Female**	**Both Sexes**	**Male**	**Female**
All Sites	1,665,540	855,220	810,320	585,720	310,010	275,710
Oral cavity & pharynx	42,440	30,220	12,220	8,390	5,730	2,660
Tongue	13,590	9,720	3,870	2,150	1,450	700
Mouth	11,920	7,150	4,770	2,070	1,130	940
Pharynx	14,410	11,550	2,860	2,540	1,900	640
Other oral cavity	2,520	1,800	720	1,630	1,250	380
Digestive system	289,610	162,730	126,880	147,260	84,970	62,290
Esophagus	18,170	14,660	3,510	15,450	12,450	3,000
Stomach	22,220	13,730	8,490	10,990	6,720	4,270
Small intestine	9,160	4,880	4,280	1,210	640	570
Colon†	96,830	48,450	48,380	50,310	26,270	24,040
Rectum	40,000	23,380	16,620			
Anus, anal canal, & anorectum	7,210	2,660	4,550	950	370	580
Liver & intrahepatic bile duct	33,190	24,600	8,590	23,000	15,870	7,130
Gallbladder & other biliary	10,650	4,960	5,690	3,630	1,610	2,020
Pancreas	46,420	23,530	22,890	39,590	20,170	19,420
Other digestive organs	5,760	1,880	3,880	2,130	870	1,260
Respiratory system	242,550	130,000	112,550	163,660	90,280	73,380
Larynx	12,630	10,000	2,630	3,610	2,870	740
Lung & bronchus	224,210	116,000	108,210	159,260	86,930	72,330
Other respiratory organs	5,710	4,000	1,710	790	480	310
Bones & joints	3,020	1,680	1,340	1,460	830	630
Soft tissue (including heart)	12,020	6,550	5,470	4,740	2,550	2,190
Skin (excluding basal & squamous)	81,220	46,630	34,590	12,980	8,840	4,140
Melanoma-skin	76,100	43,890	32,210	9,710	6,470	3,240
Other nonepithelial skin	5,120	2,740	2,380	3,270	2,370	900
Breast	235,030	2,360	232,670	40,430	430	40,000
Genital system	338,450	243,460	94,990	58,970	30,180	28,790
Uterine cervix	12,360		12,360	4,020		4,020
Uterine corpus	52,630		52,630	8,590		8,590
Ovary	21,980		21,980	14,270		14,270
Vulva	4,850		4,850	1,030		1,030
Vagina & other genital, female	3,170		3,170	880		880
Prostate	233,000	233,000		29,480	29,480	
Testis	8,820	8,820		380	380	
Penis & other genital, male	1,640	1,640		320	320	
Urinary system	141,610	97,420	44,190	30,350	20,610	9,740
Urinary bladder	74,690	56,390	18,300	15,580	11,170	4,410
Kidney & renal pelvis	63,920	39,140	24,780	13,860	8,900	4,960
Ureter & other urinary organs	3,000	1,890	1,110	910	540	370
Eye & orbit	2,730	1,440	1,290	310	130	180
Brain & other nervous system	23,380	12,820	10,560	14,320	8,090	6,230
Endocrine system	65,630	16,600	49,030	2,820	1,300	1,520
Thyroid	62,980	15,190	47,790	1,890	830	1,060
Other endocrine	2,650	1,410	1,240	930	470	460
Lymphoma	79,990	43,340	36,650	20,170	11,140	9,030
Hodgkin lymphoma	9,190	5,070	4,120	1,180	670	510
Non-Hodgkin lymphoma	70,800	38,270	32,530	18,990	10,470	8,520
Myeloma	24,050	13,500	10,550	11,090	6,110	4,980
Leukemia	52,380	30,100	22,280	24,090	14,040	10,050
Acute lymphocytic leukemia	6,020	3,140	2,880	1,440	810	630
Chronic lymphocytic leukemia	15,720	9,100	6,620	4,600	2,800	1,800
Acute myeloid leukemia	18,860	11,530	7,330	10,460	6,010	4,450
Chronic myeloid leukemia	5,980	3,130	2,850	810	550	260
Other leukemia‡	5,800	3,200	2,600	6,780	3,870	2,910
Other & unspecified primary sites‡	31,430	16,370	15,060	44,680	24,780	19,900

*Rounded to the nearest 10; estimated new cases exclude basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder. About 62,570 carcinoma in situ of the female breast and 63,770 melanoma in situ will be newly diagnosed in 2014. †Estimated deaths for colon and rectal cancers are combined. ‡More deaths than cases may reflect lack of specificity in recording underlying cause of death on death certificates and/or an undercount in the case estimate.

Source: Estimated new cases are based on 1995-2010 incidence rates reported by the North American Association of Central Cancer Registries, representing 89% of the US population. Estimated deaths are based on 1995-2010 US mortality data, National Center for Health Statistics, Centers for Disease Control and Prevention.

Estimated Number* of New Cases for Selected Cancers by State, US, 2014

State	All Sites	Female Breast	Uterine Cervix	Colon & Rectum	Uterine Corpus	Leukemia	Lung & Bronchus	Melanoma of the Skin	Non-Hodgkin Lymphoma	Prostate	Urinary Bladder
Alabama	26,770	3,660	210	2,350	650	690	4,160	1,320	990	3,760	990
Alaska	3,750	450	†	280	100	100	430	90	140	530	150
Arizona	32,830	4,520	210	2,560	910	950	4,280	1,430	1,320	4,390	1,490
Arkansas	16,520	2,050	140	1,500	400	480	2,660	490	660	2,240	640
California	171,730	26,130	1,550	13,930	5,650	5,650	18,780	8,440	7,770	23,010	7,210
Colorado	23,810	3,780	160	1,720	750	870	2,540	1,400	1,060	3,680	1,040
Connecticut	22,070	3,160	120	1,650	790	610	2,730	1,090	920	3,120	1,170
Delaware	5,320	760	†	420	180	150	790	290	220	800	260
Dist. of Columbia	2,840	430	†	250	100	60	320	80	100	510	80
Florida	114,560	15,480	960	10,230	3,410	3,810	17,960	5,320	5,050	16,590	5,800
Georgia	47,390	7,010	420	3,940	1,310	1,370	6,540	2,180	1,820	7,600	1,710
Hawaii	6,640	1,090	60	700	270	220	890	410	300	810	250
Idaho	7,990	1,100	50	610	230	290	960	450	360	1,320	390
Illinois	66,840	9,230	470	5,530	2,290	2,180	9,100	2,440	2,890	8,820	3,090
Indiana	35,560	4,590	260	3,020	1,070	1,060	5,540	1,550	1,480	4,390	1,600
Iowa	17,630	2,320	100	1,580	610	640	2,330	980	800	2,340	830
Kansas	14,630	2,090	100	1,120	470	490	1,900	780	650	1,980	620
Kentucky	25,770	3,370	200	2,170	720	790	4,690	1,540	1,070	3,280	1,100
Louisiana	24,300	3,160	200	2,270	540	720	3,470	750	960	3,720	940
Maine	9,270	1,220	50	700	340	310	1,400	440	380	1,160	540
Maryland	30,680	4,570	230	2,500	1,020	800	3,990	1,400	1,210	5,000	1,280
Massachusetts	37,940	5,560	200	2,800	1,320	1,140	4,930	1,800	1,600	5,600	2,030
Michigan	58,610	7,660	340	4,570	2,010	1,830	8,090	2,830	2,500	8,740	2,930
Minnesota	29,340	3,820	130	2,240	950	1,050	3,070	1,030	1,240	3,870	1,220
Mississippi	15,740	2,130	140	1,510	360	410	2,420	560	560	2,210	540
Missouri	33,890	4,610	240	2,970	1,090	1,040	5,370	1,510	1,430	4,010	1,530
Montana	5,850	860	†	500	180	200	760	290	260	1,010	300
Nebraska	9,550	1,360	60	880	320	330	1,220	460	440	1,250	430
Nevada	14,450	1,880	120	1,290	350	440	2,040	470	550	1,890	680
New Hampshire	8,450	1,150	†	600	300	250	1,110	400	350	1,160	460
New Jersey	51,130	7,290	380	4,280	1,820	1,560	6,130	2,590	2,250	7,320	2,510
New Mexico	10,210	1,450	80	830	300	370	1,060	470	400	1,400	400
New York	107,200	15,230	850	8,590	4,040	3,460	13,720	4,240	4,720	15,440	5,330
North Carolina	52,550	7,580	380	4,230	1,570	1,550	7,850	2,540	2,110	7,580	2,170
North Dakota	3,730	510	†	350	110	130	400	160	160	460	180
Ohio	67,000	8,710	400	5,450	2,280	1,890	9,760	3,170	2,860	8,690	3,110
Oklahoma	19,830	2,700	160	1,760	530	660	3,320	650	850	2,570	830
Oregon	22,530	3,320	130	1,540	720	640	2,950	1,440	960	3,200	1,080
Pennsylvania	79,920	10,660	500	6,790	2,840	2,420	10,290	3,820	3,420	10,930	4,070
Rhode Island	6,370	870	†	500	230	180	870	260	250	840	340
South Carolina	26,390	3,750	210	2,200	750	790	4,130	1,350	1,030	4,000	1,100
South Dakota	4,490	600	†	410	150	160	540	200	200	590	210
Tennessee	36,570	4,840	290	3,030	930	1,040	5,980	1,910	1,470	4,670	1,510
Texas	115,730	16,080	1,140	9,760	3,130	4,190	14,890	3,420	5,030	15,900	4,190
Utah	10,780	1,440	60	650	350	390	650	770	490	1,780	420
Vermont	4,130	560	†	290	140	110	550	220	160	580	210
Virginia	40,970	6,170	290	3,280	1,300	1,080	5,580	2,130	1,640	6,330	1,700
Washington	38,230	5,620	230	2,670	1,160	1,250	4,630	2,410	1,710	5,380	1,730
West Virginia	11,700	1,350	90	1,060	380	330	2,090	540	480	1,450	570
Wisconsin	32,480	4,330	190	2,520	1,140	1,150	4,020	1,440	1,410	4,630	1,580
Wyoming	2,890	420	†	240	90	90	330	150	120	490	140
United States	1,665,540	232,670	12,360	136,830	52,630	52,380	224,210	76,100	70,800	233,000	74,690

*Rounded to the nearest 10. Excludes basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder. †Estimate is fewer than 50 cases.

Note: These estimates are offered as a rough guide and should be interpreted with caution. State estimates may not sum to US total due to rounding and exclusion of state estimates fewer than 50 cases.

Estimated Number* of Deaths for Selected Cancers by State, US, 2014

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non-Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	10,510	270	690	950	410	350	3,310	310	280	630	540
Alaska	990	†	70	90	†	†	270	†	†	60	60
Arizona	11,400	310	780	990	500	470	2,840	390	310	790	640
Arkansas	6,730	150	420	620	270	210	2,200	200	140	400	310
California	57,950	1,590	4,270	5,150	2,510	3,140	12,590	2,000	1,560	4,150	3,380
Colorado	7,480	240	530	670	330	300	1,720	240	240	510	450
Connecticut	6,880	180	470	460	290	250	1,760	220	180	520	390
Delaware	1,980	†	120	160	70	90	600	60	50	130	90
Dist. of Columbia	1,010	†	80	100	†	60	230	†	†	80	80
Florida	42,740	920	2,770	3,560	1,760	1,620	12,050	1,430	940	2,890	2,170
Georgia	16,320	380	1,220	1,480	620	590	4,690	460	430	1,040	800
Hawaii	2,450	†	140	230	90	140	580	80	60	210	120
Idaho	2,730	80	180	210	130	80	670	90	60	210	180
Illinois	24,020	540	1,610	2,190	1,020	810	6,570	780	560	1,610	1,190
Indiana	13,370	310	860	1,090	550	380	4,140	440	310	840	580
Iowa	6,380	190	390	570	280	190	1,780	230	180	410	330
Kansas	5,460	150	370	480	260	170	1,560	200	140	370	250
Kentucky	10,130	210	590	850	370	280	3,570	300	200	570	390
Louisiana	9,040	200	640	840	330	400	2,650	260	190	600	400
Maine	3,300	90	190	250	130	110	970	100	60	200	160
Maryland	10,500	240	820	890	390	400	2,760	300	270	760	550
Massachusetts	12,810	310	790	990	510	550	3,500	400	320	920	630
Michigan	20,800	550	1,400	1,680	910	710	5,990	720	480	1,480	890
Minnesota	9,750	260	620	780	460	360	2,480	340	240	650	540
Mississippi	6,350	140	420	640	250	240	1,990	180	120	380	330
Missouri	12,870	310	910	1,090	540	450	3,950	390	250	860	550
Montana	2,000	50	130	170	90	50	520	70	60	130	130
Nebraska	3,480	100	210	340	140	100	900	130	80	240	200
Nevada	4,790	140	380	480	190	220	1,420	140	100	370	280
New Hampshire	2,670	70	170	200	100	80	750	80	60	190	130
New Jersey	16,350	350	1,290	1,510	630	600	3,970	510	440	1,220	760
New Mexico	3,600	90	260	350	140	170	790	110	90	240	220
New York	34,440	790	2,390	2,970	1,440	1,470	8,790	1,110	910	2,540	1,760
North Carolina	18,980	410	1,310	1,500	720	660	5,700	560	430	1,190	920
North Dakota	1,270	†	90	130	60	†	310	†	†	80	80
Ohio	25,260	600	1,720	2,140	990	790	7,370	810	570	1,730	1,200
Oklahoma	7,980	200	510	690	320	280	2,440	270	180	470	370
Oregon	7,940	230	510	660	320	340	2,090	280	220	550	440
Pennsylvania	28,670	610	1,940	2,490	1,200	980	7,600	1,010	730	1,990	1,370
Rhode Island	2,140	50	130	160	90	80	580	60	50	130	100
South Carolina	9,950	220	670	840	360	370	2,970	280	230	610	510
South Dakota	1,610	50	110	150	70	50	440	50	†	110	90
Tennessee	14,280	350	910	1,220	540	500	4,630	440	290	820	630
Texas	37,830	950	2,700	3,430	1,530	2,080	9,600	1,230	900	2,440	1,660
Utah	2,870	110	270	250	150	100	460	120	80	240	210
Vermont	1,340	†	80	100	50	60	390	†	†	90	70
Virginia	14,750	350	1,090	1,240	570	520	4,110	460	380	1,010	730
Washington	12,550	380	820	970	540	550	3,270	430	360	880	730
West Virginia	4,680	100	270	420	170	120	1,480	160	100	230	190
Wisconsin	11,360	310	710	860	550	390	3,000	400	300	800	630
Wyoming	990	†	60	90	70	†	250	†	†	80	40
United States	585,720	14,320	40,000	50,310	24,090	23,000	159,260	18,990	14,270	39,590	29,480

*Rounded to nearest 10. †Estimate is fewer than 50 deaths.
Note: These estimates are offered as a rough guide and should be interpreted with caution. State estimates may not sum to US total due to rounding and exclusion of state estimates fewer than 50 deaths.

Incidence Rates* for Selected Cancers by State, US, 2006-2010

	All Sites		Breast	Colon & Rectum		Lung & Bronchus		Non-Hodgkin Lymphoma		Prostate	Urinary Bladder	
State	**Male**	**Female**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Male**	**Female**
Alabama	573.2	395.2	118.7	57.2	40.3	103.2	54.0	19.5	13.6	157.7	33.3	7.5
Alaska	521.0	430.3	127.7	53.1	44.5	83.8	60.4	21.8	16.1	137.3	38.0	9.8
Arizona	441.4	371.2	110.2	41.4	32.0	61.8	47.9	18.0	13.4	112.7	32.2	8.4
Arkansas†‡	557.7	388.1	110.3	55.6	40.5	108.4	60.4	21.2	15.3	156.4	33.9	8.1
California	505.7	397.1	122.0	49.4	37.3	60.4	44.4	22.9	15.6	140.3	33.5	8.0
Colorado	483.1	396.4	125.3	43.6	33.6	56.1	44.2	22.5	15.9	142.7	31.2	8.2
Connecticut	576.2	456.9	136.3	51.3	39.2	75.5	59.5	25.2	17.3	160.0	46.8	12.6
Delaware	601.7	443.3	126.5	53.1	39.6	87.1	65.8	23.7	16.7	177.3	43.2	11.3
Dist. of Columbia	574.8	427.7	139.7	50.9	44.8	77.5	48.1	21.8	13.4	194.4	25.1	9.0
Florida	518.8	399.9	114.3	47.8	36.6	79.4	56.7	21.9	15.2	131.2	35.3	8.6
Georgia	568.7	403.1	121.5	52.1	38.4	93.3	55.0	21.5	14.8	165.7	33.9	7.9
Hawaii	484.4	393.4	123.1	56.9	38.0	64.3	38.7	20.7	13.7	119.9	25.8	6.3
Idaho	513.3	410.1	119.5	43.2	34.8	61.5	47.2	21.3	17.5	152.9	36.1	8.9
Illinois	566.6	440.3	126.4	59.1	43.4	86.7	60.9	24.0	16.4	153.9	39.4	9.9
Indiana	527.4	422.0	117.4	54.7	41.8	96.4	63.5	23.3	17.0	122.4	35.2	8.8
Iowa	555.7	437.1	123.4	56.9	44.3	84.7	54.9	26.8	18.9	137.2	41.7	8.8
Kansas	552.2	422.0	123.2	55.0	39.9	80.2	54.5	23.4	16.8	152.4	37.9	9.3
Kentucky	611.2	462.4	121.3	63.9	46.0	125.9	80.3	25.3	17.5	134.6	40.5	9.7
Louisiana	603.4	413.6	119.7	62.4	44.0	99.6	57.7	24.5	16.5	169.3	34.1	8.1
Maine	581.5	460.6	126.5	51.4	41.2	91.5	67.3	25.4	17.9	144.8	48.0	13.2
Maryland	529.1	415.0	128.0	47.6	36.7	74.4	55.8	21.3	15.0	157.2	33.4	9.2
Massachusetts	568.1	460.4	134.2	49.9	38.8	78.3	64.1	25.0	16.5	153.6	43.9	11.9
Michigan	574.1	433.5	120.0	51.0	39.3	86.1	61.6	24.9	17.7	163.7	41.3	10.7
Minnesota§	---	---	---	---	---	---	---	---	---	---	---	---
Mississippi	598.6	396.9	113.8	61.3	44.7	112.7	56.2	21.6	14.5	166.3	30.8	7.2
Missouri	530.8	423.3	121.5	55.3	40.8	95.6	64.3	22.3	16.0	126.2	34.8	8.4
Montana	520.8	421.9	124.1	51.1	39.0	68.9	56.3	22.8	15.0	155.2	36.4	9.9
Nebraska	526.2	420.9	122.3	57.7	44.4	74.6	51.2	23.5	17.7	143.0	35.0	8.6
Nevada†¶	509.8	399.2	112.7	52.0	38.1	75.7	64.7	20.4	15.3	138.9	37.3	10.7
New Hampshire	580.3	452.1	132.0	46.7	38.0	80.1	62.2	25.1	17.1	155.4	49.1	13.2
New Jersey	582.6	450.6	129.3	54.7	41.2	72.8	55.3	25.2	17.8	169.2	43.6	11.6
New Mexico	461.9	362.5	108.8	44.1	33.6	52.9	38.1	18.2	13.8	134.1	26.2	6.2
New York	585.4	449.2	127.7	53.3	40.9	76.3	56.0	26.3	18.1	167.3	42.1	10.6
North Carolina	564.9	416.0	124.9	50.8	37.1	96.7	57.2	22.6	15.7	151.9	37.5	8.9
North Dakota	528.6	410.2	123.0	59.2	41.8	68.1	43.3	22.0	18.4	156.2	38.6	9.2
Ohio†¶	548.1	425.4	120.5	55.5	42.2	92.6	60.7	23.0	16.1	145.2	38.7	9.6
Oklahoma	552.2	422.0	121.7	53.6	40.8	96.1	62.7	22.4	17.1	148.4	34.7	8.6
Oregon	508.8	429.2	129.5	45.5	36.8	70.6	57.6	22.8	15.3	139.3	37.1	9.5
Pennsylvania	573.6	454.8	126.0	56.0	42.8	84.4	57.9	25.2	17.8	149.5	44.1	11.0
Rhode Island	575.7	462.4	131.0	51.3	41.3	84.1	64.5	22.5	17.9	148.9	48.7	13.8
South Carolina	551.7	401.1	122.3	50.3	37.9	94.1	53.9	20.5	13.4	152.8	30.8	8.4
South Dakota	499.4	395.9	117.9	55.7	41.8	73.8	48.0	21.6	15.9	145.5	33.6	8.3
Tennessee	562.0	416.0	118.8	53.4	40.4	103.4	61.3	22.6	16.3	144.3	35.4	8.2
Texas	513.9	389.9	114.4	50.9	35.7	78.2	49.0	22.2	15.9	133.2	29.5	6.9
Utah	494.8	357.7	110.8	39.4	31.2	34.1	23.3	25.2	16.3	175.9	31.4	5.3
Vermont	539.8	453.8	131.4	44.8	38.3	81.2	65.6	24.1	17.7	139.9	40.5	12.2
Virginia†	521.7	397.4	124.5	46.9	36.7	82.2	53.9	21.7	14.2	150.3	33.3	8.3
Washington	544.6	437.7	131.0	46.1	36.3	72.1	57.3	26.2	17.4	151.6	38.9	9.3
West Virginia	557.7	434.1	110.2	58.0	43.8	106.4	70.0	23.2	17.5	131.8	38.8	10.7
Wisconsin	530.8	419.2	122.5	48.4	37.5	73.6	53.4	24.3	17.3	142.9	39.2	9.7
Wyoming	497.1	384.2	110.8	47.5	37.7	57.3	46.0	19.8	15.0	152.2	38.7	9.9
United States	542.3	418.8	122.2	51.7	39.1	80.0	55.1	23.3	16.3	146.6	36.9	9.1

*Per 100,000, age adjusted to the 2000 US standard population. †This state's data are not included in US combined rates because they did not meet high-quality standards for one or more years during 2006-2010 according to the North American Association of Central Cancer Registries (NAACCR). ‡Rates are based on incidence data for 2006-2008. §This state's registry did not submit 2006-2010 cancer incidence data to NAACCR. ¶ Rates are based on incidence data for 2006-2009.

Source: NAACCR, 2013. Data are collected by cancer registries participating in the National Cancer Institute's SEER program and the Centers for Disease Control and Prevention's National Program of Cancer Registries.

American Cancer Society, Surveillance Research, 2014

Death Rates* for Selected Cancers by State, US, 2006-2010

	All Sites		Breast	Colon & Rectum		Lung & Bronchus		Non-Hodgkin Lymphoma		Pancreas		Prostate
State	Male	Female	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Alabama	255.4	156.4	23.3	22.5	15.0	87.4	40.8	8.0	5.3	13.2	9.7	28.9
Alaska	210.5	161.0	24.2	19.6	15.1	61.8	45.8	7.6	5.5	12.9	9.8	22.5
Arizona	186.0	131.7	20.6	17.1	11.9	49.8	33.2	7.6	4.8	11.4	8.3	20.5
Arkansas	250.6	160.9	23.4	22.7	15.6	90.1	45.4	8.6	5.5	13.2	9.6	25.3
California	189.8	139.8	21.9	17.5	12.7	47.2	32.3	7.8	4.9	11.7	9.4	22.3
Colorado	181.4	133.2	19.6	16.7	12.4	44.2	31.3	7.8	4.4	10.8	9.0	22.9
Connecticut	199.5	144.7	21.6	16.2	12.1	52.7	38.2	7.5	4.9	13.9	9.9	22.3
Delaware	228.0	159.3	22.8	20.4	13.3	68.2	47.7	8.3	4.8	13.0	9.5	23.7
Dist. of Columbia	248.5	167.6	29.8	22.2	18.9	61.9	35.0	8.0	4.0	16.9	12.0	38.8
Florida	204.5	140.7	21.3	18.1	12.8	61.4	38.8	7.8	4.9	12.1	8.8	20.1
Georgia	228.3	147.8	23.4	20.2	13.8	73.1	38.7	7.6	4.5	12.5	9.1	27.1
Hawaii	178.4	117.1	16.4	17.3	10.9	48.8	25.9	7.2	4.3	12.3	9.7	15.7
Idaho	192.9	140.2	21.6	16.1	12.4	49.2	34.5	7.2	5.6	12.0	9.2	25.9
Illinois	223.3	158.5	23.6	21.7	15.4	65.8	41.9	8.5	5.3	13.0	10.1	24.3
Indiana	238.8	161.5	23.9	21.3	14.5	79.4	46.7	9.3	5.4	13.0	9.4	23.2
Iowa	212.6	148.4	21.3	20.0	15.2	64.1	38.3	8.9	5.5	12.2	8.8	22.7
Kansas	214.4	146.5	22.2	20.6	13.1	66.8	39.4	9.1	5.3	12.6	9.1	20.7
Kentucky	262.7	173.3	23.1	23.4	16.2	97.1	55.8	9.0	5.7	12.7	9.6	23.9
Louisiana	254.7	164.4	25.4	24.0	15.7	80.9	43.6	8.6	5.2	14.2	11.1	26.6
Maine	231.1	158.3	20.9	20.2	13.9	69.9	46.0	8.8	5.1	11.6	9.8	22.9
Maryland	216.9	154.0	24.5	20.5	14.0	61.7	40.8	7.4	4.5	12.9	10.3	25.0
Massachusetts	216.6	152.5	21.3	18.7	13.4	60.6	42.1	7.8	4.8	12.7	10.4	22.4
Michigan	223.0	159.5	24.0	19.4	14.2	68.2	43.9	8.9	5.8	13.9	10.2	21.8
Minnesota	203.9	145.0	20.9	17.6	12.6	53.3	37.0	9.4	5.2	11.9	9.3	23.9
Mississippi	270.6	159.1	24.7	24.8	16.5	95.4	42.0	8.3	4.7	14.1	10.1	31.2
Missouri	231.1	160.2	24.2	21.2	14.6	76.5	46.2	8.3	5.4	13.0	9.9	21.8
Montana	195.3	145.1	19.8	16.7	14.0	52.1	39.6	7.9	4.9	11.8	8.4	26.4
Nebraska	208.4	143.8	20.1	21.4	15.0	60.3	35.5	8.4	5.7	12.0	9.7	22.9
Nevada	211.4	153.6	23.0	21.0	14.9	59.7	46.5	7.1	4.6	12.6	9.7	23.9
New Hampshire	211.7	154.2	21.3	17.9	13.1	59.0	43.3	7.3	4.7	13.2	10.4	22.4
New Jersey	207.8	154.3	25.2	21.0	14.9	55.8	37.2	7.8	5.2	13.4	10.1	21.6
New Mexico	187.4	131.6	20.9	18.8	12.7	43.4	28.6	6.6	4.5	10.9	8.4	24.4
New York	199.7	145.4	22.3	19.2	13.8	54.3	36.1	7.9	4.9	12.8	9.9	21.8
North Carolina	232.2	149.9	23.1	19.4	13.1	76.6	40.7	7.5	5.0	12.0	9.6	25.8
North Dakota	203.6	137.2	21.6	21.2	13.9	54.1	32.2	6.7	5.1	12.6	8.3	23.6
Ohio	236.5	162.6	24.8	21.8	15.2	74.8	44.2	9.2	5.6	13.1	10.1	23.8
Oklahoma	238.8	161.0	23.9	22.1	14.5	79.6	46.6	9.0	6.0	12.2	8.9	23.5
Oregon	208.5	153.4	21.6	18.1	13.3	58.4	42.7	8.5	5.3	12.3	9.9	24.4
Pennsylvania	225.6	157.0	23.8	21.5	15.0	65.8	39.6	8.9	5.5	13.4	10.0	22.7
Rhode Island	221.8	149.6	20.8	18.6	13.2	64.9	42.6	8.3	4.4	12.2	8.9	20.6
South Carolina	240.1	151.7	23.5	20.2	14.2	77.1	39.9	7.8	4.7	12.7	9.8	27.5
South Dakota	206.8	141.3	20.3	19.8	13.9	61.9	34.1	7.8	5.3	11.1	9.3	23.4
Tennessee	256.4	160.4	23.3	21.8	15.3	89.5	46.6	9.2	5.4	13.1	9.4	25.2
Texas	209.3	141.8	21.8	20.0	13.1	60.7	35.4	7.9	4.9	11.8	8.8	21.3
Utah	157.1	112.3	21.8	14.3	10.7	27.5	16.8	7.7	4.7	10.0	8.4	25.9
Vermont	212.0	154.3	20.4	17.4	14.8	62.3	45.1	7.8	5.0	12.4	9.3	22.1
Virginia	221.1	151.4	24.0	19.2	14.0	67.1	40.0	8.2	4.8	12.7	9.7	24.7
Washington	207.2	152.2	21.5	17.1	12.5	57.0	42.1	8.6	5.4	12.7	10.0	24.2
West Virginia	246.9	168.6	22.1	23.4	16.1	84.3	50.9	8.7	6.6	11.3	7.8	20.9
Wisconsin	213.7	149.7	21.3	18.0	12.7	58.4	38.4	9.0	5.5	12.8	10.0	24.5
Wyoming	196.0	146.8	21.3	18.7	14.7	49.9	36.4	7.6	5.3	12.9	9.0	22.8
United States	215.3	149.7	22.6	19.6	13.9	63.5	39.2	8.2	5.1	12.5	9.6	23.0

*Per 100,000, age adjusted to the 2000 US standard population.

Source: US Mortality Data, National Center for Health Statistics, Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2014

Selected Cancers

Breast

New cases: An estimated 232,670 new cases of invasive breast cancer are expected to be diagnosed among women in the US during 2014; about 2,360 new cases are expected in men. Excluding cancers of the skin, breast cancer is the most frequently diagnosed cancer in women. The dramatic decrease in the breast cancer incidence rate of almost 7% from 2002 to 2003 has been attributed to reductions in the use of menopausal hormone therapy (MHT), previously known as hormone replacement therapy, following the publication of results from the Women's Health Initiative in 2002. This study found that the use of combined estrogen plus progestin MHT was associated with an increased risk of breast cancer, as well as coronary heart disease. From 2006 to 2010, the most recent five years for which data are available, breast cancer incidence rates were stable.

In addition to invasive breast cancer, 62,570 new cases of in situ breast cancer are expected to occur among women in 2014. Of these, approximately 83% will be ductal carcinoma in situ (DCIS). In situ breast cancer incidence rates were also stable from 2006 to 2010.

Deaths: An estimated 40,430 breast cancer deaths (40,000 women, 430 men) are expected in 2014. Breast cancer ranks second as a cause of cancer death in women (after lung cancer). Death rates for breast cancer have steadily decreased in women since 1989, with larger decreases in younger women; from 2006 to 2010, rates decreased 3.0% per year in women under 50 years and 1.8% per year in women 50 and older. The decrease in breast cancer death rates represents improvements in early detection and treatment, and possibly decreased incidence.

Signs and symptoms: Breast cancer typically produces no symptoms when the tumor is small and most treatable. Therefore, it is important for women to follow recommended screening guidelines to detect breast cancer at an early stage. Larger tumors may become evident as a breast lump, which is often painless. Less common symptoms include persistent changes to the breast, such as thickening, swelling, distortion, tenderness, skin irritation, redness, scaliness, or nipple abnormalities, such as ulceration, retraction, or spontaneous discharge. Breast pain is more likely to be caused by benign conditions and is not a common early symptom of breast cancer.

Risk factors: Potentially modifiable factors associated with increased breast cancer risk include weight gain after the age of 18, being overweight or obese (for postmenopausal breast cancer), use of MHT (combined estrogen and progestin), physical inactivity, and alcohol consumption. In addition, recent research indicates that long-term, heavy smoking also increases breast cancer risk, particularly among women who start smoking before first pregnancy. The International Agency for Research on Cancer has concluded that there is limited evidence that shift work, particularly at night, is also associated with an increased risk of breast cancer.

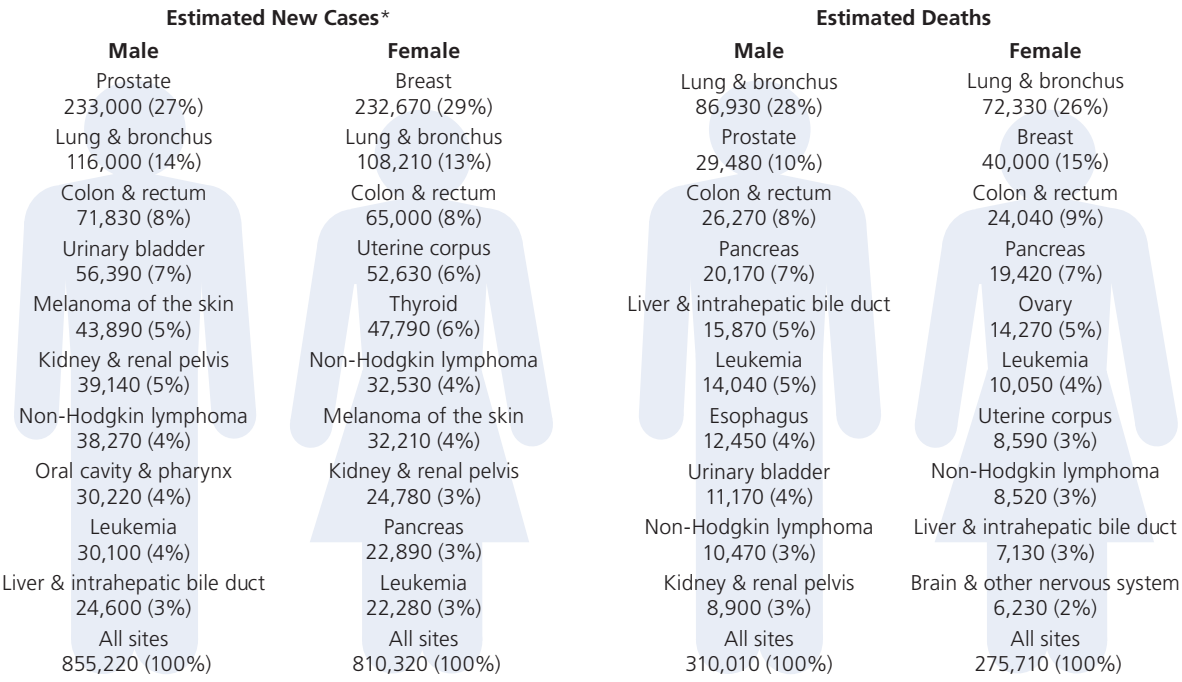
Other factors associated with increased breast cancer risk include high breast tissue density (the amount of glandular tissue relative to fatty tissue measured on a mammogram), high bone mineral density (women with low density are at increased risk for osteoporosis), type 2 diabetes, certain benign breast conditions (such as atypical hyperplasia), and lobular carcinoma in situ. High-dose radiation to the chest for cancer treatment also increases risk. Reproductive factors that increase risk include a long menstrual history (menstrual periods that start early and/or end later in life), recent use of oral contraceptives or depoprovera, never having children, and having one's first child after age 30.

Risk is also increased by a family history of breast cancer, particularly having one or more affected first-degree relatives (though most women with breast cancer do not have a family history of the disease). Inherited mutations (alterations) in the breast cancer susceptibility genes *BRCA1* and *BRCA2* are very rare in the general population (much less than 1%), but account for 5%-10% of all female breast cancers, an estimated 5%-20% of male breast cancers, and 15%-20% of familial breast cancers. Scientists now believe that most familial breast cancer is due to the interaction between lifestyle factors and more common variations in the genetic code that confer a small increase in breast cancer risk. Individuals with a strong family history of breast and/or certain other cancers, such as ovarian and colon cancer, should consider counseling to determine if genetic testing is appropriate. Prevention measures may be possible for individuals with breast cancer susceptibility mutations. Studies show that removal of the ovaries and/or breasts considerably decreases the risk of breast cancer in *BRCA1* and *BRCA2* mutation carriers; however, not all women who choose this surgery would have developed breast cancer. Women should receive counseling before undergoing surgical procedures for breast cancer prevention.

Factors associated with a decreased risk of breast cancer include breastfeeding, regular moderate or vigorous physical activity, and maintaining a healthy body weight. Two medications – tamoxifen and raloxifene – have been approved to reduce breast cancer risk in women at high risk. Raloxifene appears to have a lower risk of certain side effects, such as uterine cancer and blood clots; however, it is only approved for use in postmenopausal women.

Early detection: Breast cancer screening for women at average risk includes clinical breast exam and mammography. Mammography can often detect breast cancer at an early stage, when treatment is more effective. Numerous studies have shown that

Leading New Cancer Cases and Deaths – 2014 Estimates



*Excludes basal and squamous cell skin cancers and in situ carcinoma except urinary bladder.

early detection with mammography saves lives and increases treatment options. Steady declines in breast cancer mortality among women since 1989 have been attributed to a combination of early detection and improvements in treatment. Mammography is a very accurate screening tool for women at both average and increased risk; however, like any medical test, it is not perfect. Mammography will detect most breast cancers in women without symptoms, though the sensitivity is lower for younger women and women with dense breasts. For these women, digital mammography or ultrasound imaging in combination with standard mammography may increase the likelihood of detecting cancer. Mammography also results in some overdiagnoses, which is the detection of cancer that would neither have caused harm nor been diagnosed in the absence of screening. Most women with an abnormal mammogram do not have cancer. Lesions that remain suspicious after additional imaging are usually biopsied for a definitive diagnosis. For most women at high risk of breast cancer, annual screening using magnetic resonance imaging (MRI) in addition to mammography is recommended, typically starting at the age of 30. (For more information, see *Breast Cancer Facts & Figures* at cancer.org/statistics.) Concerted efforts should be made to improve access to health care and encourage all women 40 and older to receive regular mammograms. For more information on the Society's recommendations for breast cancer screening, see page 68.

Treatment: Taking into account tumor size, extent of spread, and other characteristics, as well as patient preference, treatment usually involves breast-conserving surgery (surgical removal of the tumor and surrounding tissue) or mastectomy (surgical removal of the breast). Numerous studies have shown that for early breast cancer (cancer that has not spread to the skin, chest wall, or distant organs), long-term survival is similar among women treated with breast-conserving surgery plus radiation therapy and those treated with mastectomy. Women undergoing mastectomy who elect breast reconstruction have several options, including the materials used to restore the breast shape and the timing of the procedure.

Underarm lymph nodes are usually removed and evaluated during surgery to determine whether the tumor has spread beyond the breast. In women with early stage disease, sentinel lymph node biopsy, a procedure in which only the first lymph nodes to which cancer is likely to spread are removed, has a lower chance of long-term side effects (e.g., lymphedema, arm swelling caused by the accumulation of lymph fluid) and is as effective as a full axillary node dissection, in which many nodes are removed.

Treatment may also involve radiation therapy, chemotherapy (before or after surgery), hormone therapy (e.g., selective estrogen response modifiers, aromatase inhibitors, ovarian ablation), and/or targeted therapy. Postmenopausal women with early stage breast cancer that tests positive for hormone receptors

benefit from treatment with an aromatase inhibitor (e.g., letrozole, anastrozole, or exemestane) in addition to, or instead of, tamoxifen. For women whose cancer tests positive for HER2/neu, several therapies are available that target the growth-promoting protein HER2. The US Food and Drug Administration (FDA) revoked approval of bevacizumab (Avastin) for the treatment of metastatic breast cancer in 2011 because of evidence showing minimal benefit and potentially dangerous side effects.

While some cases of ductal carcinoma in situ (DCIS) will progress to invasive cancer, many will not. However, because there is currently no way to distinguish which lesions will go on to cause harm, surgery is recommended for all patients. Treatment options for DCIS include breast-conserving surgery with radiation therapy or mastectomy; if the tumor is hormone receptor-positive, surgery may be followed by treatment with tamoxifen. Removal of axillary lymph nodes is not generally needed, but a sentinel lymph node procedure may be performed with a mastectomy. A report by a panel of experts convened by the National Institutes of Health concluded that in light of the noninvasive nature and favorable prognosis of DCIS, the primary goal of future research should be the development of risk categories so each patient can receive the minimum treatment necessary for a successful outcome.

Survival: Overall, 61% of breast cancer cases are diagnosed at a localized stage (no spread to lymph nodes or other locations outside the breast), for which the 5-year relative survival rate is 99%. If the cancer has spread to tissues or lymph nodes under the arm (regional stage), the survival rate is 84%. If the spread is to lymph nodes around the collarbone or to distant lymph nodes or organs (distant stage), the survival rate falls to 24%. For all stages combined, relative survival rates at 10 and 15 years after diagnosis are 83% and 78%, respectively. Caution should be used when interpreting long-term survival rates because they represent patients who were diagnosed many years ago and do not reflect recent advances in detection and treatment. For example, 15-year relative survival is based on patients diagnosed as early as 1992. There are large differences in breast cancer survival by race; for all stages combined, the 5-year survival rate is 90% for white women and 79% for African American women.

Many studies have shown that being overweight adversely affects survival for postmenopausal women with breast cancer. In addition, breast cancer survivors who are more physically active, particularly after diagnosis, are less likely to die from breast cancer, or other causes, than those who are inactive.

For more information about breast cancer, see the American Cancer Society's *Breast Cancer Facts & Figures*, available online at cancer.org/statistics.

Childhood Cancer (Ages 0-14 years)

See page 25 for special section on childhood and adolescent cancers.

Colon and Rectum

New cases: An estimated 96,830 cases of colon cancer and 40,000 cases of rectal cancer are expected to be diagnosed in 2014. Colorectal cancer is the third most common cancer in both men and women. Incidence rates have been decreasing for most of the past two decades, which has largely been attributed to increases in the use of colorectal cancer screening tests that allow for the detection and removal of colorectal polyps before they progress to cancer. From 2006 to 2010, incidence rates declined by 3.7% per year among adults 50 years of age and older (among whom screening is recommended), but increased by 1.8% per year among adults younger than age 50.

Deaths: An estimated 50,310 deaths from colorectal cancer are expected to occur in 2014. Mortality rates for colorectal cancer have declined in both men and women over the past two decades; from 2006 to 2010, the rate declined by 2.5% per year in men and by 3.0% per year in women. These decreases reflect declining incidence rates and improvements in early detection and treatment.

Signs and symptoms: Early stage colorectal cancer typically does not have symptoms, which is why screening is usually necessary to detect this cancer in its early stages. Symptoms may include rectal bleeding, blood in the stool, a change in bowel habits or stool shape (e.g., narrower than usual), the feeling that the bowel is not completely empty, cramping pain in the lower abdomen, decreased appetite, or weight loss. In some cases, blood loss from the cancer leads to anemia (low red blood cells), causing symptoms such as weakness and excessive fatigue. Timely evaluation of symptoms consistent with colorectal cancer is essential, even for adults younger than age 50, among whom colorectal cancer is rare, but increasing.

Risk factors: The risk of colorectal cancer increases with age; in 2010, 90% of cases were diagnosed in individuals 50 years of age and older. Modifiable factors associated with increased risk include obesity, physical inactivity, a diet high in red or processed meat, alcohol consumption, long-term smoking, and very low intake of fruits and vegetables. Hereditary and medical factors that increase risk include a personal or family history of colorectal cancer and/or polyps, a personal history of chronic inflammatory bowel disease (e.g., ulcerative colitis or Crohn disease), certain inherited genetic conditions (e.g., Lynch syndrome, also known as hereditary non-polyposis colorectal cancer, or familial adenomatous polyposis [FAP]), and type 2 diabetes.

Consumption of milk and calcium and higher blood levels of vitamin D appear to decrease colorectal cancer risk. Regular use of nonsteroidal anti-inflammatory drugs, such as aspirin, also

reduces risk. However, these drugs are not recommended for the prevention of colorectal cancer among individuals at average risk because they can have serious adverse health effects. Accumulating evidence suggests that past or current use of menopausal hormone therapy (particularly combined estrogen and progesterone) also lowers risk. However, hormone therapy is not recommended for the prevention of colorectal cancer because it increases risk for breast cancer, stroke, heart attack, and blood clots.

Early detection: Beginning at the age of 50, men and women who are at average risk for developing colorectal cancer should begin screening. Screening can detect and allow for the removal of colorectal polyps that might become cancerous, as well as detect cancer at an early stage, when treatment is usually less extensive and more successful. In 2008, the American Cancer Society collaborated with several other organizations to release cancer screening guidelines. These joint guidelines emphasize cancer prevention and draw a distinction between screening tests that primarily detect cancer and those that can detect both cancer and precancerous polyps. There are a number of recommended screening options, which differ by the extent of bowel preparation, as well as test performance, limitations, time interval, and cost. For detailed information on colorectal cancer screening options, see *Colorectal Cancer Facts & Figures* at cancer.org/statistics, and for the Society's screening guidelines for colorectal cancer, see page 68.

Treatment: Surgery is the most common treatment for colorectal cancer. For cancers that have not spread, surgical removal may be curative. A permanent colostomy (creation of an abdominal opening for elimination of body waste) is rarely needed for colon cancer and is infrequently required for rectal cancer. Chemotherapy alone, or in combination with radiation, is given before (neoadjuvant) or after (adjuvant) surgery to most patients whose cancer has penetrated the bowel wall deeply or spread to lymph nodes. Adjuvant chemotherapy for colon cancer in otherwise healthy patients age 70 and older is equally effective as in younger patients; toxicity in older patients can be limited by avoiding certain drugs (e.g., oxaliplatin). Several targeted therapies have been approved by the FDA to treat metastatic colorectal cancer.

Survival: The 1- and 5-year relative survival rates for people with colorectal cancer are 83% and 65%, respectively. Survival continues to decline to 58% at 10 years after diagnosis. When colorectal cancers are detected at a localized stage, the 5-year survival is 90%; however, only 40% of colorectal cancers are diagnosed at this early stage, in part due to the underuse of screening. If the cancer has spread regionally to involve nearby organs or lymph nodes by the time of diagnosis, the 5-year survival drops to 70%. If the disease has spread to distant organs, the 5-year survival is 13%.

Kidney

New cases: An estimated 63,920 new cases of kidney (renal) cancer are expected to be diagnosed in 2014. This estimate largely reflects renal cell carcinomas, which start in the body of the kidney, but also includes cancers of the renal pelvis (6%), which behave more like bladder cancer, and Wilms tumor (1%), a childhood cancer that usually develops before the age of 5 (see special section on childhood and adolescent cancers, page 25). After increasing for several decades, kidney cancer incidence rates were stable in both men and women from 2006 to 2010.

Deaths: An estimated 13,860 deaths from kidney cancer are expected to occur in 2014. Death rates for kidney cancer decreased by 0.9% per year from 2006 to 2010.

Signs and symptoms: Early stage kidney cancer usually has no symptoms. As the tumor progresses, symptoms may include blood in the urine, a pain or lump in the lower back or abdomen, fatigue, weight loss, fever, or swelling in the legs and ankles.

Risk factors: Tobacco use is a strong risk factor for kidney cancer, with the largest risk for cancer of the renal pelvis, particularly among heavy smokers. Additional risk factors for renal cell carcinoma include obesity, to which an estimated 30% of cases can be attributed; high blood pressure; chronic renal failure; and occupational exposure to certain chemicals, such as trichloroethylene, an industrial agent used as a metal degreaser and chemical additive. Radiation exposure (such as for cancer treatment) slightly increases risk. A small proportion of renal cell cancers are the result of rare hereditary conditions (e.g., von Hippel-Lindau disease and hereditary papillary renal cell carcinoma). Physical activity decreases the risk of kidney cancer.

Early detection: There are no recommended screening tests for the early detection of kidney cancer among people at average risk.

Treatment: Active surveillance (observation) may be offered to some patients with small tumors. Surgery (traditional or laparoscopic, i.e., minimally invasive, performed through very small incisions) is the primary treatment for most kidney cancers. Patients who are not surgical candidates may be offered ablation therapy, a procedure that uses heat or cold to destroy the tumor. Kidney cancer tends to be resistant to both traditional chemotherapy and radiation therapy. Improved understanding of the biology of kidney cancer has led to the development of several targeted therapies that are used to treat metastatic disease.

Survival: The 1- and 5-year relative survival rates for cancers of the kidney are 85% and 72%, respectively. More than half (63%) of cases are diagnosed at the local stage, for which the 5-year relative survival rate is 92%. Five-year survival is lower for renal pelvis (51%) than for renal cell carcinoma (73%).

Leukemia

New cases: An estimated 52,380 new cases of leukemia are expected in 2014. Leukemia is a cancer of the bone marrow and blood and is classified into four main groups according to cell type and rate of growth: acute lymphocytic (ALL), chronic lymphocytic (CLL), acute myeloid (AML), and chronic myeloid (CML). The majority (91%) of leukemia cases are diagnosed in adults 20 years of age and older, among whom the most common types are CLL (35%) and AML (32%). Among children and teens, ALL is most common, accounting for 75% of leukemia cases (see special section on childhood and adolescent cancers, page 25). From 2006 to 2010, overall leukemia incidence rates increased slightly (by 0.5% per year).

Deaths: An estimated 24,090 deaths are expected to occur in 2014. Death rates for leukemia have been declining for the past several decades; from 2006 to 2010, rates decreased by 0.8% per year among males and by 1.3% per year among females.

Signs and symptoms: Symptoms may include fatigue, paleness, weight loss, repeated infections, fever, bruising easily, and nosebleeds or other hemorrhages. In acute leukemia, these signs can appear suddenly. Chronic leukemia typically progresses slowly with few symptoms and is often diagnosed during routine blood tests. Patients with CML or CLL may experience swollen lymph nodes or pain in the upper left abdomen due to an enlarged spleen.

Risk factors: Exposure to ionizing radiation increases the risk of several types of leukemia (excluding CLL). Medical radiation, such as that used in cancer treatment, is one of the most common sources of radiation exposure. Leukemia may also occur as a side effect of chemotherapy. Children with Down syndrome and certain other genetic abnormalities are at increased risk of leukemia. Workers in the rubber-manufacturing industry also have an increased risk. Recent studies suggest that obesity increases the risk of leukemia.

Some risk factors are most closely associated with specific types of leukemia. For example, family history is a strong risk factor for CLL. Cigarette smoking is a risk factor for AML in adults, and there is accumulating evidence that parental smoking before and after childbirth may increase the risk of childhood leukemia. There is limited evidence that maternal exposure to paint fumes also increases the risk of childhood leukemia. Exposure to certain chemicals, such as formaldehyde and benzene (a component in cigarette smoke and gasoline that has become more regulated due to its carcinogenicity), increases the risk of AML. Infection with human T-cell leukemia virus type I (HTLV-I) can cause a rare type of leukemia called adult T-cell leukemia/lymphoma. The prevalence of HTLV-I infection is geographically localized and is most common in southern Japan and the Caribbean; infected individuals in the US tend to be descendants or immigrants from endemic regions.

Early detection: Although leukemia is sometimes found early because of abnormalities on blood tests done for other indications, it is not usually diagnosed early based on symptoms because these often resemble those of other, less serious conditions.

Treatment: Chemotherapy is used to treat most types of leukemia. Various anticancer drugs are used, either in combination or as single agents. Several targeted drugs (e.g., imatinib [Gleevec]) are effective for treating CML because they attack cells with the Philadelphia chromosome, the genetic abnormality that is the hallmark of this type of leukemia. Some of these drugs are also FDA-approved to treat a type of ALL involving the same genetic defect. People diagnosed with CLL that is not progressing or causing symptoms may not require treatment. Recent clinical trials have shown that adults with AML who are treated with twice the conventional dose of daunorubicin experience higher and more rapid rates of remission. Antibiotics and transfusions of blood components are used as supportive treatments. Under appropriate conditions, high-dose chemotherapy followed by stem cell transplantation may be used to treat certain types of leukemia.

Survival: Survival rates vary substantially by leukemia subtype, ranging from a current 5-year relative survival of 24% for patients diagnosed with AML to 79% for those with CLL. Advances in treatment have resulted in a dramatic improvement in survival over the past three decades for most types of leukemia. For example, from 1975-1977 to 2003-2009, the overall 5-year relative survival rate for ALL increased from 41% to 69%. In large part due to the discovery of targeted cancer drugs like imatinib, the 5-year survival rate for CML has almost doubled from 31% for cases diagnosed during 1990-1992 to 59% for those diagnosed during 2003-2009.

Liver

New Cases: An estimated 33,190 new cases of liver cancer (including intrahepatic bile duct cancers) are expected to occur in the US during 2014. Most (80%) of these cases are hepatocellular carcinoma (HCC). Liver cancer incidence rates are about three times higher in men than in women. From 2006 to 2010, rates increased by 3.7% per year in men and by 2.9% per year in women.

Deaths: An estimated 23,000 liver cancer deaths (7,130 women, 15,870 men) are expected in 2014. From 2006 to 2010, death rates for liver cancer increased by 2.3% per year in men and 1.4% per year in women.

Signs and symptoms: Common symptoms include abdominal pain and/or swelling, weight loss, weakness, loss of appetite, jaundice (a yellowish discoloration of the skin and eyes), and fever. Enlargement of the liver is the most common physical sign.

Probability (%) of Developing Invasive Cancers during Selected Age Intervals by Sex, US, 2008-2010*

		Birth to 49	50 to 59	60 to 69	70 and Older	Birth to Death
All sites†	Male	3.5 (1 in 29)	6.8 (1 in 15)	15.4 (1 in 6)	36.9 (1 in 3)	43.9 (1 in 2)
	Female	5.4 (1 in 19)	6.0 (1 in 17)	10.1 (1 in 10)	26.7 (1 in 4)	38.0 (1 in 3)
Kidney & renal pelvis	Male	0.2 (1 in 480)	0.3 (1 in 289)	0.6 (1 in 154)	1.3 (1 in 75)	2.1 (1 in 49)
	Female	0.1 (1 in 753)	0.2 (1 in 586)	0.3 (1 in 317)	0.7 (1 in 134)	1.2 (1 in 83)
Breast	Female	1.9 (1 in 53)	2.3 (1 in 43)	3.5 (1 in 29)	6.7 (1 in 15)	12.3 (1 in 8)
Colon & rectum	Male	0.3 (1 in 305)	0.7 (1 in 144)	1.3 (1 in 76)	4.0 (1 in 25)	5.0 (1 in 20)
	Female	0.3 (1 in 334)	0.5 (1 in 189)	0.9 (1 in 109)	3.7 (1 in 27)	4.6 (1 in 22)
Leukemia	Male	0.2 (1 in 421)	0.2 (1 in 614)	0.4 (1 in 279)	1.3 (1 in 76)	1.7 (1 in 60)
	Female	0.2 (1 in 526)	0.1 (1 in 979)	0.2 (1 in 475)	0.8 (1 in 120)	1.2 (1 in 86)
Lung & bronchus	Male	0.2 (1 in 548)	0.7 (1 in 134)	2.1 (1 in 47)	6.7 (1 in 15)	7.6 (1 in 13)
	Female	0.2 (1 in 522)	0.6 (1 in 171)	1.6 (1 in 62)	4.9 (1 in 20)	6.3 (1 in 16)
Melanoma of the skin§	Male	0.4 (1 in 284)	0.4 (1 in 134)	0.8 (1 in 129)	2.1 (1 in 48)	2.9 (1 in 34)
	Female	0.5 (1 in 206)	0.3 (1 in 313)	0.4 (1 in 243)	0.9 (1 in 113)	1.9 (1 in 53)
Non-Hodgkin lymphoma	Male	0.3 (1 in 357)	0.3 (1 in 338)	0.6 (1 in 171)	1.8 (1 in 56)	2.4 (1 in 42)
	Female	0.2 (1 in 537)	0.2 (1 in 475)	0.4 (1 in 233)	1.4 (1 in 71)	1.9 (1 in 52)
Prostate	Male	0.3 (1 in 298)	2.3 (1 in 43)	6.4 (1 in 16)	11.2 (1 in 9)	15.3 (1 in 7)
Uterine cervix	Female	0.3 (1 in 348)	0.1 (1 in 812)	0.1 (1 in 824)	0.2 (1 in 619)	0.7 (1 in 151)
Uterine corpus	Female	0.3 (1 in 370)	0.6 (1 in 171)	0.9 (1 in 111)	1.3 (1 in 78)	2.7 (1 in 37)

*For those who are cancer-free at the beginning of each age interval. †All sites excludes basal cell and squamous cell skin cancers and in situ cancers except urinary bladder. §Statistic is for whites only.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.0. Statistical Research and Applications Branch, National Cancer Institute, 2013. www.srab.cancer.gov/devcan.

American Cancer Society, Surveillance Research, 2014

Risk factors: In the US and other Western countries, the majority of liver cancer cases are due to alcohol-related cirrhosis, and possibly nonalcoholic fatty liver disease associated with obesity, diabetes, and related metabolic disorders. Chronic hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are associated with less than half of liver cancer cases in the US, although they are the major risk factors for the disease worldwide. In the US, rates of HCC are higher in immigrants from areas where HBV is endemic, such as China, Southeast Asia, and sub-Saharan Africa. A vaccine that protects against HBV has been available since 1982. Vaccination is recommended for all infants at birth; for all children under 18 years of age who were not vaccinated at birth; and for adults in high-risk groups (e.g., health care workers, injection drug users, and those younger than 60 years of age who have been diagnosed with diabetes). It is also recommended that pregnant women be tested for HBV.

There is no vaccine available to prevent HCV infection, though new antiviral therapies may prevent chronic infection among those with acute (new) infection. The Centers for Disease Control and Prevention (CDC) recommends one-time HCV testing for everyone born from 1945 to 1965 because people in this birth cohort account for about three-fourths of HCV-infected individuals and HCV-related deaths in the US. Routine testing is recommended for individuals at high risk of infection, such as injection drug users, those on hemodialysis, and people who are HIV infected. People who test positive can receive treatment, which may reduce their risk of liver cancer, and counseling to reduce the risk of HCV transmission to others. Other preventive measures for HCV infection include screening of donated blood, organs, and tissues; adherence to infection control practices during medical and dental procedures; and needle-exchange programs for injecting drug users. For more information on viral hepatitis, including who is at risk, visit the CDC Web site at cdc.gov/hepatitis/.

Certain genetic disorders, such as hemochromatosis, also increase the risk of liver cancer. In economically developing countries, the risk is increased by some parasitic infections (schistosomiasis and liver flukes) and consumption of food contaminated with aflatoxin, a toxin produced by mold during the storage of agricultural products in a warm, humid environment.

Early detection: Screening for liver cancer has not been shown to reduce mortality. Nonetheless, many doctors in the US screen high-risk people (e.g., those with cirrhosis) with ultrasound or blood tests.

Treatment: Early stage liver cancer can sometimes be successfully treated with surgery in a limited number of patients with sufficient healthy liver tissue. Liver transplantation may be an option for individuals with small tumors that cannot be surgically removed. Other treatment options include ablation (tumor destruction) or embolization (blocking blood flow to the tumor).

Fewer treatment options exist for patients diagnosed at an advanced stage. Sorafenib (Nexavar) is a targeted drug approved for the treatment of HCC in patients who are not candidates for surgery.

Survival: The overall 5-year relative survival rate for patients with liver cancer is 16%. Forty-one percent of patients are diagnosed at an early stage, for which 5-year survival is 29%, up from 9% in the mid-1970s. Survival decreases to 10% and 3% for patients who are diagnosed at regional and distant stages of disease, respectively.

Lung and Bronchus

New cases: An estimated 224,210 new cases of lung cancer are expected in 2014, accounting for about 13% of all cancer diagnoses. The incidence rate has been declining since the mid-1980s in men, but only since the mid-2000s in women. From 2006 to 2010, lung cancer incidence rates decreased by 1.9% per year in men and by 1.2% per year in women.

Deaths: Lung cancer accounts for more deaths than any other cancer in both men and women. An estimated 159,260 deaths, accounting for about 27% of all cancer deaths, are expected to occur in 2014. Death rates began declining in 1991 in men and in 2003 in women. From 2006 to 2010, rates decreased 2.9% per year in men and 1.4% per year in women. Gender differences in lung cancer mortality reflect historical differences in patterns of smoking uptake and cessation over the past 50 years.

Signs and symptoms: Symptoms may include persistent cough, sputum streaked with blood, chest pain, voice change, and recurrent pneumonia or bronchitis.

Risk factors: Cigarette smoking is by far the most important risk factor for lung cancer; risk increases with both quantity and duration of smoking. Cigar and pipe smoking also increase risk. Exposure to radon gas released from soil and building materials is estimated to be the second leading cause of lung cancer in Europe and North America. Other risk factors include occupational or environmental exposure to secondhand smoke, asbestos (particularly among smokers), certain metals (chromium, cadmium, arsenic), some organic chemicals, radiation, air pollution, and diesel exhaust. Additional occupational exposures that increase risk include rubber manufacturing, paving, roofing, painting, and chimney sweeping. Risk is also probably increased among people with a medical history of tuberculosis. Genetic susceptibility plays a contributing role in the development of lung cancer, especially in those who develop the disease at a young age.

Early detection: In 2010, results from the National Lung Screening Trial (NLST) showed 20% fewer lung cancer deaths among current and former heavy smokers who were screened with spiral CT compared to standard chest x-ray. In January 2013, the American Cancer Society issued guidelines for the early detection of lung cancer based on a systematic review of the evidence. These guidelines endorse a process of shared decision making between clinicians who have access to high-volume, high-quality lung cancer screening programs and current or former adult smokers (quit within the previous 15 years) who are 55 to 74 years of age, in good health, and with at least a 30-year pack history of smoking. Shared decision making should include a discussion of the benefits, uncertainties, and harms associated with lung cancer screening. For more information on lung cancer screening, see the American Cancer Society's screening guidelines on page 68.

Treatment: Lung cancer is classified as small cell (14%) or non-small cell (84%) for the purposes of treatment. Based on type and stage of cancer, as well as specific molecular characteristics of cancer cells, treatments include surgery, radiation therapy, chemotherapy, and targeted therapies. For early stage non-small cell lung cancers, surgery is usually the treatment of choice; chemotherapy (sometimes in combination with radiation therapy) is often given as well. Advanced-stage non-small cell lung cancer patients are usually treated with chemotherapy, targeted drugs, or some combination of the two. Chemotherapy alone or combined with radiation is the usual treatment of choice for small cell lung cancer; on this regimen, a large percentage of patients experience remission, though the cancer often returns.

Survival: The 1- and 5-year relative survival rates for lung cancer cases diagnosed during 2003-2009 were 43% and 17%, respectively. Only 15% of lung cancers are diagnosed at a localized stage, for which the 5-year survival rate is 54%. The 5-year survival for small cell lung cancer (6%) is lower than that for non-small cell (18%).

Lymphoma

New cases: An estimated 79,990 new cases of lymphoma will be diagnosed in 2014. Lymphoma is a type of cancer that begins in certain immune system cells, and is classified as either Hodgkin (9,190 cases in 2014) or non-Hodgkin (NHL, 70,800 cases in 2014). From 2006 to 2010, incidence rates increased slightly among men for both NHL (0.7% per year) and Hodgkin lymphoma (0.4% per year), while among women rates were stable. However, it is important to note that NHL encompasses a wide variety of disease subtypes for which incidence patterns may vary.

Deaths: An estimated 20,170 deaths from lymphoma will occur in 2014, most of which are NHL (18,990). Death rates for Hodgkin lymphoma have been decreasing for the past four decades; from 2006 to 2010, rates decreased by 2.2% per year among men and by 2.6% per year among women. Death rates for NHL began decreasing in the late 1990s; from 2006 to 2010, rates decreased by 2.4% per year among men and women combined. Declines in lymphoma death rates reflect improvements in treatment over time.

Signs and symptoms: The most common symptoms of lymphoma are produced by swollen lymph nodes, which can cause lumps under the skin; chest pain and shortness of breath; and abdominal fullness and loss of appetite. Other symptoms include itching, night sweats, fatigue, unexplained weight loss, and intermittent fever.

Risk factors: Like most cancers, the risk of developing NHL increases with age. In contrast, the risk of Hodgkin lymphoma is highest during adolescence and early adulthood. Most of the few known risk factors for lymphoma are associated with altered immune function. NHL risk is elevated in people who receive immune suppressants to prevent organ transplant rejection, in people with severe autoimmune conditions, and in people infected with human immunodeficiency virus (HIV) or human T-cell leukemia virus type I. Epstein Barr virus causes Burkitt lymphoma (an aggressive type of NHL that occurs most often in children and young adults) and is associated with a number of autoimmune-related NHLs and some types of Hodgkin lymphoma. Chronic infection with some types of bacteria that cause the immune system to be continuously active are associated with certain types of NHL; for example, *Helicobacter pylori (H. pylori)* infection increases the risk of gastric lymphoma and *Chlamydophila psittaci* infection increases the risk of a lymphoma that occurs in the tissues of the eye. A family history of lymphoma and a growing number of confirmed common genetic variations are associated with modestly increased risk, including variations in the human leukocyte antigen (HLA). Working in the rubber manufacturing industry and occupational and environmental exposure to certain chemicals (e.g., solvents such as dichloromethane) may also modestly increase risk.

Treatment: Non-Hodgkin lymphoma patients are usually treated with chemotherapy; radiation, alone or in combination with chemotherapy, is used less often. Highly specific monoclonal antibodies directed at lymphoma cells, such as rituximab (Rituxan) and alemtuzumab (Campath), are used for some types of NHL, as are antibodies linked to a radioactive atom, such as ibritumomab tiuxetan (Zevalin) and tositumomab (Bexxar). If NHL persists or recurs after standard treatment, stem cell transplantation (with high-dose or nonmyeloablative chemotherapy) may be an option.

Hodgkin lymphoma is usually treated with chemotherapy, radiation therapy, or a combination of the two, depending on disease stage and cell type. Stem cell transplantation may be an option if these are not effective. The targeted drug brentuximab vedotin (Adcetris) – a monoclonal antibody linked to a chemotherapy drug – is used to treat Hodgkin lymphoma (as well as a rare form of NHL) in patients whose disease has failed to respond to other treatment.

Survival: Survival varies widely by cell type and stage of disease. For NHL, the overall 1- and 5-year relative survival rates are 81% and 69%, respectively; survival declines to 58% at 10 years after diagnosis. For Hodgkin lymphoma, the 1-, 5-, and 10-year relative survival rates are 92%, 85%, and 80%, respectively.

Oral Cavity and Pharynx

New cases: An estimated 42,440 new cases of cancer of the oral cavity and pharynx (throat) are expected in 2014. Incidence rates are more than twice as high in men as in women. From 2006 to 2010, incidence rates were stable in men and decreased by 0.9% annually in women. However, among white men and women, incidence rates are increasing for a subset of cancers in the oropharynx (the middle part of the pharynx that includes the back of the mouth, base of the tongue, and tonsils) that are associated with human papillomavirus (HPV) infection.

Deaths: An estimated 8,390 deaths from oral cavity and pharynx cancer are expected in 2014. Death rates have been decreasing over the past three decades; from 2006 to 2010, rates decreased by 1.2% per year in men and by 2.1% per year in women.

Signs and symptoms: Symptoms may include a lesion in the throat or mouth that bleeds easily and does not heal; a persistent red or white patch, lump or thickening in the throat or mouth; ear pain; a neck mass; or coughing up blood. Difficulty chewing, swallowing, or moving the tongue or jaws are often late symptoms.

Risk factors: Known risk factors include tobacco use in any form (smoked and smokeless) and excessive alcohol consumption. Many studies have reported a synergistic relationship between smoking and alcohol that results in a 30-fold increased risk for individuals who both smoke and drink heavily. HPV infection is associated with cancers of the tonsil, base of the tongue, and some other sites within the oropharynx and is believed to be transmitted through sexual contact.

Early detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Visual inspection by dentists and physicians can often detect premalignant abnormalities and cancer at an early stage, when treatment can be both less extensive and more successful.

Treatment: Radiation therapy and surgery, separately or in combination, are standard treatments; chemotherapy is added for advanced disease. Targeted therapy with cetuximab (Erbitux) may be combined with radiation in initial treatment or used to treat recurrent cancer.

Survival: For all stages combined, about 83% of people with oral cavity and pharynx cancer survive at least 1 year after diagnosis. The 5-year and 10-year relative survival rates are 62% and 51%, respectively.

Five-year Relative Survival Rates* (%) by Stage at Diagnosis, 2003-2009

	All Stages	Local	Regional	Distant		All Stages	Local	Regional	Distant
Breast (female)	89	99	84	24	Ovary	44	92	72	27
Colon & rectum	65	90	70	13	Pancreas	6	24	9	2
Esophagus	17	39	21	4	Prostate	99	100	100	28
Kidney†	72	92	64	12	Stomach	28	63	28	4
Larynx	61	76	43	35	Testis	95	99	96	74
Liver‡	16	29	10	3	Thyroid	98	100	97	55
Lung & bronchus	17	54	26	4	Urinary bladder§	78	70	33	5
Melanoma of the skin	91	98	62	16	Uterine cervix	68	91	57	16
Oral cavity & pharynx	62	83	59	36	Uterine corpus	82	95	68	17

*Rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 18 areas from 2003-2009, all followed through 2010.
†Includes renal pelvis. ‡Includes intrahepatic bile duct. §Rate for in situ cases is 96%.

Local: an invasive malignant cancer confined entirely to the organ of origin. **Regional:** a malignant cancer that 1) has extended beyond the limits of the organ of origin directly into surrounding organs or tissues; 2) involves regional lymph nodes; or 3) has both regional extension and involvement of regional lymph nodes.
Distant: a malignant cancer that has spread to parts of the body remote from the primary tumor either by direct extension or by discontinuous metastasis to distant organs, tissues, or via the lymphatic system to distant lymph nodes.

Source: Howlader N, Noone AM, Krapcho M, et al. (eds). *SEER Cancer Statistics Review, 1975-2010*, National Cancer Institute, Bethesda, MD http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER Web site, April 2013.

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Ovary

New cases: An estimated 21,980 new cases of ovarian cancer are expected in the US in 2014. Incidence has been slowly decreasing since the mid-1980s; from 2006 to 2010, the incidence rate decreased by 0.9% per year.

Deaths: An estimated 14,270 deaths are expected in 2014. Ovarian cancer accounts for 5% of cancer deaths among women and causes more deaths than any other cancer of the female reproductive system. From 2006 to 2010, the death rate for ovarian cancer decreased by 2.8% per year among women younger than 65 years of age and by 1.7% per young among those 65 and older.

Signs and symptoms: Early ovarian cancer usually has no obvious symptoms. However, studies have indicated that some women experience persistent, nonspecific symptoms, such as bloating, pelvic or abdominal pain, difficulty eating or feeling full quickly, or urinary urgency or frequency. Women who experience such symptoms daily for more than a few weeks should seek prompt medical evaluation. The most common sign of ovarian cancer is swelling of the abdomen, which is caused by the accumulation of fluid. Abnormal vaginal bleeding is rarely a symptom of ovarian cancer, though it is a symptom of cervical and uterine cancers.

Risk factors: The most important risk factor is a strong family history of breast or ovarian cancer. Women who have had breast cancer or who have tested positive for inherited mutations in *BRCA1* or *BRCA2* genes are at increased risk. Studies indicate that preventive surgery to remove the ovaries and fallopian tubes in these women can decrease the risk of ovarian cancer. Other medical conditions associated with increased risk include pelvic inflammatory disease and a genetic condition called hereditary nonpolyposis colorectal cancer (also called Lynch syndrome). The use of estrogen alone as menopausal hormone therapy has been shown to increase risk in several large studies. Tobacco smoking increases the risk of mucinous ovarian cancer. Heavier body weight may be associated with increased risk of ovarian cancer. Pregnancy, long-term use of oral contraceptives, and tubal ligation reduce the risk of ovarian cancer. Hysterectomy (removal of the uterus) and salpingectomy (removal of fallopian tubes) may decrease risk.

Early detection: There is currently no sufficiently accurate screening test for the early detection of ovarian cancer in average risk women. Pelvic examination only occasionally detects ovarian cancer, generally when the disease is advanced. However, for women who are at high risk, a thorough pelvic exam in combination with transvaginal ultrasound and a blood test for the tumor marker CA125 may be offered, though this strategy has not yet proven effective in screening even high-risk groups of women. Although a clinical trial in the US showed that these tests had no effect on ovarian cancer mortality when used as a screening tool in average risk women, results are expected in 2015 from another large screening trial under way in the United Kingdom. A pelvic exam, sometimes in combination with a transvaginal ultrasound, may be used to evaluate women with symptoms.

Treatment: Treatment includes surgery and usually chemotherapy. Surgery usually involves removal of one or both ovaries and fallopian tubes (salpingo-oophorectomy), the uterus (hysterectomy), and the omentum (fatty tissue attached to some of the organs in the belly), along with biopsies of the peritoneum (lining of the abdominal cavity). In younger women with very early stage tumors who want to have children, only the involved

Trends in 5-year Relative Survival Rates* (%) by Race, US, 1975-2009

	All races			White			African American		
	1975-77	1987-89	2003-2009	1975-77	1987-89	2003-2009	1975-77	1987-89	2003-2009
All sites	49	55	68†	50	57	69†	39	43	61†
Brain & other nervous system	22	29	35†	22	28	33†	25	32	41†
Breast (female)	75	84	90†	76	85	92†	62	71	79†
Colon	51	60	65†	51	61	67†	45	52	56†
Esophagus	5	9	19†	6	11	20†	4	7	14†
Hodgkin lymphoma	72	79	88†	72	80	89†	70	72	83†
Kidney & renal pelvis	50	57	73†	50	57	73†	49	55	72†
Larynx	66	66	63†	67	67	64	58	56	52
Leukemia	34	43	59†	35	44	60†	33	35	53†
Liver & intrahepatic bile duct	3	5	18†	3	6	17†	2	3	12†
Lung & bronchus	12	13	18†	12	13	18†	11	11	14†
Melanoma of the skin	82	88	93†	82	88	93†	57‡	79‡	77‡
Myeloma	25	27	45†	24	27	45†	30	30	44†
Non-Hodgkin lymphoma	47	51	71†	47	51	72†	48	46	64†
Oral cavity & pharynx	53	54	65†	54	56	67†	36	34	46†
Ovary	36	38	44†	35	38	44†	42	34	36
Pancreas	2	4	6†	3	3	7†	2	6	6†
Prostate	68	83	100†	69	84	100†	61	71	98†
Rectum	48	58	68†	48	59	68†	44	52	62†
Stomach	15	20	29†	14	18	28†	16	19	29†
Testis	83	95	97†	83	96	97†	73‡#	88‡	90
Thyroid	92	94	98†	92	94	98†	90	92	97†
Urinary bladder	72	79	80†	73	80	81†	50	63	64†
Uterine cervix	69	70	69	70	73	71	64	57	63
Uterine corpus	87	82	84†	88	84	86†	60	57	64

*Survival rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 9 areas from 1975-77, 1987-89, and 2003 to 2009, all followed through 2010. †The difference in rates between 1975-1977 and 2003-2009 is statistically significant ($p < 0.05$). ‡The standard error is between 5 and 10 percentage points. #Survival rate is for cases diagnosed in 1978-1980.

Source: Howlader N, Noone AM, Krapcho M, et al. (eds). *SEER Cancer Statistics Review, 1975-2010*, National Cancer Institute, Bethesda, MD http://seer.cancer.gov/csr/1975_2010/, based on November 2012 SEER data submission, posted to the SEER Web site, April 2013.

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ovary and fallopian tube may be removed. Among patients with early ovarian cancer, complete surgical staging has been associated with better outcomes. For women with advanced disease, surgically removing all abdominal metastases larger than one centimeter (debulking) enhances the effect of chemotherapy and helps improve survival. For women with stage III ovarian cancer that has been optimally debulked, studies have shown that chemotherapy administered both intravenously and directly into the abdomen (intraperitoneally) improves survival. Studies have also found that ovarian cancer patients whose surgery is performed by a gynecologic oncologist have more successful outcomes. Clinical trials are currently under way to test targeted drugs such as bevacizumab and cediranib in the treatment of ovarian cancer.

Survival: Relative survival varies substantially by age; women younger than 65 years of age are twice as likely to survive 5 years following diagnosis as women 65 and older (57% versus 28%). Overall, the 1-, 5-, and 10-year relative survival rates for ovarian cancer patients are 75%, 44%, and 35%, respectively. If diagnosed at the localized stage, the 5-year survival rate is 92%; however, only 15% of all cases are detected at this stage, usually incidentally during another medical procedure. The majority of cases (61%) are diagnosed at distant stage, for which the 5-year survival rate is 27%.

Pancreas

New cases: An estimated 46,420 new cases of pancreatic cancer are expected to occur in the US in 2014. Pancreatic cancer incidence rates have been increasing at about the same rate among men and women since around 2000; from 2006 to 2010, rates increased by 1.3% per year.

Deaths: An estimated 39,590 deaths are expected to occur in 2014, about the same number in women (19,420) as in men (20,170). From 2006 to 2010, the death rate for pancreatic cancer increased by 0.4% per year.

Signs and symptoms: Cancer of the pancreas usually develops without early symptoms. Symptoms may include weight loss, mild abdominal discomfort that may radiate to the back, and occasionally glucose intolerance (high blood glucose levels).

Tumors that develop near the common bile duct may cause a blockage that leads to jaundice (yellowing of the skin and eyes), which can sometimes allow the tumor to be diagnosed at an early stage. Signs of advanced stage disease may include severe abdominal pain, nausea, and vomiting.

Risk factors: Approximately 20% of pancreatic cancers are attributable to cigarette smoking; incidence rates are about twice as high for smokers as for never smokers. Use of smokeless tobacco products also increases risk. Aside from tobacco, risk increases with a family history of pancreatic cancer and a personal history of chronic pancreatitis, diabetes, obesity, and possibly high levels of alcohol consumption. Individuals with Lynch syndrome and certain other genetic syndromes are also at increased risk. Studies suggest that chronic infection with HBV, HCV, or *H. pylori* may also increase risk. Though evidence is still accumulating, consumption of red or processed meat, or meat cooked at very high temperatures, may slightly increase risk.

Early detection: At present, there is no reliable method for the early detection of pancreatic cancer, though research is under way in this area.

Treatment: Surgery, radiation therapy, and chemotherapy are treatment options that may extend survival and/or relieve symptoms in many patients, but they seldom produce a cure. Less than 20% of patients are candidates for surgery because pancreatic cancer is usually detected after it has spread beyond the pancreas. Even among those patients who were thought to be surgical candidates, the cancer has often spread too extensively to be removed. For those who do undergo surgery, adjuvant treatment with the chemotherapy drug gemcitabine lengthens survival. For advanced disease, chemotherapy is often offered and may lengthen survival. The targeted anticancer drug erlotinib (Tarceva) has demonstrated a slight improvement in advanced pancreatic cancer survival when used in combination with gemcitabine. Clinical trials with several new agents, combined with radiation and surgery, may offer improved survival.

Survival: For all stages combined, the 1- and 5-year relative survival rates are 27% and 6%, respectively. Even for the small percentage of people diagnosed with local disease (9%), the 5-year survival is only 24%. More than half (53%) of patients are diagnosed at a distant stage, for which 5-year survival is 2%.

Prostate

New cases: An estimated 233,000 new cases of prostate cancer will occur in the US during 2014. Prostate cancer is the most frequently diagnosed cancer in men aside from skin cancer. For reasons that remain unclear, incidence rates are about 60% higher in African Americans than in non-Hispanic whites. Incidence rates for prostate cancer changed substantially between the mid-1980s and mid-1990s and have since fluctuated widely from year to year, in large part reflecting changes in the use of the prostate-specific antigen (PSA) blood test for screening. From 2006 to 2010, incidence rates decreased by 2.0% per year.

Deaths: With an estimated 29,480 deaths in 2014, prostate cancer is the second-leading cause of cancer death in men. Prostate cancer death rates have been decreasing since the early 1990s in men of all races/ethnicities, though they remain more than twice as high in African Americans as in any other group (see table in the Cancer Disparities section on page 51). Overall, prostate cancer death rates decreased by 3.1% per year from 2006 to 2010.

Signs and symptoms: Early prostate cancer usually has no symptoms. With more advanced disease, men may experience weak or interrupted urine flow; the inability to urinate or difficulty starting or stopping the urine flow; the need to urinate frequently, especially at night; blood in the urine; or pain or burning with urination. Advanced prostate cancer commonly spreads to the bones, which can cause pain in the hips, spine, ribs, or other areas.

Risk factors: The only well-established risk factors for prostate cancer are increasing age, African ancestry, a family history of the disease, and certain inherited genetic conditions. About 60% of all prostate cancer cases are diagnosed in men 65 years of age and older, and 97% occur in men 50 and older. African American men and Caribbean men of African descent have the highest documented prostate cancer incidence rates in the world. Genetic studies suggest that strong familial predisposition may be responsible for 5%-10% of prostate cancers. Inherited conditions associated with increased risk include Lynch syndrome and the *BRCA2* mutation phenotype. Studies suggest that a diet high in processed meat or dairy foods may be a risk factor, and obesity appears to increase the risk of aggressive prostate cancer. There is some evidence that occupational exposures of firefighters (e.g., toxic combustion products) increase risk.

Prevention: The chemoprevention of prostate cancer is an active area of research. Two drugs of interest, finasteride and dutasteride, reduce the amount of certain male hormones in the body and are approved to treat the symptoms of benign prostate enlargement. Both drugs have been found to lower the risk of prostate cancer by 25% in large clinical trials with similar potential side effects, including reduced libido and the risk of erectile dysfunction. However, a study of long-term survival among participants in the finasteride trial recently reported that the drug had no effect on overall survival or survival after the diagnosis of prostate cancer. Neither finasteride nor dutasteride is approved for the prevention of prostate cancer at this time.

Early detection: Results from two large clinical trials designed to determine the efficacy of PSA testing for reducing prostate

cancer death were inconsistent. Given the significant potential for serious side effects associated with prostate cancer treatment, along with concerns about the high prevalence of slow-growing, non-lethal disease, no organizations presently endorse regular prostate cancer screening. The American Cancer Society recommends that beginning at the age of 50, men who are at average risk of prostate cancer and have a life expectancy of at least 10 years have a conversation with their health care provider about the benefits and limitations of PSA testing. Men should have an opportunity to make an informed decision about whether to be tested based on their personal values and preferences. Men at high risk of developing prostate cancer (African Americans or men with a close relative diagnosed with prostate cancer before the age of 65) should have this discussion with their health care provider beginning at 45. Men at even higher risk (because they have several close relatives diagnosed with prostate cancer at an early age) should have this discussion with their provider at 40. The American Urologic Association recently issued similar recommendations. Current research is exploring new biologic markers for prostate cancer to improve diagnosis and prognosis.

Treatment: Treatment options vary depending on age, stage, and grade of cancer, as well as other medical conditions. The grade assigned to the tumor, typically called the Gleason score, indicates the likely aggressiveness of the cancer. Although scores as low as 2 are theoretically possible, in practice most cancers are assigned scores ranging from 6 (low grade, less aggressive) to 10 (high grade, very aggressive).

Early stage disease may be treated with surgery (open, laparoscopic, or robotic-assisted), external beam radiation, or radioactive seed implants (brachytherapy). Data show similar survival rates for patients with early stage disease treated with any of these methods, and there is no current evidence supporting a "best" treatment for prostate cancer. Hormonal therapy may be used along with surgery or radiation therapy in some cases. Treatment often impacts a man's quality of life due to side effects or complications, such as urinary and erectile difficulties, that may be short or long term. Accumulating evidence indicates that careful observation ("active surveillance"), rather than immediate treatment, can be an appropriate option for men with less aggressive tumors and for older men.

More advanced disease is treated with hormonal therapy, chemotherapy, radiation therapy, and/or other treatments. Hormone treatment may control advanced prostate cancer for long periods by shrinking the size or limiting the growth of the cancer, thus helping to relieve pain and other symptoms. An option for some men with advanced prostate cancer that is no longer responding to hormones is a cancer vaccine known as sipuleucel-T (Provenge). For this treatment, special immune cells are removed from a man's body, exposed to prostate proteins in a lab, and then re-infused back into the body, where they attack prostate cancer cells. Newer, more effective forms of hormone therapy, such as abiraterone (Zytiga) and enzalutamide (Xtandi), have been shown to be beneficial for the treatment of metastatic disease that is resistant to initial hormone therapy and/or chemotherapy. Radium-223 (Xofigo) was recently approved to treat hormone-resistant prostate cancer that has spread to the bones.

Survival: The majority (93%) of prostate cancers are discovered in the local or regional stages, for which the 5-year relative survival rate approaches 100%. Over the past 25 years, the 5-year relative survival rate for all stages combined has increased from 68% to almost 100%. According to the most recent data, 10- and 15-year relative survival rates are 99% and 94%, respectively. Obesity and smoking are associated with an increased risk of dying from prostate cancer.

Skin

New cases: The number of basal cell and squamous cell skin cancers (i.e., keratinocyte carcinomas), more commonly referred to as nonmelanoma skin cancers (NMSC), is difficult to estimate because these cases are not required to be reported to cancer registries. One study of NMSC occurrence in the US estimated that in 2006, 3.5 million cases were diagnosed among 2.2 million people. Most cases of NMSC are highly curable.

An estimated 76,100 new cases of melanoma will be diagnosed in 2014. Melanoma accounts for less than 2% of all skin cancer cases, but the vast majority of skin cancer deaths. Melanoma is rare among African Americans; lifetime risk of developing the disease is 0.1%, compared to 2.4% among whites. Incidence rates are higher in women than in men before the age of 45, but by the age of 60, rates in men are more than double those in women and by the age of 80 they are almost triple. Melanoma incidence rates have been increasing for at least 30 years. From 2006 to 2010, incidence rates among whites increased by 2.7% per year.

Deaths: An estimated 9,710 deaths from melanoma and 3,270 deaths from other types of skin cancer (not including NMSC) will occur in 2014. Death rates for melanoma have been declining rapidly in whites younger than 50: from 2006 to 2010, rates decreased by 2.6% per year in men and by 2.0% per year in women. In contrast, among whites 50 and older, death rates increased by 1.1% per year in men and by 0.2% per year in women during this same time period.

Signs and symptoms: Important warning signs of melanoma include changes in the size, shape, or color of a mole or other skin lesion, the appearance of a new growth on the skin, or a sore that doesn't heal. Changes that progress over a month or more should be evaluated by a doctor. Basal cell carcinomas may appear as growths that are flat, or as small, raised, pink or red, translucent, shiny areas that may bleed following minor injury.

Squamous cell carcinomas may appear as growing lumps, often with a rough surface, or as flat, reddish patches that grow slowly.

Risk factors: Risk factors vary for different types of skin cancer. For melanoma, major risk factors include a personal or family history of melanoma and the presence of atypical, large, or numerous (more than 50) moles. Other risk factors for all types of skin cancer include sun sensitivity (e.g., sunburning easily, difficulty tanning, or natural blond or red hair color); a history of excessive sun exposure, including sunburns; use of tanning booths; diseases or treatments that suppress the immune system; and a past history of skin cancer.

Prevention: Skin should be protected from intense sun exposure by wearing tightly woven clothing and a wide-brimmed hat, applying sunscreen that has a sun protection factor (SPF) of 30 or higher to unprotected skin, seeking shade (especially at midday, when the sun's rays are strongest), and avoiding sunbathing and indoor tanning. Sunglasses should be worn to protect the skin around the eyes. Children in particular should be protected from the sun because severe sunburns in childhood may greatly increase the risk of melanoma later in life. Tanning beds and sun lamps, which provide an additional source of UV radiation, can cause skin cancer and should be avoided. The International Agency for Research on Cancer has classified indoor tanning devices as "carcinogenic to humans" based on an extensive review of scientific evidence.

Early detection: At this time, the best way to detect skin cancer early is to recognize new or changing skin growths, particularly those that look different than surrounding moles. All major areas of the skin should be examined regularly, and any new or unusual lesions, or a progressive change in a lesion's appearance (size, shape, or color, etc.), should be evaluated promptly by a physician. Melanomas often start as small, mole-like growths that increase in size and may change color. A simple ABCD rule outlines the warning signals of the most common type of melanoma: A is for asymmetry (one half of the mole does not match the other half); B is for border irregularity (the edges are ragged, notched, or blurred); C is for color (the pigmentation is not uniform, with variable degrees of tan, brown, or black); D is for diameter greater than 6 millimeters (about the size of a pencil eraser). Other types of melanoma may not have these signs, so be alert for any new or changing skin growths.

Treatment: Most early skin cancers are diagnosed and treated by removal and microscopic examination of the cells. Early stage basal cell and squamous cell cancers can be treated in most cases by one of several methods: surgical excision, electrodesiccation and curettage (tissue destruction by electric current and removal by scraping with a curette), or cryosurgery (tissue destruction by freezing). Radiation therapy and certain topical medications may be used in some cases. For malignant melanoma, the primary growth and surrounding normal tissue are removed and sometimes a sentinel lymph node is biopsied to determine stage. More extensive lymph node surgery may be needed if the sentinel lymph nodes contain cancer. Melanomas with deep invasion or that have spread to lymph nodes may be treated with surgery, immunotherapy, chemotherapy, and/or radiation therapy. Advanced cases of melanoma are treated with palliative surgery, newer targeted or immunotherapy drugs, and sometimes chemotherapy and/or radiation therapy. The treatment of advanced melanoma has changed in recent years with the FDA approval of targeted drugs such as vemurafenib (Zelboraf), dabrafenib (Tafinlar), and trametinib (Mekinist) and the immunotherapy drug ipilimumab (Yervoy).

Survival: Almost all cases of basal cell and squamous cell skin cancer can be cured, especially if the cancer is detected and treated early. Melanoma is also highly curable if detected in its earliest stages and treated properly. However, melanoma is more likely than NMSCs to spread to other parts of the body. The 5- and 10-year relative survival rates for people with melanoma are 91% and 89%, respectively. For localized melanoma (84% of cases), the 5-year survival rate is 98%; survival declines to 62% and 16% for regional and distant stage disease, respectively.

Thyroid

New cases: An estimated 62,980 new cases of thyroid cancer are expected to be diagnosed in 2014 in the US, with 3 in 4 cases occurring in women. Thyroid cancer is the most rapidly increasing cancer in the US and has been increasing worldwide over the past few decades. The rise is thought to be partly due to increased detection because of more sensitive diagnostic procedures, perhaps resulting in some overdiagnoses. In the US, rates increased by 5.4% per year in men and by 6.5% per year in women from 2006 to 2010.

Deaths: An estimated 1,890 deaths from thyroid cancer are expected in 2014 in the US. From 2006 to 2010, the death rate for thyroid cancer was stable at 0.5 per 100,000 in both men and women.

Signs and symptoms: The most common symptom of thyroid cancer is a lump in the neck that is noticed by a patient or felt by a health care provider during a clinical exam. Other symptoms include a tight or full feeling in the neck, difficulty breathing or swallowing, hoarseness, swollen lymph nodes, and pain in the throat or neck that does not go away. Although most lumps in the thyroid gland are not cancerous, individuals who notice an abnormality should seek timely medical attention. Many thyroid cancers are diagnosed in people without symptoms because an abnormality is seen on a CT scan or other imaging test performed for another purpose.

Risk factors: Risk factors for thyroid cancer include being female, having a history of goiter (enlarged thyroid) or thyroid nodules, a family history of thyroid cancer, and radiation exposure early in life (e.g., as a result of medical treatment). Certain

rare genetic syndromes also increase risk. People who test positive for an abnormal gene that causes a hereditary form of thyroid cancer can decrease the risk of developing the disease with surgical removal of the thyroid gland. Unlike most other adult cancers, for which older age increases risk, 80% of newly diagnosed thyroid cancers are in patients younger than age 65.

Early detection: At present, there is no screening test recommended for the early detection of thyroid cancer. However, because symptoms usually develop early and many cancers are found incidentally, most thyroid cancers (68%) are diagnosed at an early stage. Tests used in the diagnosis of thyroid cancer include blood tests to determine thyroid hormone levels, medical imaging, and biopsy.

Treatment: Most thyroid cancers are highly curable, though about 5% of cases (medullary and anaplastic thyroid cancers) are more aggressive and more likely to spread to other organs. Treatment depends on the cell type, tumor size, and extent of the disease. The first choice of treatment is usually surgery, involving total or partial removal of the thyroid gland (thyroidectomy), with or without lymph node removal. Treatment with radioactive iodine (I-131) after surgery to destroy any remaining thyroid tissue may be recommended for more advanced disease. Hormone therapy is given after thyroidectomy to replace hormones normally produced by the thyroid gland and to prevent the body from making thyroid-stimulating hormone, decreasing the likelihood of recurrence.

Survival: The overall 5-year relative survival rate is 98%. However, survival varies by stage, age at diagnosis, and disease subtype. The 5-year survival rate approaches 100% for localized disease, is 97% for regional stage disease, and 55% for distant stage disease.

Urinary Bladder

New cases: An estimated 74,690 new cases of bladder cancer are expected to occur in 2014. From 2006 to 2010, bladder cancer incidence rates were stable in men and decreased by 0.4% per year in women. Bladder cancer incidence is about four times higher in men than in women and almost two times higher in white men than in African American men.

Deaths: An estimated 15,580 deaths will occur in 2014. From 2006 to 2010, death rates were stable in men and decreased by 0.5% per year in women.

Signs and symptoms: The most common symptom is blood in the urine. Other symptoms include increased frequency or urgency of urination and pain or feelings of irritation during urination.

Risk factors: Smoking is the most well-established risk factor for bladder cancer. The risk of bladder cancer among smokers is approximately four-fold that among nonsmokers. Half of all bladder cancers in both men and women are attributed to smoking. Workers in the dye, rubber, leather, and aluminum industries, painters, people who live in communities with high levels of arsenic in the drinking water, and people with certain bladder birth defects also have an increased risk.

Early detection: There is currently no screening method recommended for people at average risk. Bladder cancer is diagnosed by microscopic examination of cells from urine or bladder tissue and examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that can be inserted through the urethra. These and other tests may be used to screen people at increased risk, as well as during follow up after bladder cancer treatment to detect recurrent or new tumors.

Treatment: Surgery, alone or in combination with other treatments, is used in more than 90% of cases. Early stage cancers may be treated by removing the tumor and then administering immunotherapy or chemotherapy drugs directly into the bladder after surgery. More advanced cancers may require removal of the entire bladder (cystectomy). Patient outcomes are improved with the use of chemotherapy, alone or with radiation, before cystectomy. Timely follow-up care is extremely important because of the high rate of bladder cancer recurrence.

Survival: For all stages combined, the 5-year relative survival rate is 78%. Survival declines to 71% at 10 years and 66% at 15 years after diagnosis. Half of all bladder cancer patients are diagnosed while the tumor is in situ (noninvasive, present only in the layer of cells in which the cancer developed), for which the 5-year survival is 96%. Patients with invasive tumors diagnosed at a localized stage have a 5-year survival rate of 70%; 35% of cancers are detected at this early stage. For patients diagnosed with regional and distant stage disease, 5-year survival is 33% and 5%, respectively.

Uterine Cervix

New cases: An estimated 12,360 cases of invasive cervical cancer are expected to be diagnosed in 2014. Large declines in incidence rates over most of the past several decades have begun to taper off, particularly among younger women; from 2006 to 2010, rates were stable in women younger than 50 years of age and decreasing by 3.1% per year in women 50 and older.

Deaths: An estimated 4,020 deaths from cervical cancer are expected in 2014. Mortality rates declined rapidly in past decades due to prevention and early detection as a result of screening with the Pap test; however, similar to incidence, mortality rates have begun to level off in recent years, particularly among younger women. From 2006 to 2010, death rates were stable among women younger than 50, but continued to decrease among those 50 years of age and older (by 1.2% per year).

Signs and symptoms: Pre-invasive cervical lesions often have no symptoms. Once abnormal cervical cells become cancerous and invade nearby tissue, the most common symptom is abnormal vaginal bleeding. Bleeding may start and stop between regular menstrual periods, or it may occur after sexual intercourse, douching, or a pelvic exam. Menstrual bleeding may last longer and be heavier than usual. Bleeding after menopause or increased vaginal discharge may also be symptoms.

Risk factors: Most cervical cancers are caused by persistent infection with certain types of human papillomavirus (HPV). While women who begin having sex at an early age or who have had many sexual partners are at increased risk for HPV infection and cervical cancer, a woman may be infected with HPV even if she has had only one sexual partner. In fact, HPV infections are common in healthy women and are usually cleared successfully by the immune system. Only rarely does the infection persist, increasing the risk of cervical cancer. Both the persistence of HPV infection and the progression to cancer may be influenced by many factors, including a suppressed immune system, a high number of live childbirths, and cigarette smoking. Long-term use of oral contraceptives (birth control pills) is also associated with increased risk of cervical cancer.

Prevention: There are two vaccines (Gardasil and Cervarix) recommended for use in females 9 to 26 years of age for protection against the two types of HPV that cause most (70%) cervical cancers. HPV vaccines cannot protect against established infections, nor do they protect against all types of HPV that cause cervical cancer, which is why vaccinated women should still be screened for cervical cancer.

Screening can prevent cervical cancer by detecting precancerous lesions. As screening has become more common, precancerous lesions of the cervix are detected far more frequently than invasive cancer. The Pap test is the most widely used cervical cancer screening method. It is a simple procedure in which a small sample of cells is collected from the cervix and examined under a microscope. Pap tests are effective, but not perfect. Sometimes results are reported as normal when abnormal cells are present (false negative), and likewise, sometimes test results are positive when no cancer or precancer is present (false positive). HPV tests, which detect HPV infections associated with cervical cancer, can forecast cervical cancer risk many years in the future and are used in conjunction with the Pap test, either as an additional screening test or when Pap test results are uncertain. Most cervical precancers develop slowly, so cancer can usually be prevented if a woman is screened regularly. It is important for all women, even those who have received the HPV vaccine, to follow cervical cancer screening guidelines.

Early detection: In addition to preventing cervical cancer, screening can detect invasive cancer early, when treatment is most successful. Most cervical cancers are detected in women who have never or have not recently been screened. The American Cancer Society, in collaboration with the American Society for Colposcopy and Cervical Pathology and the American Society for Clinical Pathology, issued new screening guidelines for the prevention and early detection of cervical cancer in 2012. The most important changes to the guidelines are the age range for which screening is appropriate and the emphasis on the incorporation of HPV testing in addition to the Pap test. Among women at average risk, screening is now recommended for those 21 to 65 years of age, and the preferred screening method for women 30 to 65 is now HPV and Pap "co-testing" every five years. For more detailed information on the American Cancer Society's screening guidelines for the early detection of cervical cancer, see page 68.

Treatment: Precancerous cervical lesions may be treated with a loop electrosurgical excision procedure (LEEP), which removes abnormal tissue with a wire loop heated by electric current; cryotherapy (the destruction of cells by extreme cold); laser ablation (removal of tissue); or local surgery. Invasive cervical cancers are generally treated with surgery or with radiation combined with chemotherapy. Chemotherapy alone is often used to treat advanced disease.

Survival: One- and 5-year relative survival rates for cervical cancer patients are 87% and 68%, respectively. The 5-year survival rate for patients diagnosed with localized, regional, and distant disease is 91%, 57%, and 16%, respectively. Cervical cancer is diagnosed at a localized stage more often in whites (49%) than in African Americans (39%) and more often in women younger than 50 years of age (59%) than in women 50 and older (33%).

Uterine Corpus (Endometrium)

New cases: An estimated 52,630 cases of cancer of the uterine corpus (body of the uterus) are expected to be diagnosed in 2014. These usually occur in the endometrium (lining of the uterus). From 2006 to 2010, incidence rates of endometrial cancer increased by 1.5% per year among women younger than 50 years and by 2.6% per year among women 50 and older.

Deaths: An estimated 8,590 deaths are expected in 2014. From 2006 to 2010, death rates for cancer of the uterine corpus increased by 1.5% per year among women younger than 50 and were stable among women 50 and older.

Signs and symptoms: Abnormal uterine bleeding or spotting (especially in postmenopausal women) is a frequent early sign. Pain during urination, intercourse, or in the pelvic area is also a symptom.

Risk factors: Obesity and abdominal fatness increase the risk of endometrial cancer, most likely by increasing the amount of estrogen in the body. Estrogen exposure is a strong risk factor for endometrial cancer. Other factors that increase estrogen exposure include menopausal estrogen therapy, late menopause,

never having children, and a history of polycystic ovary syndrome. (Estrogen plus progestin menopausal hormone therapy does not appear to increase risk.) Tamoxifen, a drug used to reduce breast cancer risk, increases risk slightly because it has estrogen-like effects on the uterus. Medical conditions that increase risk include Lynch syndrome (also known as hereditary nonpolyposis colorectal cancer) and diabetes. Pregnancy, use of oral contraceptives or intrauterine devices, and physical activity are associated with reduced endometrial cancer risk.

Early detection: There is no standard or routine screening test for endometrial cancer. Most endometrial cancer (68%) is diagnosed at an early stage because of postmenopausal bleeding. Women are encouraged to report any unexpected bleeding or spotting to their physicians. The American Cancer Society recommends that women with known or suspected Lynch syndrome be offered annual screening with endometrial biopsy and/or transvaginal ultrasound beginning at 35 years of age.

Treatment: Uterine corpus cancers are usually treated with surgery, radiation, hormones, and/or chemotherapy, depending on the stage of disease.

Survival: The 1- and 5-year relative survival rates for uterine corpus cancer are 92% and 82%, respectively. The 5-year survival rate is 95%, 68%, or 17%, if the cancer is diagnosed at a local, regional, or distant stage, respectively. The overall 5-year relative survival for whites (84%) is 23 percentage points higher than that for African Americans (61%). Higher body weight adversely affects endometrial cancer survival, whereas physical activity is associated with improved survival.

Special Section: Cancer in Children & Adolescents

Overview

The news of a cancer diagnosis is never welcome, but may be even more unexpected and difficult when the disease is diagnosed in a child or adolescent. Although cancer is much less common among children compared to older adults, approximately 1 in 285 children in the US will be diagnosed with the disease before the age of 20. While advances in treatment have increased the survival rate for many childhood cancers, the disease is still the second leading cause of death (following accidents) in children ages 5-14.[1]

The types of cancers that develop in children and adolescents differ from those that develop in adults. The predominant types of pediatric cancers (ages 0-19) are leukemia (26%), cancers of the brain and central nervous system (CNS) (18%), and lymphoma (14%). Some of the cancers that develop in children are rarely seen in older individuals, notably those cancers that arise from embryonic cells and originate in developing tissues and organ systems. Embryonal cancers include neuroblastoma (sympathetic peripheral nervous system), Wilms tumor or nephroblastoma (developing kidney), medulloblastomas (brain), rhabdomyosarcomas (muscle), and retinoblastoma (retina of the eye). Some pediatric cancers, particularly those that are more common in adolescents, are more similar to those that arise in adults (e.g., acute myeloid leukemia, Hodgkin lymphoma, thyroid cancer, and melanoma).

Pediatric cancers represent 1% of all new cancers diagnosed in the US. Because these cancers occur in the context of rapid growth and development, most experts strongly recommend that they be treated at medical centers specialized in childhood cancer by multidisciplinary teams including pediatric oncologists, surgeons, radiation oncologists, and other specialists. At pediatric cancer centers, treatment protocols are available for most types of cancer that occur in children and adolescents, and the opportunity to participate in clinical trials is offered to most patients and their families. Clinical trials are generally designed to compare a potential improvement in therapy with therapy that is currently accepted as standard; improvements may result in an increase in cure rates or a reduction in acute or long-term complications. Member institutions of the Children's Oncology Group (COG), a National Cancer Institute-supported clinical trials group, care for more than 90% of US children and adolescents diagnosed with cancer (childrensoncologygroup.org). The COG has nearly 100 active clinical trials open at any given time, which include studies to test the efficacy of new treatments for many types of childhood cancers at diagnosis or recurrent diseases, improve understanding of the underlying biology of these diseases, and improve supportive care and survivorship. Children and adolescents diagnosed with types of cancer more commonly seen in adults also benefit from treatment in pediatric cancer centers.

In this special section, we provide an overview of trends in incidence, mortality, and survival for cancers commonly diagnosed in children and adolescents. We also provide more detailed information on risk factors, symptoms, treatment, and important long-term and late effects for these cancers. The major types of cancers included are: leukemias and lymphomas, brain and CNS tumors, embryonal tumors, sarcomas of bone and soft tissue, and gonadal germ cell tumors.

How Many Cases and Deaths Are Expected to Occur in 2014?

An estimated 10,450 new cases and 1,350 cancer deaths are expected to occur among children (ages 0-14) in 2014. The corresponding figures among adolescents (ages 15-19) are 5,330 new cases and 610 cancer deaths.

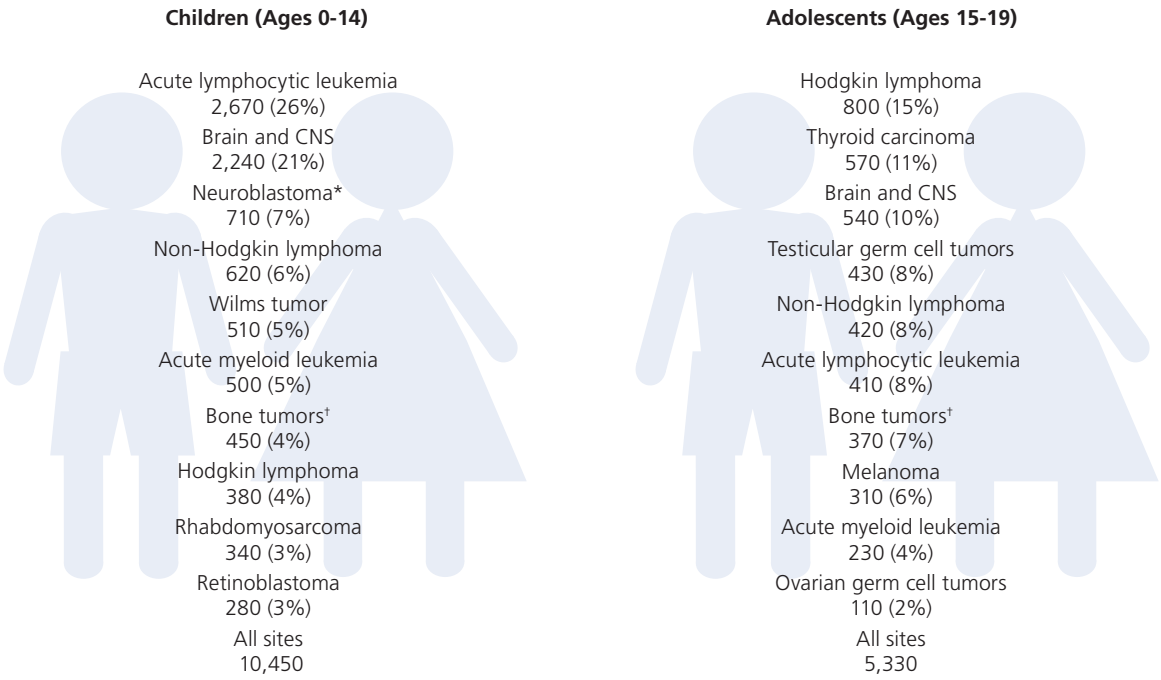
What Are the Most Common Cancers in Children and Adolescents?

The most common cancers among children and adolescents vary by age and are shown in Figure 1 (page 26).

- Cancers that are most common in children ages 0-14 are acute lymphocytic leukemia (26%), brain and CNS (21%), neuroblastoma (7%), and non-Hodgkin lymphoma (6%).
- The most common cancers among adolescents ages 15-19 are Hodgkin lymphoma (15%), thyroid carcinoma (11%), brain and CNS (10%), and testicular germ cell tumors (8%).

While cancers occurring in adults are classified by the anatomical site of the primary tumor, cancers in children and younger adolescents are classified by histology (tissue type) into 12 major groups using the International Classification of Childhood Cancers (ICCC).[2] Figure 1 (page 26) shows the distribution of the most common cancers in children and adolescents by ICCC group.

Figure 1. Estimated Cases for Childhood and Adolescent Cancers, US, 2014



Estimates are for malignant cancers only and are rounded to the nearest 10. In addition, 730 children and 630 adolescents will be diagnosed with benign and borderline brain tumors in 2014.
CNS = central nervous system
* Includes ganglioneuroblastoma.
†Bone tumors include osteosarcoma and Ewing sarcoma.

How Do Childhood and Adolescent Cancers Vary in the US Population?

Table 1 (page 28) summarizes differences in cancer incidence, mortality, and survival rates by sex and race/ethnicity.

Sex

- In children, incidence and mortality rates are lower in girls than in boys, while survival rates are similar.
- In adolescents, boys and girls have similar incidence rates, while mortality rates are lower and survival is higher for girls. Some of these differences may reflect the different types of cancers that occur in boys compared to girls in this age group.

Race/Ethnicity

Cancer incidence, mortality, and survival rates show substantial variability by race and ethnicity.

- Non-Hispanic white (white) and Hispanic children have the highest incidence rates for childhood and adolescent cancers.
- Although incidence rates are substantially lower for non-Hispanic black (African American) children and adolescents than for whites and Hispanics, death rates are similar due to lower survival rates in African Americans.
- Incidence and mortality rates for Asian American/Pacific Islander children are lower than those for whites and generally similar to rates in African American children.
- American Indian/Alaska Native children have the lowest cancer incidence and mortality of all racial/ethnic groups.

Reasons for differences in incidence rates of childhood cancers by race and ethnicity in the US are not well understood. Unlike many adult cancers, incidence is not consistently higher among populations with lower socioeconomic status.[3] In general, the incidence of pediatric cancer is higher in industrialized countries than in developing countries, but patterns differ by cancer type.[4,5]

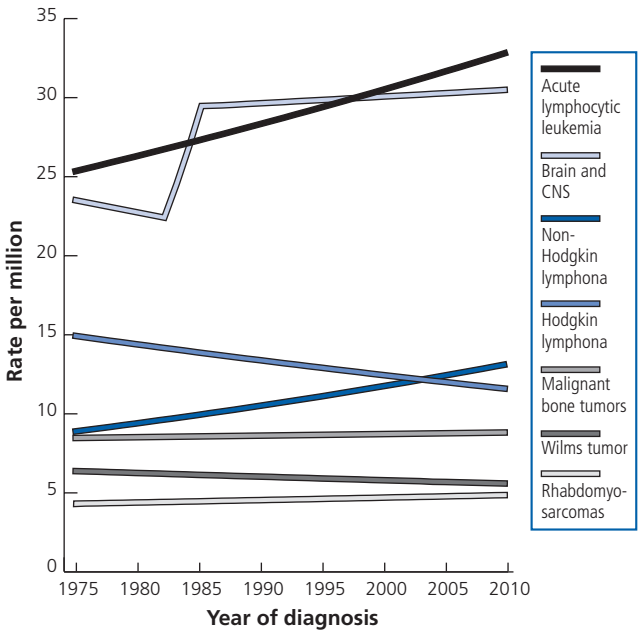
Racial and ethnic disparities in survival for childhood and adolescent cancers have been noted previously.[6,7] Factors that may be associated with these survival disparities include socioeconomic status, health insurance status, timely diagnosis and quality of treatment and supportive care, and genetic factors.[6]

How Has the Occurrence of Pediatric Cancers Changed over Time?

Trends in incidence rates

From 1975 to 2010, the overall incidence of pediatric cancer in the US increased slightly, by an average of 0.6% per year.[8] Specifi-

Figure 2. Trends in Pediatric Cancer Incidence Rates by Site, Ages 0-19, 1975-2010



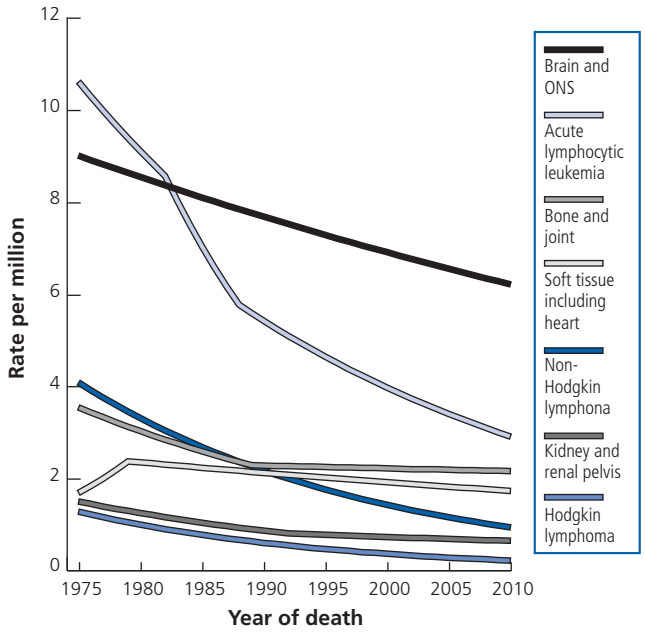
CNS = Central nervous system.

Note: lines represent Joinpoint fitted trends. Benign and borderline brain tumors are not included. Malignant bone tumors include osteosarcoma and Ewing sarcoma. Average annual percent change (APC) for cancers with significant trends during most recent period: ALL (0.7), NHL (1.1), and Hodgkin lymphoma (-0.7).

Source: Surveillance, Epidemiology, and End Results (SEER) Program, 9 SEER Registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2014

Figure 3. Trends in Pediatric Cancer Mortality Rates by Site, Ages 0-19, 1975-2010



ONS = Other nervous system.

Note: Lines are fitted trends based on Joinpoint analyses.

Average annual percent change (APC) for cancers with significant trends during most recent period: ALL (-3.1 during 1988-2010), brain (-1.1 during 1975-2010), NHL (-4.1 during 1975-2010), soft tissue (-1.0 during 1979-2010), kidney (-1.2 during 1992-2010), HL (-4.9 during 1975-2010).

Source: National Center for Health Statistics, Centers for Disease Control and Preventaion.

American Cancer Society, Surveillance Research, 2014

cally, incidence rates increased for 4 cancer types: acute lymphocytic leukemia, acute myeloid leukemia, non-Hodgkin lymphoma, and testicular germ cell tumors. Incidence rates decreased for Hodgkin lymphoma and remained stable for other cancers (Figure 2). Similar incidence patterns were observed in Europe.[9] Reasons for increases in incidence rates are largely unknown. It is possible that some of this increase may be due to changes in environmental factors. Improved diagnosis and access to medical care over time may also have contributed, as without medical care some children may die of infections or other complications of their cancers without ever being diagnosed.[10] The sharp rise in incidence of CNS tumors that occurred in the 1980s is thought to reflect increased detection of tumors as a result of the introduction of magnetic resonance imaging (MRI) and stereotactic biopsy (biopsy accompanied by computer imaging), leading to more complete reporting (see section on CNS tumors, page 32).[11]

Trends in mortality rates

Death rates for all childhood and adolescent cancers combined declined steadily from 1975 to 2010 by an average of 2.1% per year resulting in an overall decline of more than 50%. Mortality declines were observed for all sites in Figure 3 with the steepest declines in Hodgkin lymphoma, non-Hodgkin lymphoma, and acute lymphocytic leukemia. (Please note that the classification of tumors in Figure 3 differs from that used in other tables and figures because deaths are classified according to anatomic site rather than International Classification of Childhood Cancers group.)

What Is the Probability of Developing a Childhood or Adolescent Cancer?

A child born in the United States has a 0.24% chance of developing cancer before age 15 and a 0.35% chance of developing cancer before age 20.[8] Another way of saying that is 1 in 408 children will be diagnosed with cancer before age 15 and 1 in 285 children will be diagnosed with cancer before age 20.

How Many Survivors of Pediatric Cancer Are in the US?

An estimated 379,112 survivors of childhood and adolescent cancer (diagnosed at ages 0-19) were alive in the US as of January 1, 2010. The top three cancer types among childhood cancers

Table 1. Incidence, Mortality, and Survival Rates for Childhood and Adolescent Cancers by Sex and Race/Ethnicity

Characteristic	Ages 0–14			Ages 15–19		
	Incidence, 2006-2010*	Mortality, 2006-2010*	Observed Survival (%), 2003-2009	Incidence, 2006-2010*	Mortality, 2006-2010*	Observed Survival (%), 2003-2009
Sex						
Boys	178.0	23.3	81.3	237.7	34.5	80.0
Girls	160.1	21.1	82.0	235.5	24.7	85.4
Race/ethnicity						
Non-Hispanic White	178.2	22.4	84.2	259.4	29.0	85.9
Non-Hispanic Black	134.5	21.9	75.3	171.9	30.6	76.8
Hispanic	167.3	22.6	80.3	220.7	32.4	75.8
Asian American/ Pacific Islander	131.9	19.1	78.3	167.8	25.6	80.4
American Indian/ Alaska Native†	117.1	15.8	78.5	200.1	24.0	77.3

*Rates are per 1,000,000 and age-adjusted to the 2000 US standard population. †Based on data from Indian Health Service Contract Health Service Delivery Areas.

Note: Incidence rates include benign and borderline brain tumors.

Source: Incidence: North American Association of Central Cancer Registries; Mortality: National Center for Health Statistics, Centers for Disease Control and Prevention; Survival: Surveillance, Epidemiology and End Results (SEER) Program, 18 SEER Registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2014

survivors are acute lymphocytic leukemia, brain and CNS tumors, and Hodgkin lymphoma (Table 2). Most (70%) survivors of childhood and adolescent cancer are 20 years of age or older. Approximately 1 in 530 adults between the ages of 20 and 39 is a survivor of childhood cancer.

What Are the Risk Factors for Childhood and Adolescent Cancer?

In contrast to cancers in adults, only a relatively small proportion of childhood cancers have known or preventable causes. Ionizing radiation exposure is a well-recognized risk factor for cancer in children and adolescents based on studies of medical and environmental radiation exposure. The association between low doses of radiation received by an unborn fetus during an x-ray and subsequent risk of leukemia and other childhood cancers was demonstrated in the 1950s.[12] As a result, precautions have been taken to minimize radiation exposure during pregnancy, so this exposure is not likely to be of current concern. Radiation exposure from diagnostic CT scans is higher and more variable than exposures from conventional x-rays, and studies suggest that radiation exposure early in life increases long-term risk of leukemia and brain cancer.[13] Health care providers are encouraged to limit the use of CT scans to situations where there is a definite clinical indication and to optimize scans using the lowest possible radiation dose.[14]

A number of recent studies have found that accelerated fetal growth and higher birth weight are associated with increased risk for some childhood and adolescent cancers, including acute lymphocytic leukemia, central nervous system (CNS) tumors, Wilms tumor, non-Hodgkin lymphoma, and rhabdomyosarcoma, while lower birth weight has been associated with acute myeloid leukemia and some CNS tumor subtypes.[15-21] Although numerous epidemiologic studies have investigated potential environmental causes of childhood cancers, few strong or consistent associations have been found. The International Agency for Research on Cancer has concluded there is sufficient evidence that parental smoking increases the risk of hepatoblastoma (a type of liver cancer that occurs in young children) and limited evidence for an association with childhood leukemia (particularly ALL).[22] They also found limited evidence that maternal exposure to paint is linked with childhood leukemia.[22] Larger studies with the ability to examine specific histological and/or molecular tumor subtypes may be needed to identify and confirm potential environmental causes of childhood cancer.[23] It is reasonable to suggest that pediatric tumors reflect, at least in part, an inherent risk associated with the complex process of normal development and chance rather than a response to an external exposure. At the same time, it is known that the process of development occurring in immature cells and organisms renders them more vulnerable to toxic exposures than mature cells, and it is therefore important to minimize exposure to environmental agents with potential cancer-causing effects.[24] For more information on precautions to minimize exposures during pregnancy, see sidebar.

Table 2. US Childhood and Adolescent Cancer Survivors by Cancer Site, as of January 1, 2010

Site	Complete Prevalence Counts by Age at Prevalence: Ages 0–19	Ages 20+	All Ages
All Sites	113,782	265,330	379,112
Acute lymphocytic leukemia	30,171	30,318	60,489
Acute myeloid leukemia	4,045	4,222	8,267
Hodgkin lymphoma	4,514	30,739	35,253
Non-Hodgkin lymphoma	6,442	16,301	22,743
Brain and CNS	20,430	38,653	59,083
Neuroblastoma	9,704	9,748	19,452
Wilms tumor	7,831	15,707	23,538
Bone tumors	3,766	9,366	13,132
Soft tissue sarcomas	6,849	24,599	31,448
Testicular germ cell tumors	2,755	17,890	20,645
Ovarian germ cell tumors	2,464	14,628	17,092

CNS= central nervous system.

Note: Does not include benign and borderline brain tumors.

Source: Howlader, et al, 2013.[8]

American Cancer Society, Surveillance Research 2014

Some pediatric cancers, such as Wilms tumor and retinoblastoma, are associated with recognized genetic factors. Potential environmental and genetic risk factors for pediatric cancers will be discussed in relation to specific cancer types.

What Are Signs and Symptoms for Pediatric Cancers?

Early diagnosis of cancer in children is often difficult because of the similarity of symptoms to more common diseases of childhood.[27] Parents should ensure that children have regular medical checkups and be alert to any unusual signs or persistent symptoms. Some common symptoms of childhood cancer that should alert parents and health care providers include an unusual mass or swelling; unexplained paleness or loss of energy; a sudden tendency to bruise; a persistent, localized pain or limping; a prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision changes; and excessive, rapid weight loss. Information on symptoms for specific cancer types is discussed in the next section.

Major Cancer Types

Leukemia and lymphoma

Leukemia is a cancer of blood-forming cells arising in the bone marrow. Lymphomas are cancers of a certain type of white blood cell (lymphocyte) that can arise anywhere lymphocytes can be found, including bone marrow, lymph nodes, the spleen, the intestines, and other areas of the lymphatic system. Leukemias and lymphomas are classified according to the type of cell that is exhibiting uncontrolled growth.

The two most common types of leukemia in children and adolescents are acute lymphocytic leukemia (ALL) and acute myeloid leukemia (AML). Chronic leukemias are very rare in children and adolescents. ALL accounts for about 80% of leukemia cases in children and 56% of leukemia cases in adolescents. Acute myeloid leukemia (AML) is less common in children than ALL, comprising about 15% of leukemia cases in children and 31% in adolescents. There are two types of lymphoma: Hodgkin

Precautions to Minimize Exposures during Pregnancy

Some of the changes in cells that lead to the development of childhood cancer may take place during pregnancy. Radiation exposures, both in utero and during early life, have been found to increase cancer risk. It is also possible that environmental exposures to either parent prior to the child's conception may influence childhood cancer risk. Research studies have not identified strong and consistent preventable causes of childhood cancer (other than exposure to ionizing radiation). However, since the developing fetus is more sensitive to some exposures than adults, women are advised to take precautions to minimize exposures during pregnancy. With respect to environmental exposures, the Office of Women's Health, Department of Health and Human Services recommends that during pregnancy, women should avoid exposure to:[25]

- Lead – Found in some water and paints, mainly in homes built before 1978
- Mercury – The harmful form is found mainly in large, predatory fish.
- Arsenic – High levels can be found in some well water.
- Pesticides – Both household products and agricultural pesticides
- Solvents – Such as degreasers and paint strippers and thinners
- Cigarette smoke

Additional precautions include:

- Clean in only well-ventilated spaces. Open the windows or turn on a fan.
- Check product labels for warnings for pregnant women and follow instructions for safe use.
- Do not clean the inside of an oven while pregnant.
- Leave the house if paint is being used, and don't return until the fumes are gone.

The National Institute for Occupational Safety and Health provides additional recommendations for women who are employed in occupations with potential toxic exposures.[26]

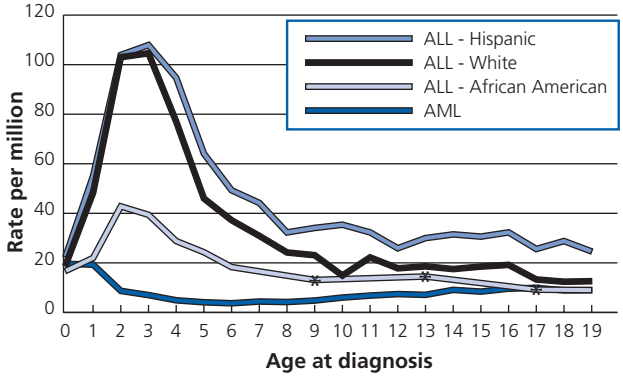
lymphoma (HL) and non-Hodgkin lymphoma (NHL). HL accounts for about 38% of lymphomas in children and about 65% in adolescents, while NHL accounts for 62% of lymphomas in children and 35% of lymphomas in adolescents.

Acute lymphocytic leukemia (ALL)

An estimated 2,670 children and 410 adolescents will be diagnosed with ALL in 2014 (Figure 1, page 26). ALL is the most common cancer in children, accounting for 26% of cancers diagnosed in ages 0-14. Similar to lymphomas, ALL is a cancer of lymphocytes. Most often ALL in children involves B lymphocytes, the type of lymphocyte that makes antibodies to infections, but it can also involve T lymphocytes, which help the body fight disease in other ways.

ALL occurs in children throughout the world, but it is more common in industrialized countries than in developing countries. In the US, ALL is more common in boys than in girls and in Hispanic and white children than in African American children (Table 3). In industrialized countries, there is a sharp peak in ALL incidence rates at ages 2-4, which is not apparent among children in developing countries.[10] The characteristic age peak for ALL in the US is striking for white and Hispanic children, but less so for African American children (Figure 4).

Figure 4. Age-specific Incidence Rates of Acute Lymphocytic Leukemia (ALL) by Race/ethnicity and Acute Myeloid Leukemia (AML) All Races Combined, 2001-2010



Note: Data not shown for ages with fewer than 25 cases. Data for whites and African Americans exclude Hispanic ethnicity. Due to sparse data for ALL in African Americans for some ages, data are shown for combined age groups: 7-10, 11-14, 15-19 marked by astericks.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, 18 SEER Registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2014

There is evidence that some cases of ALL arise in utero, including a frequent concordance of ALL in identical twins.[28] Inherited risk factors associated with ALL include trisomy 21 (Down syndrome), which confers a 10- to 20-fold increased risk, certain genetic syndromes (Bloom syndrome, Fanconi anemia, and Nijmegen breakage syndrome) and congenital immunodeficiency diseases.[28] Although many epidemiologic studies have sought to find the causes of ALL, few environmental agents are definitively linked with this disease. According to the International Agency for Research on Cancer, there is limited evidence that parental smoking and maternal exposure to paint increase the risk for childhood leukemia (particularly ALL).[22] Higher birth weight has also been associated with higher ALL risk in a number of studies.[23, 29] Recent studies suggest that early exposure to infections (such as occurs in infant day care settings) may be protective for childhood ALL.[30, 31]

Improved treatment for ALL in childhood has increased the 5-year survival rate from 57% in 1975-1979 to 90% in 2003-2009 (Table 4, page 35). Treatment is generally in three phases, and consists of 4-6 weeks of induction chemotherapy (chemotherapy given to induce remission) administered in the hospital, followed by several months of consolidation chemotherapy and 2-3 years of maintenance chemotherapy.[28] The central nervous system (CNS) is a common site for relapse, so children receive specific treatment to prevent this (CNS prophylaxis). Bone marrow transplantation is recommended for some children whose leukemia has high- risk characteristics at diagnosis and for children who relapse after remission.[28] It may also be used if the leukemia does not go into remission after a successive course of induction chemotherapy. Successful treatment of ALL requires multidisciplinary teams to provide supportive care and careful monitoring for infection and adequate nutrition.

Disparities in survival between white and African American children treated for ALL have been documented in a number of studies.[4, 5, 32] Notably, this disparity has diminished in recent years, from a 21% difference in 5-year survival during 1980-84 (68% vs. 47%, in whites and African Americans, respectively) to a 6% difference in 2003-2009 (90% vs. 84%, respectively).[33]

Long-term adverse health effects among children treated for ALL can include neurocognitive defects, growth deficiency, and increased risk of second cancers, including AML and CNS tumors.[34] Early forms of CNS prophylaxis that combined high doses of radiation and intrathecal (injected into the fluid surrounding the brain and spinal cord) chemotherapy had a high risk of damage to brain tissue resulting in neurocognitive defects; less toxic therapies that avoid the use of radiation have reduced, but not eliminated these risks. Radiation therapy is now used in only a small fraction of ALL patients at high risk of CNS relapse. Children treated with anthracyclines are at risk for late cardiac effects.[28]

Acute myeloid leukemia

An estimated 500 children and 230 adolescents will be diagnosed with AML in 2014. AML arises from blood-forming cells, most often those that would turn into white blood cells (except

lymphocytes). The incidence of AML is highest in the first two years of life (Figure 4). Incidence rates for AML are slightly higher in Hispanic children compared to other racial/ethnic groups (Table 3).

Radiation exposure is an established risk factor for childhood leukemia, and some studies have found associations of childhood leukemia with specific chemicals, such as benzene, and drugs used to treat cancer, such as alkylating agents and topoisomerase II inhibitors; these are more strongly associated with AML than ALL.[35]

Children with AML and high white blood cell counts may develop symptoms due to impaired transit of cancer cells (blasts) through small blood vessels.[36] Many AML patients are prone to excessive bleeding and other blood clotting disorders. Death occurs during the first 2 weeks after diagnosis in 2-4% of children with AML.[36] Treatment for AML consists of induction chemotherapy, CNS prophylaxis, and post-remission therapy. Stem cell transplant has been investigated in clinical trials and has been shown to improve survival rates for some children with AML.[36] Treatment toxicity and long-term effects for AML are similar to those for ALL; however, AML less often requires treatment or prophylaxis of the CNS, so side effects related to radiation of the brain are not as common.[36] The 5-year survival rate for AML for children diagnosed in 2003-2009 was 64% (Table 4, page 35). Survival rates for AML have improved in recent decades, but remain lower than for ALL.

Hodgkin lymphoma

An estimated 380 children and 800 adolescents will be diagnosed with HL in 2014. HL is a cancer of lymphocytes that often starts in the lymph nodes in the chest, neck, or abdomen. There are two major types of HL: classic, which is the most common and is characterized by the presence of multinucleated giant cells called Reed-Sternberg cells, and nodular lymphocyte predominant, which is characterized by so called "popcorn cells." This type is rare and tends to be slower growing than the classic form.[37]

HL is rare among children younger than age 5; incidence rates increase slightly up to about age 10 and then rise rapidly through

Table 3. Pediatric Cancer Incidence Rates* by Sex and Race/Ethnicity, Ages 0-19, US, 2006-2010

	All Races		Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian American/ Pacific Islander
	Boys	Girls				
All ICCC sites	196.7	182.3	201.7	146.1	184.2	140.8
Leukemia	52.0	43.1	46.9	29.9	59.6	39.4
Acute lymphocytic leukemia	38.4	30.2	34.2	18.3	44.9	28.7
Acute myeloid leukemia	7.9	8.0	7.7	7.1	8.7	8.0
Lymphomas and reticuloendothelial neoplsams	29.8	20.7	27.4	22.2	21.6	18.3
Hodgkin lymphoma	12.9	11.8	13.9	10.3	10.2	7.5
Non-Hodgkin lymphoma	15.1	7.7	11.9	11.4	9.5	10.0
Brain and CNS	45.5	45.9	50.9	36.1	38.7	28.6
Ependymoma	3.2	2.4	3.0	2.1	2.7	2.6
Astrocytoma	16.5	15.5	18.8	12.3	12.0	9.1
Medulloblastomas	5.1	3.3	4.8	2.7	3.7	3.3
Neuroblastoma and ganglioneuroblastoma	8.5	7.6	9.7	6.8	5.2	5.9
Retinoblastoma	2.9	3.3	2.7	3.4	3.4	3.1
Wilms tumor	5.3	6.3	6.2	6.7	4.5	2.9
Hepatic tumors	2.8	1.8	2.2	1.7	2.5	3.0
Bone tumors	9.8	7.7	9.2	7.2	8.9	6.7
Osteosarcoma	5.5	4.5	4.6	5.7	5.4	3.9
Ewing sarcoma	3.3	2.4	3.7	0.5	2.5	2.0
Rhabdomyosarcoma	5.4	4.2	4.8	5.5	4.5	2.9
Testicular germ cell tumors	9.9	---	10.9	1.4	13.6	6.1
Ovarian germ cell tumors	---	4.4	3.4	5.3	6.1	4.7
Thyroid carcinoma	3.0	12.6	9.1	2.8	7.2	6.9
Melanoma	3.7	5.8	7.1	0.5	1.4	†

ICCC=International classification of childhood cancers. CNS=Central nervous system.

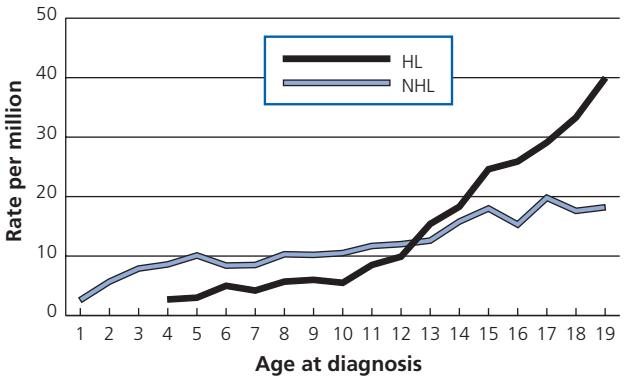
*Rates are per 1,000,000 and age-adjusted to the 2000 US standard population. †Statistic not displayed if based on fewer than 25 cases.

Note: Rates include benign and borderline brain tumors.

Source: North American Association of Central Cancer Registries. Data are included from all US states and the District of Columbia except Arkansas, Minnesota, Nevada, Ohio, and Virginia. Rates by Hispanic ethnicity also exclude data from Massachussets.

American Cancer Society, Surveillance Research 2014

Figure 5. Age-specific Incidence Rates of Non-Hodgkin Lymphoma (NHL) and Hodgkin Lymphoma (HL), 2001-2010



Note: Data not shown for ages with fewer than 25 cases.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, 18 SEER Registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2014

adolescence (Figure 5). HL is the most common cancer in adolescents, accounting for about 15% of cancers diagnosed between ages 15 and 19 (Figure 1, page 26). Incidence rates for HL are about 30% higher among white children compared to African American and Hispanic children (Table 3, page 31). Asian American/Pacific Islanders have the lowest incidence rate for HL. Risk factors for HL include Epstein Barr virus (EBV) or a having a personal history of mononucleosis and human immunodeficiency virus (HIV) infection.

Survival rates for HL increased from 87% in 1975-1979 to 97% in 2003-2009 (Table 4, page 35). HL is highly sensitive to radiation, and cure can be achieved in some patients by radiation therapy alone, although this is seldom the preferred treatment in children and adolescents. The high dose of radiation used to treat HL in past decades was found to be damaging to organs such as the lungs and heart, so current therapies usually combine lower doses of chemotherapy and radiation to achieve a high cure rate with less toxicity.[37] Long-term and late effects of treatment may include pulmonary and cardiac diseases, thyroid abnormalities, infertility, and second cancers. Girls age 10 and older and young women treated with radiation to the chest for HL have an exceptionally high relative and absolute risk of developing breast cancer.[38, 39] The American Cancer Society recommends annual MRI in addition to mammographic screening for women were treated for HL.[40]

Non-Hodgkin lymphoma

An estimated 620 children and 420 adolescents will be diagnosed with NHL in 2014. The most common subtypes among children and adolescents in the US are Burkitt lymphoma (BL) (19%), diffuse large B-cell lymphoma (DLBCL) (22%), lymphoblastic lymphoma (20%), and anaplastic large cell lymphoma (10%).[41] Both the incidence and distribution of NHL subtypes vary throughout the world. For example, in equatorial Africa, lymphomas account for nearly one-half of childhood cancers, reflecting the very high incidence of BL.[10] The high incidence of BL in equatorial Africa is associated with high rates of co-infection with EBV and malaria.[10] BL in Africa, also known as endemic BL, is much more common in boys than in girls and often arises in the jaw or around the eyes. In the US, the incidence of BL is also much higher in boys than in girls, but occurs most frequently in the abdomen and is less common in African American than in white children (Table 3, page 31).

EBV infection is also associated with many other types of NHL, although not as strongly as for BL in Africa. Immunosuppression from a variety of causes increases the risk of NHL, including inherited immunodeficiency disorders, HIV infection, and post-transplantation immune suppression.[42] Multiagent chemotherapy is the main form of treatment for most types of NHL. The dramatic improvement in survival rates for adults with DLBCL when rituximab (a monoclonal antibody) is administered with multiagent chemotherapy has stimulated clinical trials to evaluate the role of monoclonal antibodies in treatment of pediatric DLBCL.[42] Survival rates for NHL in children and adolescents have increased dramatically in recent decades: from 47% in 1975-1979 to 85% in 2003-2009 (Table 4, page 35). Long-term and late effects of NHL include heart damage, cognitive effects, infertility, and low bone density.

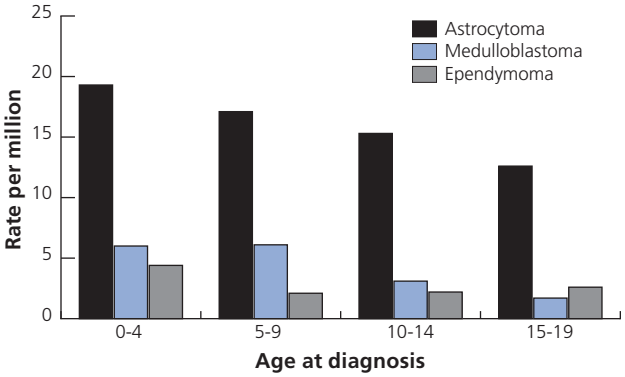
Brain and central nervous system tumors (CNS tumors)

An estimated 2,240 children and 540 adolescents will be diagnosed with malignant CNS tumors in 2014. CNS tumors are the second most common cancer in children, accounting for 21% of cases, and the third most common cancer type in adolescents, accounting for 10% of cases. CNS tumors are classified by the cells and tissues in which they originate and their location and grade, ranging from I (low) to IV (high). Symptoms of benign tumors and side effects of treatment can be quite severe; therefore since 2004, cancer registries have been collecting data for benign as well as malignant CNS tumors. Statistics with benign and malignant tumors combined are used in this report when available. In 2014, an estimated 730 children and 630 adolescents will be diagnosed with benign and borderline malignant brain tumors.

Figure 5 provides age-specific incidence rates for three common categories of CNS tumors in children and adolescents:

- Astrocytoma, the most common type of CNS tumor, accounts for 35% of CNS tumors in ages 0-19. These tumors arise from brain cells called astrocytes. Astrocytomas range from low grade to high grade. Pilocytic astrocytoma, the most common type of astrocytoma in children, is a low-grade tumor

Figure 6. Age-specific Incidence Rates for CNS Tumors, US, 2006-2010



CNS=Central nervous system.
Source: North American Association of Central Cancer Registries. Data are included from all US states and the District of Columbia except Arkansas, Minnesota, Nevada, Ohio, and Virginia.

American Cancer Society, Surveillance Research, 2014

that typically arises in the cerebellum. Fibrillary astrocytoma, another common type of astrocytoma in children, is usually found in the mid-brain, has less well-defined borders and can spread throughout both sides of the brain.[43]

- Medulloblastoma most commonly diagnosed in children younger than 10 (Figure 6). It is a highly invasive embryonal tumor that arises in the cerebellum and has a tendency to spread throughout the central nervous system early in its course.[44]
- Ependymoma is a tumor that begins in the ependymal lining of the ventricular system (fluid-filled cavities in the brain) or the central canal of the spinal cord. Ependymomas range from low to high grade.[43]

The symptoms of brain tumors are varied, as is the time course over which symptoms develop and increase in severity. Signs and symptoms of brain cancer depend on the tumor location, the developmental stage and communication ability of the child or young person, and whether intracranial pressure is raised.

Trends in CNS tumors have been of interest because of a sharp increase in overall incidence in the mid-1980s (Figure 2, page 27), with significant increases in incidence rates for pilocytic astrocytoma, primitive neuroectodermal tumor (PNET)/medulloblastoma, and mixed glioma.[11,43,45] Many experts believe that this short-term increase in incidence resulted from the introduction of MRI for evaluating children with neurologic conditions and increased use of computer image-guided biopsies to document tumors that could not otherwise be biopsied. Furthermore, the rate of increase in pilocytic astrocytoma was similar to the rate of decrease for astrocytomas NOS (not otherwise specified), suggesting an improvement in classification.[46] After the increase in the mid-1980s, the incidence rate of CNS tumors stabilized (Figure 2, page 27).

The cause of brain tumors in childhood is unclear.[47] Children with certain genetic syndromes (e.g., Turcot syndrome, Li-Fraumeni syndrome, neurofibromatosis type 1, and neurofibromatosis type 2) have increased risk of brain and CNS tumors.[43] High-dose therapeutic radiation is a recognized cause of brain tumors, and children who receive cranial irradiation for ALL or other cancers have an excess risk of brain and CNS tumors. A number of studies have also found associations between consumption of cured meats during pregnancy and childhood brain tumors.[48-51]

Treatment of brain and other CNS tumors depends on the cancer type, grade, location, size, and other prognostic factors. Whenever possible, surgery is performed to remove as much of the tumor as possible while avoiding damage to healthy tissue. Optimal therapy, which may include chemotherapy and/or radiation, requires coordinated efforts of pediatric cancer specialists in fields such as neurosurgery, neuropathology, radiation oncology, and pediatric oncology. Late effects can include impaired growth and neurologic development following radiation therapy, especially in younger children. For this reason, children under age 3 usually receive chemotherapy first with delayed and/or reduced radiation. Radiation is not always needed for low-grade tumors.[43]

Survival rates vary depending on tumor type, location, and grade. Trends in survival rates over time are available for malignant brain tumors only (Table 4, page 35). While there has been progress in survival for CNS tumors overall, there has been little progress for some subtypes, such as DIPG (diffuse intrinsic pontine glioma), for which the median survival time after diagnosis remains less than one year. [51]

Embryonal tumors

Embryonal tumors arise from cells in developing tissues and organ systems of a fetus. These tumors are usually diagnosed in children before age 5. Age-specific incidence rates for three common types of embryonal tumors in children (neuroblastoma, Wilms tumor, and retinoblastoma) are presented in Figure 7 (page 34). Other embryonal tumors, including medulloblastoma and rhabdomyosarcoma, are discussed in other sections of this report.

Neuroblastoma

An estimated 710 cases of neuroblastoma will be diagnosed among children (ages 0-14) in 2014. It is the third most common childhood cancer and represents 7% of the total cases in this age group. Neuroblastoma develops from certain types of very primitive nerve cells in the embryo and is the most common cancer diagnosed during the first year of life; it is very uncommon after age 10. The incidence of neuroblastoma is slightly higher in boys than girls and substantially higher in whites than children of other races/ethnicities (Table 3, page 31). Although epidemiologic studies have investigated environmental factors that may

be associated with neuroblastoma, no strong or consistent risk factors have been identified. A family history of neuroblastoma is present in 1% to 2% of cases. Children who have siblings with neuroblastoma are nearly 10 times more likely to be diagnosed with the disease than children without a family history.[52]

Neuroblastoma can spread through the lymph system and blood, and over half of children have regional or distant stage disease at diagnosis.[53] A rare form of neuroblastoma (stage 4S) occurs in infants with a specific pattern of metastatic disease and often regresses with little or no treatment.[54] Depending on stage and other prognostic factors, children with neuroblastoma are most commonly treated with surgery and/or chemotherapy and radiation therapy; patients with high-risk disease may receive high-dose chemotherapy followed by stem cell transplant.[53] Overall survival rates for neuroblastoma have increased from 54% in 1975-1979 to 79% in 2003-09 (Table 4). However, survival remains poor for children with high-risk disease. Children treated for high-risk disease also have the greatest risk of treatment-related complications, including severe hearing loss, infertility, cardiac toxicity, and second cancers related to the use of high-dose chemotherapy.[53]

Wilms Tumor

An estimated 510 cases of Wilms tumor will be diagnosed among children in 2014. Also called nephroblastoma, Wilms tumor is an embryonal tumor of the kidney that usually occurs in children under age 5 (Figure 7). The vast majority (92%) of kidney tumors in this age group are Wilms tumor.[41] The incidence rate of Wilms tumor is slightly higher in girls than boys and in African American children compared to children of other races/ethnicities (Table 3, page 31). Wilms tumor is bilateral (occurring in both kidneys) in about 5-10% of cases.[55] About 10% of cases are associated with a birth defect such as urogenital tract abnormalities.[56] Epidemiologic studies have not identified strong or consistent environmental risk factors for Wilms tumor.

The majority of children with Wilms tumor are diagnosed with an asymptomatic abdominal mass that is incidentally noted while bathing or dressing the child.[57] Wilms tumor may spread locally or through the bloodstream; distant metastases are uncommon at diagnosis. Treatment involves surgery and may include radiation and/or chemotherapy. In addition to stage, histology (how the cancer cells look under the microscope) and age at diagnosis are important prognostic factors.[57] Survival rates for Wilms tumor increased from 75% in 1975-1979 to 90% in 2003-2009 (Table 4). Late effects observed among survivors of Wilms tumor include heart damage, diminished lung and kidney function, reduced fertility and pregnancy complications among girls treated with radiation, and an increased risk of second cancers.[57]

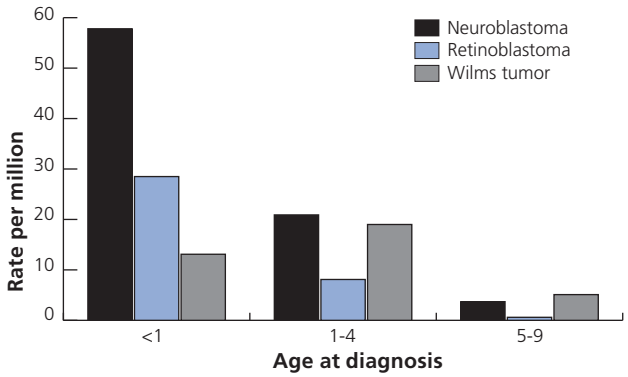
Retinoblastoma

An estimated 280 children will be diagnosed with retinoblastoma in 2014. Retinoblastoma is a cancer that starts in the retina, the very back part of the eye. Retinoblastoma usually occurs in children under age 5 and accounts for 6% of cancers in this age group (Figure 7). The incidence of retinoblastoma is similar in boys and girls, does not vary substantially by race and ethnicity, and has been stable in the US population since 1975 (Table 3, page 31, Figure 2, page 27). Symptoms of retinoblastoma may include "white pupil," in which the pupil of the eye appears white instead of red when light shines into it, eye pain or redness, and vision problems.

Most cases of retinoblastoma are due to a mutation in the *RB1* gene. Approximately one-third of retinoblastomas are inherited, meaning that the *RB1* mutation is in all of the body's cells (i.e., a germline mutation).[58] Genetic counseling should be an integral part of the therapy for the family of a patient with retinoblastoma.[58] Patients who carry a germline *RB1* mutation have an increased risk of second cancers, especially if they receive radiation therapy.[59]

The type of treatment required for retinoblastoma depends largely on the extent of the disease within the eye and whether the disease has spread beyond the eye. Treatment options consider both cure and preservation of sight. Small tumors may sometimes be treated with cryotherapy (freezing), laser therapy, or thermotherapy (heat laser). Patients with more advanced disease, but that only involves one eye without spread to nearby tissues, are often treated with surgery to remove the eye (enucleation), which may be the only treatment needed.[58] Children with bilateral (both eyes are affected) disease, and some children with unilateral disease, may be treated with chemotherapy to shrink tumors to a size where local treatment is effective.

Figure 7. Age-specific Incidence Rates for Embryonal Tumors, US, 2006-2010



Source: North American Association of Central Cancer Registries. Data are included from all US states and the District of Columbia except Arkansas, Minnesota, Nevada, Ohio, and Virginia.

American Cancer Society, Surveillance Research, 2014

Table 4. Pediatric Cancer Five-year Observed Survival Rates for Two Time Periods, Ages 0-19

	Year of Diagnosis 1975-79 %	2003-09* %
All ICCC sites	63	83
Leukemia	48	84
Acute lymphocytic leukemia	57	90
Acute myeloid leukemia	21	64
Lymphomas and reticuloendothelial neoplsams	72	91
Hodgkin lymphoma	87	97
Non-Hodgkin lymphoma	47	85
Brain and CNS	59	75
Ependymoma	37	81
Astrocytoma	69	85
Medulloblastoma	47	70
Neuroblastoma and ganglioneuroblastoma	54	79
Retinoblastoma	92	99
Wilms tumor	75	90
Hepatic tumors	25	74
Bone tumors	49	73
Osteosarcoma	45	71
Ewing sarcoma	42	72
Rhabdomyosarcoma	49	64
Testicular germ cell tumors	74	96
Ovarian germ cell tumors	75	94
Thyroid carcinoma	99	98
Melanoma	83	95

ICCC=International classification of childhood cancers.

CNS=Central nervous system.

*Cases were followed through 2010.

Note: Does not include benign and borderline brain tumors.

Source: Surveillance, Epidemiology, and End Results (SEER) program, 9 SEER registries, National Cancer Institute.

American Cancer Society, Surveillance Research, 2014

Patients with more advanced disease are treated with chemotherapy and sometimes surgery and/or radiation.[59] Recent studies have investigated the efficacy of intra-arterial chemotherapy with promising results.[60] Five-year survival rates for retinoblastoma have increased from 92% in 1975-1979 to 99% in 2003-2009 (Table 4). Late effects of retinoblastoma include visual impairment and increased risks of second cancers, including bone and soft tissue sarcomas and melanoma.[61]

Bone tumors and soft tissue sarcomas

Sarcomas are tumors that develop from connective tissues in the body, such as muscles, fat, bones, membranes that line the joints, or blood vessels. An estimated 450 children and 370 adolescents will be diagnosed with bone tumors in 2014. The two most common types of bone tumors in children and adolescents are osteosarcoma and Ewing sarcoma. The most common type of soft tissue sarcoma is rhabdomyosarcoma, which will be diagnosed in an estimated 340 children in 2014. Age-specific incidence rates for these three types of sarcoma are presented in Figure 8, page 36. Another type of soft tissue sarcoma, Kaposi sarcoma, while extremely rare among children in the US, is very common in children in Africa due in part to the high prevalence of HIV infection.[4, 5]

Osteosarcoma

Osteosarcoma is the most common type of bone cancer in children and adolescents. The incidence of osteosarcoma increases with age throughout childhood and adolescence; it is very rare among children under age 5 (Figure 8, page 36). The incidence of osteosarcoma is slightly higher in boys than girls and also higher in African American and Hispanic children than in white and Asian American/Pacific Islander children (Table 3, page 31). Osteosarcoma arises from primitive bone-forming stem cells and usually develops in areas where the bone is growing rapidly, such as near the ends of the long bones around the knee. Osteosarcoma commonly appears as sporadic pain in the affected bone that may worsen at night or with activity, with progression to local swelling.[62]

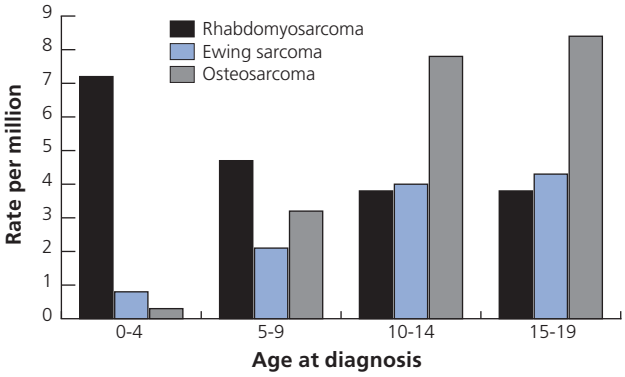
Prior radiation treatment for another tumor increases the risk of osteosarcoma. Radiation-associated osteosarcomas usually occur 7 to 15 years after treatment of the primary tumor. Some studies have found that taller children are at greater risk of osteosarcoma, while others have not.[63] The incidence of osteosarcoma is increased among individuals with the hereditary form of retinoblastoma and Li-Fraumeni syndrome, as well as several other genetic syndromes.[62]

About 20% of patients have detectable metastases (distant spread) at diagnosis, most commonly in the lung.[64] Nearly all patients receive systemic therapy (chemotherapy given through the blood stream to reach cancer cells throughout the body) due to the high risk of metastases. Current standard therapy consists of neoadjuvant chemotherapy to shrink the tumor, followed by surgery and adjuvant chemotherapy.[62] Amputation is rarely needed. The 5-year survival rate for osteosarcoma was 71% in 2003-09, up from 45% in 1975-79 (Table 4). Therapy-related late effects can include heart damage, hearing loss, kidney dysfunction, second cancers, and infertility. Patients treated for osteosarcoma may also have physical limitations resulting from surgery.[62]

Ewing sarcoma

Ewing sarcoma is the second most common malignant bone tumor in children and adolescents. It is more common among older children and adolescents than young children (Figure 8, page 36). Notably, incidence rates of Ewing sarcoma in whites are nearly 7.5 times higher than in African Americans, and moderately higher than in Hispanics and Asian American/Pacific Islanders (Table 3, page 31). Similar differences in incidence are observed globally.[10] Ewing sarcoma is a highly aggressive cancer, and it is characterized by a mutation in the *EWSR1* gene.[65]

Figure 8. Age-specific Incidence Rates for Bone and Soft Tissue Sarcomas, US, 2006-2010



Source: North American Association of Central Cancer Registries. Data are included from all US states and the District of Columbia except Arkansas, Minnesota, Nevada, Ohio, and Virginia..

American Cancer Society, Surveillance Research, 2014

Ewing sarcomas arise about equally in bones of the extremities and those in other parts of the body, and may also arise in soft tissues.[66] The first symptom is usually pain at the tumor site, sometimes along with a mass or swelling. Metastases are present in about 25% of patients at diagnosis; the most common metastatic sites are the lungs, bone, and bone marrow.[67] Treatment for Ewing sarcoma typically involves induction chemotherapy followed by local therapy (surgery and/or radiation) and adjuvant chemotherapy. There is continuing uncertainty about whether surgery or radiation therapy is preferred for local control, and sometimes radiation therapy is used both before and after surgery.[68] Survival rates for Ewing sarcoma have increased from 42% in 1975-1979 to 72% in 2003-09 (Table 4, page 35). Ewing sarcoma survivors are at increased risk for developing a second cancer, heart and lung conditions, infertility, and musculoskeletal problems.[68]

Rhabdomyosarcoma

Rhabdomyosarcoma is a cancer made up of cells that normally develop into skeletal muscles. This cancer accounts for 3% of childhood cancers and 2% of adolescent cancers. There are two major subtypes of rhabdomyosarcoma: embryonal rhabdomyosarcoma (about 75% of cases), which is most common in children under age 5, and alveolar rhabdomyosarcoma (about 16% of cases), for which incidence does not vary by age in children and adolescents.[69] Embryonal rhabdomyosarcoma most commonly occurs in the head and neck, whereas alveolar rhabdomyosarcoma is most common in the trunk and extremities. The first symptoms often include pain and/or a mass or swelling at the site of origin. Rhabdomyosarcoma is associated with a number of genetic syndromes, including Li-Fraumeni syndrome and neurofibromatosis type 1.

All patients with rhabdomyosarcoma receive several types of treatment, including chemotherapy in conjunction with surgery, radiation, or a combination thereof.[70] Although survival for rhabdomyosarcoma has improved (from 49% in 1975-1979 to 64% in 2003-09), it remains lower than many other pediatric cancers (Table 4, page 35). Treatments for patients with intermediate and high-risk disease continue to be studied in clinical trials in hopes of achieving better outcomes.[71] Late effects of treatment for rhabdomyosarcoma depend on whether radiation therapy was given and the specific chemotherapy agents received, which have varied over time.

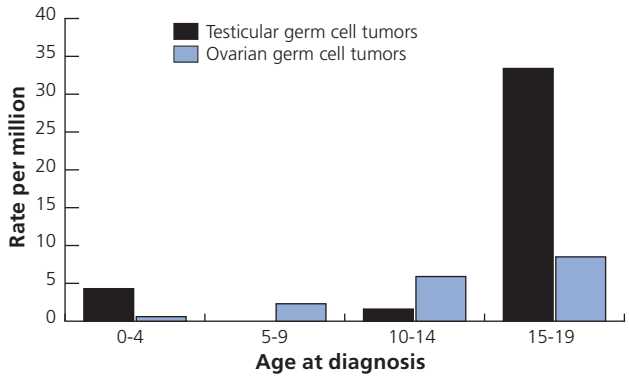
Gonadal germ cell tumors

Gonadal germ cell tumors are a diverse group of tumors that arise from either the ovaries in girls or the testicles in boys. These tumors are more common in adolescents than in young children and occur more frequently in boys than girls (Figure 9). Incidence rates vary by race/ethnicity, with Hispanic children having the highest rates and African American children having the lowest (Table 3, page 31).

Ovarian germ cell tumors

An estimated 110 adolescent girls will be diagnosed with ovarian germ cell tumors in 2014. Ovarian germ cell tumors are more common in older girls (ages 10-14) and adolescents than in younger girls (Figure 9). The risk of ovarian tumors is increased among individuals with several genetic syndromes involving sex chromosomes, including Turner syndrome and Swyer syndrome.[72] Ovarian germ cell tumors often cause abdominal pain, swelling, and weight gain.[73] Surgery is the primary treatment; removal of only the affected ovary and fallopian tube is an option for most patients who wish to preserve fertility. Patients with early stage disease may be monitored after surgery, while those

Figure 9. Age-specific Incidence Rates for Gonadal Germ Cell Tumors, US, 2006-2010



Rates are not shown when based on fewer than 25 cases.
Source: North American Association of Central Cancer Registries. Data are included from all US states and the District of Columbia except Arkansas, Minnesota, Nevada, Ohio, and Virginia.

American Cancer Society, Surveillance Research, 2014

with more advanced disease receive chemotherapy. The 5-year survival rate is 94% (Table 4, page 35). The chemotherapy regimens most commonly used for ovarian germ cell tumors may cause hearing loss and kidney damage.[74]

Testicular germ cell tumors

An estimated 430 testicular germ cell tumors (TGCT) will be diagnosed in boys ages 15-19 in 2014, making it the fourth most common cancer in this age group. Some TGCT also occur in boys under the age of 4 (Figure 9). The incidence of TGCT is higher among whites and Hispanics than among African Americans (Table 3, page 31). There are two major types of TGCT: non-seminomas (accounting for the majority of TGCT in adolescents) and seminomas.[75] A lump on the testicle is usually the first sign and often leads to diagnosis at an early stage. Risk factors for TGCT include a history of an undescended testicle and a family history of testicular cancer.[74] Removal of the affected testicle is the primary treatment for all TGCT; subsequent treatment varies by stage. Early stage cancers (stages I and II) may be observed closely after surgery, while those with continued elevation of serum markers should undergo radiation therapy. Later-stage cancer requires chemotherapy. Survival rates for testicular cancer have improved substantially since the mid-1970s (from 74% to 96% in 2003-2009), and most patients have a good prognosis (Table 4, page 35).

Side Effects and Support during Cancer Therapy

Children with cancer may suffer from pain and other symptoms due to the cancer itself, pain and anxiety related to medical procedures and hospitalizations, physical side effects of treatment, separation anxiety, and psychological distress.[76,77] Pediatric nurse oncologists and other members of the health care team play important supportive roles in assessing and managing pain, distress, and other symptoms that may arise in children and adolescents undergoing cancer treatment. Optimal care for children with cancer may also involve consultation with specialists, such as psychologists and social workers, who are trained and experienced in methods to reduce pain and suffering for pediatric cancer patients and to provide psychosocial and other support to patients, siblings, parents, and other caregivers.[76, 78] Major pediatric centers that treat cancer in children also have palliative care teams that specialize in managing pain and other distressing symptoms. Palliative care, also called supportive care, should be provided throughout the course of pediatric cancer treatment and continued as needed to minimize pain and suffering, improve patient and family quality of life, facilitate decision making, and assist in care coordination between clinicians and across sites of care.[78, 79]

Caring for a child who is undergoing cancer treatment is difficult for many families. Psychosocial support for parents and other family members is an important component of care.[81] Oncology social workers, psychologists, child life specialists, and other staff at pediatric cancer centers provide psychosocial support to families, as well as help to address practical issues such as insurance and opportunities for the child to continue their education while under treatment. To further advance health care provider and health system efforts to deliver optimal care that integrates psychosocial and palliative care alongside disease-directed treatment, several patient quality of life-focused public policy initiatives are now under way involving a coalition of patient advocacy and professional organizations. For more information, see the Advocacy section on page 38.

Despite advances in treatment and survival for some cancers, some children with cancer will not survive the disease. Although patients, families, and health care providers often find it difficult to discuss issues concerning prognosis, goals of care, and transitions to end-of-life care, it is important that health care providers are available, attentive, and sensitive to these concerns.[80,82] Pediatric oncology centers often partner with the

Common side effects of cancer treatment [80]

- Low red blood cell counts (anemia) can result in pallor, dizziness, weakness, lack of energy, headache, and irritability. Low platelet counts (thrombocytopenia) can result in easy bleeding and bruising. Low white blood cell counts (including low neutrophil counts or neutropenia) reduce the body's ability to fight infection. Low blood cell counts can be treated by transfusions or hematopoietic growth factors, and risk of infection may be reduced by prophylactic antibiotics.
- Gastrointestinal side effects are common among children receiving chemotherapy or radiation therapy, and can include oral mucositis (irritation and/or sores in the mouth), diarrhea or constipation, nausea, vomiting, and retching. Gastrointestinal side effects can result in poor nutritional intake, leading to weight loss and delayed growth. Medications, such as antiemetics given before chemotherapy, are available to reduce some of these side effects, and nutritional advice is available to help children and parents with these issues. Nutritional support, such as tube feedings, intravenous feedings, or appetite stimulants, may be recommended.
- Pain may arise from the tumor as it presses on bone, nerves, or body organs; it can also result from procedures, including surgeries and needle sticks. Pain can also be a side effect of some cancer treatment, such as neuropathic pain from some chemotherapy drugs. Pain is often treatable by medication and other integrative non-medicine therapies. Children whose pain cannot be well-controlled by available interventions should be seen by a specialist in pediatric pain management.

family's pediatrician and hospice professionals to provide care to terminally ill children to manage pain and other symptoms, help families to make informed decisions about the child's care, and support them through bereavement.[83,84] The loss of a child to cancer is an incredibly difficult experience. A variety of resources (see page 39) are available for helping people through their grieving process, including assistance in obtaining referrals for counseling and community-based support services.

Transition from Active Treatment to Survivorship Care

Children treated for cancer often maintain their relationship with their primary care pediatrician.[85] Following cancer treatment, children and adolescents may be monitored by their pediatric oncologist for 3 or more years, depending on the disease, age of the patient, and other factors. Follow-up care by pediatric oncologists focuses on checking for recurrence; more extensive follow-up may be offered by the treating oncologist or by referral to a comprehensive clinic. When the time comes for discontinuing visits to the pediatric oncologist for initial follow-up care, long-term follow-up care is still needed. Such follow-up care includes assessment of short- and long-term complications and late effects of cancer therapies; detection of recurrent and secondary cancers; counseling about behaviors such as smoking, diet, and physical activity; assessment of psychosocial adjustment and quality of life; and treatment for any identified late effects.

Many of the late effects of childhood and adolescent cancer may not become apparent until adulthood. Therefore, it is important that young adults who are transitioning from pediatric to adult primary care receive information regarding their cancer experience, including diagnosis and treatment, as well as follow-up recommendations, especially if they are not participating in specialized survivorship care programs.[85] The Children's Oncology Group (COG) has developed long-term follow-up guidelines for survivors of childhood cancers.[86] These guidelines help health care providers and patients know what to watch for, what type of screening tests should be done to look for problems, and how late effects can be treated. For more information on these guidelines, visit the COG Web site at survivorshipguidelines.org.

Global Burden of Childhood Cancer

An estimated 175,000 cases of cancer are diagnosed annually in children younger than 15 years of age worldwide, and fewer than 40% of patients (mostly in high-income countries) are adequately diagnosed and treated.[87] A child's probability of surviving cancer is poor in less developed countries, and extreme discomfort is likely in the absence of palliative care. Many childhood cancers are highly curable if diagnosed at an early stage, and some treatment regimens are relatively simple, inexpensive, and well-established.[88] For example, about 50% of African BL can be cured with a 28-day course of low-dose cyclophosphamide and prednisone and four intrathecal injections costing less than $50.[89] A number of organizations have drawn attention to the survival disparity for retinoblastoma between high- and low-income countries, and to the possibility that interventions such as public awareness campaigns, physician education, hospital partnerships, and donation of equipment could improve early detection and treatment in low-income countries.[90]

What Is the American Cancer Society Doing about Cancer in Children and Adolescents?

Advocacy

The Society's nonprofit, nonpartisan advocacy affiliate, the American Cancer Society Cancer Action Network℠ (ACS CAN), supports laws and policies that increase funding for cancer research, improve the quality of life of all adults and children with cancer and their families, and broaden access to quality care.

A top and ongoing priority for ACS CAN is protecting and increasing federal funding for cancer research at the National Institutes of Health and the National Cancer Institute (NCI). NCI funds about $200 million a year in research specific to childhood cancer. For more information, visit acscan.org/research and ovaconline.org.

ACS CAN has worked with the Society to develop a menu of new public policy proposals focused on increasing quality of life (QOL) and scientific research on survivorship, boosting the health care workforce, and improving access to quality health care. In partnership with diverse stakeholders, ACS CAN is currently advancing federal and state legislation to promote pain and symptom management and other aspects of palliative care integrated with disease-directed treatment. These initiatives include specific emphasis on addressing the quality-of-life needs of children and adolescents who are facing cancer or other serious illness. For more information about this QOL campaign, visit acscan.org/qualityoflife.

Moreover, for more than a decade, ACS CAN has worked on a variety of childhood cancer public policies and legislative initiatives. Specifically, ACS CAN endorsed a number of bills, which became law in 2012, that focus on pediatric cancer, including the Reauthorization of the Best Pharmaceuticals for Children Act (BPCA) and the Pediatric Research Equity Act (PREA). In addition, ACS CAN has endorsed the pediatric cancer community's legislative priorities for the 113th Congress, including the Childhood Cancer Survivors' Quality of Life Act, and reauthorization and appropriations for the Caroline Pryce Walker Conquer Childhood Cancer Act.

ACS CAN is also an active participant in the Alliance for Childhood Cancer — a coalition of more than 25 member organizations dedicated to advancing childhood cancer issues.

More information about the Alliance can be found at allianceforchildhoodcancer.org/about.

ACS CAN has successfully advocated for the inclusion of the following and other patient protections in the Affordable Care Act that are vitally important to childhood and adolescent cancer patients and survivors:

- Protecting children and others from being dropped from health insurance plans when they get sick
- Banning lifetime dollar caps on coverage and annual dollar limits so that those with cancer get access to needed care
- Allowing families with children with life-threatening illnesses to enroll their children in hospice that is provided concurrently with disease-directed treatment
- Enabling dependent children to remain on their parents' health insurance policy up to age 26

Research

The American Cancer Society, through its Extramural Grants program, funds individual investigators engaged in cancer research or training at medical schools, universities, research institutes, and hospitals throughout the US. As of September 2013, this program is funding approximately $29 million in research specifically related to childhood and adolescent cancer through 56 research grants. Additionally, the Society is funding about $16 million in brain cancer research, $28 million in leukemia research, and $15 million in lymphoma research covering both childhood and adult disease.

Following are some examples of ongoing Society-funded childhood and adolescent cancer research projects:

- Researchers at the University of Texas, Southwestern Medical Center are focused on what causes rhabdomyosarcoma. They have discovered that many cases are associated with a fusion of two genes. The team is currently conducting studies to understand the consequences of this gene fusion, with the goal of creating new therapies for this difficult-to-treat cancer.
- Investigators from the University of Kansas Medical Center are attempting to better understand metastasis in osteosarcoma. The investigators have discovered that a particular regulatory protein, MTBP, can interfere with the primary growth of osteosarcoma and its ability to metastasize to distant sites. A better understanding of the molecular events that promote metastases will provide the framework for improved prevention and treatment.
- A research team at the Children's Hospital of Los Angeles is focused on trying to improve treatment of medulloblastoma. Recent studies have shown that radiation treatment, when added to surgery and chemotherapy, may not be necessary for some children. The researchers are trying to develop a prognostic tool that would identify those children who might be cured without use of radiation to spare them the additional side effects associated with radiation.
- Researchers at Yale University are comparing two survivorship models for children with cancer to improve long-term outcomes and quality of life in these patients. Specifically, the researchers are comparing the effectiveness of "survivorship clinics" to care provided by primary care physicians with training in survivorship care.

Resources for clinicians and parents

A detailed guide with additional information and resources on cancer in children is available on the Society Web site: cancer.org/cancer/cancerinchildren. This guide includes a listing of additional Society publications that may be downloaded or ordered by calling our toll-free number, 1-800-227-2345.

Other national organizations and Web sites that provide information and support:

- American Childhood Cancer Organization: acco.org
- Children's Oncology Group (COG): childrensoncologygroup.org
- CureSearch for Children's Cancer: curesearch.org
- National Cancer Institute resources for childhood cancer: cancer.gov/cancertopics/types/childhoodcancers
- National Children's Cancer Society, Inc: thenccs.org

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Tobacco Use

Smoking-related diseases remain the world's most preventable cause of death. Since the first US Surgeon General's report on smoking and health in 1964, there have been more than 15 million premature deaths attributable to smoking in the US.[1,2] Worldwide, 6 million people die annually from tobacco use; by 2030, the number will rise to 8 million deaths annually.[3, 4]

Health Consequences of Smoking

Half of all those who continue to smoke will die from smoking-related diseases.[5] In the US, tobacco use is responsible for nearly 1 in 5 deaths; this equaled an estimated 443,000 premature deaths each year between 2000 and 2004.[6,7] In addition, an estimated 8.6 million people suffer from chronic conditions related to smoking, such as chronic bronchitis, emphysema, and cardiovascular diseases.[8]

- Smoking accounts for at least 30% of all cancer deaths, including 87% of lung cancer deaths among men and 70% of lung cancer deaths among women.[9]
- The risk of developing lung cancer is about 23 times higher in male smokers and 13 times higher in female smokers, compared to lifelong nonsmokers.[1]
- Smoking increases the risk of the following types of cancer: nasopharynx, nasal cavity and paranasal sinuses, lip, oral cavity, pharynx, larynx, lung, esophagus, pancreas, uterine cervix, ovary (mucinous), kidney, bladder, stomach, colorectum, and acute myeloid leukemia.[1,10]
- The International Agency for Research on Cancer (IARC) recently concluded that there is some evidence that tobacco smoking causes female breast cancer.[10]
- Smoking is a major cause of heart disease, cerebrovascular disease, chronic bronchitis, and emphysema, and is associated with gastric ulcers.[1,11]
- The risk of lung cancer is just as high in smokers of "light" or "low-tar" yield cigarettes as in those who smoke "regular" or "full-flavored" products.[12]

Reducing Tobacco Use and Exposure

In 2000, the US Surgeon General outlined the goals and components of comprehensive statewide tobacco control programs.[13] These programs seek to prevent the initiation of tobacco use among youth; promote quitting at all ages; eliminate nonsmokers' exposure to secondhand smoke; and identify and eliminate the disparities related to tobacco use and its effects among different population groups.[14]

The Centers for Disease Control and Prevention (CDC) recommends funding levels for comprehensive tobacco use prevention and cessation programs for all 50 states and the District of Columbia. In fiscal year 2013, 5 states allocated 50% or more of CDC-recommended funding levels for tobacco control programs.[15] States that have previously invested in comprehensive tobacco control programs, such as California, Massachusetts, and Florida, have reduced smoking rates and saved millions of dollars in tobacco-related health care costs.[13] Recent federal initiatives in tobacco control, including national legislation ensuring coverage of some clinical cessation services, regulation of tobacco products, and tax increases, hold promise for reducing tobacco use. Provisions in the Affordable Care Act ensure at least minimum coverage of evidence-based cessation treatments, including pharmacotherapy and cessation counseling, to previously uninsured tobacco users, pregnant Medicaid recipients, and eligible Medicare recipients. The Centers for Medicare and Medicaid Services subsequently issued a decision memo changing the eligibility requirement for Medicare recipients, so that they no longer have to be diagnosed with a smoking-related disease in order to access cessation treatments. Starting in 2014, state Medicaid programs can no longer exempt cessation pharmacotherapy from prescription drug coverage. Several provisions of the Family Smoking Prevention and Tobacco Control Act, which for the first time grants the US Food and Drug Administration the authority to regulate the manufacturing, selling, and marketing of tobacco products, have already gone into effect. For more information about tobacco control, see *Cancer Prevention & Early Detection Facts & Figures*, available online at cancer.org/statistics.

Cigarette Smoking

Between 1965 and 2004, cigarette smoking among adults 18 years of age and older declined by half from 42% to 21%.[16] Between 2005 and 2012, there was a modest, but statistically significant, decline in smoking prevalence from 21% to 18%, though declines were not consistent from year to year and were not observed in all population subgroups.[17-19]

- In 2011, approximately 41.5 million adults were current smokers, about 4 million fewer than in 2005.
- The proportion of daily smokers reporting light or intermittent smoking (less than 10 cigarettes per day) increased significantly between 2005 (16%) and 2012 (21%), whereas heavy smoking declined from 13% to 7%.[17-19]
- Although cigarette smoking became prevalent among men before women, the gender gap narrowed in the mid-1980s and has since remained constant.[20] As of 2012, there was a 2 percentage point difference in smoking prevalence between white men (21%) and women (19%), a 7 percentage point difference between African American men (22%) and women

(15%), a 9 percentage point difference between Hispanic men (17%) and women (8%), and a 12 percentage point difference between Asian men (17%) and women (5%).[19]

- Smoking is most common among the least educated. For example, in 2012, smoking prevalence was 32% among adults with 9-11 years of education and 6% among those with graduate degrees.[19] The highest smoking rate was among adults with a GED (General Educational Development), or high school equivalency credential (42%).
- While the percentage of smokers has decreased at every level of educational attainment, college graduates have had the greatest decline, from 21% in 1983 to 9% in 2012.[18,19,21] Among those with a high school diploma, prevalence decreased less dramatically, from 34% to 23%.
- Among US states in 2012, the prevalence of adult smoking ranged from 10.6% in Utah to 28.3% in Kentucky.[22]
- The decrease in smoking prevalence among high school students between the late 1970s and early 1990s was more rapid among African Americans than whites; consequently, lung cancer rates among adults younger than 40 years of age, which historically were substantially higher in African Americans, have converged.[23]
- Although cigarette smoking among US high school students increased from 28% in 1991 to 36% in 1997, it had declined to 14% by 2012.[24-26]

Smokeless Tobacco Products

Smokeless tobacco products include moist snuff, chewing tobacco, snus (a "spitless," moist powder tobacco pouch), dissolvable nicotine products (e.g., Camel Orbs, Camel Strips, and Camel Sticks), and a variety of other tobacco-containing products that are not smoked. Recently, the smokeless market in high-income countries, including the US, has been consolidated from smaller tobacco companies into the control of tobacco multinational corporations.[4] In the US, the sales of smokeless tobacco products are growing at a more rapid pace than cigarettes. As part of their marketing strategy, the industry is actively promoting these products both for use in settings where smoking is prohibited and as a way to quit smoking; however, there is no evidence to date that these products are as effective as proven cessation therapies for quitting. When smokeless tobacco was aggressively marketed in the US in the 1970s and 1980s, use of these products increased among adolescent males, but not among older smokers trying to quit.[28,29] Use of any smokeless tobacco product is not considered a safe substitute for quitting. These products cause oral, esophageal, and pancreatic cancers, precancerous lesions of the mouth, gum recession, bone loss around the teeth, and tooth staining; they can also lead to nicotine addiction.[30,31]

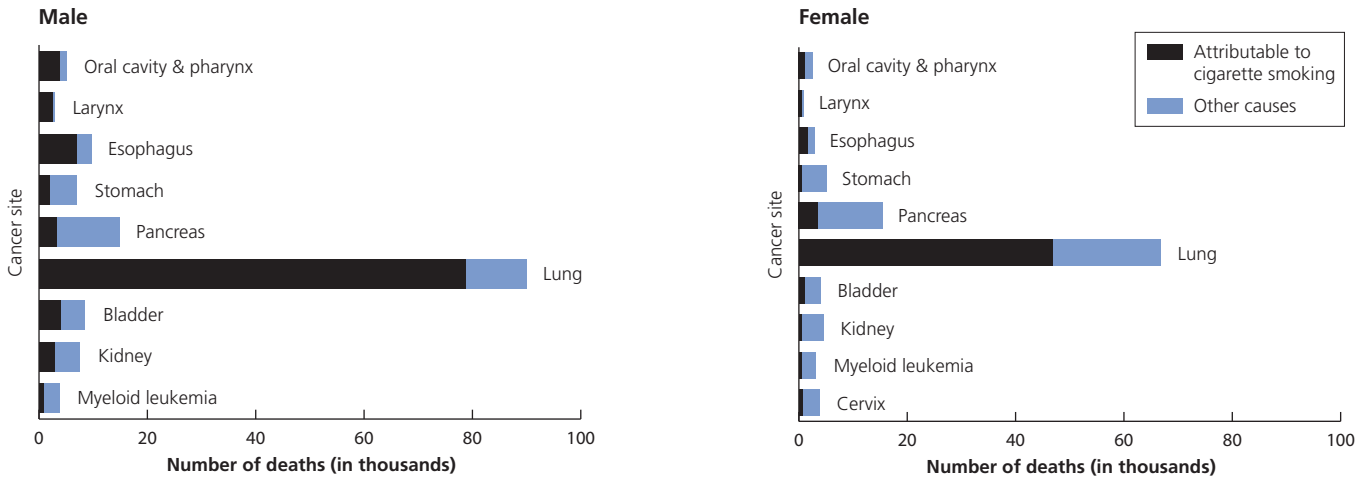
- Smokers who use smokeless products as a supplemental source of nicotine to postpone or avoid quitting will increase rather than decrease their risk of lung cancer.[32]
- Long-term use of snuff substantially increases the risk of cancers of the oral cavity, particularly cancers of the cheek and gum.[31]
- According to the US Department of Agriculture, manufactured output of moist snuff has increased more than 80% in less than two decades, from 48 million pounds in 1991 to an estimated 88 million pounds in 2007.[33,34]
- According to the 2012 National Health Interview Survey, 11% of adults 18 years of age and older (20% of men and 3% of women) have ever used smokeless products.[19]
- According to the 2012 National Survey on Drug Use and Health (NSDUH), whites and American Indians/Alaska Natives were more likely to use smokeless tobacco than African Americans, Hispanics/Latinos, or Asians.[35]
- Adult smokeless tobacco use (including snus use) varied from 1% to 9% across states in 2012, with higher rates observed in the South and North-Central states.[22]
- Smokeless tobacco use among high school boys decreased consistently between 1986 and 2003 (from 19% to 11%), but has since remained fairly level (13% in 2011 and 11% in 2012).[26,27] Use among girls has been low and stable (from 1% in 1986 to 2% in 2003, 2011, and 2012).

Cigars

Cigar smoking has health consequences similar to those of cigarette smoking and smokeless tobacco.[36] Historically, lower tax rates on cigars have caused some smokers to switch from cigarettes to less costly cigars. While total cigarette consumption declined by 33% from 2000 to 2011, large cigar consumption (including cigarillos) increased by 233%.[37]

- Regular cigar smoking is associated with an increased risk of cancers of the lung, oral cavity, larynx, esophagus, and probably pancreas. Cigar smokers have 4 to 10 times the risk of dying from laryngeal, oral, or esophageal cancer compared to nonsmokers.[36]
- In 2012, 5% of adults 18 years of age and older (9% of men and 2% of women) were current cigar smokers (at least once in the past month).[35]
- According to the 2012 NSDUH, African Americans had the highest prevalence of cigar use, followed by American Indians/Alaska Natives, whites, Hispanics, and Asians.[35]
- In 2011, 13% of US high school students had smoked cigars, cigarillos, or little cigars at least once in the past 30 days down from 22% in 1997.[26]
- Cigars are taxed based on weight, and large cigars are taxed at a lower rate than small cigars and manufactured ciga-

Annual Number of Cancer Deaths Attributable to Smoking by Sex and Site, US, 2000-2004



Source: Centers for Disease Control and Prevention. Smoking-attributable mortality, years of potential life lost, and productivity losses – United States, 2000-2004. *MMWR Morb Mortal Wkly Rep*. 2008;57(45):1226-1228.

American Cancer Society, Surveillance Research, 2014

rettes.[38] Manufacturers are taking advantage of the tax break for large cigars by slightly increasing the weight of small cigars in order to lower cost while maintaining the appeal of the smaller size.[35]

Smoking Cessation

A US Surgeon General's Report outlined the benefits of smoking cessation: [39]

- People who quit, regardless of age, live longer and are healthier than people who continue to smoke.
- Smokers who quit before age 50 cut their risk of dying in the next 15 years in half.
- Quitting smoking substantially decreases the risk of lung, laryngeal, esophageal, oral, pancreatic, bladder, and cervical cancers.
- Quitting lowers the risk for other major diseases, including heart disease, chronic lung disease, and stroke.
- While the majority of ever-smokers in the US have quit smoking, rates of adult smoking cessation remained stable between 1998 and 2008.[40]
- In 2012, an estimated 51.5 million adults were former smokers, representing 55% of living persons who ever smoked.[19]
- In fact, in all 50 states and the District of Columbia, the majority of adults who have ever smoked have now quit.[22]
- Smokers with an undergraduate or graduate degree are more likely to quit than less educated smokers.[40] Among those who smoked in 2012, approximately 51% had stopped smoking at least one day during the preceding 12 months because they were trying to quit.[19]
- In 2011, among high school students who were current cigarette smokers, national data showed that one-half (50%) had tried to quit smoking cigarettes during the 12 months preceding the survey; female students (54%) were more likely to have made a quit attempt than male students (47%).[26]

Effective cessation treatments can double or triple a smoker's chances of long-term abstinence.[41] Certain racial and ethnic groups (Hispanics and non-Hispanic African Americans) and those with low socioeconomic status are significantly less likely to receive cessation services.[42] One way to help reduce these disparities is by increasing insurance coverage and promoting available coverage for these treatments through government health programs, including Medicaid and Medicare, and private health insurance mandates.

Secondhand Smoke

In 2006, the US Surgeon General published a comprehensive report titled *The Health Consequences of Involuntary Exposure to Tobacco Smoke*.[43] This report determined that secondhand smoke (SHS), or environmental tobacco smoke, contains numerous human carcinogens for which there is no safe level of exposure. It is estimated that more than 88 million nonsmoking Americans 3 years of age and older were exposed to SHS in 2007-2008.[44] Numerous other scientific consensus groups have also reviewed data on the health effects of SHS.[43-49] Public policies to protect people from SHS are based on the following detrimental effects:

- SHS contains more than 7,000 chemicals, at least 69 of which cause cancer.[2]
- Each year, about 3,400 nonsmoking adults die of lung cancer as a result of breathing SHS.[6]
- SHS causes an estimated 42,000 deaths annually from heart disease in people who are not current smokers.[50]
- SHS may cause coughing, wheezing, chest tightness, and reduced lung function in adult nonsmokers.[44]
- Some studies have reported an association between SHS exposure and breast cancer. In 2006, the US Surgeon General designated this evidence as suggestive rather than conclusive, while a subsequent meta-analysis concluded that there was no association between secondhand smoke and breast cancer.[43,51] In any case, women should be aware that there are many health reasons to avoid exposure to tobacco smoke.

Laws that prohibit smoking in public places and create smoke-free environments are the most effective approach to prevent exposure to and harm from SHS.[52] In addition, there is strong evidence that smoke-free policies decrease the prevalence of both adult and youth smoking.[52] Momentum to regulate public smoking began to increase in 1990, and smoke-free laws have become increasingly common and comprehensive over time.[53]

- In the past decade, the largest decline in SHS exposure among nonsmokers occurred from 1999-2000 (53%) to 2001-2002 (42%), with estimates since remaining relatively unchanged (2007-2008: 40%).[43]
- In the US, as of July 8, 2013, 575 municipalities and 24 states, the District of Columbia, the Northern Mariana Islands, Puerto Rico, American Samoa, and the US Virgin Islands have laws in place requiring all non-hospitality workplaces, restaurants, and bars to be 100% smoke-free.[54]
- In the US, as of July 8, 2013, there were 1,182 100% smoke-free college campuses; of these, 798 are 100% tobacco-free (i.e., no forms of tobacco allowed).[54]
- Currently, 49% of the US population is covered by a 100% smoke-free policy in workplaces, restaurants, and bars.[54]

Workplace smoking restrictions vary by geographic area; 72% of Southern residents reported working under a smoke-free policy, compared to 81% of workers in the Northeast.[55]

Costs of Tobacco

The number of people who die prematurely or suffer illness from tobacco use impose substantial health-related economic costs on society. It is estimated that in the US, between 2000 and 2004, smoking accounted for 3.1 million years of potential life lost in men and 2.0 million years of potential life lost in women. Smoking, on average, reduces an individual's life expectancy by approximately 14 years.[6]

In addition:

- Between 2000 and 2004, smoking resulted in more than $193 billion in average annual health-related costs, including $96 billion in smoking-attributable medical costs and $97 billion in productivity losses.[6]
- From 1997-2001 to 2000-2004, smoking-attributable health care expenditures were estimated to increase $24 billion annually, while smoking-attributable productivity losses increased $4.3 billion annually.[6,56]

Conclusion

Substantial progress has been made in reducing the disease burden from tobacco over the nearly 50 years since the first report of the Surgeon General's Advisory Committee on Smoking and Health. Smoking prevalence has been reduced by more than half and millions of premature deaths have been averted. Nevertheless, more needs to be done to further reduce the health and economic burden of tobacco. Numerous studies confirm that a comprehensive approach to tobacco control, including higher taxes, 100% smoke-free environments, coverage for tobacco dependence treatment, full implementation of the FDA Family Smoking Prevention and Tobacco Control Act, and vigorous tobacco counter-advertising, can be successful in reducing the death, disease, and economic disruption from tobacco use.

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Cancer Disparities

An overarching objective of the American Cancer Society's 2015 challenge goals is to eliminate disparities in the cancer burden among different segments of the US population, defined in terms of socioeconomic status (income, education, insurance status, etc.), race/ethnicity, geographic location, sex, and sexual orientation. The causes of health disparities within each of these groups are complex and include interrelated social, economic, cultural, environmental, and health system factors. However, disparities predominantly arise from inequities in work, wealth, education, housing, and overall standard of living, as well as social barriers to high-quality cancer prevention, early detection, and treatment services.

Socioeconomic Status

People with lower socioeconomic status (SES) have disproportionately higher cancer death rates than those with higher SES, regardless of demographic factors such as race/ethnicity. For example, cancer mortality rates among both African American and non-Hispanic white men with 12 or fewer years of education are almost 3 times higher than those of college graduates for all cancers combined, and are 4-5 times higher for lung cancer. Furthermore, progress in reducing cancer death rates has been slower in people with lower SES. These disparities occur largely because people with lower SES are at higher risk for cancer and have less favorable outcomes after diagnosis. People with lower SES are more likely to engage in behaviors that increase cancer risk, such as tobacco use, physical inactivity, and poor diet. This is in part because of marketing strategies that target these populations, but also because of environmental or community factors that provide fewer opportunities for physical activity and less access to fresh fruits and vegetables. Lower SES is also associated with financial, structural, and personal barriers to health care, including inadequate health insurance, reduced access to recommended preventive care and treatment services, and lower literacy rates. Individuals with no health insurance are more likely to be diagnosed with advanced cancer and less likely to receive standard treatment and survive their disease.

For example, stage II colorectal cancer patients with private insurance have better survival than stage I patients who are uninsured. For more information about the relationship between SES and cancer, see *Cancer Facts & Figures 2011*, Special Section, and *Cancer Facts & Figures 2008*, Special Section, available online at cancer.org.

Racial and Ethnic Minorities

Disparities in the cancer burden among racial and ethnic minorities largely reflect obstacles to receiving health care services related to cancer prevention, early detection, and high-quality treatment, with poverty as the overriding factor. According to the US Census Bureau, in 2011, 28% of African Americans and 25% of Hispanics/Latinos lived below the poverty line, compared to 10% of non-Hispanic whites. Moreover, 20% of African Americans and 30% of Hispanics/Latinos were uninsured, compared to 11% of non-Hispanic whites.

Discrimination is another factor that contributes to racial/ethnic disparities in cancer mortality. Racial and ethnic minorities tend to receive lower-quality health care than whites even when insurance status, age, severity of disease, and health status are comparable. Social inequalities, including communication barriers and provider assumptions, can affect interactions between patient and physician and contribute to miscommunication or delivery of substandard care.

In addition to poverty and social discrimination, cancer occurrence in a population may also be influenced by cultural and/or inherited factors that decrease or increase risk. For example, Hispanic women have a lower risk of breast cancer, in part, because they tend to begin having children at a younger age, which decreases breast cancer risk. Individuals who maintain a primarily plant-based diet or do not use tobacco because of cultural or religious beliefs have a lower risk of many cancers. Populations that include a large number of recent immigrants, such as Hispanics and Asians, have higher rates of cancers related to infectious agents (e.g., stomach, liver, uterine cervix), reflecting a higher prevalence of infection in immigrant countries of origin. Genetic factors may also explain some differences in cancer incidence. For example, women from population groups with a higher frequency of mutations in the breast cancer susceptibility genes *BRCA1 and BRCA2*, such as women of Ashkenazi Jewish descent, have an increased risk of breast and ovarian cancer. Genetic factors may also play a role in the elevated risk of prostate cancer among African American men and the incidence of more aggressive forms of breast cancer in African American women. However, genetic differences associated with race or ethnicity make only a minor contribution to the disparate cancer burden between populations. Following is a brief overview of the cancer burden for each of the four major nonwhite racial/ethnic groups.

African Americans: African Americans are more likely to develop and die from cancer than any other racial or ethnic group. Compared to non-Hispanic whites, the death rate for cancer among African Americans is 27% higher among men and 11% higher among women. With the exception of kidney cancer mortality, African American men have higher incidence and death rates than non-Hispanic whites for each of the cancer sites listed in the table on page 51. The largest disparity is stomach cancer, for which death rates are 2½-fold higher in African Americans than in non-Hispanic whites among both men and women. In addition, African Americans have double the death rates of non-Hispanic whites for both cervical and prostate cancers. Notably, although African American women have a lower breast cancer incidence rate than non-Hispanic white women, their breast cancer death rate is higher. For more information on cancer in African Americans, see *Cancer Facts & Figures for African Americans*, available online at cancer.org/statistics.

Hispanics: Hispanics have the lowest lung cancer incidence and mortality rates of any major racial/ethnic group. However, they have among the highest rates for cancers associated with infection, such as liver, stomach, and uterine cervix. For example, cervical cancer incidence rates among Hispanic women are the highest of any major minority population, and are 50% higher than those among non-Hispanic whites. Incidence rates of liver cancer and stomach cancers are about twice as high in Hispanics as in non-Hispanic whites. Higher prevalence of infection with human papillomavirus (cervical cancer), hepatitis B virus (liver cancer), and the bacterium *H. pylori* (stomach cancer) in immigrant countries of origin contributes to these disparities. For more information on cancer in Hispanics, see *Cancer Facts & Figures for Hispanics/Latinos*, available online at cancer.org/statistics.

Asian Americans and Pacific Islanders: Compared to other racial/ethnic groups, Asian Americans and Pacific Islanders (APIs) have the lowest overall cancer incidence and mortality rates, as shown in the table on page 51. However, similar to Hispanics, this population has among the highest rates for cancers of the liver and stomach due to a higher prevalence of infections with hepatitis B virus and *H. pylori*, respectively. Liver cancer incidence rates among APIs are about 2½-fold higher than those among non-Hispanic whites, while death rates are double. In contrast to Hispanics, APIs have the lowest cervical cancer incidence and mortality rates of all major racial/ethnic groups.

American Indians and Alaska Natives: American Indians and Alaska Natives (AIANs) have the highest kidney cancer incidence and death rates by far of any other racial or ethnic population – three times higher than those among APIs and 50% higher than those among the remaining subpopulations listed in the table (page 51). A high prevalence of smoking and obesity likely contributes to this disparity. Cancer information for American Indians and Alaska Natives is known to be incomplete because the racial/ethnic status of many of these individuals is

not correctly identified in medical and death records. Although efforts have been made to collect more accurate information through linkage with the Indian Health Service records, available statistics probably do not represent the true cancer burden in this population.

Note: It is important to recognize that although cancer data in the US are primarily reported for broad racial and ethnic minority groups, these populations are not homogenous. There are significant variations in the cancer burden within each racial/ethnic group. For example, among Asian Americans, incidence rates for cervical cancer are almost three times higher in Vietnamese women than in Chinese and Japanese women, partly because the Vietnamese, in general, immigrated more recently and are poorer, with less access to cervical cancer screening.

Geographic Variability

Cancer rates in the US vary by geographic area, with larger differences for some cancer sites than others. Lung cancer, for example, shows the most striking variation by state (figure, page 52). Lung cancer death rates are more than 3-fold higher in Kentucky (97 and 56 per 100,000 in men and women, respectively) – the state with the highest rates – than in Utah (28 and 17 per 100,000 in men and women, respectively), which has the lowest rates. These differences reflect the substantial historic and continuing variation in smoking prevalence among states, which is influenced to some extent by state tobacco control policies. Geographic variations in cancer occurrence also reflect differences in environmental exposures, socioeconomic factors related to population demographics, and screening behaviors. For more information about cancer disparities, see *Cancer Facts & Figures 2011*, Special Section, available online at cancer.org.

Public Policy

The American Cancer Society and the American Cancer Society Cancer Action Network℠ (ACS CAN), the Society's nonprofit, nonpartisan advocacy affiliate, are dedicated to reducing cancer incidence and mortality rates among minority and medically underserved populations. This goal can be achieved by instituting effective policies and public health programs that promote overall wellness and help save lives. Listed below are some of the efforts at both the state and federal levels that the Society and ACS CAN have been involved with in the past few years:

- **Patient Protection and Affordable Care Act.** The Society and ACS CAN are working to ensure that key provisions of the Affordable Care Act (ACA) that benefit cancer patients and survivors are implemented as strongly as possible and are adequately funded. Some of the law's provisions that will directly help address disparities include:
  - Improving the affordability of coverage by increasing insurance subsidies and eliminating arbitrary annual and lifetime caps on coverage for all insurance plans so that families affected by cancer will face fewer financial barriers to care
  - Focusing on prevention and early detection by requiring all new insurance plans to provide coverage for essential, evidence-based preventive measures with no additional copays
  - Eliminating discrimination based on health status and preexisting conditions, which has been so detrimental to cancer patients over the years
  - Requiring qualified health plans to provide materials in appropriate languages

ACS CAN will continue to look for ways to strengthen the legislation throughout the implementation process both at the federal and state level.

- **National Breast and Cervical Cancer Early Detection Program.** A high priority for the Society and ACS CAN at both the state and federal level is fighting to increase funding for the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). This successful program, which began in 1991, provides community-based breast and cervical cancer screening to low-income, uninsured, and underinsured women, more than 50% of whom are from racial/ethnic minority groups. Due to a large cut in funding, screening rates within the program greatly declined in 2007; rates have been increasing slowly since, but still have not fully recovered. ACS CAN is asking Congress to protect funding for fiscal year 2014 to support continued need and to give women access to lifesaving screening services. While the Affordable Care Act will greatly improve access to screening, the NBCCEDP will remain an essential program for improving breast and cervical cancer screening and treatment in our nation's most vulnerable populations. It will be critical to use the program's infrastructure and community-outreach specialists to help women receive the lifesaving services they need.
- **Patient Navigation.** Patient navigation demonstration programs show that navigation is an important aspect of improving satisfaction and care among cancer patients, especially those in medically underserved and minority populations. In order to increase patient navigation services, ACS CAN is looking to expand the reach of patient navigators through federal funding support.

The Society and ACS CAN also are leading efforts to increase federal investment in cutting-edge biomedical and cancer research and treatments, as well as ways to expand access to them. To learn more, to get involved, and to make a difference in the fight against cancer, visit cancer.org/involved/advocate.

Cancer Incidence and Death Rates* by Site, Race, and Ethnicity, US, 2006-2010

Incidence	Non-Hispanic White	African American	Asian American or Pacific Islander	American Indian or Alaska Native†	Hispanic/ Latino
All sites					
Male	548.6	601.0	326.1	441.1	426.8
Female	436.2	395.9	282.6	372.0	330.8
Breast (female)	127.3	118.4	84.7	90.3	91.1
Colon & rectum					
Male	50.9	62.5	40.8	51.7	47.3
Female	38.6	46.7	31.0	42.7	32.6
Kidney & renal pelvis					
Male	21.6	23.0	10.6	30.6	20.5
Female	11.2	12.2	5.1	17.5	11.5
Liver & intrahepatic bile duct					
Male	8.7	14.9	21.3	17.8	18.8
Female	2.9	4.4	8.0	8.0	6.9
Lung & bronchus					
Male	82.9	94.7	48.8	70.2	45.9
Female	59.9	50.4	28.0	52.1	26.6
Prostate	138.6	220.0	75.0	104.1	124.2
Stomach					
Male	7.8	15.7	15.6	13.1	13.9
Female	3.5	8.1	9.0	6.9	8.2
Uterine cervix	7.2	10.3	6.7	9.7	10.9
Mortality					
All sites					
Male	217.3	276.6	132.4	191.0	152.1
Female	153.6	171.2	92.1	139.0	101.2
Breast (female)	22.7	30.8	11.5	15.5	14.8
Colon & rectum					
Male	19.2	28.7	13.1	18.7	16.1
Female	13.6	19.0	9.7	15.4	10.2
Kidney & renal pelvis					
Male	5.9	5.7	3.0	9.5	5.1
Female	2.6	2.6	1.2	4.4	2.3
Liver & intrahepatic bile duct					
Male	7.1	11.8	14.4	13.2	12.3
Female	2.9	4.1	6.0	6.1	5.4
Lung & bronchus					
Male	65.7	78.5	35.5	49.6	31.3
Female	42.7	37.2	18.4	33.1	14.1
Prostate	21.3	50.9	10.1	20.7	19.2
Stomach					
Male	3.9	9.8	8.7	8.1	7.6
Female	1.9	4.7	5.1	3.8	4.4
Uterine cervix	2.1	4.2	1.9	3.5	2.9

Hispanic origin is not mutually exclusive from African American, Asian American/Pacific Islander, or American Indian/Alaska Native.

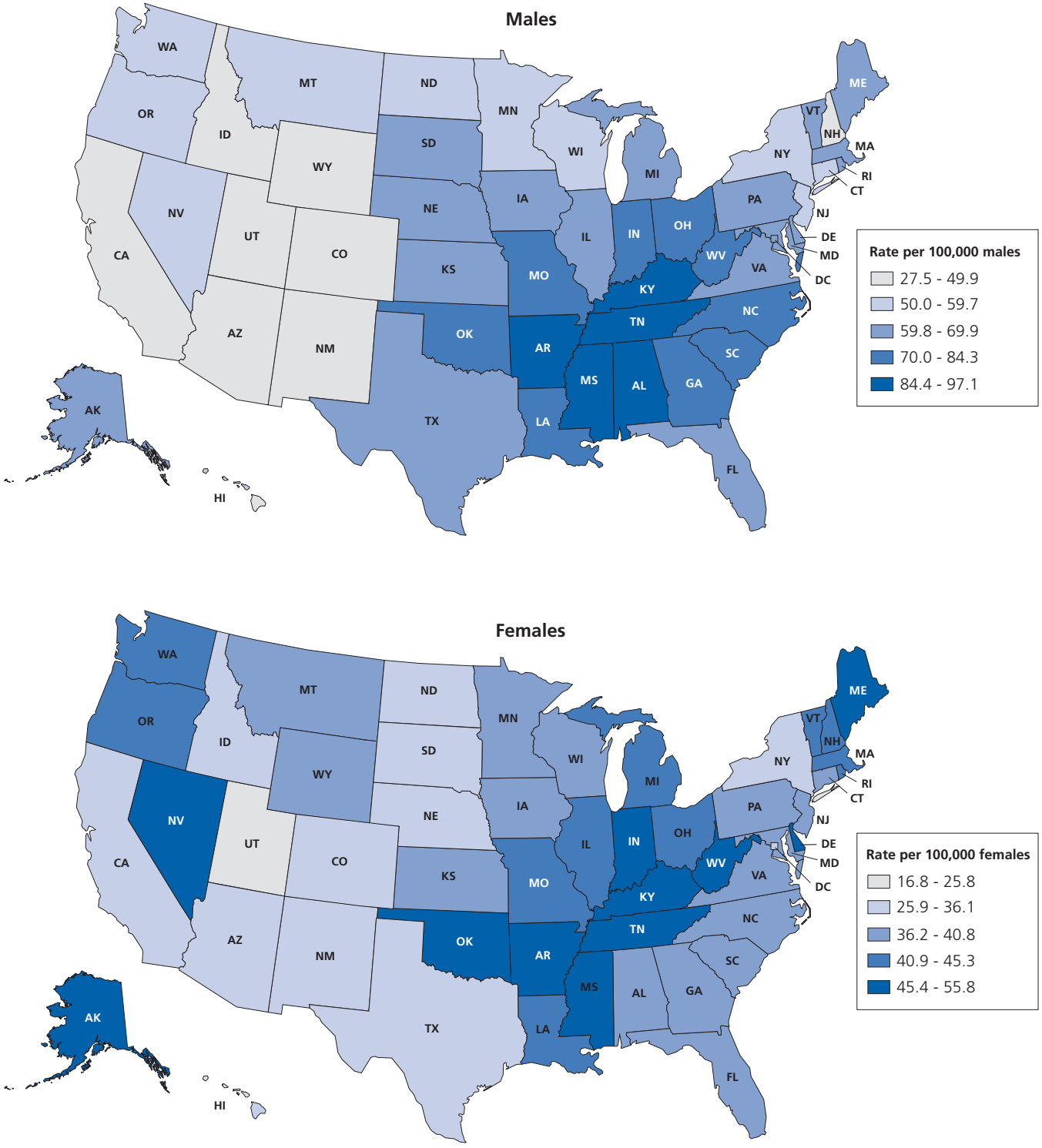
*Rates are per 100,000 population and age adjusted to the 2000 US standard population. † Data based on Indian Health Service Contract Health Service Delivery Areas.

‡Mortality rates for Hispanics and non-Hispanic whites exclude deaths from the District of Columbia, North Dakota, and South Carolina. Source: Incidence - North American Association of Central Cancer Registries.

Source: Incidence - North American Association of Central Cancer Registries, 2013. US Mortality Data - National Center for Health Statistics Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2014

Geographic Patterns in Lung Cancer Death Rates* by State, US, 2006-2010



*Rates adjusted to the 2000 US standard population.
Source: US Mortality Data, National Center for Health Statistics, Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2014

Nutrition and Physical Activity

It has been estimated by the World Cancer Research Fund that one-quarter to one-third of the cancers that occur in high-income countries like the US are due to poor nutrition, physical inactivity, and excess weight, and thus could be prevented. Maintaining a healthy body weight, being physically active on a regular basis, and eating a healthy diet are as important as avoiding tobacco products for reducing cancer risk. The American Cancer Society's nutrition and physical activity guidelines emphasize the importance of weight control, physical activity, healthy dietary patterns, and limited, if any, alcohol consumption in reducing cancer risk and helping people stay well. Unfortunately, the majority of Americans are not meeting these recommendations. Increasing trends in unhealthy eating and physical inactivity – and resultant increases in overweight and obesity – have largely been influenced by the environments in which people live, learn, work, and play. As a result, the Society's guidelines include explicit Recommendations for Community Action to facilitate the availability of healthy, affordable food choices and opportunities for physical activity in communities, schools, and workplaces.

The following recommendations reflect the best nutrition and physical activity evidence available to help Americans reduce their risk of cancer and promote overall health.

Recommendations for Individual Choices

1. Achieve and maintain a healthy weight throughout life.

- Be as lean as possible throughout life without being underweight.
- Avoid excess weight gain at all ages. For those who are currently overweight or obese, losing even a small amount of weight has health benefits and is a good place to start.
- Engage in regular physical activity and limit consumption of high-calorie foods and beverages as key strategies for maintaining a healthy weight.

In 2003, overweight and obesity were found to contribute to 14% to 20% of all cancer-related mortality; however, because this estimate was based on weight patterns during 1999-2000, the fraction is probably larger today. Overweight and obesity are clearly associated with increased risk for developing many cancers, including adenocarcinoma of the esophagus and cancers of the breast (in postmenopausal women), colon, rectum, endometrium, kidney, and pancreas. Overweight and obesity may also be associated with an increased risk of aggressive prostate cancer, non-Hodgkin lymphoma, multiple myeloma, and cancers of the liver, cervix, ovary, and gallbladder. Abdominal fatness in particular is convincingly associated with colorectal cancer, and probably related to higher risk of pancreatic and endometrial cancers.

Increasing evidence also suggests that being overweight increases the risk for cancer recurrence and decreases the likelihood of survival for several cancers. Some studies have shown that surgery to treat morbid obesity reduces mortality from major chronic diseases, including cancer. Although knowledge about the relationship between weight loss and cancer risk is incomplete, individuals who are overweight should be encouraged and supported in their efforts to reduce weight.

At the same time that evidence connecting excess weight to increased cancer risk has been accumulating, trends in overweight and obesity have been increasing dramatically. The prevalence of obesity in the US more than doubled between 1976-1980 and 2003-2006. Although obesity levels have stabilized in recent years, more than one-third of adults – 36% of both men and women – were obese in 2009-2010. More than likely, these trends are already impacting cancer rates: in the midpoint assessment of its 2015 Challenge Goals, American Cancer Society researchers reported that while the incidence of both colorectal cancer and postmenopausal breast cancer had been declining, it is likely that the declines in both would have started earlier and would have been steeper had it not been for the increasing prevalence of obesity. Indeed, some researchers have speculated that the longstanding, historic increases in life expectancy in the US may level off or even decline within the first half of this century as a result of the obesity epidemic.

Similar to adults, obesity among children and adolescents has tripled over the past several decades across race, ethnicity, and gender. In 2009-2010, 17% of American children 2 to 19 years of age were obese, including 24% of African Americans, 21% of Hispanics, and 14% of non-Hispanic whites. Because overweight in youth tends to continue throughout life, efforts to establish healthy body weight patterns should begin in childhood. The high prevalence of overweight and obesity in children and adolescents may impact the future cancer burden. However, a recent study of preschoolers enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children conducted by the Centers for Disease Control and Prevention (CDC) hinted that the obesity epidemic may be stalling. Downturns in the prevalence of obesity were observed among children 3 or 4 years of age in New York City since 2003 and in Los Angeles since 2008.

2. Adopt a physically active lifestyle.

- Adults should engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity activity each week, or an equivalent combination, preferably spread throughout the week.
- Children and adolescents should engage in at least 1 hour of moderate- or vigorous-intensity activity each day, with vigorous-intensity activity at least three days each week.
- Limit sedentary behavior such as sitting, lying down, and watching television and other forms of screen-based entertainment.
- Doing any intentional physical activity above usual activities can have many health benefits.

Living a physically active lifestyle helps reduce the risk of a variety of cancer types, as well as heart disease, diabetes, and many other diseases. Scientific evidence indicates that physical activity may reduce the risk of cancers of the breast, colon, and endometrium, as well as advanced prostate cancer. Physical activity also indirectly reduces the risk of developing obesity-related cancers because of its role in helping to maintain a healthy weight. Being active is thought to reduce cancer risk largely by improving energy metabolism and reducing circulating concentrations of estrogen, insulin, and insulin-like growth factors. Physical activity also improves the quality of life of cancer patients and has been associated with reduced cancer recurrence and overall mortality in multiple cancer survivor groups, including breast, colorectal, prostate, and ovarian cancer.

Despite the wide variety of health benefits from being active, 25% of adults report no leisure-time activity, and only 49% meet minimum recommendations for moderate activity. Similarly, only 37% of youth meet recommendations. However, recent data released by the CDC indicate that trends may be slightly improving. Walking prevalence (defined as walking for transportation or leisure in at least one bout of 10 minutes or more in the preceding 7 days) among adults increased significantly from 56% in 2005 to 62% in 2010.

3. Consume a healthy diet, with an emphasis on plant foods.

- Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
- Limit consumption of red and processed meat.
- Eat at least 2½ cups of vegetables and fruits each day.
- Choose whole grains instead of refined-grain products.

There is strong scientific evidence that healthy dietary patterns, in combination with regular physical activity, are needed to maintain a healthy body weight and to reduce cancer risk. Studies have shown that individuals who eat more processed and red meat, potatoes, refined grains, and sugar-sweetened beverages and foods are at a higher risk of developing or dying from a variety of cancers. Alternatively, adhering to a diet that contains a variety of fruits and vegetables, whole grains, and fish or poultry and fewer red and processed meats is associated with lower risk. A recent study found that dietary and lifestyle behaviors consistent with the American Cancer Society nutrition and physical activity guidelines are associated with lower mortality rates for all causes of death combined, and for cancer and cardiovascular diseases specifically. Despite the known benefits of a healthy diet, Americans are not following recommendations; according to the US Department of Agriculture, the majority of Americans would need to substantially lower their intake of added sugars, added fats, refined grains, and sodium, and increase their consumption of fruits, vegetables, whole grains, and low-fat dairy products in order to meet the 2010 Dietary Guidelines for Americans.

Currently, the overall evidence related to dietary supplements does not support their use in cancer prevention. The results of recently completed randomized clinical trials of antioxidant supplements and selenium, which showed no reduction in risk for cancer, at least in generally well-nourished populations, joins the ranks of other nutritional supplements (such as beta-carotene) for which no benefit in cancer prevention has been shown. Because it is likely that healthful components in fruits and vegetables work synergistically to exert beneficial effects, it is recommended that nutritional needs be met primarily through food sources.

The scientific study of nutrition and cancer is highly complex, and many important questions remain unanswered. It is not presently clear how single nutrients, combinations of nutrients, over-nutrition, and energy imbalance, or the amount and distribution of body fat at particular stages of life, affect a person's risk of specific cancers. Until more is known about the specific components of diet that influence cancer risk, the best advice is to consume a mostly plant-based diet that limits red and processed meats and emphasizes a variety of vegetables, fruits, and whole grains. A special emphasis should be placed on controlling total caloric intake to help achieve and maintain a healthy weight.

4. If you drink alcoholic beverages, limit consumption.

People who drink alcohol should limit their intake to no more than two drinks per day for men and one drink per day for women. Alcohol consumption is a risk factor for cancers of the mouth, pharynx, larynx, esophagus, liver, colorectum, breast, and possibly pancreas. For each of these cancers, risk increases substantially with the intake of more than two drinks per day. Even a few drinks per week may be associated with a slightly increased risk of breast cancer in women. The mechanism for how alcohol can affect breast cancer is not known with certainty, but it may be due to alcohol-induced increases in circulating estrogen or other hormones in the blood or a direct

effect of alcohol or its metabolites on breast tissue. Alcohol consumption combined with tobacco use increases the risk of cancers of the mouth, larynx, and esophagus far more than either drinking or smoking alone.

The American Cancer Society Recommendations for Community Action

Many Americans encounter substantial barriers to consuming healthy food and engaging in physical activity. Among those barriers that have collectively contributed to increased obesity are: limited access to affordable, healthy foods; increased portion sizes, especially of restaurant meals; marketing and advertising of foods and beverages high in calories, fat, and added sugar, particularly to kids; schools and worksites that are not conducive to good health; community design that hinders physical activity and promotes sedentary behavior; and economic and time constraints.

The Society's nutrition and physical activity guidelines include Recommendations for Community Action because of the tremendous influence that the surrounding environment has on individual food and activity choices. Acknowledging that reversing obesity trends will require extensive policy and environmental changes, the Society calls for public, private, and community organizations to create social and physical environments that support the adoption and maintenance of healthy nutrition and physical activity behaviors to help people stay well.

Achieving these Recommendations for Community Action will require multiple strategies and bold action, ranging from the implementation of community and workplace health promotion programs to policies that affect community planning, transportation, school-based physical activity, and food services. The Centers for Disease Control and Prevention (CDC), the Institute of Medicine, the World Health Organization (WHO), and others have outlined a variety of evidenced-based approaches in communities, worksites, and schools to halt and ultimately turn around the obesity trends. Following are some specific approaches recommended by the aforementioned groups that are supported by the American Cancer Society and the American Cancer Society Cancer Action Network (ACS CAN), the nonprofit, nonpartisan advocacy affiliate of the Society:

- Strengthen nutrition standards for all foods and beverages sold or served to students in schools, both as part of school meal programs and as competitive foods and beverages sold outside of the programs.
- Increase the quality and quantity of physical education and the amount of time students are physically active in K-12 schools.
- Limit the availability, advertising, and marketing of foods and beverages of low nutritional value, particularly in schools.
- Ensure that worksites have healthy food and beverage options and that physical environments and workplace culture are designed or adapted and maintained to facilitate physical activity and weight control.
- Provide calorie information on chain restaurant menus.
- Invest in community design that supports development of sidewalks, bike lanes, and access to parks and green space.

The tobacco control experience has shown that policy and environmental changes at the national, state, and local levels are critical to achieving changes in individual behavior. Measures such as smoke-free laws and increases in cigarette excise taxes have been highly effective in deterring tobacco use. To avert an epidemic of obesity-related disease, similar purposeful changes in public policy and in the community environment will be required to help individuals make smart food and physical activity choices and maintain a healthy body weight.

Environmental Cancer Risk

Two major classes of factors influence the incidence of cancer: hereditary factors and acquired (environmental) factors. Hereditary factors come from our parents and cannot be modified. Environmental factors, which include behavioral choices, are potentially modifiable. These include tobacco use, poor nutrition, physical inactivity, obesity, certain infectious agents, certain medical treatments, excessive sun exposure, and exposures to carcinogens (cancer-causing agents) that exist as pollutants in our air, food, water, and soil. Some carcinogens occur naturally, and some are created or concentrated by human activity. For example, radon is a naturally occurring carcinogen present in soil and rock; however, occupational radon exposure occurs in underground mines, and substantial exposures also occur in poorly ventilated basements in regions where radon soil emissions are high.

Environmental factors (as opposed to hereditary factors) account for an estimated 75%-80% of cancer cases and deaths in the US. Exposure to carcinogenic agents in occupational, community, and other settings is thought to account for a relatively small percentage of cancer deaths – about 4% from occupational exposures and 2% from environmental pollutants (man-made and naturally occurring). Although the estimated percentage of cancers related to occupational and environmental carcinogens is small compared to the cancer burden from tobacco smoking

(30%) and the combination of poor nutrition, physical inactivity, and obesity (35%), the relationship between such agents and cancer is important for several reasons. First, even a small percentage of cancers can represent many deaths: 6% of cancer deaths in the US in 2011 correspond to approximately 34,320 deaths. Second, the burden of exposure to occupational and environmental carcinogens is borne disproportionately by lower-income workers and communities, contributing to disparities in the cancer burden across the US population. Third, although much is known about the relationship between occupational and environmental exposure and cancer, some important research questions remain. These include the role of exposures to certain classes of chemicals (such as hormonally active agents) during critical periods of human development and the potential for pollutants to interact with each other, as well as with genetic and acquired factors.

How Environmental Carcinogens Are Identified

The term carcinogen refers to exposures that can increase the incidence of malignant tumors (cancer). The term can apply to a single chemical such as benzene; fibrous minerals such as asbestos; metals and physical agents such as x-rays or ultraviolet light; or exposures linked to specific occupations or industries (e.g., nickel refining). Carcinogens are usually identified on the basis of epidemiological studies or by testing in animals. Studies of occupational groups (cohorts) have played an important role in understanding many chemical carcinogens – as well as radiation – because exposures are often higher among workers, who can be followed for long periods of time. Some information has also come from studies of persons exposed to carcinogens during medical treatments (such as radiation and estrogen), as well as from studies conducted among individuals who experienced high levels of short-term exposure to a chemical or physical agent due to an accidental or intentional release (such as survivors of the atomic bomb explosions of Hiroshima and Nagasaki). It is more difficult to study the relationship between exposure to potentially carcinogenic substances and cancer risk in the general population because of uncertainties about exposure and the challenge of long-term follow up. Moreover, relying upon epidemiological information to determine cancer risk does not fulfill the public health goal of prevention since by the time the increased risk is detected, a large number of people may have been exposed.

Thus, for the past 40 years, the US and many other countries have developed methods for identifying carcinogens through animal testing using the "gold standard" of a 2-year or lifetime bioassay in rodents. This test is expensive and time-consuming, but it can provide information about potential carcinogens so that human exposure can be reduced or eliminated. Many substances that are carcinogenic in rodent bioassays have not been adequately studied in humans, usually because an acceptable study population has not been identified. Among the substances that have proven carcinogenic in humans, all have shown positive results in animals when tested in well-conducted 2-year bioassays.[1] Between 25%-30% of established human carcinogens were first identified through animal bioassays. Since animal tests necessarily use high-dose exposures, human risk assessment usually requires extrapolation of the exposure-response relationship observed in rodent bioassays to predict effects in humans at lower doses. Typically, regulatory agencies in the US and abroad have adopted the default assumption that no threshold level (level below which there is no increase in risk) of exposure exists for carcinogenesis.

Evaluation of Carcinogens

The National Toxicology Program (NTP) plays an important role in the identification and evaluation of carcinogens in the US, and the International Agency for Research on Cancer (IARC) plays a similar role internationally. The NTP was established in 1978 to coordinate toxicology testing programs within the federal government, including tests for carcinogenicity. The NTP is also responsible for producing the Report on Carcinogens, an informational scientific and public health document that identifies agents, substances, mixtures, or exposure circumstances that may increase the risk of developing cancer.2 There are currently 107 agents classified by IARC as Group 1 (i.e., carcinogenic to humans). For a list of substances included in the 11th Report on Carcinogens that are known or reasonably anticipated to be human carcinogens, see ntp.niehs.nih.gov/ntp/roc/toc11.html. The IARC is a branch of the World Health Organization that regularly convenes scientific consensus groups to evaluate potential carcinogens. After reviewing published data from laboratory, animal, and human research, these committees reach consensus about whether the evidence should be designated "sufficient," "limited," or "inadequate" to conclude that the substance is a carcinogen. For a list of substances that have been reviewed by the IARC monograph program, visit monographs.iarc.fr/ENG/Classification/index.pdf. The American Cancer Society does not have a formal program to systematically review and evaluate carcinogens. However, information on selected topics can be found at cancer.org.

Although the relatively small risks associated with low-level exposure to carcinogens in air, food, or water are difficult to detect in epidemiological studies, scientific and regulatory bodies worldwide have accepted the principle that it is reasonable and prudent to reduce human exposure to substances shown to be carcinogenic at higher levels of exposure. Although much public concern about the influence of manmade pesticides and industrial chemicals has focused on cancer, pollution may adversely affect the health of humans and ecosystems in many other ways. Research to understand the short- and long-term

impact of environmental pollutants on a broad range of outcomes, as well as regulatory actions to reduce exposure to recognized hazards, has contributed to the protection of the public and the preservation of the environment for future generations. It is important that this progress be recognized and sustained. For more information on environmental cancer risks, see the article published by Fontham et al. in *CA: A Cancer Journal for Clinicians.*[3]

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The Global Fight against Cancer

The ultimate mission of the American Cancer Society is to eliminate cancer as a major health problem. Because cancer knows no boundaries, this mission extends around the world. Cancer is an enormous global health burden, touching every region and socioeconomic level. Today, cancer accounts for one in every eight deaths worldwide – more than HIV/AIDS, tuberculosis, and malaria combined. In 2012, there were an estimated 14.1 million cases of cancer diagnosed and 8.2 million deaths from the disease around the world. More than 60 percent of all cancer deaths occur in low- and middle-income countries, many of which lack the medical resources and health systems to support the disease burden. Moreover, the global cancer burden is growing at an alarming pace; in 2030 alone, about 21.7 million new cancer cases and 13.0 million cancer deaths are expected to occur, simply due to the growth and aging of the population. The future burden may be further increased by the adoption of behaviors and lifestyles associated with economic development and urbanization (e.g., smoking, poor diet, physical inactivity, and reproductive patterns) in low- and middle-income countries. Tobacco use is a major cause of the increasing global burden of cancer as the number of smokers worldwide continues to grow.

Worldwide Tobacco Use

Tobacco use is the most preventable cause of death worldwide, and is responsible for the deaths of approximately half of long-term users.

- Tobacco use killed 100 million people in the 20th century and will kill 1 billion people in the 21st century if current trends continue.
- Each year, tobacco use is responsible for almost 6 million premature deaths, 80% of which are in low- and middle-income countries; by 2030, this number is expected to increase to 8 million.
- Between 2002 and 2030, tobacco-attributable deaths are expected to decrease by 9% in high-income countries, while increasing by 100% (from 3.4 million to 6.8 million) in low- and middle-income countries.

The first global public health treaty, the Framework Convention on Tobacco Control (FCTC), was unanimously adopted by the World Health Assembly on May 21, 2003, and subsequently entered into force as a legally binding accord for all ratifying states on February 27, 2005. The FCTC features specific provisions to control both the global supply and demand for tobacco, including the regulation of tobacco product contents, packaging, labeling, advertising, promotion, sponsorship, taxation, illicit trade, youth access, exposure to secondhand tobacco smoke, and environmental and agricultural impacts. Parties to the treaty are expected to strengthen national legislation, enact effective tobacco control policies, and cooperate internationally to reduce global tobacco consumption. A number of major tobacco-producing nations, including Argentina, Indonesia, Malawi, the US, and Zimbabwe, have either not signed or have signed but not ratified the treaty.

- As of June 2013, out of 195 eligible countries, 177 have ratified or acceded to the treaty, representing approximately 88% of the world's population.
- About one-third of the world's population was covered by at least one comprehensive tobacco control measure in 2012, up from about 15% in 2008.
- The WHO estimates that 16% of the world's population lives in smoke-free environments.
- Although tobacco tax increases are among the most cost-effective tobacco control strategies, only 8% of the world population is covered by comprehensive tobacco tax policy.

The Role of the American Cancer Society

With a century of experience in cancer control, the American Cancer Society is uniquely positioned to help in leading the global fight against cancer and tobacco by assisting and empowering the world's cancer societies and anti-tobacco advocates. The Society's Global Health and Intramural Research departments are raising awareness about the growing global cancer burden and promoting evidence-based cancer and tobacco control programs.

The Society has established key focus areas to help reduce the global burden of cancer, including global grassroots policy and awareness, tobacco control, cancer screening and vaccination for women and girls, and access to pain relief.

Make cancer control a political and public health priority. Noncommunicable diseases (NCDs) such as cancer, heart disease, and diabetes account for about 65% of the world's deaths. Although 67% of these deaths occur in low- and middle-income countries, less than 3% of private and public funding for health is allocated to prevent and control NCDs in these areas. In September 2011, world leaders gathered at a special United Nations High-level Meeting and adopted a Political Declaration that elevates cancer and other NCDs on the global health and development agenda and includes key commitments to address these diseases. In 2012, the decision-making body of the World Health Organization (WHO) approved a resolution calling for a 25 percent reduction in premature deaths from NCDs by 2025 (also known as 25 by 25). This ambitious goal set the stage for the adoption of: a comprehensive framework aimed at monitoring NCD risk factors, such as smoking prevalence, and targets for and indicators of increased access to breast and cervical cancer screening, palliative care, and vaccination coverage. To maintain the momentum for making cancer and NCDS a global priority, the Society collaborates with key partners, including the NCD Alliance, the Union for International Cancer Control (UICC), the American Heart Association, and the American Diabetes Association.

Reduce tobacco use, with a particular focus on sub-Saharan Africa. Through an $8 million (US) grant received from the Bill & Melinda Gates Foundation in 2010, the Society and its partners, the Africa Tobacco Control Alliance, the Framework Convention Alliance, the Campaign for Tobacco-Free Kids, and the International Union Against Tuberculosis and Lung Disease, support and assist national governments and civil societies in Africa to implement tobacco control policies such as advertising bans, tobacco tax increases, graphic warning labels, and the promotion of smoke-free environments.

Increase awareness about the global cancer burden. The Society continues to work with global partners to increase awareness about the growing global cancer and tobacco burdens and their impact on low- and middle-income countries. In addition to print publications, the Society provides cancer information to millions of individuals throughout the world on its Web site, cancer.org. More than 35% of the visitors to the Web site come from outside the US. Information is currently available in English, Spanish, Mandarin, and several other Asian languages, with plans to include more languages in the near future. For more information on the global cancer burden, visit the Society's Global Health program Web site at cancer.org/international and global.cancer.org and see the following Intramural Research program publications available on cancer.org and tobaccoatlas.org:

Global Cancer Facts & Figures 2nd Edition

The Tobacco Atlas, Fourth Edition

The Cancer Atlas

The American Cancer Society

In 1913, 10 physicians and five laypeople founded the American Society for the Control of Cancer. Its purpose was to raise awareness about cancer symptoms, treatment, and prevention; to investigate what causes cancer; and to compile cancer statistics. Later renamed the American Cancer Society, Inc., the organization now works with its more than 3 million volunteers to save lives and create a world with less cancer and more birthdays by helping people stay well, helping people get well, by working to find cures, and by fighting back against the disease. A century later, the Society is making remarkable progress in cancer prevention, early detection, treatment, and patient quality of life. The overall cancer death rate has steadily declined since the early 1990s, and the 5-year survival rate is now 68%, up from 49% in the 1970s. Thanks to this progress, nearly 14 million cancer survivors in the US will celebrate another birthday this year.

How the American Cancer Society Is Organized

The American Cancer Society, Inc., is a 501(c)(3) nonprofit corporation governed by a Board of Directors that sets policy, develops and approves an enterprise-wide strategic plan and related resource allocation, and is responsible for the performance of the organization as a whole, with the advice and support of regionally based volunteer boards.

The Society's structure includes a central corporate office in Atlanta, Georgia, regional offices supporting 11 geographic Divisions, and more than 900 local offices in those regions. The corporate office is responsible for overall strategic planning; corporate support services such as human resources, financial management, IT, etc.; development and implementation of global and nationwide endeavors such as our groundbreaking research program, our global program, and our 24-hour call

center; and provides technical support and materials to regional and local offices for local delivery.

With a presence in more than 5,100 communities, the American Cancer Society fights for every life threatened by every cancer in every community. Our regional and local offices are organized to engage communities in the cancer fight, delivering lifesaving programs and services and raising money at the local level. Offices are strategically placed around the country in an effort to maximize the impact of our efforts, and to be as efficient as possible with the money donated to the Society to fight cancer and save lives.

Volunteers

As a global grassroots force, the Society relies on the strength of more than 3 million dedicated volunteers. From leadership volunteers who set strategy and policy to members of the community who organize special events, patient support, and education programs, Society volunteers, supported by professional staff, drive every part of our mission. The Society's vast array of volunteer opportunities empowers people from every community to play a role in saving lives, while they fulfill their own.

How the American Cancer Society Saves Lives

The American Cancer Society is working relentlessly to saves lives from cancer by helping people stay well and get well, by finding cures, and by fighting back against the disease.

Helping People Stay Well

The American Cancer Society provides information that empowers people to take steps that help them prevent cancer or find it early, when it is most treatable.

Prevention

The **Quit For Life® Program** is the nation's leading tobacco cessation initiative, offered by 27 states and more than 675 employers and health plans throughout the US. Brought to you by a collaboration between the American Cancer Society and Alere Wellbeing, the program is built on the organizations' 35 years of combined experience in tobacco cessation. The Quit For Life Program employs an evidence-based combination of physical, psychological, and behavioral strategies to enable participants to take responsibility for and overcome their addiction to tobacco. A critical mix of medication support, phone-based cognitive behavioral coaching, text messaging, Web-based learning and support tools produces an average quit rate of 46 percent, making the program nine times more effective than quitting without support.

The Society offers many other programs to employers and other systems to help their employees stay well and reduce their cancer risk, too. These include:

- The **FreshStart®** group-based tobacco cessation counseling program, which is designed to help employees plan a successful quit attempt by providing essential information, skills for coping with cravings, and group support
- **Content subscription service**, a free electronic tool kit subscription offered by the Society to employers that support the health and wellness needs of employees with information about cancer prevention and early detection, and that support services and resources for those facing cancer
- ***HealthyLiving***, a monthly electronic newsletter produced by the American Cancer Society that teaches the importance of making healthy lifestyle choices. The monthly e-newsletter focuses on exercising, eating better, maintaining a healthy weight, and avoiding the negative effects of stress. *HealthyLiving* is available in both English and Spanish, and the content has been edited by the Society's scientific staff to ensure that the most up-to-date and accurate information is being provided to employees.
- **Assessment and consulting**, which surveys a company's health and wellness policies and practices and recommends evidence-based strategies that help improve employee health behaviors, control health care costs, and increase productivity
- The 10-week **Active For Life℠** online program, which uses individual and group goal-setting strategies to help employees become more physically active
- **Tobacco Policy Planner**, a free online assessment of company policies, benefits, and programs related to tobacco control. After survey completion, the company receives an automatic report highlighting where they are demonstrating best practices and areas needing improvement. This customized report includes links to best practices and access to the Society's resources library to help plan the company's next steps.

Across the nation, the Society's nonprofit, nonpartisan advocacy affiliate, the American Cancer Society Cancer Action Network (ACS CAN), works to create healthier communities by protecting people from the dangers of secondhand smoke. Today, 49% of the US population is covered by a comprehensive smoke-free workplace, restaurant, and bar law. In 2009, the Family Smoking Prevention and Tobacco Control Act was signed into law. A decade in the making, the law grants the US Food and Drug Administration the authority to regulate the manufacturing, selling, and marketing of tobacco products. Strong implementation of the law is vital to reducing death and disease from tobacco products.

For the majority of Americans who do not smoke, the most important ways to reduce cancer risk are to maintain a healthy weight, be physically active on a regular basis, and eat a mostly plant-based diet, consisting of a variety of vegetables and fruit,

whole grains, and limited amounts of red and processed meats. The Society publishes guidelines on nutrition and physical activity for cancer prevention in order to review the accumulating scientific evidence on diet and cancer; to synthesize this evidence into clear, informative recommendations for the general public; to promote healthy individual behaviors, as well as environments that support healthy eating and physical activity habits; and, ultimately, to reduce cancer risk. These guidelines form the foundation for the Society's communication, worksite, school, and community strategies designed to encourage and support people in making healthy lifestyle behavior changes.

Early Detection

Finding cancer at its earliest, most treatable stage gives patients the greatest chance of survival. To help the public and health care providers make informed decisions about cancer screening, the American Cancer Society publishes a variety of early detection guidelines. These guidelines are assessed regularly to ensure that recommendations are based on the most current scientific evidence.

The Society currently provides screening guidelines for cancers of the breast, cervix, colorectum, prostate, and endometrium, and general recommendations for a cancer-related component of a periodic checkup to examine the thyroid, mouth, skin, lymph nodes, testicles, and ovaries.

Throughout its history, the Society has implemented a number of aggressive awareness campaigns targeting the public and health care professionals. Campaigns to increase usage of Pap testing and mammography have contributed to a 70% decrease in cervical cancer incidence rates since the introduction of the Pap test in the 1950s and a 33% decline in breast cancer mortality rates since 1989. More recently, the Society launched ambitious multimedia campaigns to encourage adults 50 years of age and older to get tested for colorectal cancer. The Society also continues to encourage the early detection of breast cancer through public awareness and other efforts targeting poor and underserved communities.

Helping People Get Well

For the nearly 1.7 million cancer patients diagnosed this year and the approximately 14 million US cancer survivors, the American Cancer Society is available anytime, day or night, to offer free information, programs, services, and community referrals to patients, survivors, and caregivers to help them make decisions through every step of a cancer experience. These resources are designed to help people facing cancer on their journey to getting well.

Information, 24 Hours a Day, Seven Days a Week

The American Cancer Society is available 24 hours a day, seven days a week online at cancer.org and by calling 1-800-227-2345. Callers are connected with a Cancer Information Specialist who can help them locate a hospital, understand cancer and treatment options, learn what to expect and how to plan, help address insurance concerns, find financial resources, find a local support group, and more. The Society can also help people who speak languages other than English or Spanish find the assistance they need, offering services in 170 languages in total.

Information on every aspect of the cancer experience, from prevention to survivorship, is also available through the Society's Web site, cancer.org. The site contains in-depth information on every major cancer type, as well as on treatments, side effects, caregiving, and coping.

The Society also publishes a wide variety of pamphlets and books that cover a multitude of topics, from patient education, quality of life, and caregiving issues to healthy living. A complete list of Society books is available for order at cancer.org/bookstore.

The Society publishes three peer-reviewed journals for health care providers and researchers: *Cancer, Cancer Cytopathology*, and *CA: A Cancer Journal for Clinicians*. More information about the journals and their content can be found at acsjournals.com

Day-to-day Help and Emotional Support

The American Cancer Society can help cancer patients and their families find the resources they need to make decisions about the day-to-day challenges that can come from a cancer diagnosis, such as transportation to and from treatment, financial and insurance needs, and lodging when having to travel away from home for treatment. The Society also connects people with others who have been through similar experiences to offer emotional support.

Help navigating the health care system: Learning how to navigate the cancer journey and the health care system can be overwhelming for anyone, but it is particularly difficult for those who are medically underserved, those who experience language or health literacy barriers, or those with limited resources. The American Cancer Society Patient Navigator Program was designed to reach those most in need. The largest oncology-focused patient navigator program in the country, it has specially trained patient navigators at 123 cancer treatment facilities across the nation. Patient navigators work in cooperation with patients, family members, caregivers, and facility staff to connect patients with information, resources, and support to decrease barriers and ultimately to improve health outcomes. In 2012, approximately 88,000 people relied on the Patient Navigator Program to help them through their diagnosis and treatment. The Society collaborates with a variety of organizations, including the National Cancer Institute's Center to Reduce Cancer Health Disparities, the Center for Medicare and Medicaid Services, numerous cancer treatment centers, and others to implement and evaluate this program.

Transportation to treatment: Cancer patients cite transportation to and from treatment as a critical need, second only to direct financial assistance. The American Cancer Society Road To Recovery® program matches these patients with specially trained volunteer drivers. This program offers patients an additional key benefit of companionship and moral support during the drive to medical appointments. In 2012, the American Cancer Society provided more than 1.48 million transportation services to more than 81,000 constituents.

Lodging during treatment: When someone diagnosed with cancer must travel away from home for the best treatment, where to stay and how to afford accommodations are immediate concerns and can sometimes affect treatment decisions. American Cancer Society Hope Lodge® facilities provide free, homelike, temporary lodging for patients and their caregivers close to treatment centers, thereby easing the emotional and financial burden of finding affordable lodging. In 2012, the 31 Hope Lodge locations provided approximately 261,000 nights of free lodging to nearly 50,000 patients and caregivers – saving them more than $27 million in lodging expenses. The American Cancer Society also provided discounted lodging to many patients and caregivers through arrangements with hotels in some communities without a Hope Lodge facility.

Breast cancer support: Through the American Cancer Society Reach To Recovery® program, trained breast cancer survivor volunteers provide one-on-one support, information, and resource referrals to people facing breast cancer. Patients are matched with a volunteer who has had a similar breast cancer experience as well as other similar characteristics. These volunteers will meet one-on-one, either in person, by telephone, or via email, with women anytime throughout their breast cancer experience.

Cancer education classes: The I Can Cope® online educational program is available free to people facing cancer and their families and friends. The program consists of self-paced classes that can be taken anytime, day or night. People are welcome to take as few or as many classes as they like. Among the topics offered are information about cancer, managing treatments and side effects, healthy eating during and after treatment, communicating with family and friends, finding resources, and more. The classes are available at cancer.org/onlineclasses.

Hair-loss and mastectomy products: Some women wear wigs, hats, breast forms, and special bras to help cope with the effects of mastectomy and hair loss. The American Cancer Society's *"tlc" Tender Loving Care*® magazine/catalog offers informative articles and a line of products to help women who are battling cancer restore their appearance and self-esteem. The *"tlc"* products and catalogs may be ordered online at tlcdirect.org or by calling 1-800-850-9445. All proceeds from product sales go back into the Society's programs and services for patients and survivors.

Help with appearance-related side effects of treatment: The Look Good Feel Better® program is a collaboration of the American Cancer Society, the Personal Care Products Council Foundation, and the Professional Beauty Association that helps women learn beauty techniques to restore their self-image and cope with appearance-related side effects of cancer treatment. This free program engages certified, licensed beauty professionals trained as Look Good Feel Better volunteers to provide tips on makeup, skin care, nail care, and head coverings. Information and materials are also available for men and teens. To learn more, visit the Look Good Feel Better Web site at lookgoodfeelbetter.org or call 1-800-395-LOOK (1-800-395-5665).

Finding hope and inspiration: People with cancer and their loved ones do not have to face their cancer experience alone. They can connect with others who want support through the American Cancer Society Cancer Survivors Network® program.

Finding Cures

Research is at the heart of the American Cancer Society's mission. For more than 65 years, the Society has been finding answers that save lives – from changes in lifestyle to new approaches in therapies to improving cancer patients' quality of life. No single nongovernmental, not-for-profit organization in the US has invested more to find the causes and cures of cancer than the Society. We relentlessly pursue the answers that help us understand how to prevent, detect, and treat all cancer types. We combine the world's best and brightest researchers with the world's largest, oldest, and most effective community-based anti-cancer organization to put answers into action.

The Society's comprehensive research program consists of extramural grants, as well as intramural programs in epidemiology, surveillance and health policy research, behavioral research, international tobacco control research, and statistics and evaluation. Intramural Research programs are led by the Society's own staff scientists.

Extramural Grants

The American Cancer Society's extramural grants program supports research in a wide range of cancer-related disciplines at more than 230 institutions. The Society is currently funding 982 research and training grants totaling approximately $492 million as of August 12, 2013. Grant applications are solicited through a nationwide competition and are subjected to a rigorous external peer-review process, ensuring that only the most promising research is funded. The Society primarily funds investigators early in their research careers, at a time when they are less likely to receive funding from the federal government, thus giving the best and the brightest a chance to explore cutting-edge ideas at a time when they might not find funding elsewhere. In addition to funding across the continuum of cancer research, from basic science to clinical and quality-of-life research, the Society also focuses on needs that are unmet by

other funding organizations. For instance, for 10 years, the Society supported a targeted research program to address the causes of higher cancer mortality in the poor and medically underserved; this has recently become a priority area for funding.

To date, 47 Nobel Prize winners have received grant support from the Society early in their careers, a number unmatched in the nonprofit sector, and proof that the organization's approach to funding young researchers truly helps launch high-quality scientific careers.

Intramural Research

For more than 65 years, the Society's Intramural Research program has conducted and published high-quality epidemiologic research to advance understanding of the causes and prevention of cancer and monitor and disseminate surveillance information on cancer occurrence, risk factors, and screening.

Epidemiology

As a leader in cancer research, the Society's Epidemiology Research program has been conducting studies to identify factors that cause or prevent cancer since 1951. The first of these, the Hammond-Horn Study, helped to establish cigarette smoking as a cause of death from lung cancer and coronary heart disease, and also demonstrated the Society's ability to conduct very large prospective cohort studies. The Cancer Prevention Study I (CPS-I) was launched in 1959 and included more than 1 million men and women recruited by 68,000 volunteers. Results from CPS-I clearly demonstrated that the sharp increase in lung cancer death rates among US men and women between 1959-1972 occurred only in smokers. Epidemiologic study of this cohort was also among the first to show a relationship between obesity and all-cause and cancer mortality.

In 1982, Cancer Prevention Study II (CPS-II) was established through the recruitment of 1.2 million men and women by 77,000 volunteers. The more than 480,000 lifelong nonsmokers in CPS-II provide the most stable estimates of lung cancer risk in the absence of active smoking. CPS-II data are used extensively by the Centers for Disease Control and Prevention (CDC) to estimate deaths attributable to smoking. The CPS-II study also made important contributions in establishing the link between obesity and cancer. A subgroup of CPS-II participants, the CPS-II Nutrition Cohort has been particularly valuable for clarifying associations of obesity, physical activity, diet, aspirin use, and hormone use with cancer risk. Blood samples from this group allow Society investigators and their collaborators at other institutions to study how genetic, hormonal, nutritional, and other blood markers are related to cancer risk and/or progression.

The Cancer Prevention Studies have resulted in more than 500 scientific publications and have provided unique contributions both within the Society and the global scientific community. In addition to key contributions to the effects of the tobacco epidemic over the past half-century, other important findings from these studies include:

- The association of obesity with increased death rates for at least 10 cancer sites, including colon and postmenopausal breast cancer
- The link between aspirin use and lower risk of colon cancer, opening the door to research on chronic inflammation and cancer
- The relationship between cancer and certain potentially modifiable factors, such as physical inactivity, prolonged hormone use, and certain dietary factors
- The association between air pollution, especially small particulates and ozone, with increased death rates from heart and lung conditions, which helped to motivate the Environmental Protection Agency to propose more stringent limits on air pollution

While landmark findings from the CPS-II Nutrition Cohort have informed multiple areas of public health policy and clinical practice, the cohort is aging. A new cohort is needed to explore the effects of changing exposures and to provide greater opportunity to integrate biological measurements into studies of genetic and environmental risk factors. In 2006, Society epidemiologists began the enrollment of a new cohort, CPS-3, with the goal of recruiting and following approximately 300,000 men and women. All participants are providing blood samples at the time of enrollment. Following on the long history of partnering with Society volunteers and supporters for establishing a cohort, the Society's community-based Relay For Life® events are one of the primary venues for recruiting and enrolling participants. Although similar large cohorts are being established in Canada and some European and Asian countries, there are currently no nationwide studies of this magnitude; therefore, the data collected from CPS-3 participants will provide unique opportunities for research in the US.

Surveillance & Health Services Research

Through the Surveillance Research program, the Society disseminates the most current cancer statistics in *CA: A Cancer Journal for Clinicians* (caonline.amcancersoc.org), as well as eight *Cancer Facts & Figures* publications. These publications are the most widely cited sources for cancer statistics and are available in hard copy from Society Division offices and online through the Society's Web site at cancer.org/statistics. Society scientists also monitor trends in cancer risk factors and screening and publish these results annually – along with Society recommendations, policy initiatives, and evidence-based programs – in *Cancer Prevention & Early Detection Facts & Figures*. Surveillance Research also collaborates with the International Agency for Research on Cancer (IARC) to publish *Global Cancer Facts & Figures*, an inter-national companion to *Cancer Facts & Figures*.

Since 1998, the Society has collaborated with the National Cancer Institute, the Centers for Disease Control and Prevention, the National Center for Health Statistics, and the North American Association of Central Cancer Registries to produce the Annual Report to the Nation on the Status of Cancer, a peer-reviewed journal article that reports current information related to cancer rates and trends in the US.

Epidemiologists in Surveillance Research also conduct and publish high-quality epidemiologic research in order to advance the understanding of cancer. Research topics include exploring socioeconomic, racial, and geographic cancer disparities, describing global cancer trends, and demonstrating the association between public health interventions, such as tobacco control, and cancer incidence and mortality. Recent studies have focused on declines in colorectal cancer incidence in relation to increased colonoscopy screening, differences in cigarette affordability by state, and disparities in trends of pancreatic cancer death rates in the US.

Interest in developing a Health Services Research (HSR) program within the American Cancer Society's Intramural Research program began in the late 1990s, motivated by increasing disparities in the quality and outcomes of cancer care. The primary objective of the HSR program is to perform high-quality, high-impact research to evaluate disparities in cancer treatment and outcomes and support the Society's mission and program initiatives. To accomplish its objectives, the HSR program's work has primarily involved the use of secondary data sources. The National Cancer Data Base (NCDB), jointly sponsored by the American Cancer Society and the American College of Surgeons, has been key to the HSR program's research on the impact of insurance on cancer status, treatments, and outcomes, as well as for broader surveillance of cancer incidence/prevalence and treatment patterns. Other databases used to support the HSR program's objectives include linked SEER-Medicare data, linked state registry and Medicaid enrollment data, and Medical Expenditure Panel Survey Data linked with National Health Interview Survey Data. Recent studies include disparities in the stage at diagnosis for testicular cancer and a comparison of case coverage between the NCDB and population-based cancer registries.

Economic and Health Policy Research

The predecessor of the Economic and Health Policy Research program (EHPR), the International Tobacco Control Research program (ITCR), was created in 2006 to support collaborative tobacco control efforts involving the Society and numerous international organizations and academic institutions such as the WHO Tobacco Free Initiative, the Centers for Disease Control and Prevention (CDC), the Campaign for Tobacco Free Kids, the Johns Hopkins University, and the University of Illinois, among others. The ITCR focused on economic and policy research in tobacco control and research capacity building for the collection and analysis of economic data to provide the evidence base for tobacco control in low- and middle- income countries. This was an important investment by the Society since the economic forces and economic tobacco control measures are major factors in driving and containing the global tobacco epidemic. Major donors in global health such as the Bloomberg Philanthropies, the Bill & Melinda Gates Foundation, and the National Institutes of Health supported this effort by granting the ITCR additional funding.

The most important service publication of the ITCRP is *The Tobacco Atlas*, which is produced in collaboration with the Society's Global Health department, Georgia State University, and the World Lung Foundation. *The Tobacco Atlas, Fourth Edition* (tobaccoatlas.org) was released at the 15th World Conference on Tobacco or Health in 2012 in Singapore and has been translated to four other languages – French, Spanish, Mandarin, and Arabic.

Due to the high demand for the type of analysis generated by the ITCR, the Society's leadership made a strategic decision in early 2013 to expand the program to the area of obesity, nutrition and physical activity and change the name of the program to Economic and Health Policy Research.

Behavioral Research Center

The American Cancer Society was one of the first organizations to recognize the importance of behavioral and psychosocial factors in the prevention and control of cancer and to fund extramural research in this area. In 1995, the Society established the Behavioral Research Center (BRC) as an intramural department. The BRC's work currently focuses on cancer survivorship, quality of life, and tobacco research. It also addresses the issues of underserved and disadvantaged populations, including racial/ethnic minorities, rural, low-income, and aging populations. The BRC's ongoing projects include:

- Studies of the quality of life of cancer survivors, which include a nationwide longitudinal study of a cohort of more than 3,000 cancer survivors that explores the physical and psychosocial adjustment to cancer and identifies factors affecting quality of life. Results from this research have informed the Society's informational materials and support programs for cancer patients, survivors, and their loved ones.
- A study of side effects of cancer treatment such as pain, fatigue or depression, which often go under-reported or undertreated. Data from this collaboration between the Society, the National Cancer Institute, and the American College of Surgeons could play an important role in improving symptom control, which would ultimately lead to improvements in quality of life, functioning, and treatment adherence.
- Studies to identify and prioritize gaps in information and resources for cancer survivors as they transition from active treatment under the care of the oncology team back to the

community care setting. Research results will inform interventions by the Society and others by describing the issues cancer survivors continue to face after their treatment ends, the key variables interventions should target, and the best time to intervene.

- Studies of family caregivers that explore the impact of the family's involvement in cancer care on the quality of life of the cancer survivor and the caregiver
- Studies investigating how social, psychological, and other factors impact smokers' motivation and ability to quit in order to improve existing Society programs for smoking cessation (e.g., FreshStart, Great American Smokeout®) or to develop new technology-based interventions for smokers who seek cessation assistance
- Contributions to the development of a National Cancer Survivorship Resource Center meant to advance survivorship as a distinct phase of cancer care, promote healthy behaviors to reduce long-term and late effects of cancer and its treatment, and improve surveillance and screening practices to detect the return of cancer
- Research to better understand cancer prevention and control behavior in underserved populations and identify effective strategies for connecting individuals with cancer control needs to information, programs, and services

Statistics and Evaluation Center

The mission of the Statistics and Evaluation Center (SEC) is to deliver valid, reliable, accurate, and timely information to American Cancer Society staff for evidence-based decision making that ensures the Society continues to provide effective, high-quality programs. Staffed by professional statisticians and evaluators, the SEC has three main responsibilities: 1) to provide leadership on evaluations of Society mission and income delivery programs, including study design, data analysis, and report preparation; 2) to provide operational support for surveys and other data collection related to Society constituents and consumers; and 3) to support the broader Society mission through information integration, including mapping and return on investment studies. SEC expertise and assistance are available to Society staff at the Corporate Center and across the Divisions.

SEC staff design and conduct process and outcome evaluations of Society programs, projects, and initiatives; focus groups; structured/semi-structured interviews; and needs assessments. All evaluations are logic model driven. Since 2006, the SEC, the Behavioral Research Center, Health Promotions and Cancer Control Sciences have worked together on the Integrated Evaluation Team, which has coordinated a systematic evaluation of all Society survivorship and quality of life programs.

The SEC is currently engaged in evaluating the Society's externally funded community-based cancer prevention initiatives, its Cancer Survivors Network online community, its health professional training grant program, and an online self-help program for cancer survivors. SEC staff are active participants in transformation discussions, especially those related to metrics and evaluation. They also are part of the effort to develop guidelines for programs that support cancer survivors. All of these studies are focused on improving the Society's mission and income delivery programs.

Fighting Back

Conquering cancer is as much a matter of public policy as scientific discovery. Whether it's advocating for quality, affordable health care for all Americans, increasing funding for cancer research and programs, improving quality of life for patients and their families, or enacting laws and policies that help decrease tobacco use, lawmakers play a critical role in determining how much progress we make as a country to defeat cancer. The American Cancer Society Cancer Action Network (ACS CAN), the Society's nonprofit, nonpartisan advocacy affiliate, uses applied policy analysis, direct lobbying, grassroots action, and media advocacy to ensure elected officials nationwide pass laws that help save lives from cancer.

Created in 2001, ACS CAN is the force behind a powerful grassroots movement uniting and empowering cancer patients, survivors, caregivers, and their families to fight back against cancer. The nation's leading voice advocating for public policies that are helping to defeat cancer, ACS CAN works to encourage elected officials and candidates to make the fight against cancer a top national priority. In recent years, ACS CAN has worked to pass laws at the federal, state, and local levels focused on increasing funding for groundbreaking cancer research; improving access to proven prevention and early detection measures, treatment, and follow-up care; and improving quality of life for cancer patients. Some recent advocacy accomplishments impacting cancer patients include:

- Continued implementation of the Affordable Care Act (ACA) of 2010, which includes numerous provisions that help people with cancer and their families access lifesaving care. The law's patient protections ensure that:
  - Cancer patients are no longer denied health coverage because of a preexisting condition.
  - People with cancer are no longer charged more for coverage because of their health status.
  - Health coverage can no longer be rescinded just because someone gets sick.
  - Health plans no longer include annual and lifetime dollar limits on coverage.
  - Children and young adults can be covered under their parents' health plan until they turn 26.
  - Most health plans are required to cover essential benefits needed to prevent, treat, and survive a serious disease such as cancer.

- Patients who take part in clinical trials are still covered for routine care.
- Patients receive proven preventive care, including breast, cervical, and colorectal cancer screening and smoking cessation treatment, at no cost to them.

The law also refocuses the health care system on disease prevention by calling for the creation of a national prevention strategy and establishing a Prevention and Public Health Fund to support successful prevention programs in communities nationwide. In addition, the law provides federal funds to states that choose to expand access to health coverage for the uninsured through Medicaid. Please refer to acscan.org/healthcare for more information.

- Supporting legislation that focuses on preventing cancer by reducing tobacco use, obesity prevalence, and tanning bed use by minors; improving nutrition; and increasing physical activity. By successfully working with partners, ACS CAN helped pass a law that gave the FDA authority to regulate the production and marketing of tobacco products.
- Helped pass comprehensive smoke-free laws in 24 states and the District of Columbia, Puerto Rico, and the US Virgin Islands that require all workplaces, restaurants, and bars to be smoke-free, covering nearly half of the US population, and defended these laws in court
- Helped increase taxes on tobacco products to an average state cigarette tax of $1.53 per pack and defended against tax rollbacks
- Continued its role as intervener in the US government's lawsuit against the tobacco industry, in which manufacturers have been convicted as racketeers for decades of fraud associated with marketing of tobacco products
- Continued implementation of the Healthy, Hunger-Free Kids Act of 2010, strong legislation to reauthorize the federal child nutrition programs and strengthen school nutrition. The law improves nutrition standards and increases funding for school meals, establishes nutrition standards for foods sold in schools outside of meal programs, and strengthens local wellness policies by providing resources and technical assistance for their implementation and requiring them to be publicly available and periodically reviewed.
- Advocated for state requirements for increased quality physical education in all schools
- Supported the federal government's development of voluntary nutrition standards for foods marketed to children
- Worked with state governments to implement laws prohibiting tanning bed use for everyone under the age of 18
- Worked to improve access to essential cancer screening services, especially among low-income, uninsured, and underinsured populations
- Advocated for full funding for the National Breast and Cervical Cancer Early Detection Program (NBCCEDP), which provides free breast and cervical cancer screenings and treatment to low-income, uninsured, and medically underserved women
- Advocated for legislation to create a new nationwide colorectal screening and treatment program modeled after NBCCEDP
- Improved quality of life for cancer patients by advocating for patients and survivors to receive the best cancer care that matches treatments to patient and family goals across their life course. ACS CAN has:
  - Advocated for balanced pain policies in multiple states and at the federal level to ensure patients and survivors have continued access to the treatments that promote better pain management and improved quality of life
  - Advanced a new quality-of-life legislative platform that addresses the need for better patient access to palliative care services that address patient symptoms such as pain and fatigue that begins at point of diagnosis and is provided alongside curative treatment, as well as expand research funding in this area and build the workforce of the health professions needed to provide patients with serious illnesses better patient-centered, coordinated care. Increased public awareness of the increasingly urgent cancer drug shortage problem and advocated for solutions to the complex, multiple causes of cancer drug shortages

Some efforts in the fight against cancer are more visible than others, but each successful battle is an important contribution to what will ultimately be victory over the disease. ACS CAN is making sure the voice of the cancer community is heard in the halls of government and is empowering communities everywhere to fight back.

The Society is also rallying people to fight back against the disease through our Relay For Life® and Making Strides Against Breast Cancer® programs. As the world's largest movement to finish the fight against cancer, the Relay For Life program brings communities together across the globe to celebrate cancer survivors, remember loved ones lost, and fight back against a disease that has taken too much. At Relay events, teams of people camp out at a local high school, park, or fairground and take turns walking or running around track or path for up to 24 hours. The Making Strides Against Breast Cancer program is the largest network of breast cancer awareness events in the nation, uniting communities across the United States to fund the fight against the disease. Every event is a powerful and inspiring opportunity to honor people who have battled breast cancer, raise awareness about the disease, and raise funds to help the Society fight it with research, information, and services, and access to mammograms for women who need them.

Sources of Statistics

Estimated new cancer cases in 2014. The number of new US cancer cases in the US in 2014 was projected using a spatiotemporal model based on incidence data from 49 states and the District of Columbia for the years 1995-2010 that met the North American Association of Central Cancer Registries' (NAACCR) high-quality data standard for incidence. This method considers geographic variations in sociodemographic and lifestyle factors, medical settings, and cancer screening behaviors as predictors of incidence, and also accounts for expected delays in case reporting. (For more information on the estimation of new cases, see "A" in Additional information on page 67.)

Incidence rates. Incidence rates are defined as the number of people per 100,000 who are diagnosed with cancer during a given time period. Incidence rates in this publication are age adjusted to the 2000 US standard population to allow comparisons across populations with different age distributions. State-, race-, and ethnicity-specific incidence rates were previously published in NAACCR's publication *Cancer Incidence in North America, 2006-2010*. (See "B" in Additional information on page 67 for full reference.)

Trends in cancer incidence provided in the Selected Cancers section of this publication are based on incidence data reported to the 13 oldest Surveillance, Epidemiology, and End Results (SEER) registries, representing approximately 14% of the US population, and were adjusted for delays in reporting. Delay-adjustment accounts for delays and error corrections that occur in the reporting of cancer cases. Incidence rates that are not adjusted for delays in reporting underestimate the number of cancer cases in the most recent time period. Cancer rates most affected by reporting delays are melanoma of the skin, leukemia, and prostate because these cancers are frequently diagnosed in nonhospital settings. These trends were originally published in the *SEER Cancer Statistics Review (CSR) 1975-2010*. (See "C" in Additional information on page 67 for full reference).

Estimated cancer deaths in 2014. The estimated number of US cancer deaths in the US was calculated by fitting the number of cancer deaths from 1995 to 2010 to a statistical model that forecasts the number of deaths expected to occur in 2014. The estimated number of cancer deaths for each state is calculated similarly, using state-level data. For both US and state estimates, data on the number of deaths are obtained from the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention. (For more information on this method, see "D" in Additional information on page 67.)

Mortality rates. Mortality rates, or death rates, are defined as the number of people per 100,000 dying of a disease during a given year. In this publication, mortality rates are based on counts of cancer deaths compiled by NCHS and population data from the US Census Bureau. Death rates in this publication are age adjusted to the 2000 US standard population to allow comparisons across populations with different age distributions. These rates should be compared only to other statistics that are age adjusted to the US 2000 standard population. Trends in cancer mortality rates provided for selected cancer sites were based on mortality data from 1992 to 2010 and were first published in the *CSR 1975-2010*. (See "C" in Additional information for full reference on page 67.)

Important note about estimated cancer cases and deaths for the current year. The estimated number of new cancer cases and deaths in the current year is model-based and may produce numbers that vary considerably from year to year for reasons other than changes in cancer occurrence. For this reason, the use of our estimates to track year-to-year changes in cancer occurrence or deaths is strongly discouraged. Age-adjusted incidence and mortality rates reported by the SEER program and NCHS, respectively, are the suggested statistics to use when tracking cancer trends for the US. Rates from state cancer registries are useful for tracking local trends.

Survival. This report presents relative survival rates to describe cancer survival. Relative survival adjusts for normal life expectancy by comparing survival among cancer patients to that of people not diagnosed with cancer who are of the same age, race, and sex. Five-year survival statistics presented in this publication were originally published in *CSR 1975-2010* and are for diagnosis years 2003 to 2009, with all patients followed through 2010. In addition to 5-year relative survival rates, 1-, 10-, and 15-year survival rates are presented for selected cancer sites. These survival statistics are generated using the National Cancer Institute's SEER 18 database and SEER*Stat software version 8.0.4. (See "E" in Additional information for full references.) One-year survival rates were based on cancer patients diagnosed from 2005 to 2009, 10-year survival rates were based on diagnoses from 1997 to 2009, and 15-year survival rates were based on diagnoses from 1992 to 2009; all patients were followed through 2010.

Probability of developing cancer. Probabilities of developing cancer were calculated using DevCan (Probability of Developing Cancer) software version 6.7.0, developed by the National Cancer Institute. (See "F" in Additional information for full reference.) These probabilities reflect the average experience of people in the US and do not take into account individual behaviors and risk factors. For example, the estimate of 1 man in 13 developing lung cancer in a lifetime underestimates the risk for smokers and overestimates the risk for nonsmokers.

Additional information. More information on the methods used to generate the statistics for this report can be found in the following publications:

A. Zhu L, Pickle LW, Naishadham D, et al. Predicting US and state-level cancer counts for the current calendar year: part II – evaluation of spatio-temporal projection methods for incidence. *Cancer* 2012;118(4): 1100-9.

B. Copeland G, Lake A, Firth R, et al. (eds). *Cancer in North America: 2006-2010. Volume Two: Registry-specific Cancer Incidence in the United States and Canada*. Springfield, IL: North American Association of Cen¬tral Cancer Registries, Inc. May 2013. Available at naaccr.org/ Dataand¬Publications/CINAPubs.aspx.

C. Howlader N, Noone AM, Krapcho M, et al. (eds). *SEER Cancer Statistics Review, 1975-2010*. National Cancer Institute. Bethesda, MD, 2013. Avail¬able at seer.cancer.gov.

D. Chen HS, Portier K, Ghosh K, et al. Predicting US and State-level counts for the current calendar year: part I – evaluation of temporal projection methods for mortality. *Cancer* 2012;118(4):1091-9.

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Screening Guidelines for the Early Detection of Cancer in Average-risk Asymptomatic People

Cancer Site	Population	Test or Procedure	Frequency
Breast	Women, ages 20+	Breast self-examination (BSE)	It is acceptable for women to choose not to do BSE or to do BSE regularly (monthly) or irregularly. Beginning in their early 20s, women should be told about the benefits and limitations of BSE. Whether or not a woman ever performs BSE, the importance of prompt reporting of any new breast symptoms to a health professional should be emphasized. Women who choose to do BSE should receive instruction and have their technique reviewed on the occasion of a periodic health examination.
		Clinical breast examination (CBE)	For women in their 20s and 30s, it is recommended that CBE be part of a periodic health examination, preferably at least every three years. Asymptomatic women ages 40 and over should continue to receive a CBE as part of a periodic health examination, preferably annually.
		Mammography	Begin annual mammography at age 40.*
Cervix†	Women, ages 21-65	Pap test & HPV DNA test	Cervical cancer screening should begin at age 21. For women ages 21-29, screening should be done every 3 years with conventional or liquid-based Pap tests. For women ages 30-65, screening should be done every 5 years with both the HPV test and the Pap test (preferred), or every 3 years with the Pap test alone (acceptable). Women ages 65+ who have had ≥3 consecutive negative Pap tests or ≥2 consecutive negative HPV and Pap tests within the past 10 years, with the most recent test occurring within 5 years, and women who have had a total hysterectomy should stop cervical cancer screening. Women should not be screened annually by any method at any age.
Colorectal	Men and women, ages 50+	Fecal occult blood test (FOBT) with at least 50% test sensitivity for cancer, or fecal immunochemical test (FIT) with at least 50% test sensitivity for cancer, **or**	Annual, starting at age 50. Testing at home with adherence to manufacturer's recommendation for collection techniques and number of samples is recommended. FOBT with the single stool sample collected on the clinician's fingertip during a digital rectal examination is not recommended. Guaiac-based toilet bowl FOBT tests also are not recommended. In comparison with guaiac-based tests for the detection of occult blood, immunochemical tests are more patient-friendly, and are likely to be equal or better in sensitivity and specificity. There is no justification for repeating FOBT in response to an initial positive finding.
		Stool DNA test**, **or**	Interval uncertain, starting at age 50
		Flexible sigmoidoscopy (FSIG), **or**	Every 5 years, starting at age 50. FSIG can be performed alone, or consideration can be given to combining FSIG performed every 5 years with a highly sensitive gFOBT or FIT performed annually.
		Double contrast barium enema (DCBE), **or**	Every 5 years, starting at age 50
		Colonoscopy	Every 10 years, starting at age 50
		CT Colonography	Every 5 years, starting at age 50
Endometrial	Women, at menopause	At the time of menopause, women at average risk should be informed about risks and symptoms of endometrial cancer and strongly encouraged to report any unexpected bleeding or spotting to their physicians.	
Lung	Current or former smokers ages 55-74 in good health with at least a 30 pack-year history	Low-dose helical CT (LDCT)	Clinicians with access to high-volume, high-quality lung cancer screening and treatment centers should initiate a discussion about lung cancer screening with apparently healthy patients ages 55-74 who have at least a 30 pack-year smoking history, and who currently smoke or have quit within the past 15 years. A process of informed and shared decision making with a clinician related to the potential benefits, limitations, and harms associated with screening for lung cancer with LDCT should occur before any decision is made to initiate lung cancer screening. Smoking cessation counseling remains a high priority for clinical attention in discussions with current smokers, who should be informed of their continuing risk of lung cancer. Screening should not be viewed as an alternative to smoking cessation
Prostate	Men, ages 50+	Digital rectal examination (DRE) and prostate-specific antigen test (PSA)	Men who have at least a 10-year life expectancy should have an opportunity to make an informed decision with their health care provider about whether to be screened for prostate cancer, after receiving information about the potential benefits, risks, and uncertainties associated with prostate cancer screening. Prostate cancer screening should not occur without an informed decision-making process.
Cancer-related checkup	Men and women, ages 20+	On the occasion of a periodic health examination, the cancer-related checkup should include examination for cancers of the thyroid, testicles, ovaries, lymph nodes, oral cavity, and skin, as well as health counseling about tobacco, sun exposure, diet and nutrition, risk factors, sexual practices, and environmental and occupational exposures.	

*Beginning at age 40, annual clinical breast examination should be performed prior to mammography. **The stool DNA test approved for colorectal cancer screening in 2008 is no longer commercially available. New stool DNA tests are presently undergoing evaluation.

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