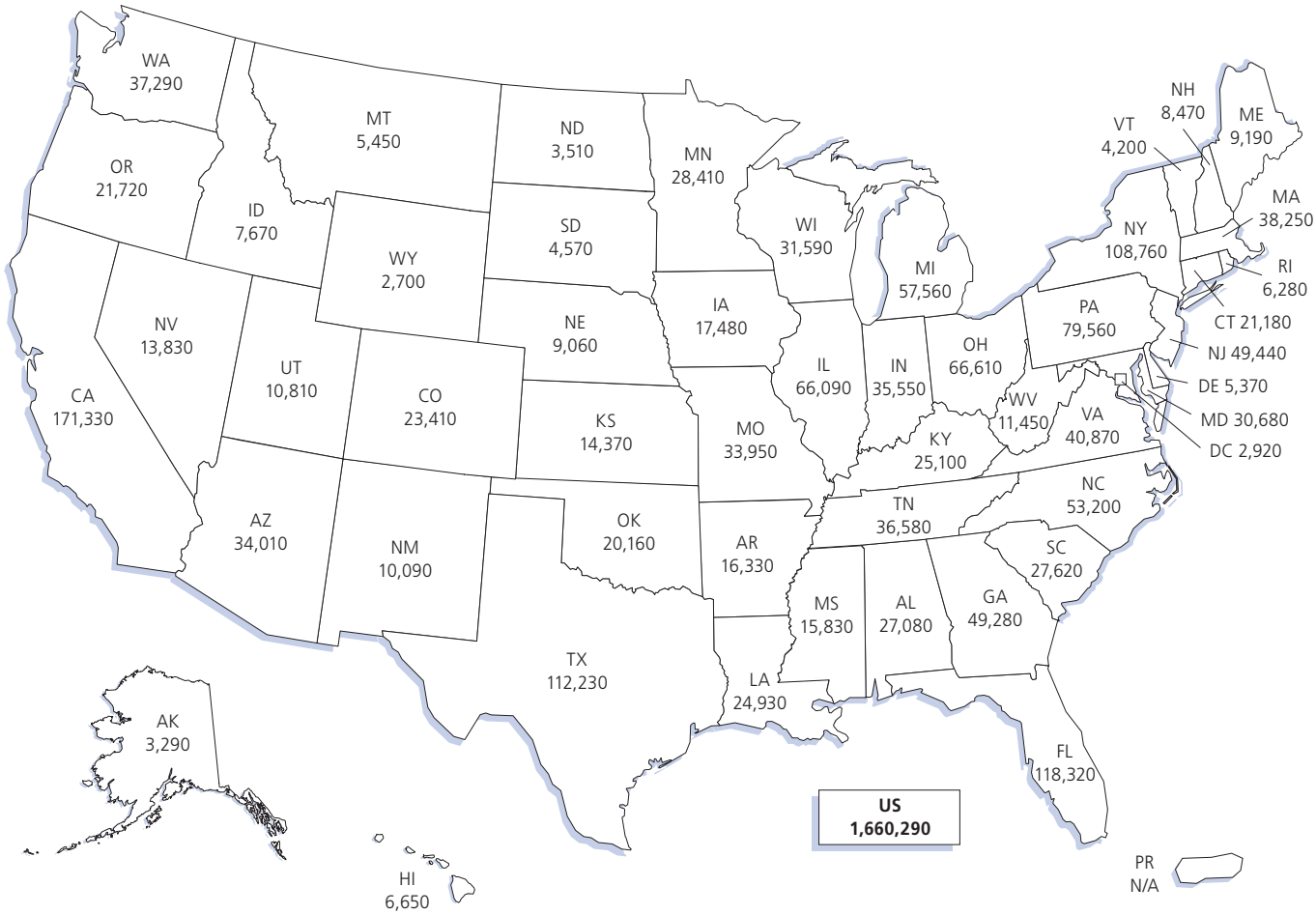
Cancer Facts & Figures 2013



Estimated numbers of new cancer cases for 2013, 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:
Pancreatic Cancer
see page 25

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Basic Cancer Facts

What Is Cancer?

Cancer is a group of diseases characterized by 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, biological 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. The American Cancer Society estimates that in 2013 about 174,100 cancer deaths will be caused by tobacco use. The World Cancer Research Fund estimates that about one-quarter to one-third of the new cancer cases expected to occur in the US in 2013 will be related to overweight or obesity, physical inactivity, and 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, vaccines, or antibiotics. Many of the more than 2 million skin cancers that are diagnosed annually could be prevented by protecting skin from excessive sun exposure and avoiding indoor tanning.

In addition to preventing cancer through the avoidance of risk factors, regular screening tests that allow the detection and removal of precancerous growths can prevent cancers of the cervix, colon, and rectum.

Early detection of cancer, which usually results in less extensive treatment and better outcomes, can also be achieved through screening for some cancers. Screening is known to reduce mortality for cancers of the breast, colon, rectum, and cervix. A heightened awareness of changes in the breast or skin may also result in detection of these tumors at earlier stages. For complete cancer screening guidelines, please see page 60.

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 persons 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.

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. However, it is important to note that these estimates are based on the average experience of the general population and may over- or underestimate individual risk because of differences in exposure (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 persons with a certain exposure or trait to the risk in persons 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 two times more likely to develop breast cancer than women who do not have this family history.

All cancers involve the malfunction of genes that control cell growth and division. About 5% of all cancers are strongly hereditary, in that an inherited genetic alteration confers a very high risk of developing one or more specific types of cancer. However, most cancers do not result from inherited genes but from damage to genes occurring during one'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?

The National Cancer Institute estimates that 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 1,660,290 new cancer cases are expected to be diagnosed in 2013. This estimate does not include carcinoma in situ (noninvasive cancer) of any site except urinary bladder, and does not include basal cell and 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 2013, about 580,350 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?

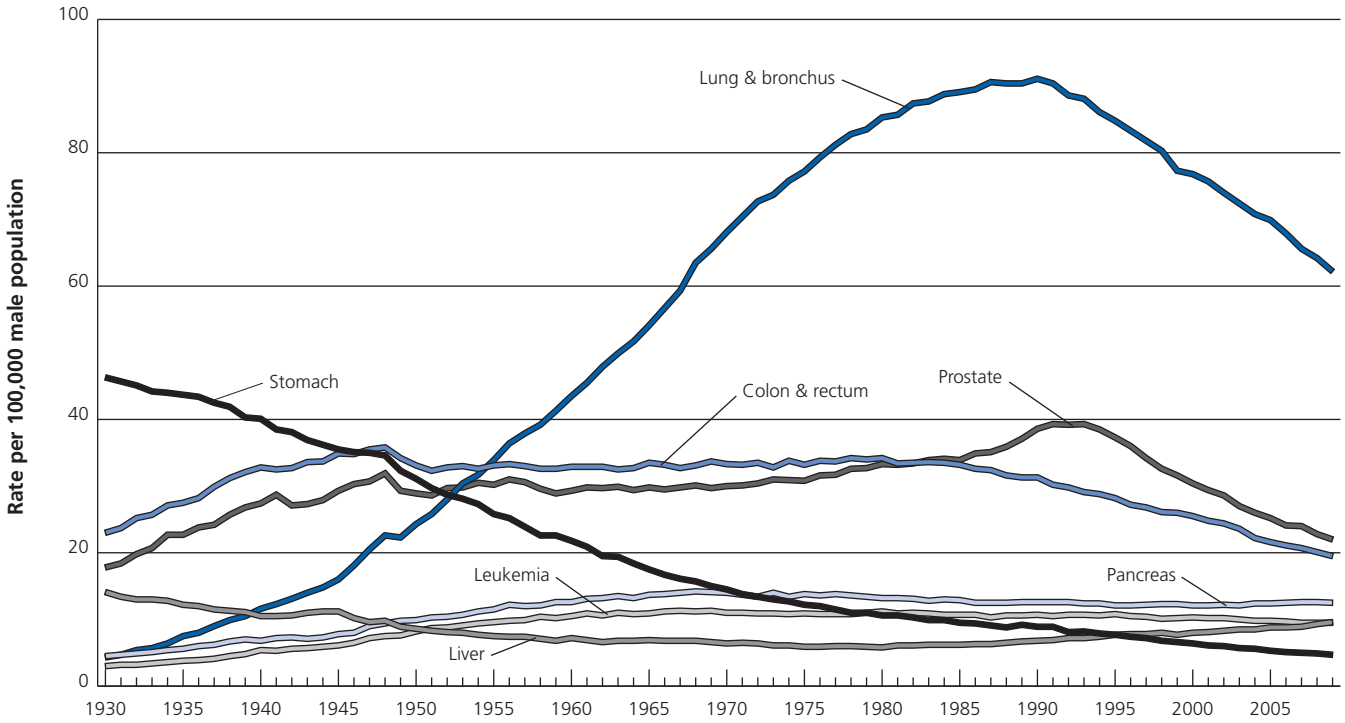
The 5-year relative survival rate for all cancers diagnosed between 2002 and 2008 is 68%, up from 49% in 1975-1977 (see page 18). The improvement in survival reflects both progress in diagnosing certain cancers at an earlier stage and improvements in treatment. Survival statistics vary greatly by cancer type and stage at diagnosis. Relative survival compares survival among cancer patients to that of people not diagnosed with cancer who are of 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 persons without cancer. It does not distinguish between patients who have been cured 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 permanently, since 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 or 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 2002 to 2008 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 and behavioral differences of 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 58.

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 other areas of the body. A number of different staging systems are used to classify tumors. A system of summary staging (in situ, local, regional, and distant) 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 the original layer of tissue, the cancer is invasive and categorized as local, regional, or distant stage based on the

Age-adjusted Cancer Death Rates*, Males by Site, US, 1930-2009



*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, US Mortality Data 1960 to 2009, National Center for Health Statistics, Centers for Disease Control and Prevention.

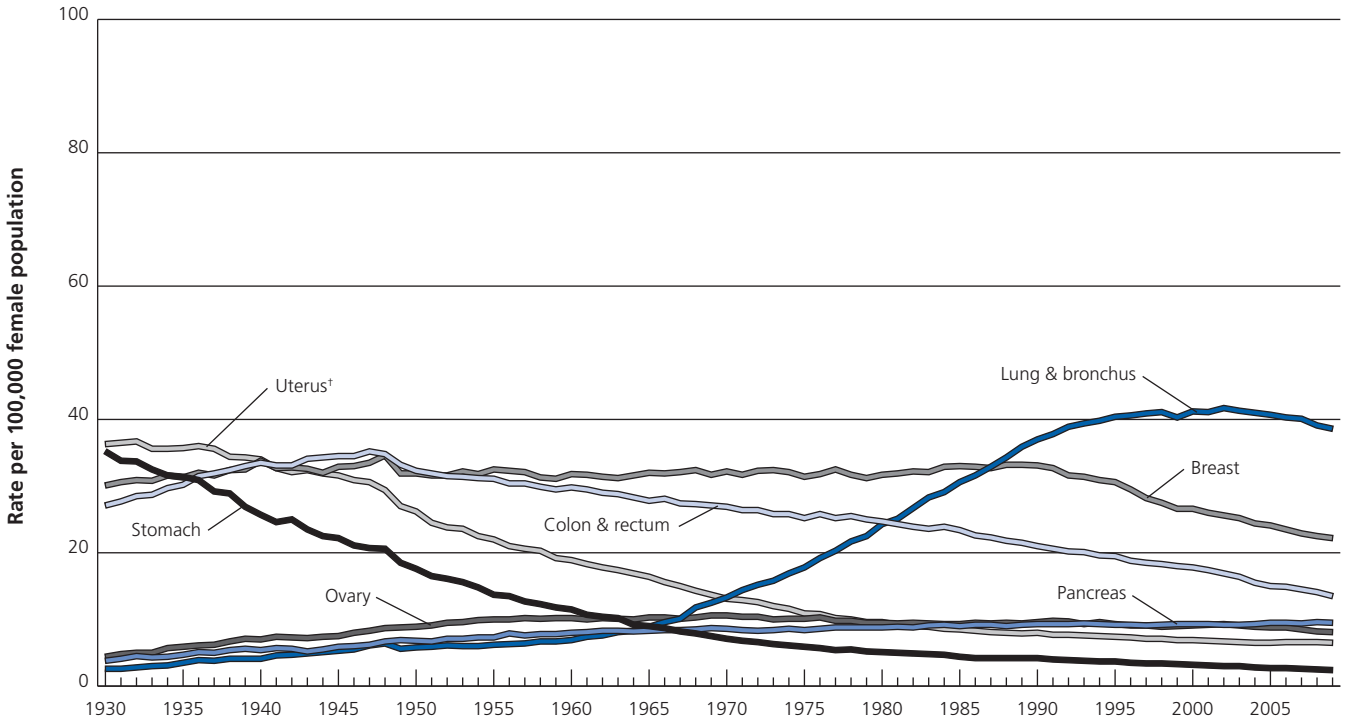
extent of spread. (For a description of the summary stage categories, see the footnotes in the table on page 17, Five-year Relative Survival Rates (%) by Stage at Diagnosis, 2002-2008.) Clinicians typically use the TNM cancer staging system, which assesses tumors in three ways: extent of the primary 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 stage IV being the most advanced disease. Some cancers have alternative staging systems (e.g., leukemia). 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 2008 were $201.5 billion: $77.4 billion for direct medical costs (total of all health expenditures) and $124.0 billion for indirect mortality costs (cost of lost productivity due to premature death). PLEASE NOTE: These numbers are not comparable to those published in previous years because as of 2011, the NIH is calculating the 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, please visit nhlbi.nih.gov/about/factpdf.htm.

Lack of health insurance and other barriers prevents many Americans from receiving optimal health care. According to the US Census Bureau, approximately 50 million Americans were uninsured in 2010; almost one-third of Hispanics (31%) and one in 10 children (17 years of age and younger) had no health insurance coverage. 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. 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, 1930-2009



*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, US Mortality Data 1960 to 2009, National Center for Health Statistics, Centers for Disease Control and Prevention.

Estimated Number* of New Cancer Cases and Deaths by Sex, US, 2013

	Estimated New Cases			Estimated Deaths		
	Both Sexes	**Male**	**Female**	**Both Sexes**	**Male**	**Female**
All Sites	1,660,290	854,790	805,500	580,350	306,920	273,430
Oral cavity & pharynx	41,380	29,620	11,760	7,890	5,500	2,390
Tongue	13,590	9,900	3,690	2,070	1,380	690
Mouth	11,400	6,730	4,670	1,800	1,080	720
Pharynx	13,930	11,200	2,730	2,400	1,790	610
Other oral cavity	2,460	1,790	670	1,640	1,260	380
Digestive system	290,200	160,750	129,450	144,570	82,700	61,870
Esophagus	17,990	14,440	3,550	15,210	12,220	2,990
Stomach	21,600	13,230	8,370	10,990	6,740	4,250
Small intestine	8,810	4,670	4,140	1,170	610	560
Colon†	102,480	50,090	52,390	50,830	26,300	24,530
Rectum	40,340	23,590	16,750			
Anus, anal canal, & anorectum	7,060	2,630	4,430	880	330	550
Liver & intrahepatic bile duct	30,640	22,720	7,920	21,670	14,890	6,780
Gallbladder & other biliary	10,310	4,740	5,570	3,230	1,260	1,970
Pancreas	45,220	22,740	22,480	38,460	19,480	18,980
Other digestive organs	5,750	1,900	3,850	2,130	870	1,260
Respiratory system	246,210	131,760	114,450	163,890	90,600	73,290
Larynx	12,260	9,680	2,580	3,630	2,860	770
Lung & bronchus	228,190	118,080	110,110	159,480	87,260	72,220
Other respiratory organs	5,760	4,000	1,760	780	480	300
Bones & joints	3,010	1,680	1,330	1,440	810	630
Soft tissue (including heart)	11,410	6,290	5,120	4,390	2,500	1,890
Skin (excluding basal & squamous)	82,770	48,660	34,110	12,650	8,560	4,090
Melanoma-skin	76,690	45,060	31,630	9,480	6,280	3,200
Other nonepithelial skin	6,080	3,600	2,480	3,170	2,280	890
Breast	234,580	2,240	232,340	40,030	410	39,620
Genital system	339,810	248,080	91,730	58,480	30,400	28,080
Uterine cervix	12,340		12,340	4,030		4,030
Uterine corpus	49,560		49,560	8,190		8,190
Ovary	22,240		22,240	14,030		14,030
Vulva	4,700		4,700	990		990
Vagina & other genital, female	2,890		2,890	840		840
Prostate	238,590	238,590		29,720	29,720	
Testis	7,920	7,920		370	370	
Penis & other genital, male	1,570	1,570		310	310	
Urinary system	140,430	96,800	43,630	29,790	20,120	9,670
Urinary bladder	72,570	54,610	17,960	15,210	10,820	4,390
Kidney & renal pelvis	65,150	40,430	24,720	13,680	8,780	4,900
Ureter & other urinary organs	2,710	1,760	950	900	520	380
Eye & orbit	2,800	1,490	1,310	320	120	200
Brain & other nervous system	23,130	12,770	10,360	14,080	7,930	6,150
Endocrine system	62,710	16,210	46,500	2,770	1,270	1,500
Thyroid	60,220	14,910	45,310	1,850	810	1,040
Other endocrine	2,490	1,300	1,190	920	460	460
Lymphoma	79,030	42,670	36,360	20,200	11,250	8,950
Hodgkin lymphoma	9,290	5,070	4,220	1,180	660	520
Non-Hodgkin lymphoma	69,740	37,600	32,140	19,020	10,590	8,430
Myeloma	22,350	12,440	9,910	10,710	6,070	4,640
Leukemia	48,610	27,880	20,730	23,720	13,660	10,060
Acute lymphocytic leukemia	6,070	3,350	2,720	1,430	820	610
Chronic lymphocytic leukemia	15,680	9,720	5,960	4,580	2,750	1,830
Acute myeloid leukemia	14,590	7,820	6,770	10,370	5,930	4,440
Chronic myeloid leukemia	5,920	3,420	2,500	610	340	270
Other leukemia‡	6,350	3,570	2,780	6,730	3,820	2,910
Other & unspecified primary sites‡	31,860	15,450	16,410	45,420	25,020	20,400

*Rounded to the nearest 10; estimated new cases exclude basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder. About 64,640 carcinoma in situ of the female breast and 61,300 melanoma in situ will be newly diagnosed in 2013. †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 cancer incidence rates from 49 states and the District of Columbia during 1995-2009 as reported by the North American Association of Central Cancer Registries (NAACCR), represesnting about 98% of the US population. Estimated deaths are based on US mortality data during 1995-2009, National Center for Health Statistics, Centers for Disease Control and Prevention.

Estimated Number* of New Cases for Selected Cancers by State, US, 2013

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	27,080	3,720	200	2,390	610	640	4,550	1,300	990	3,940	960
Alaska	3,290	510	†	310	90	100	470	90	140	440	140
Arizona	34,010	4,660	220	2,630	860	920	4,250	1,400	1,360	4,340	1,400
Arkansas	16,330	2,280	150	1,540	370	450	2,700	530	680	2,370	610
California	171,330	25,360	1,480	14,690	5,160	5,210	18,720	8,530	7,280	23,740	6,920
Colorado	23,410	3,300	160	1,880	690	840	2,550	1,310	1,050	3,870	990
Connecticut	21,180	3,050	110	1,670	740	570	2,780	1,080	890	2,940	1,090
Delaware	5,370	770	†	430	170	140	760	300	220	860	250
Dist. of Columbia	2,920	450	†	240	90	70	320	90	100	500	90
Florida	118,320	15,710	940	10,290	3,110	3,490	17,960	5,330	5,060	17,330	5,720
Georgia	49,280	7,310	420	3,970	1,230	1,290	6,690	2,360	1,810	7,930	1,610
Hawaii	6,650	960	50	730	240	180	900	380	240	800	200
Idaho	7,670	1,010	50	670	220	270	930	420	360	1,330	380
Illinois	66,090	9,350	500	6,140	2,150	2,020	9,270	2,480	2,840	9,230	2,990
Indiana	35,550	4,540	260	3,250	1,040	1,000	5,500	1,470	1,460	4,310	1,560
Iowa	17,480	2,310	90	1,640	580	590	2,350	980	790	2,270	810
Kansas	14,370	2,160	90	1,250	440	450	1,930	800	650	2,020	600
Kentucky	25,100	3,300	190	2,300	700	720	4,560	1,540	1,100	3,130	1,060
Louisiana	24,930	3,630	220	2,400	550	660	3,740	770	950	4,040	930
Maine	9,190	1,150	50	730	310	280	1,380	440	390	1,290	530
Maryland	30,680	4,760	220	2,410	950	780	4,040	1,530	1,180	4,880	1,220
Massachusetts	38,250	5,820	210	2,910	1,280	990	4,880	1,840	1,590	5,700	2,060
Michigan	57,560	8,140	330	4,730	1,920	1,750	8,250	2,900	2,530	9,490	2,860
Minnesota	28,410	4,260	120	2,220	890	950	3,860	1,020	1,210	4,090	1,190
Mississippi	15,830	2,080	130	1,580	340	390	2,630	550	560	2,490	540
Missouri	33,950	4,680	250	3,110	1,040	980	5,410	1,500	1,480	4,170	1,480
Montana	5,450	740	†	510	160	180	700	250	260	870	280
Nebraska	9,060	1,230	50	910	290	310	1,220	460	430	1,290	420
Nevada	13,830	1,760	120	1,350	330	400	1,970	440	520	1,900	660
New Hampshire	8,470	1,180	50	640	290	240	1,150	410	350	1,180	460
New Jersey	49,440	6,960	460	4,640	1,740	1,430	5,960	2,520	2,190	7,190	2,450
New Mexico	10,090	1,360	80	860	270	330	1,050	460	400	1,610	380
New York	108,760	14,950	850	9,210	3,850	3,270	13,480	4,200	4,740	16,720	5,510
North Carolina	53,200	7,430	360	4,260	1,430	1,470	8,040	2,620	2,080	8,150	2,070
North Dakota	3,510	450	†	370	100	120	460	150	150	550	170
Ohio	66,610	9,060	440	5,890	2,230	1,770	10,230	2,960	2,840	8,530	3,020
Oklahoma	20,160	2,690	170	1,780	500	610	3,370	770	840	2,500	790
Oregon	21,720	3,310	120	1,610	670	620	2,860	1,410	950	3,380	1,030
Pennsylvania	79,560	10,490	480	7,390	2,720	2,240	10,980	3,890	3,440	9,450	3,980
Rhode Island	6,280	900	†	530	210	180	870	270	250	820	340
South Carolina	27,620	3,580	220	2,340	710	760	4,390	1,320	1,040	4,160	1,070
South Dakota	4,570	600	†	430	140	150	620	200	200	730	220
Tennessee	36,580	5,070	280	3,180	900	990	6,200	1,900	1,450	4,990	1,440
Texas	112,230	14,980	1,110	9,750	2,870	3,740	15,000	3,930	4,830	15,730	4,030
Utah	10,810	1,550	70	740	320	380	800	720	490	1,960	420
Vermont	4,200	550	†	320	130	110	590	220	170	560	210
Virginia	40,870	6,280	300	3,270	1,240	990	5,380	2,380	1,590	6,840	1,590
Washington	37,290	5,610	230	2,730	1,140	1,160	4,700	2,350	1,650	5,690	1,690
West Virginia	11,450	1,460	80	1,180	350	330	2,100	540	470	1,470	530
Wisconsin	31,590	4,490	190	2,610	1,080	1,050	4,310	1,250	1,400	4,370	1,530
Wyoming	2,700	380	†	240	80	80	320	130	120	430	130
United States	1,660,290	232,340	12,340	142,820	49,560	48,610	228,190	76,690	69,740	238,590	72,570

*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, 2013

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non-Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	10,430	250	690	970	400	330	3,290	320	270	630	550
Alaska	980	†	70	80	†	†	270	†	†	60	50
Arizona	11,210	310	790	990	480	460	2,850	400	310	740	630
Arkansas	6,650	150	420	610	270	200	2,170	200	150	390	320
California	57,290	1,590	4,220	5,150	2,460	2,980	12,700	2,000	1,540	4,010	3,390
Colorado	7,350	230	510	680	320	290	1,710	250	230	500	440
Connecticut	6,890	170	460	470	290	230	1,740	230	170	530	400
Delaware	1,940	50	120	170	70	80	580	60	50	120	100
Dist. of Columbia	1,030	†	80	100	†	50	240	†	†	80	80
Florida	42,370	880	2,660	3,640	1,770	1,550	12,070	1,400	930	2,770	2,200
Georgia	16,010	360	1,200	1,450	600	530	4,670	460	410	1,010	790
Hawaii	2,400	†	140	230	80	120	580	80	50	210	110
Idaho	2,660	90	180	220	120	80	670	100	60	200	180
Illinois	24,000	530	1,610	2,230	1,010	750	6,560	780	550	1,620	1,230
Indiana	13,250	320	850	1,120	550	370	4,110	440	300	820	590
Iowa	6,420	190	400	580	280	200	1,780	230	170	390	350
Kansas	5,430	150	360	490	250	170	1,590	210	140	350	240
Kentucky	9,970	200	590	880	340	270	3,510	300	200	540	390
Louisiana	9,040	210	650	860	330	380	2,670	260	190	580	420
Maine	3,240	90	190	250	130	90	950	110	60	200	160
Maryland	10,480	230	800	930	410	380	2,810	310	250	730	560
Massachusetts	12,840	310	810	1,020	500	500	3,530	400	340	910	650
Michigan	20,570	540	1,360	1,700	910	670	5,940	730	490	1,460	890
Minnesota	9,610	250	610	770	440	330	2,500	340	240	630	520
Mississippi	6,300	140	420	630	250	210	2,010	170	110	380	330
Missouri	12,730	310	890	1,100	540	420	3,940	380	240	820	560
Montana	2,000	50	120	180	90	50	550	70	50	130	140
Nebraska	3,440	100	210	340	140	90	900	130	80	230	210
Nevada	4,760	140	360	450	180	210	1,480	140	100	350	290
New Hampshire	2,680	70	170	200	100	80	750	80	60	200	140
New Jersey	16,410	340	1,330	1,560	630	570	4,060	530	440	1,180	750
New Mexico	3,540	90	240	350	140	170	770	110	90	240	230
New York	34,240	780	2,390	3,020	1,450	1,410	8,790	1,090	900	2,500	1,770
North Carolina	18,620	390	1,260	1,510	710	620	5,660	550	420	1,150	910
North Dakota	1,280	†	90	130	60	†	310	†	†	90	80
Ohio	25,130	590	1,720	2,170	980	750	7,350	800	560	1,620	1,240
Oklahoma	7,850	190	490	720	300	270	2,440	260	170	440	380
Oregon	7,820	230	490	660	320	310	2,110	280	220	520	460
Pennsylvania	28,680	600	1,950	2,540	1,190	930	7,640	1,020	730	1,950	1,430
Rhode Island	2,140	50	130	170	100	80	600	60	50	130	100
South Carolina	9,800	220	660	820	360	340	2,990	280	210	600	500
South Dakota	1,590	50	110	150	60	†	440	50	†	110	90
Tennessee	14,080	360	910	1,220	520	460	4,600	440	280	800	630
Texas	37,180	940	2,650	3,390	1,490	1,950	9,670	1,210	850	2,340	1,650
Utah	2,790	110	260	240	150	90	450	120	80	220	210
Vermont	1,300	†	80	100	50	50	380	†	†	90	60
Virginia	14,720	320	1,110	1,270	580	480	4,130	460	370	1,020	740
Washington	12,390	350	800	980	520	530	3,260	440	360	850	730
West Virginia	4,660	100	280	440	170	120	1,480	160	100	230	190
Wisconsin	11,220	310	700	880	520	370	2,980	400	300	770	630
Wyoming	950	†	60	80	†	†	240	†	†	70	50
United States	580,350	14,080	39,620	50,830	23,720	21,670	159,480	19,020	14,030	38,460	29,720

*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, 2005-2009

	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†	582.4	395.4	119.4	59.7	41.3	104.8	54.6	19.5	13.4	162.1	33.2	7.4
Alaska	523.7	435.7	130.0	55.4	44.2	83.8	63.0	22.0	18.3	139.9	38.2	9.5
Arizona	439.6	361.0	106.7	41.9	31.8	62.5	48.2	17.6	13.3	118.1	31.5	8.3
Arkansas‡	551.6	381.6	109.2	54.7	39.8	107.4	59.6	21.9	15.0	153.4	32.5	7.9
California	510.5	398.9	123.3	50.7	38.1	62.4	45.2	23.0	15.6	143.0	33.9	8.0
Colorado	493.9	396.4	125.4	46.0	35.1	57.2	44.6	22.2	15.8	152.3	31.8	8.3
Connecticut	594.1	462.5	137.3	55.3	41.1	78.5	61.0	25.9	17.9	165.2	47.9	12.5
Delaware	613.1	448.2	127.9	56.4	41.4	90.6	68.8	24.0	17.1	182.8	44.2	11.3
Dist. of Columbia‡	562.6	399.0	128.3	53.0	42.2	77.2	45.9	21.3	13.5	185.1	24.6	8.0
Florida	528.3	403.1	114.9	49.6	37.9	82.8	58.1	21.7	15.2	137.7	35.6	8.8
Georgia	569.8	397.2	119.7	53.4	38.8	95.6	54.7	21.6	14.2	167.8	33.0	7.8
Hawaii	504.3	401.6	125.1	59.6	38.7	68.7	40.4	20.9	13.0	128.4	26.2	6.4
Idaho	528.7	411.6	119.1	45.8	36.5	64.6	48.1	22.1	17.3	160.1	36.7	8.9
Illinois	573.5	437.8	125.4	61.3	44.8	88.9	60.6	23.8	16.3	157.9	40.2	10.3
Indiana	539.3	421.5	116.9	57.5	43.3	99.5	64.0	23.1	17.0	129.2	36.3	8.9
Iowa	568.2	436.5	123.5	59.6	45.9	87.6	56.3	26.5	18.5	142.2	43.0	8.7
Kansas	563.8	422.2	124.6	57.6	40.4	85.0	55.0	23.6	17.2	157.3	38.2	9.3
Kentucky	615.4	459.7	121.2	65.7	46.9	128.2	80.1	25.1	17.3	139.0	40.3	9.9
Louisiana†	614.5	410.9	118.9	64.6	43.7	101.9	58.2	24.2	16.8	173.7	34.4	8.2
Maine	600.1	467.3	128.5	55.8	43.9	95.5	67.6	25.6	18.4	153.6	48.1	13.5
Maryland	532.8	411.8	124.8	49.9	37.9	77.3	56.6	21.1	14.2	158.4	33.5	9.3
Massachusetts	581.1	459.2	132.8	53.3	40.3	81.0	64.0	25.1	16.3	157.5	45.0	12.3
Michigan	578.0	433.3	120.3	52.9	40.9	87.3	61.3	24.8	17.8	166.5	42.5	10.9
Minnesota	566.5	424.4	128.5	51.2	40.1	66.7	49.8	26.9	18.1	179.0	40.0	9.6
Mississippi†	612.1	395.5	114.3	62.7	44.7	116.4	56.3	21.8	14.4	174.2	31.4	7.2
Missouri	548.3	423.4	121.9	58.3	42.0	100.0	64.7	22.3	15.9	132.9	36.3	8.4
Montana	531.6	417.9	123.0	52.7	38.5	73.0	58.5	23.0	15.3	164.1	37.6	9.7
Nebraska	547.1	426.6	124.7	62.8	46.2	78.2	51.7	24.2	17.7	150.9	35.8	8.9
Nevada	514.4	405.1	114.3	52.1	39.3	76.8	65.5	20.9	15.4	138.4	38.4	11.0
New Hampshire	584.8	452.4	132.5	51.9	39.5	81.4	62.2	23.9	17.4	155.1	48.1	13.3
New Jersey	593.0	454.1	130.0	58.2	43.0	76.1	56.8	25.5	17.6	172.4	45.1	11.8
New Mexico	480.8	370.5	111.4	46.4	34.6	55.7	39.3	19.1	14.5	141.6	26.9	6.4
New York	583.3	442.7	125.8	54.6	41.5	77.1	55.1	25.9	17.8	167.2	42.5	10.9
North Carolina	579.2	418.1	125.0	54.5	38.7	100.1	58.2	23.0	15.6	158.3	37.5	9.1
North Dakota	555.6	421.0	126.4	62.9	44.1	71.5	46.2	22.0	17.8	169.4	40.9	10.1
Ohio	546.5	421.5	119.6	56.3	42.3	93.2	60.0	23.0	16.0	144.1	39.0	9.7
Oklahoma	567.8	426.7	123.9	56.1	42.1	101.9	64.7	22.6	17.6	153.2	35.5	8.7
Oregon	521.7	432.3	130.7	47.9	38.3	74.2	59.2	23.3	16.1	145.1	37.6	10.0
Pennsylvania	583.8	453.7	125.8	59.4	44.5	87.5	58.2	25.4	17.8	154.1	44.5	11.0
Rhode Island	590.8	466.7	133.2	55.2	43.0	88.2	64.7	23.9	17.6	152.6	52.4	13.8
South Carolina	559.9	397.7	121.4	52.2	38.7	96.7	53.7	20.6	13.6	159.0	30.4	8.0
South Dakota	494.3	389.8	118.4	54.2	41.0	72.2	47.1	20.5	16.0	149.1	34.2	8.0
Tennessee	565.6	413.7	119.6	56.2	41.3	106.1	61.5	23.0	16.2	145.6	34.9	8.4
Texas†	533.7	394.6	116.1	53.0	37.0	81.8	49.9	22.6	15.9	142.7	30.1	6.9
Utah	469.7	345.2	108.0	39.3	31.3	33.8	22.8	23.0	15.5	169.8	28.8	5.6
Vermont	554.3	455.5	129.4	45.8	40.4	82.0	64.6	24.0	17.7	150.9	43.6	12.6
Virginia‡	537.0	396.9	124.0	49.8	37.9	85.2	54.5	21.4	14.3	157.7	33.8	8.1
Washington	552.6	438.4	131.8	48.6	37.2	73.3	57.7	26.6	17.5	155.3	39.5	9.5
West Virginia	576.5	441.6	112.2	61.8	45.4	112.7	73.6	24.0	16.8	138.4	39.3	11.4
Wisconsin‡	513.8	404.6	118.8	48.2	37.4	70.6	51.2	22.5	16.5	144.4	36.4	9.3
Wyoming	513.8	388.8	113.2	49.5	38.7	59.7	47.9	20.9	15.5	162.6	42.6	10.4
United States	550.7	419.3	122.3	54.0	40.3	82.7	55.9	23.3	16.2	151.4	37.5	9.3

*Per 100,000, age adjusted to the 2000 US standard population. †Data for 2005 are limited to cases diagnosed from January-June due to the effect of large migrations of populations on this state as a result of Hurricane Katrina in September 2005. ‡This state's data are not included in the US rates because cancer registry data submitted for 2009 did not meet high-quality standards according to the North American Association of Central Cancer Registries (NAACCR).

Source: NAACCR, 2012. 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, 2013

Death Rates* for Selected Cancers by State, US, 2005-2009

	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	259.0	157.4	24.0	22.9	15.1	89.4	41.1	8.3	5.3	13.3	9.5	28.7
Alaska	209.5	159.6	23.5	20.0	14.1	62.9	45.5	7.9	5.8	12.3	10.0	22.1
Arizona	182.1	130.0	20.5	16.8	11.6	50.2	33.2	7.5	4.8	10.9	7.9	19.7
Arkansas	253.7	161.2	23.6	22.5	15.2	92.5	46.3	8.8	5.2	13.6	9.4	25.3
California	194.9	141.7	22.3	18.1	12.9	49.2	33.1	8.1	5.0	11.8	9.4	23.2
Colorado	185.0	134.4	19.9	17.4	13.0	45.1	31.9	8.0	4.4	10.9	8.9	23.8
Connecticut	212.0	149.6	22.5	17.3	13.0	55.9	38.8	8.1	5.2	14.7	10.2	24.8
Delaware	229.6	162.8	23.0	20.3	14.3	69.2	48.5	8.4	5.0	12.3	9.7	24.9
Dist. of Columbia	256.3	160.4	28.0	23.1	17.7	64.7	34.8	9.4	3.5	16.3	10.7	41.3
Florida	206.0	141.9	21.5	18.3	13.0	63.5	39.3	7.8	4.9	12.0	8.7	19.6
Georgia	230.8	146.8	23.0	20.2	13.8	75.8	38.7	7.7	4.6	12.4	8.9	27.5
Hawaii	184.6	119.6	17.8	18.7	10.8	51.2	27.0	7.5	4.2	12.9	9.4	16.2
Idaho	195.9	143.5	21.3	15.9	13.4	51.3	35.6	8.1	5.4	11.5	9.8	26.7
Illinois	229.4	160.1	24.2	22.5	15.6	67.8	41.9	8.8	5.5	13.1	10.1	25.5
Indiana	244.9	163.2	23.9	22.5	15.0	82.0	47.2	9.7	5.6	13.1	9.4	23.8
Iowa	220.1	151.0	21.8	20.6	15.2	67.5	39.4	9.2	5.5	12.0	8.8	23.9
Kansas	221.5	149.9	22.9	21.2	14.0	70.6	41.0	9.6	5.2	12.5	9.4	21.4
Kentucky	267.2	173.6	23.4	24.3	16.6	99.7	55.5	9.2	5.9	12.5	9.4	24.6
Louisiana	260.8	165.8	26.3	25.1	15.7	84.4	44.1	9.0	5.2	13.8	11.0	27.1
Maine	240.0	161.6	21.4	20.5	14.4	73.1	46.4	9.2	5.5	12.2	9.8	24.4
Maryland	226.5	157.3	24.9	22.0	14.6	65.6	41.8	7.9	4.9	12.9	10.4	26.7
Massachusetts	222.6	154.0	21.9	19.6	13.8	62.6	42.5	8.3	5.1	13.1	10.3	23.4
Michigan	228.1	160.9	24.0	20.2	14.7	70.3	43.9	9.2	6.1	13.9	10.1	22.6
Minnesota	206.8	146.0	21.3	18.0	12.6	55.2	37.2	9.6	5.2	11.8	9.5	24.3
Mississippi	274.2	158.8	24.9	24.9	16.2	97.3	42.3	8.3	4.8	13.8	9.9	31.0
Missouri	237.6	160.4	24.9	21.6	14.6	79.8	46.0	8.4	5.3	13.1	9.7	22.7
Montana	203.4	150.5	20.5	17.8	14.7	57.1	41.3	8.1	5.4	12.4	8.7	27.2
Nebraska	215.2	145.7	21.2	22.5	15.1	62.4	36.0	9.0	5.7	12.2	9.4	24.7
Nevada	213.3	158.4	23.3	20.7	15.3	62.5	48.8	6.7	4.8	12.3	9.8	23.4
New Hampshire	218.2	154.7	21.4	19.3	13.2	62.0	43.0	7.7	5.0	13.4	10.6	23.2
New Jersey	213.8	157.7	26.1	22.0	15.5	57.9	38.3	8.1	5.5	13.3	10.0	22.4
New Mexico	190.1	134.3	21.1	18.7	13.5	44.4	29.1	6.7	4.4	11.6	8.9	24.3
New York	201.3	145.2	22.5	19.4	14.0	55.2	35.8	8.0	4.9	12.6	9.7	22.2
North Carolina	236.9	152.7	23.5	19.8	13.6	79.3	41.6	7.6	5.0	12.1	9.7	25.9
North Dakota	210.2	144.1	22.0	21.6	14.8	56.5	34.3	7.4	5.5	12.8	8.7	25.2
Ohio	243.4	163.4	25.2	22.5	15.5	77.4	44.5	9.4	5.6	13.1	9.9	25.4
Oklahoma	243.0	161.2	23.8	22.9	14.8	82.7	46.9	8.9	5.9	12.0	8.7	23.6
Oregon	214.4	155.5	21.5	18.5	13.9	61.2	43.6	8.6	5.7	12.2	10.0	25.7
Pennsylvania	232.4	158.5	24.1	22.3	15.2	68.5	40.0	9.2	5.6	13.4	10.0	23.7
Rhode Island	228.8	151.3	21.9	19.6	13.3	66.3	43.0	8.8	4.6	12.4	8.4	22.5
South Carolina	241.3	151.0	24.0	20.5	14.1	79.6	40.0	8.0	4.8	12.5	9.7	26.9
South Dakota	206.0	141.5	20.9	20.1	14.2	62.2	35.5	7.8	5.1	11.1	9.1	22.9
Tennessee	257.9	162.0	24.0	22.4	15.1	91.5	47.2	9.3	5.5	13.0	9.3	25.3
Texas	212.5	142.8	22.2	20.2	13.1	63.4	35.9	8.1	5.0	11.7	8.7	21.4
Utah	154.1	109.6	21.5	14.3	10.4	28.1	16.1	7.5	4.6	9.5	8.0	24.5
Vermont	211.9	152.8	20.7	18.8	14.2	61.6	44.3	8.1	5.0	12.5	9.6	22.0
Virginia	228.5	153.9	24.8	19.9	14.2	70.6	40.7	8.3	5.0	13.0	9.9	26.0
Washington	209.6	153.9	21.9	17.7	12.7	58.1	42.8	8.8	5.5	12.4	9.8	24.9
West Virginia	254.8	173.2	23.6	24.2	16.8	87.5	51.9	9.1	6.4	11.2	7.7	21.7
Wisconsin	218.8	152.0	21.6	18.7	13.1	59.9	38.7	9.4	5.7	12.9	9.8	25.6
Wyoming	199.5	148.3	21.4	18.9	14.2	52.8	38.5	8.1	5.9	13.2	9.7	20.9
United States	219.4	151.1	23.0	20.2	14.1	65.7	39.6	8.4	5.2	12.5	9.5	23.6

*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, 2013

Selected Cancers

Breast

New cases: An estimated 232,340 new cases of invasive breast cancer are expected to be diagnosed among women in the US during 2013; about 2,240 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 2005 to 2009, the most recent five years for which data are available, breast cancer incidence rates were stable.

In addition to invasive breast cancer, 64,640 new cases of in situ breast cancer are expected to occur among women in 2013. Of these, approximately 85% will be ductal carcinoma in situ (DCIS). In situ breast cancer incidence rates increased 2.8% per year from 2005 to 2009.

Deaths: An estimated 40,030 breast cancer deaths (39,620 women, 410 men) are expected in 2013. 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 2005 to 2009, rates decreased 3.0% per year in women younger than 50 and 2.0% per year in women 50 and older. The decrease in breast cancer death rates represents progress in earlier detection, improved treatment, and possibly decreased incidence as a result of declining use of MHT.

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 mass, 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: Besides being female, increasing age is the most important risk factor for breast cancer. Potentially modifiable risk factors include weight gain after age 18, being overweight or obese (for postmenopausal breast cancer), use of menopausal hormone therapy (combined estrogen and progestin), physical inactivity, and alcohol consumption. Medical findings that predict higher risk include high breast tissue density (a mammographic measure of the amount of glandular tissue relative to fatty tissue), high bone mineral density (women with low density are at increased risk for osteoporosis), and biopsy-confirmed hyperplasia (overgrowth of cells), especially atypical hyperplasia (overgrowth of abnormal cells). 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, never having children, and having one's first child after age 30.

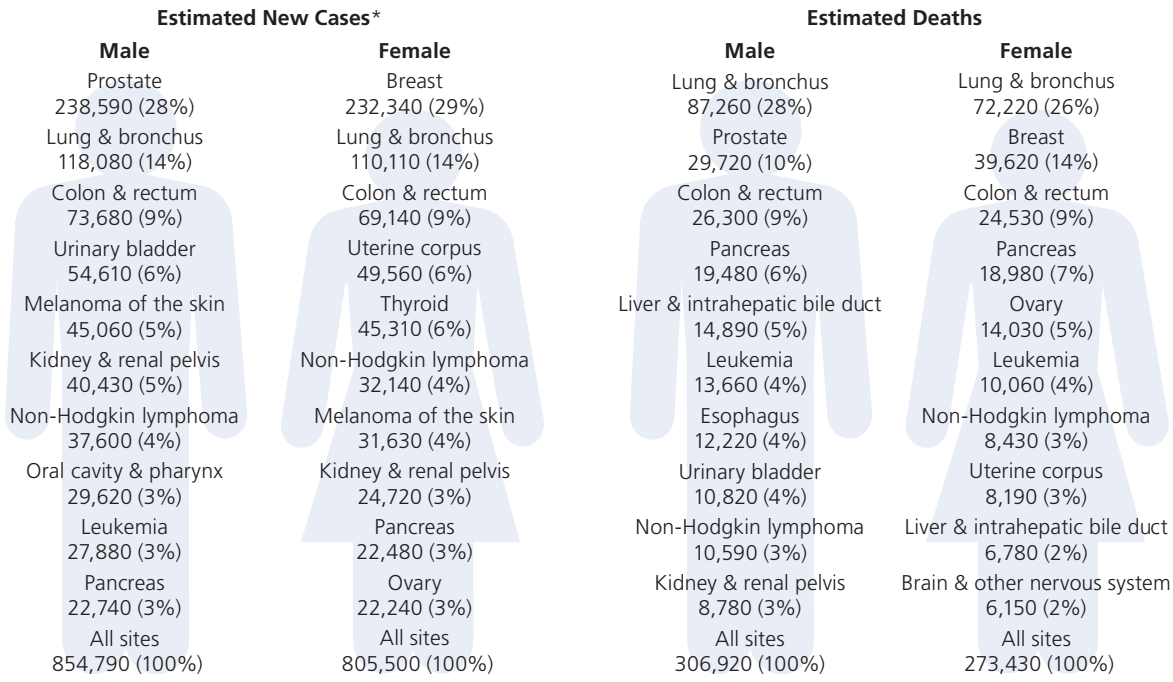
Risk is also increased by a family history of breast cancer, particularly having one or more first-degree relatives with breast cancer (though most women with breast cancer do not have a family history of the disease). Inherited mutations (alterations) in breast cancer susceptibility genes account for approximately 5%-10% of all female breast cancers and an estimated 4%-40% of all male breast cancers, but are very rare in the general population (much less than 1%). Most of these mutations are located in *BRCA1* and *BRCA2* genes, although mutations in other known genes have also been identified. Individuals with a strong family history of breast and 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. In *BRCA1* and *BRCA2* mutation carriers, studies suggest that prophylactic removal of the ovaries and/or breasts decreases the risk of breast cancer considerably, though not all women who choose this surgery would have developed breast cancer. Women who consider prophylactic surgery should undergo counseling before reaching a decision.

There is limited, but accumulating evidence that long-term, heavy smoking increases the risk of breast cancer, particularly among women who began smoking at an early age. 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.

Modifiable factors that are associated with a lower risk of breast cancer include breastfeeding, 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 and a cure is more likely. Numerous studies have shown that early detection with mammography

Leading New Cancer Cases and Deaths – 2013 Estimates



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

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, but not all, breast cancers in women without symptoms, and the sensitivity of the test is lower for women with dense breasts. However, newer technologies have shown promising developments for women with dense breast tissue. Digital mammography has improved sensitivity for women with dense breasts. In addition, the Food and Drug Administration recently approved the use of several ultrasound technologies that could be used in addition to standard mammography for women with dense breast tissue. Although the majority of women with an abnormal mammogram do not have cancer, all suspicious lesions that cannot be resolved with additional imaging should be biopsied for a definitive diagnosis. Annual screening using magnetic resonance imaging (MRI) in addition to mammography is recommended for women at high lifetime risk of breast cancer starting at age 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 to encourage all women 40 and older to receive regular mammograms. For more information on the American Cancer Society's recommendations for breast cancer screening, see page 60.

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 for women treated with breast-conserving surgery plus radiation therapy is similar to that for those treated with mastectomy. For women undergoing mastectomy, significant advances in reconstruction techniques provide several options for breast reconstruction, including the timing of the procedure.

Removal and evaluation of some of the underarm lymph nodes during surgery is usually recommended 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 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), or/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, approved targeted therapies include trastuzumab (Herceptin) and, for advanced disease, lapatinib (Tykerb) and pertuzumab (Perjetal). 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 some potentially dangerous side effects.

It is recommended that all patients with ductal carcinoma in situ (DCIS) be treated to avoid potential progression to invasive cancer. Treatment options for DCIS include breast-conserving surgery with radiation therapy or mastectomy; either of these options may be followed by treatment with tamoxifen if the tumor is hormone receptor-positive. Removal of axillary lymph nodes is not generally needed, but a sentinel lymph node procedure may be performed. 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 for future research is to accurately define patient risk categories in order to administer the minimum treatment required for a successful outcome.

Survival: The 5-year relative survival rate for female invasive breast cancer patients has improved from 75% in the mid-1970s to 90% today. The 5-year relative survival for women diagnosed with localized breast cancer (cancer that has not spread to lymph nodes or other locations outside the breast) is 98%; if the cancer has spread to nearby lymph nodes (regional stage) or distant lymph nodes or organs (distant stage), the survival rate falls to 84% or 24%, respectively. For all stages combined, relative survival rates at 10 and 15 years after diagnosis are 83% and 77%, 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 1991.

Many studies have shown that being overweight adversely affects survival for postmenopausal women with breast cancer. In addition, women who are more physically active are less likely to die from the disease 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)

New cases: An estimated 11,630 new cases are expected to occur among children 0 to 14 years of age in 2013. Childhood cancers are rare, representing less than 1% of all new cancer diagnoses. Overall, childhood cancer incidence rates increased slightly by 0.6% per year from 2005 to 2009, the most recent 5 years of available data.

Deaths: An estimated 1,310 cancer deaths are expected to occur among children 0 to 14 years of age in 2013, about one-third of these from leukemia. Although uncommon, cancer is the second leading cause of death in children, exceeded only by accidents. Mortality rates for childhood cancer have declined by 68% over the past four decades, from 6.5 (per 100,000) in 1969 to 2.1 in 2009. The substantial progress in reducing childhood cancer mortality is largely attributable to improvements in treatment and high rates of participation in clinical trials.

Signs and symptoms: Early symptoms are usually nonspecific. Parents should ensure that children have regular medical checkups and be alert to any unusual, persistent symptoms. Signs of childhood cancer include an unusual mass or swelling; unexplained paleness or loss of energy; a sudden increase in the tendency to bruise or bleed; a persistent, localized pain; a prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision changes; and excessive, rapid weight loss. Major categories of pediatric cancer and more specific symptoms include:

- Leukemia (31% of all childhood cancers, including benign brain tumors), which may be recognized by bone and joint pain, weakness, pale skin, bleeding or bruising, and fever or infection
- Brain and other central nervous system tumors (25%), which may cause headaches, nausea, vomiting, blurred or double vision, dizziness, and difficulty walking or handling objects
- Neuroblastoma (6%), a cancer of the nervous system that is most common in children younger than 5 years of age and usually appears as a swelling in the abdomen
- Wilms tumor (5%), a kidney cancer that may be recognized by a swelling or lump in the abdomen
- Non-Hodgkin lymphoma (4%) and Hodgkin lymphoma (4%), which affect lymph nodes but may involve the bone marrow and other organs, and may cause swelling of lymph nodes in the neck, armpit, or groin, as well as weakness and fever
- Rhabdomyosarcoma (3%), a soft tissue sarcoma that can occur in the head and neck, genitourinary area, trunk, and extremities, and may cause pain and/or a mass or swelling
- Osteosarcoma (3%), a bone cancer that most often occurs in adolescents and commonly appears as sporadic pain in the affected bone that may worsen at night or with activity, with eventual progression to local swelling
- Retinoblastoma (2%), an eye cancer that usually occurs in children younger than 5 years of age and is typically recognized because of discoloration behind the pupil
- Ewing sarcoma (1%), another type of cancer that usually arises in bone, is most common in adolescents, and typically appears as pain at the tumor site.

(Proportions are based on International Classification of Childhood Cancer groupings, including benign brain/central nervous system tumors, and are for all races combined and may vary according to race/ethnicity.)

Treatment: Childhood cancers can be treated by a combination of therapies (surgery, radiation, and chemotherapy) chosen based on the type and stage of cancer. Treatment is coordinated by a team of experts, including pediatric oncologists and nurses, social workers, psychologists, and others who assist children and their families. Because these cancers are uncommon, outcomes are more successful when treatment is managed by specialists at a children's cancer center. If the child is eligible, placement in a clinical trial, which compares a new treatment to the best current treatment, should also be considered.

Survival: Survival for all invasive childhood cancers combined has improved markedly over the past 30 years due to new and improved treatments. The 5-year relative survival rate increased from 58% for diagnoses in the mid-1970s to 83% in the most recent time period (2002-2008). However, rates vary considerably depending on cancer type, patient age, and other characteristics. For the most recent time period (2002-2008), the 5-year survival among children 0-14 years of age with retinoblastoma is 98%; Hodgkin lymphoma, 96%; Wilms tumor, 89%; non-Hodgkin lymphoma, 86%; leukemia, 84%; neuroblastoma, 75%; Ewing tumors, 75%; brain and other central nervous system tumors, 71%; osteosarcoma, 71%; and rhabdomyosarcoma, 68%.

Pediatric cancer patients may experience treatment-related side effects long after active treatment. Late treatment effects include impairment in the function of specific organs, secondary cancers, and cognitive deficits. The Children's Oncology Group (COG) has developed long-term follow-up guidelines for screening and management of late effects in survivors of childhood cancer. For more information on childhood cancer management, see the COG Web site at survivorshipguidelines.org. The Childhood Cancer Survivor Study, which has followed more than 14,000 long-term childhood cancer survivors, has also provided important and valuable information about the late effects of cancer treatment; for more information, visit ccss.stjude.org.

Colon and Rectum

New cases: An estimated 102,480 cases of colon and 40,340 cases of rectal cancer are expected to occur in 2013. Colorectal cancer is the third most common cancer in both men and women. Colorectal cancer 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 2005 to 2009, incidence rates declined by 4.1% per year among adults 50 years of age and older, for whom screening is recommended, and increased by 1.1% per year among those younger than age 50.

Deaths: An estimated 50,830 deaths from colorectal cancer are expected to occur in 2013, accounting for 9% of all cancer deaths. Mortality rates for colorectal cancer have declined in both men and women over the past two decades; from 2005 to 2009, the rate declined by 2.4% per year in men and by 3.1% per year in women. These decreases reflect declining incidence rates and improvements in early detection and treatment.

Signs and symptoms: Early stage colorectal cancer does not typically have symptoms; therefore, screening is usually necessary to detect this cancer in its early stages. Symptoms of advanced disease may include rectal bleeding, blood in the stool, a change in bowel habits, 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 in adults younger than age 50 is especially important due to the increase in colorectal cancer incidence in this age group in recent years.

Risk factors: The risk of colorectal cancer increases with age; 90% of cases are 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 possibly 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, and certain inherited genetic conditions (e.g., Lynch syndrome, also known as hereditary nonpolyposis colorectal cancer, and familial adenomatous polyposis [FAP]). Studies have also found that individuals with type 2 diabetes are at higher risk of colorectal cancer.

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. Study results are mixed about the association between menopausal hormone therapy and colorectal cancer.

Early detection: Beginning at age 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 have become cancerous, as well as detect cancer at an early stage, when treatment may be less extensive and more successful. In 2008, the American Cancer Society collaborated with several other organizations to release updated colorectal cancer screening guidelines. These joint guidelines emphasize cancer prevention and draw a distinction between colorectal screening tests that primarily detect cancer and those that can detect both cancer and precancerous polyps. There are a number of recommended screening options that

vary 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 American Cancer Society's screening guidelines for colorectal cancer, see page 60.

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 or after surgery to most patients whose cancer has penetrated the bowel wall deeply or spread to lymph nodes. Adjuvant chemotherapy (anticancer drugs in addition to surgery or radiation) for colon cancer in otherwise healthy patients 70 years of age and older is equally effective as in younger patients; toxicity in older patients can be limited if certain drugs (e.g., oxaliplatin) are avoided. Several targeted therapies are approved by the FDA to treat metastatic colorectal cancer: bevacizumab (Avastin) and ziv-aflibercept (Zaltrap) block the growth of blood vessels to the tumor, and cetuximab (Erbitux) and panitumumab (Vectibix) block the effects of hormone-like factors that promote cancer growth.

Survival: The 1- and 5-year relative survival rates for persons with colorectal cancer are 84% and 64%, respectively. Survival continues to decline to 58% at 10 years after diagnosis. When colorectal cancers are detected at an early, localized stage, the 5-year survival is 90%; however, only 39% of colorectal cancers are diagnosed at this stage, in part due to the underuse of screening. If the cancer has spread regionally to involve nearby organs or lymph nodes at the time of diagnosis, the 5-year survival drops to 70%. If the disease has spread to distant organs, the 5-year survival is 12%.

Kidney

New cases: An estimated 65,150 new cases of kidney (renal) cancer are expected to be diagnosed in 2013. This estimate includes cancers of the renal pelvis (6%) and Wilms tumor (1%), a childhood cancer that usually develops before age 5 (see Childhood Cancer, page 11). From 2005 to 2009, kidney cancer incidence rates increased by 3.1% per year, primarily due to an increase in early stage disease. Some of the increase in kidney cancer rates, paticularly for early stage disease, may be due to incidental diagnosis during abdominal imaging performed for unrelated issues. Based on the most recent years of data, it appears as though the rate may be reaching a plateau after several decades of increase.

Deaths: An estimated 13,680 deaths from kidney cancer are expected to occur in 2013. Death rates for kidney cancer decreased by 0.5% per year from 2005 to 2009.

Signs and symptoms: Early stage kidney cancer usually has no symptoms. Symptoms that may develop as the tumor progresses include 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 increased 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; hypertension (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 (e.g., in medical procedures) 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).

Early detection: There are no recommended screening tests for 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 control cancer growth by blocking the tumor's blood supply or through other mechanisms and are used to treat metastatic disease.

Survival: The 1- and 5-year relative survival rates for cancers of the kidney are 85% and 71%, respectively. More than half (62%) of cases are diagnosed at the local stage, for which the 5-year relative survival rate is 91%. Five-year survival is lower for renal pelvis (50%) than for renal cell (72%) carcinoma.

Leukemia

New cases: An estimated 48,610 new cases of leukemia are expected in 2013. 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). Almost 90% of leukemia cases are diagnosed in adults 20 years of age and older, among whom the most common types are CLL (38%) and AML (30%). Among children and teens, ALL is most common, accounting for 75% of leukemia cases (see Childhood Cancer, page 11). From 2005 to 2009, overall leukemia incidence rates increased slightly by 0.4% per year.

Probability (%) of Developing Invasive Cancers during Selected Age Intervals by Sex, US, 2007-2009*

		Birth to 39	40 to 59	60 to 69	70 and Older	Birth to Death
All sites†	Male	1.46 (1 in 69)	8.79 (1 in 11)	16.03 (1 in 6)	38.07 (1 in 3)	44.81 (1 in 2)
	Female	2.20 (1 in 46)	9.19 (1 in 11)	10.39 (1 in 10)	26.69 (1 in 4)	38.17 (1 in 3)
Urinary bladder‡	Male	0.02 (1 in 4,924)	0.37 (1 in 272)	0.92 (1 in 109)	3.69 (1 in 27)	3.81 (1 in 26)
	Female	0.01 (1 in 12,663)	0.12 (1 in 864)	0.24 (1 in 410)	0.98 (1 in 106)	1.15 (1 in 87)
Breast	Female	0.50 (1 in 202)	3.78 (1 in 26)	3.56 (1 in 28)	6.65 (1 in 15)	12.38 (1 in 8)
Colon & rectum	Male	0.08 (1 in 1,212)	0.94 (1 in 106)	1.40 (1 in 71)	4.19 (1 in 24)	5.17 (1 in 19)
	Female	0.08 (1 in 1,236)	0.75 (1 in 134)	0.98 (1 in 102)	3.80 (1 in 26)	4.78 (1 in 21)
Leukemia	Male	0.16 (1 in 612)	0.23 (1 in 440)	0.35 (1 in 288)	1.26 (1 in 80)	1.59 (1 in 63)
	Female	0.13 (1 in 746)	0.15 (1 in 655)	0.21 (1 in 481)	0.81 (1 in 123)	1.14 (1 in 88)
Lung & bronchus	Male	0.03 (1 in 3,552)	0.92 (1 in 109)	2.27 (1 in 44)	6.82 (1 in 15)	7.77 (1 in 13)
	Female	0.03 (1 in 3,287)	0.76 (1 in 131)	1.72 (1 in 58)	4.93 (1 in 20)	6.35 (1 in 16)
Melanoma of the skin§	Male	0.15 (1 in 691)	0.63 (1 in 160)	0.77 (1 in 130)	2.02 (1 in 50)	2.87 (1 in 35)
	Female	0.26 (1 in 391)	0.55 (1 in 181)	0.40 (1 in 248)	0.84 (1 in 120)	1.85 (1 in 54)
Non-Hodgkin lymphoma	Male	0.13 (1 in 753)	0.44 (1 in 225)	0.60 (1 in 167)	1.77 (1 in 57)	2.34 (1 in 43)
	Female	0.09 (1 in 1,147)	0.31 (1 in 322)	0.44 (1 in 229)	1.40 (1 in 72)	1.93 (1 in 52)
Prostate	Male	0.01 (1 in 7,964)	2.68 (1 in 37)	6.78 (1 in 15)	12.06 (1 in 8)	16.15 (1 in 6)
Uterine cervix	Female	0.16 (1 in 641)	0.27 (1 in 374)	0.13 (1 in 795)	0.18 (1 in 551)	0.68 (1 in 147)
Uterine corpus	Female	0.07 (1 in 1,348)	0.77 (1 in 129)	0.89 (1 in 112)	1.25 (1 in 80)	2.64 (1 in 38)

*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. ‡Includes invasive and in situ cancers. §Statistic is for whites only.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.6.1. Statistical Research and Applications Branch, National Cancer Institute, 2012. www.srab.cancer.gov/devcan.

American Cancer Society, Surveillance Research, 2013

Deaths: An estimated 23,720 deaths are expected to occur in 2013. Death rates for leukemia have been declining for the past several decades; from 2005 to 2009, rates decreased by 0.8% per year among males and by 1.4% 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 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 risk of several types of leukemia (excluding CLL). Medical radiation, such as that used in cancer treatment, is a substantial source 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 risk of leukemia.

Some factors are most closely associated with specific types of leukemia. Family history is one of the strongest risk factors for CLL. Cigarette smoking is a risk factor for AML, and there is limited evidence that parental smoking and maternal exposure to paint 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), also increases 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: Leukemia can be difficult to diagnose early because symptoms often resemble those of other, less serious conditions. When a physician does suspect leukemia, diagnosis can be made using blood tests and a bone marrow biopsy.

Treatment: Chemotherapy is the most effective method of treating leukemia. Various anticancer drugs are used, either in combination or as single agents. Imatinib (Gleevec), nilotinib (Tasigna), and dasatinib (Sprycel) are very effective drugs that are targeted at the genetic abnormality that is the hallmark of CML. Imatinib and dasatinib are also FDA-approved to treat a type of ALL with 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, stem cell transplantation may be useful in treating certain types of leukemia.

Survival: Survival rates vary substantially by leukemia type, ranging from a 5-year relative survival of 25% for patients diagnosed with AML to 82% 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 2002-2008, the 5-year relative survival rate for ALL increased from 41% to 68% overall, and from 58% to 91% among children. In large part due to the discovery of targeted cancer drugs like imatinib, the 5-year survival rate for CML increased from 31% for cases diagnosed during 1990-1992 to 56% for those diagnosed during 2002-2008.

Liver

New Cases: An estimated 30,640 new cases of liver cancer (including intrahepatic bile duct cancers) are expected to occur in the US during 2013. More than 80% of these cases are hepatocellular carcinoma (HCC), originating from hepatocytes, the predominant liver cell type. Liver cancer incidence rates are three times higher in men than in women. From 2005 to 2009, rates increased by 3.7% per year in men and by 3.0% per year in women.

Deaths: An estimated 21,670 liver cancer deaths (6,780 women, 14,890 men) are expected in 2013. From 2005 to 2009, death rates for liver cancer increased by 2.3% per year in men and 1.3% 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.

Risk factors: In the US and other western countries, alcohol-related cirrhosis, and possibly nonalcoholic fatty liver disease associated with obesity, account for the majority of liver cancer cases. Chronic infections with hepatitis B virus (HBV) and hepatitis C virus (HCV) 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. The HBV vaccination is recommended for all infants at birth; for all children under 18 years of age who were not vaccinated at birth; for adults in high-risk groups (e.g., health care workers and those younger than 60 years who have been diagnosed with diabetes). It is also recommended that all pregnant women be tested for HBV.

There is no vaccine available against HCV, but there are treatments that can clear infection and halt liver disease progression. It is estimated that persons who were born between 1945 and 1965 account for about three-fourths of HCV-infected individuals and HCV-related deaths in the US. Therefore, the Centers for Disease Control and Prevention (CDC) now recommends one-time HCV testing for all persons born from 1945 to 1965 in addition to routine testing for individuals at high risk (e.g., injection drug users). Infected individuals can receive treatment that 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, surgical, and dental procedures; and needle-exchange programs for injecting drug users. For more information on hepatitis infections, including who is at risk, visit the CDC Web site at cdc.gov/hepatitis/.

Other risk factors for liver cancer, particularly in economically developing countries, include 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 proven to improve survival. Nonetheless, many doctors in the US screen high-risk persons (e.g., HCV-infected persons with cirrhosis) with ultrasound or blood tests.

Treatment: Early stage liver cancer can sometimes be successfully treated with surgery in patients with sufficient healthy liver tissue; liver transplantation may also be an option. Surgical treatment of early stage liver cancer is often limited by pre-existing liver disease that has damaged the portion of the liver not affected by cancer. Patients whose tumors cannot be surgically removed may choose ablation (tumor destruction) or embolization, a procedure that cuts off blood flow to the tumor. Fewer treatment options exist for patients diagnosed at an advanced stage of the disease. 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 15%. Forty percent of patients are diagnosed at an early stage, for which 5-year survival is 28%. 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 228,190 new cases of lung cancer are expected in 2013, accounting for about 14% of cancer diagnoses. The incidence rate has been declining in men over the past two decades, but has just recently begun to decrease in women. From 2005 to 2009, lung cancer incidence rates decreased by 1.9% per year in men and by 0.3% per year in women.

Deaths: Lung cancer accounts for more deaths than any other cancer in both men and women. An estimated 159,480 deaths, accounting for about 27% of all cancer deaths, are expected to occur in 2013. Death rates began declining in men in 1991; from 2005 to 2009, rates decreased 2.8% per year. Lung cancer death rates did not begin declining in women until 2003; from 2005 to

2009, rates decreased by 1.0% per year. Gender differences in lung cancer mortality patterns reflect historical differences in the uptake and reduction of cigarette smoking 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, diesel exhaust, and paint. Additional occupational exposures that increase lung cancer risk include rubber manufacturing, paving, roofing, 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: Annual screening with chest x-ray has not been shown to reduce lung cancer mortality. Results from the National Lung Screening Trial (NLST), a clinical trial designed to determine the effectiveness of lung cancer screening in high-risk individuals, showed 20% fewer lung cancer deaths among current and former heavy smokers who were screened with spiral CT compared to standard chest x-ray. However, these study participants had a history of smoking that was the equivalent of at least a pack of cigarettes per day for 30 years, so it is unknown whether these results are relevant for individuals who have smoked less. In addition, the potential risks associated with screening, including the high rate of false positive results, cumulative radiation exposure from multiple CT scans, and unnecessary lung biopsy and surgery, are important considerations. The American Cancer Society (ACS), the National Comprehensive Cancer Network (NCCN), the American College of Chest Physicians (ACCP), and the American Society of Clinical Oncology (ASCO) have all issued initial lung cancer screening guidelines. The ACS, ACCP, and ASCO have endorsed shared decision making with a clinician for adults who meet the eligibility criteria for participation in the NLST, i.e., current and former smokers (quit within previous 15 years) ages 55-74 in good health with at least a 30-year pack history of smoking. The NCCN expands eligibility for adults with additional risk factors for lung cancer. For more information, visit cancer.org/healthy/findcancerearly.

Treatment: Lung cancer is classified as small cell (15%) or non-small cell (84%) for the purposes of treatment. Based on type and stage of cancer, treatments include surgery, radiation therapy, chemotherapy, and targeted therapies such as bevacizumab (Avastin), erlotinib (Tarceva), and crizotinib (Xalkori). For localized non-small cell lung cancers, surgery is usually the treatment of choice; for most of these patients, survival is improved when chemotherapy is given after surgery. Because the disease has usually spread by the time it is discovered, radiation therapy and chemotherapy are often used, sometimes in combination with surgery. 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-year relative survival for lung cancer increased from 37% in 1975-1979 to 44% in 2005-2008, largely due to improvements in surgical techniques and combined therapies. However, the 5-year survival rate for all stages combined is only 16%. Only 15% of lung cancers are diagnosed at a localized stage, for which the 5-year survival rate is 52%. The 5-year survival for small cell lung cancer (6%) is lower than that for non-small cell (18%).

Lymphoma

New cases: An estimated 79,030 new cases of lymphoma will occur in 2013. Lymphoma is cancer of the lymphocytes, a type of white blood cell, and is classified as Hodgkin (9,290 cases in 2013) or non-Hodgkin (69,740 cases in 2013). From 2005 to 2009, incidence rates were stable among men and women for both Hodgkin and non-Hodgkin lymphoma (NHL). (NHL encompasses a wide variety of disease subtypes for which incidence patterns may vary.)

Deaths: An estimated 20,200 deaths from lymphoma will occur in 2013 (Hodgkin lymphoma, 1,180; NHL, 19,020). Death rates for Hodgkin lymphoma have been decreasing for the past four decades; from 2005 to 2009, rates decreased by 2.7% per year. Death rates for NHL began decreasing in the late 1990s; from 2005 to 2009, rates decreased 3.0% per year. Declines in lymphoma death rates reflect improvements in treatment over time.

Signs and symptoms: Symptoms may include swollen lymph nodes, 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. For most cases of lymphoma, the cause is unknown, though various risk factors associated with altered immune function have been identified. Non-Hodgkin lymphoma risk is elevated in persons who receive immune suppressants to prevent organ transplant rejection, in people with severe autoimmune conditions, and in people infected with human immunodeficiency virus (HIV) and human T-cell leukemia virus type I. Epstein Barr virus causes Burkitt lymphoma (an aggressive type of NHL that occurs most often in

Five-year Relative Survival Rates* (%) by Stage at Diagnosis, 2002-2008

	All Stages	Local	Regional	Distant		All Stages	Local	Regional	Distant
Breast (female)	89	98	84	24	Ovary	44	92	72	27
Colon & rectum	64	90	70	12	Pancreas	6	23	9	2
Esophagus	17	38	20	3	Prostate	99	100	100	28
Kidney†	71	91	64	12	Stomach	27	62	28	4
Larynx	61	76	42	35	Testis	95	99	96	73
Liver‡	15	28	10	3	Thyroid	98	100	97	54
Lung & bronchus	16	52	25	4	Urinary bladder§	78	70	33	6
Melanoma of the skin	91	98	62	15	Uterine cervix	68	91	57	16
Oral cavity & pharynx	62	82	57	35	Uterine corpus	82	95	67	16

*Rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 18 areas from 2002-2008, followed through 2009.
†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 by way of lymphatic system; 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, 1975-2009*, National Cancer Institute, Bethesda, MD, www.seer.cancer.gov/csr/1975_2009/, 2012.

American Cancer Society, Surveillance Research 2013

children and young adults) and is associated with a number of autoimmune-related NHLs and some types of Hodgkin lymphoma. *H. pylori* infection increases the risk of gastric lymphoma. A family history of lymphoma and a growing number of common genetic variations are associated with modestly increased risk. Workers in the rubber manufacturing industry are at increased risk of lymphoma, and occupational and environmental exposures to certain chemicals (e.g., solvents such as dichloromethane) may also 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 initial treatment and the recurrence of 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) 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 is 81% and 68%, respectively; survival declines to 57% 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 41,380 new cases of cancer of the oral cavity and pharynx (throat) are expected in 2013. Incidence rates are more than twice as high in men as in women. From 2005 to 2009, incidence rates were stable in men and decreasing by 0.9% annually in women. However, recent studies have shown that incidence is increasing for cancers of the oropharynx that are associated with human papillomavirus (HPV) infection among white men and women.

Deaths: An estimated 7,890 deaths from oral cavity and pharynx cancer are expected in 2013. Death rates have been decreasing over the past three decades; from 2005 to 2009, rates decreased by 1.3% per year in men and by 2.2% per year in women.

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

Risk factors: Known risk factors include all forms of smoked and smokeless tobacco products and excessive consumption of alcohol. Many studies have reported a synergism between smoking and alcohol use, resulting in a more than 30-fold increased risk for individuals who both smoke and drink heavily. HPV infection is associated with cancers of the tonsil, base of 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. Through visual inspection, dentists and primary care physicians can often

Trends in 5-year Relative Survival Rates* (%) by Race, US, 1975-2008

	All races			White			African American		
	1975-77	1987-89	2002-2008	1975-77	1987-89	2002-2008	1975-77	1987-89	2002-2008
All sites	49	56	68†	50	57	69†	39	43	60†
Brain & other nervous system	22	29	35†	22	28	34†	25	32	41†
Breast (female)	75	84	90†	76	85	92†	62	71	78†
Colon	51	61	65†	51	61	66†	45	53	55†
Esophagus	5	10	19†	6	11	21†	3	7	14†
Hodgkin lymphoma	72	79	87†	72	80	88†	70	72	83†
Kidney & renal pelvis	50	57	72†	50	57	72†	49	55	70†
Larynx	66	66	63†	67	67	65	59	56	51
Leukemia	34	43	58†	35	44	59†	33	35	51†
Liver & intrahepatic bile duct	3	5	16†	3	6	16†	2	3	11†
Lung & bronchus	12	13	17†	12	13	17†	11	11	14†
Melanoma of the skin	82	88	93†	82	88	93†	57‡	79‡	70‡
Myeloma	25	28	43†	25	27	43†	30	30	43†
Non-Hodgkin lymphoma	47	51	71†	47	52	72†	48	46	63†
Oral cavity & pharynx	53	54	65†	54	56	67†	36	34	45†
Ovary	36	38	43†	35	38	43†	42	34	36
Pancreas	2	4	6†	3	3	6†	2	6	5†
Prostate	68	83	100†	69	85	100†	61	72	98†
Rectum	48	58	68†	48	59	69†	45	52	61†
Stomach	15	20	28†	14	19	27†	16	19	28†
Testis	83	95	96†	83	96	97†	73‡#	88‡	89
Thyroid	92	95	98†	92	94	98†	90	92	96†
Urinary bladder	73	79	80†	74	80	81†	50	63	62†
Uterine cervix	69	70	69	70	73	70	65	57	61
Uterine corpus	87	83	83†	88	84	85†	60	57	63

*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 2002 to 2008, all followed through 2009. †The difference in rates between 1975-1977 and 2002-2008 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, 1975-2009*, National Cancer Institute, Bethesda, MD. seer.cancer.gov/csr/1975_2009/, 2012.

American Cancer Society, Surveillance Research, 2013

detect premalignant abnormalities and cancer at an early stage, when treatment is 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 84% of persons with oral cavity and pharynx cancer survive 1 year after diagnosis. The 5-year and 10-year relative survival rates are 62% and 51%, respectively.

Ovary

New cases: An estimated 22,240 new cases of ovarian cancer are expected in the US in 2013. Ovarian cancer accounts for about 3% of all cancers among women. From 2005 to 2009, incidence rates decreased by 0.9% per year.

Deaths: An estimated 14,030 deaths are expected in 2013. Ovarian cancer accounts for 5% of cancer deaths among women and causes more deaths than any other cancer of the female reproductive system. The death rate for ovarian cancer decreased by 2.0% per year from 2005 to 2009.

Signs and symptoms: Early ovarian cancer usually has no obvious symptoms. However, studies have indicated that some women may 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 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 developing ovarian cancer; hysterectomy (with retention of the ovaries) also appears to decrease risk.

Early detection: There is currently no sufficiently accurate screening test for the early detection of ovarian cancer. Pelvic examination only occasionally detects ovarian cancer, generally when the disease is advanced. However, for women who are at high risk of ovarian cancer, the combination of a thorough pelvic exam, 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. A pelvic exam, sometimes in combination with a transvaginal ultrasound, may be used to evaluate women with symptoms. 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.

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 wish to have children, only the involved 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 by age; women younger than 65 are twice as likely to survive 5 years (56%) following diagnosis as women 65 and older (27%). Overall, the 1-, 5-, and 10-year relative survival of ovarian cancer patients is 75%, 44%, and 34%, 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 women with regional and distant disease, 5-year survival rates are 72% and 27%, respectively.

Pancreas

Please see page 25 for the special section on pancreatic cancer.

Prostate

New cases: An estimated 238,590 new cases of prostate cancer will occur in the US during 2013. Prostate cancer is the most frequently diagnosed cancer in men aside from skin cancer. For reasons that remain unclear, incidence rates are 70% higher in African Americans than in 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 prostate cancer screening with the prostate-specific antigen (PSA) blood test. From 2005 to 2009, incidence rates decreased by 1.9% per year.

Deaths: With an estimated 29,720 deaths in 2013, prostate cancer is the second-leading cause of cancer death in men. Prostate cancer death rates have been decreasing since the early 1990s in both African Americans and whites, though they remain more than twice as high in African Americans as in whites. The higher death rate among African Americans is mostly due to higher incidence rates, but also because African American men are more likely to die from prostate cancer than are white men. Prostate cancer death rates decreased 3.4% per year in white men and 3.5% per year in African American men from 2005 to 2009.

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, and a family history of the disease. 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 Jamaican men of African descent have the highest documented prostate cancer incidence

rates in the world. The disease is common in North America and northwestern Europe, but less common in Asia and South America. Genetic studies suggest that strong familial predisposition may be responsible for 5%-10% of prostate cancers. Recent studies suggest that a diet high in processed meat or dairy foods may be a risk factor, and obesity appears to increase risk of aggressive prostate cancer. There is some evidence that occupational exposures of firefighters (e.g., toxic combustion products) moderately 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 already used to treat the symptoms of benign prostate enlargement. Both drugs have been found to lower the risk of prostate cancer by about 25% in large clinical trials with similar potential side effects, including reduced libido and risk of erectile dysfunction. However, it is not entirely clear which men are most likely to gain benefit from prophylactic treatment with these agents and an advisory committee to the FDA has recommended against approval for both finasteride and dutasteride for the prevention of prostate cancer based on risk-benefit analyses.

Early detection: At this time, there are insufficient data to recommend for or against routine testing for early prostate cancer detection with the PSA test. The American Cancer Society recommends that beginning at age 50, men who are at average risk of prostate cancer and have a life expectancy of at least 10 years receive information about the potential benefits and known limitations associated with testing for early prostate cancer detection and have an opportunity to make an informed decision about testing. Men at high risk of developing prostate cancer (African Americans or men with a close relative diagnosed with prostate cancer before age 65) should have this discussion with their health care provider beginning at age 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 age 40. All men should be given sufficient information about the benefits and limitations of testing and early detection to allow them to make a decision based on their personal values and preferences.

Results from clinical trials designed to determine the efficacy of PSA testing for reducing prostate cancer deaths have been mixed; two European studies found a lower risk of death from prostate cancer among men receiving PSA screening while a study in the US found no reduction. Current research is exploring new biologic markers for prostate cancer, as well as alternative ages of screening initiation and timing of testing, with the goal of identifying and treating men at highest risk for aggressive disease while minimizing unnecessary testing and treatment of men at low risk for prostate cancer death. See page 62 for the American Cancer Society's screening guidelines for the early detection of prostate cancer.

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). Surgery (open, laparoscopic, or robotic-assisted), external beam radiation, or radioactive seed implants (brachytherapy) may be used to treat early stage disease. 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 before or after surgery may be indicated in some cases. All of these treatments may impact a man's quality of life through side effects or complications that include urinary and erectile difficulties. 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.

Hormonal therapy, chemotherapy, radiation, or a combination of these treatments is used to treat more advanced disease. 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 chemotherapy.

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 98% and 93%, 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., nonmelanoma skin cancers, or NMSC) is difficult to estimate because these cases are not required to be reported to cancer registries. One report on NMSC occurrence in the US estimated that 3.5 million cases were diagnosed and 2.2 million people were treated for the disease in 2006, with some patients having multiple diagnoses. Most cases of these forms of skin cancer are highly curable. Melanoma is expected to be diagnosed in

about 76,690 persons in 2013, accounting for less than 5% of all skin cancer cases but the vast majority of skin cancer deaths. Melanoma is rare among African Americans; the lifetime risk of developing melanoma is 23 times higher among whites than among African Americans. Although before age 40, the incidence rate in women is twice that in men, after 40, the rate is higher in men; among those 80 and older, the rate in men is three times that in women. Melanoma incidence rates have been increasing for at least 30 years. From 2005 to 2009, incidence rates among whites increased by 2.8% per year.

Deaths: An estimated 12,650 deaths (9,480 from melanoma and 3,170 from other nonepithelial skin cancers) will occur in 2013. The death rate for melanoma has been declining rapidly in whites younger than 50 years of age; from 2005 to 2009, rates decreased by 2.8% per year in men and by 2.0% per year in women. In contrast, among whites 50 years of age and older, death rates increased by 1.1% per year in men and were stable in women during this same time period.

Signs and symptoms: Important warning signs of melanoma include changes in size, shape, or color of a mole or other skin lesion or the appearance of a new growth on the skin. 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 carcinoma may appear as growing lumps, often with a rough surface, or as flat, reddish patches that grow slowly. Another sign of skin cancers is a sore that doesn't heal.

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 or numerous moles (more than 50). Other risk factors for all types of skin cancer include sun sensitivity (sunburning easily, difficulty tanning, natural blond or red hair color); a history of excessive sun exposure, including sunburns; use of tanning booths; diseases that suppress the immune system; and a past history of skin cancer.

Prevention: Skin should be protected from intense sun exposure by covering with 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 risk of melanoma in later life. Tanning beds and sun lamps, which provide an additional source of UV radiation, are associated with cancer risk and should be avoided. In 2009, the International Agency for Research on Cancer upgraded their classification of indoor tanning devices from "probably carcinogenic" to "carcinogenic to humans" after a reassessment of the scientific evidence.

Early detection: At this time, the best way to detect skin cancer early is to recognize changes in skin growths, including the appearance of new growths. Adults should periodically examine their skin and be aware of any changes. 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: Removal and microscopic examination of all suspicious skin lesions are essential. Early stage basal cell and squamous cell cancers can be removed 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, immunotherapy, and/or chemotherapy, and sometimes radiation therapy. The targeted drug vemurafenib (Zelboraf) and the immunotherapy drug ipilimumab (Yervoy) have recently been approved by the FDA based on improved survival in people with advanced melanoma.

Survival: Most basal cell and squamous cell cancers 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 other skin tumors to spread to other parts of the body. The 5- and 10-year relative survival rates for persons 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 15% for regional and distant stage disease, respectively.

Thyroid

New cases: An estimated 60,220 new cases of thyroid cancer are expected to be diagnosed in 2013 in the US, with 3 in 4 cases occurring in women. The incidence rate of thyroid cancer has been increasing sharply since the mid-1990s, and it is the fastest-

increasing cancer in both men and women. From 2005 to 2009, incidence rates increased by 5.6% per year in men and 7.0% per year in women.

Deaths: An estimated 1,850 deaths from thyroid cancer are expected in 2013 in the US. From 2005 to 2009, 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 or 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.

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 related to medical treatment during childhood. Radiation exposure as a result of radioactive fallout from atomic weapons testing and nuclear power plant accidents, such as Chernobyl, has also been linked to increased risk of thyroid cancer, especially in children. 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 cancer patients are under 65 years of age.

Early detection: At present, there is no screening test recommended for the early detection of thyroid cancer in people without symptoms. However, because symptoms usually develop early, most thyroid cancers (68%) are diagnosed at an early stage. Tests used in the evaluation of thyroid nodules include: blood tests to determine levels of hormones related to normal functions of the thyroid gland; medical imaging techniques to determine the size and characteristics of the nodule and nearby lymph nodes; and biopsy to determine if the cells in the nodule are benign or malignant.

Treatment: Most thyroid cancers are highly curable, though about 5% of cases (medullary and anaplastic) 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 surgery in nearly all cases. Total or partial removal of the thyroid gland (thyroidectomy), with or without lymph node removal, is recommended for most patients. 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 5-year relative survival rate for all thyroid cancer patients 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 54% for distant stage disease. For all stages combined, survival is highest for patients younger than 45 years of age (almost 100%), and progressively decreases to 83% for those 75 or older.

Urinary Bladder

New cases: An estimated 72,570 new cases of bladder cancer are expected to occur in 2013. From 2005 to 2009, bladder cancer incidence rates were stable in men and decreased by 1.3% 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 15,210 deaths will occur in 2013. From 2005 to 2009, death rates were stable in men and decreasing by 0.6% per year in women.

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

Risk factors: Smoking is the most well-established risk factor for bladder cancer. Smokers' risk of bladder cancer is approximately four-fold that of nonsmokers', and smoking is estimated to cause about half of all bladder cancer cases in both men and women. Workers in the dye, rubber, leather, and aluminum industries, painters, and people who live in communities with high levels of arsenic in the drinking water 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, due to occupational exposure or certain bladder birth defects, and 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 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 65% 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 staged disease, 5-year survival is 33% and 6%, respectively.

Uterine Cervix

New cases: An estimated 12,340 cases of invasive cervical cancer are expected to be diagnosed in 2013. Large declines in incidence rates over most of the past several decades have begun to taper off, particularly among younger women; from 2005 to 2009, rates were stable in women younger than 50 years and decreased by 3.0% per year in women 50 and older.

Deaths: An estimated 4,030 deaths from cervical cancer are expected in 2013. Mortality rates declined rapidly in past decades due to prevention and early detection as a result of screening with the Pap test, but have begun to level off in recent years. From 2005 to 2009, rates were stable among both women younger than 50, and among those 50 years and older.

Signs and symptoms: Symptoms usually do not appear until abnormal cervical cells become cancerous and invade nearby tissue. When this happens, 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: The cause of cervical cancer is 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 typically cleared successfully by the immune system; only rarely does the infection persist and result in cervical cancer. Persistence of HPV infection and progression to cancer may be influenced by many factors, including a suppressed immune system, high parity (number of 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) approved for use in females 9 to 26 years of age for the prevention of the most common types of HPV infection that cause cervical cancer. Gardasil is also approved for the prevention of anal, vaginal, and vulvar cancers (and precancers) in women and for the prevention of anal and penile cancers in males 9 to 26 years of age; approximately 90% of anal cancers have been linked to HPV infection. These vaccines may also protect against HPV-related head and neck cancers, which have been increasing in recent years. HPV vaccines cannot protect against established infections, nor do they protect against all types of HPV.

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 abnormal cells are present (false positive). HPV tests, which detect types of HPV 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. Fortunately, most cervical precancers develop slowly, so most cancers can 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 cancer, cervical cancer screening can detect cancer early, when treatment is most successful. It is important that all eligible women be screened according to guidelines; most cervical cancers are detected in women who have never or 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 ages 21 years through 65 years and the preferred screening method for women 30 to 65 years 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 60.

Treatment: Preinvasive lesions may be treated by electrocoagulation (the destruction of tissue through intense heat by electric current), cryotherapy (the destruction of cells by extreme cold), laser ablation, or local surgery. Invasive cervical cancers are generally treated with surgery, radiation, or both, and with chemotherapy in selected cases.

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 disease is 91%. Cervical cancer is diagnosed at an early stage more often in whites (49%) than in African Americans (40%) 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 49,560 cases of cancer of the uterine corpus (body of the uterus) are expected to be diagnosed in 2013. These usually occur in the endometrium (lining of the uterus). From 2005 to 2009, incidence rates of endometrial cancer were stable in white women, but increasing in African American women by 2.2% per year.

Deaths: An estimated 8,190 deaths are expected in 2013. Death rates for cancer of the uterine corpus were stable in white women, but increasing slightly (by 0.4% per year) in African American women from 2005 to 2009.

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 greater 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 (without use of progestin), 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 (HNPCC), and diabetes. Pregnancy, use of oral contraceptives or intrauterine devices, and physical activity provide protection against endometrial cancer.

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%, 67%, or 16%, if the cancer is diagnosed at a local, regional, or distant stage, respectively. Relative survival in whites exceeds that for African Americans by more than 8 percentage points at every stage of diagnosis.

Special Section: Pancreatic Cancer

Cancer of the pancreas is one of the deadliest cancer types. Most pancreatic cancer patients will die within the first year of diagnosis, and just 6% will survive five years. Over the past decade, pancreatic cancer death rates have been slowly increasing among US men and women, in contrast to the downward trend in rates for most other major cancer sites, such as lung, colorectum, female breast, and prostate. The lack of progress in primary prevention, early diagnosis, and treatment underscores the need for additional efforts in pancreatic cancer research and has motivated us to address this disease in the current edition of *Cancer Facts & Figures*. Specifically, this special section provides updated information on occurrence, prevention, early detection, diagnosis, and treatment of pancreatic cancer. This information is intended to inform anyone interested in learning more about pancreatic cancer, including policy makers, researchers, clinicians, cancer control advocates, patients, and caregivers.

The pancreas contains two types of glands that each perform very different functions. The exocrine glands produce enzymes that help digest food; the endocrine glands produce important hormones such as insulin, which regulates blood sugar levels. Exocrine and endocrine cells form completely different types of tumors with distinct risk factors, symptoms, diagnostic tests, treatment, and survival rates. Exocrine tumors are the focus of this special section because they are by far the most common type of pancreatic cancer, representing about 95% of cases.

How Many Cases and Deaths Are Estimated to Occur in 2013?

Pancreatic cancer is the 10th most common cancer diagnosis among men and the 9th most common among women in the US. In 2013, an estimated 45,220 new cases of pancreatic cancer will be diagnosed nationwide.

Pancreatic cancer accounts for about 7% of all cancer deaths and ranks fourth as a cause of cancer death among both men and women in the US. In 2013, approximately 38,460 people are expected to die from pancreatic cancer nationwide.

Who Gets Pancreatic Cancer?

Sex

- Pancreatic cancer is about 30% more common in men than in women. During 2005-2009, the age-adjusted incidence rate (per 100,000 persons) of pancreatic cancer was 13.6 for men and 10.5 for women.
- The lifetime risk of developing pancreatic cancer is about 1.5% for both men and women (Table 1).
- Men are more likely than women to develop pancreatic cancer at every age after 35 years (Figure 1a, page 26).
- During 2005-2009, the age-adjusted death rate (per 100,000 persons) for pancreatic cancer was 12.5 for men and 9.5 for women.

Age

- Pancreatic cancer incidence and death rates increase with advancing age, with a steep increase after about age 50.
- During 2005-2009, the incidence rate (per 100,000) in men was 1.2 among those 35 to 39 years of age compared to 100.5 among those 85 years and older; in women the rate was 1.0 among those 35 to 39 years of age compared to 87.7 among those 85 years and older (Figure 1a, page 26).
- During 2005-2009, the median age at diagnosis of pancreatic cancer was 71 years of age. This means that about half of all patients developed this disease when they were older than age 71.
- The likelihood of developing pancreatic cancer in the next 10 years is about four times higher at age 70 than at age 50 (Table 1).

Race/Ethnicity

- Pancreatic cancer incidence and mortality rates vary across different racial/ethnic groups, with the highest rates in African Americans and the lowest rates in Asian Americans/Pacific Islanders (Figure 2, page 27).
- Incidence rates are higher in African Americans than in whites at every age (Figure 1b, page 26).
- During 2005-2009, the incidence rate (per 100,000 persons) was 15.3 for African Americans, 11.6 for whites, and 8.8 for Asian Americans/Pacific Islanders.

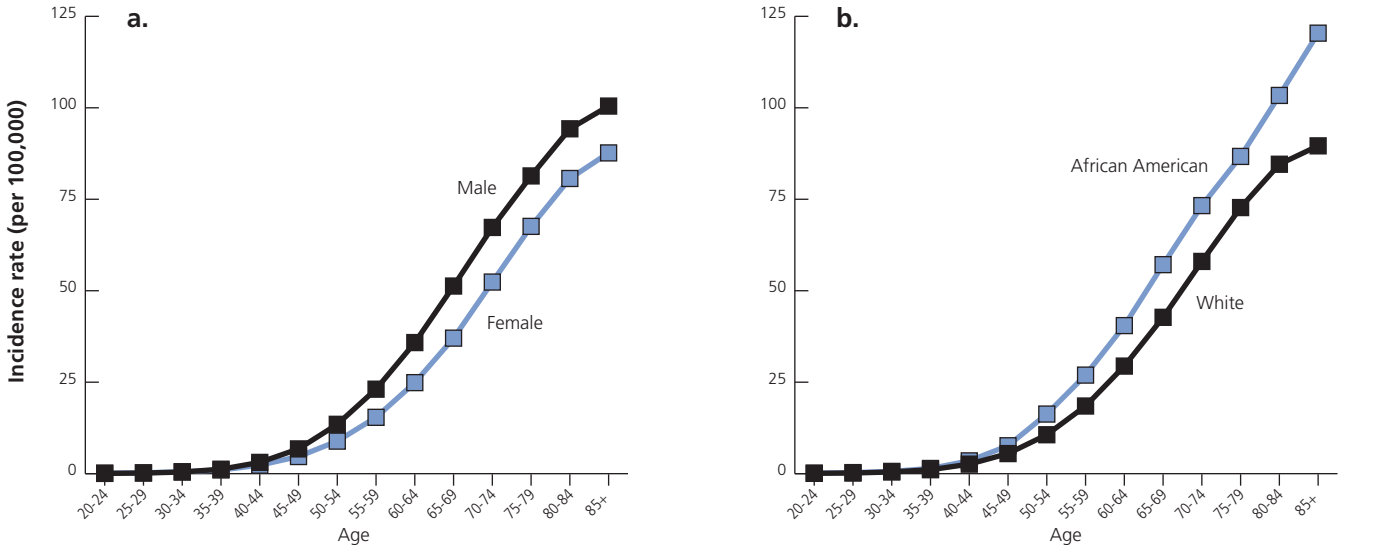
Table 1. Probability (%) of Developing Pancreatic Cancer over Selected Age Intervals by Sex, US, 2007-2009*

Age	Male	Female
0 to 39	0.01 (1 in 9,746)	0.01 (1 in 9,479)
40-49	0.05 (1 in 2,063)	0.04 (1 in 2,674)
50-59	0.18 (1 in 563)	0.12 (1 in 843)
60-69	0.41 (1 in 241)	0.30 (1 in 335)
70-79	0.65 (1 in 155)	0.56 (1 in 179)
Lifetime risk	1.48 (1 in 67)	1.45 (1 in 69)

*For people free of cancer at beginning of age interval. Percentages and "1 in" numbers may not be equivalent due to rounding.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.6.1. Statistical Research and Applications Branch, National Cancer Institute, 2012.srab.cancer.gov/devcan.

Figure 1. Pancreatic Cancer Incidence Rates* by Age and Sex (a) and Age and Race (b), US, 2005-2009.



*Age adjusted to the 2000 US standard population.
Source: North American Association of Central Cancer Registries (NAACCR). Data are collected by cancer registries participating in NCI's SEER program and CDC's National Program of Cancer Registries.

American Cancer Society, Surveillance Research, 2013

- Mortality rates (per 100,000 persons) during the corresponding time interval were 13.8, 10.7, and 7.5 for African Americans, whites, and Asian American/Pacific Islanders, respectively.
- Racial differences in pancreatic cancer rates are largely explained by established risk factors, such as cigarette smoking, obesity, and diabetes.[1]

Socioeconomic status

Number of years of education is one measure of socioeconomic status used by researchers to study health disparities.

- Pancreatic cancer death rates are higher among those with fewer years of education.
- One study found that in 2007, the pancreatic cancer death rate among non-Hispanic white men 25 to 64 years of age was about 80% higher for those with 12 or fewer years of education than for those with 16 or more years of education; among non-Hispanic white women, the death rate for the less-educated group was double that of the most educated.[2]
- This study also found that from 1993 to 2007, pancreatic cancer death rates among non-Hispanic white men and women 25 to 64 years of age increased among those with the least education, but remained stable among those with the most education.[2]
- Another study found that low income was associated with an 80% increased risk of pancreatic cancer in white men and a 170% increased risk in African American men after accounting for differences in smoking, dietary factors, and heavy alcohol drinking.[1]

Are There Geographic Differences in Pancreatic Cancer in the US?

- Despite substantial international variation, within the US, pancreatic cancer incidence and mortality rates vary only slightly between states.
- Among whites, pancreatic cancer death rates are highest in the Northeast, and range from 8.4 (per 100,000) in the District of Columbia to 12.1 in Connecticut (Figure 3, page 28).
- Among African Americans, death rates are highest in the Midwest, and range from 7.8 (per 100,000) in West Virginia to 18.9 in Iowa (Figure 3, page 28).

How Has the Occurrence of Pancreatic Cancer Changed over Time?

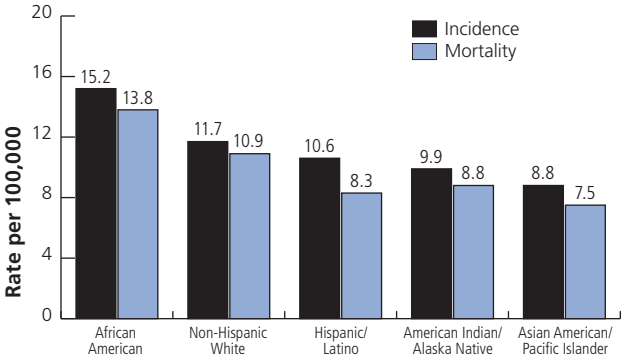
Incidence trends

During the past 10 years of data (2000-2009), for which we have coverage for almost the entire US, pancreatic cancer incidence rates increased by 0.9% per year among white men, white women, and African American men, while rates remained stable for African American women and men and women of all other major racial and ethnic groups.[3]

Mortality trends

Although the pancreatic cancer death rate increased for the overall US over the past 10 years of data (2000-2009), this increase was confined to white men and women (by 0.5% per year) and Asian American and Pacific Islander men (by 1.0% per year).[3]

Figure 2. Pancreatic Cancer Incidence and Mortality Rates* by Race and Ethnicity†, US, 2005-2009.



*Per 100,000, age adjusted to the 2000 US standard population. †Persons of Hispanic/Latino origin may be of any race.
Sources: Incidence: North American Association of Central Cancer Registries (NAACCR) data; Mortality: US mortality data, National Center for Health Statistics, Centers for Disease Control and Prevention. Data for American Indians/Alaska Natives are based on Contract Health Service Delivery Area (CHSDA) counties.

American Cancer Society, Surveillance Research, 2013

Can Pancreatic Cancer Be Prevented?

The causes of pancreatic cancer are not well understood, though there are several factors known to increase risk. Known modifiable risk factors include obesity, cigarette smoking, and other forms of tobacco use. Risk factors that are not modifiable include a family history of pancreatic cancer and certain inherited syndromes. Strategies for preventing pancreatic cancer include not smoking and maintaining normal body weight. Consuming adequate quantities of fruits and vegetables may also have a preventive effect, although strong evidence for this association is lacking.

Modifiable Risk Factors

Tobacco use

Tobacco use is the most important known risk factor for pancreatic cancer; approximately 20% of pancreatic cancers are attributable to cigarette smoking.[4] The risk of developing pancreatic cancer is about twice as high among smokers as among never smokers;[5] risk increases with greater tobacco use and longer duration of smoking.[6,7] Cigar and pipe smoking also increase risk.[8,9] Quitting smoking rapidly reduces the risk of pancreatic cancer; after 5-10 years of cessation, the risk among former smokers returns to that of never smokers.[4,10] Use of smokeless tobacco products also increases the risk of pancreatic cancer.[11] Evidence on secondhand smoke exposure and pancreatic cancer is inconsistent.[12]

Obesity and physical activity

Obesity has also been fairly consistently linked to increased risk of pancreatic cancer. Obese individuals have a 20% higher risk of developing pancreatic cancer than those who are normal weight.[13-15] Being obese during early adulthood may be associated with an even greater risk of pancreatic cancer and a younger age of disease onset.[16] Abdominal obesity may increase risk independent of general obesity, especially in women.[15,17]

Results regarding the association between physical activity and pancreatic cancer risk are mixed.[14,18-21] A slightly decreased risk of pancreatic cancer was linked to total and occupational physical activity in a recent literature review[22] but not in a previous one.[23] There is currently limited evidence to support a protective effect of recreational physical activity on risk of pancreatic cancer.[22]

Alcohol use

Whether alcohol use causes pancreatic cancer remains to be determined. A positive association between alcohol use and pancreatic cancer was found in several but not all studies.[24] Accumulating evidence suggests that a moderate increased risk is limited to heavy alcohol users.[25] A recent meta-analysis showed that consumption of three or more drinks of alcohol per day is associated with a 20% to 30% increased risk of pancreatic cancer.[25] However, due to the strong relationship between alcohol consumption and tobacco use, it is difficult to eliminate the effect of smoking when studying the association between alcohol drinking and pancreatic cancer risk.

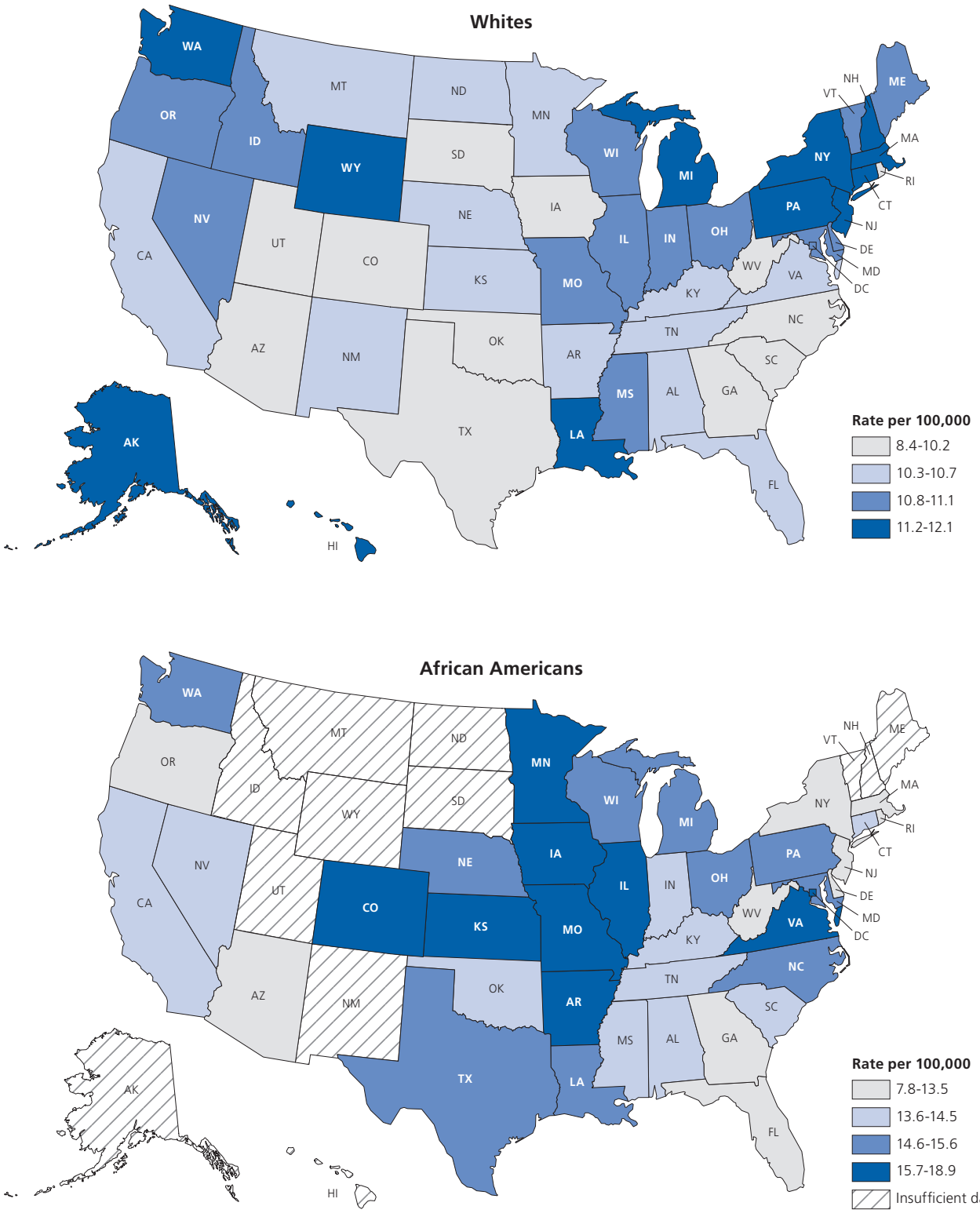
Dietary factors

A number of dietary factors have been assessed regarding their association with pancreatic cancer risk. There is some evidence that the consumption of red and processed meat may slightly increase risk.[26] Investigators have also found some evidence for increased risk among those who consume meat that has been cooked at very high temperatures.[27] A protective effect of folate intake on pancreatic cancer risk has been reported in several studies;[28] however, a recent large analysis found no association.[29] At present, there is limited evidence supporting a protective effect of fruit and vegetable consumption on the risk of pancreatic cancer.[30-33] No association between coffee consumption and pancreatic cancer was found in a recent analysis that combined many studies.[34]

Sunlight and vitamin D

Studies are conflicting about the relationship between sunlight, vitamin D, and pancreatic cancer. Several studies have found that sun exposure is associated with lower pancreatic cancer death rates, suggesting that vitamin D, acquired primarily through sun exposure to the skin, may be protective against pancreatic cancer.[35-37] However, results from epidemiological studies that assessed individual-level vitamin D intake and pancreatic cancer risk have been inconsistent. Two large studies found that both dietary vitamin D and vitamin D derived from both diet and sunlight exposure are protective.[38,39] Conversely, a recently published analysis found that while there was no association between low levels of vitamin D and pancreatic cancer, high vitamin D levels were associated with an increased risk of pancreatic cancer.[40]

Figure 3. Geographic Patterns in Pancreatic Cancer Death Rates* by State and Race, US, 2005-2009.



*Age adjusted to the 2000 US standard population. Insufficient data indicates states with fewer than 20 deaths.

Source: US mortality data, National Center for Health Statistics, Centers for Disease Control and Prevention.

American Cancer Society, Surveillance Research, 2013

Non-modifiable Factors and Medical Conditions

Family history

A number of studies have linked family history to an increased risk of pancreatic cancer. Generally, individuals with a family history of pancreatic cancer have a nearly 2-fold increased risk for developing pancreatic cancer, compared to those without such a history.[41] The risk increases to 7- to 9-fold for individuals with at least 1 first-degree relative (a parent or sibling) with pancreatic cancer and 17- to 32-fold for individuals with 3 or more first-degree relatives with pancreatic cancer.[42,43] Risk is also increased if a first-degree relative was diagnosed with pancreatic cancer before age 50.[43]

Genetic factors

Genetic factors (factors related to gene variations or alterations) account for approximately 5% to 10% of all pancreatic cancer cases.[44,45] There are several gene mutations that are associated with an increased risk of pancreatic cancer, though these are extremely rare in the general population.[46,47] Mutations in the *BRCA2* gene are associated with a 3- to 10-fold increased risk of pancreatic cancer and account for the highest proportion (5% to 17%) of known causes of inherited pancreatic cancer.[48-50] Mutations in the CDKN2A gene, which are linked to the familial atypical multiple mole-melanoma (FAMMM) syndrome, are associated with an approximately 13- to 22-fold increased risk of pancreatic cancer.[51] Patients with Peutz-Jeghers Syndrome (PJS), which is usually caused by STK11 mutations, have an 11% to 36% chance of developing pancreatic cancer during their lifetime.[52,53] The risk among people with hereditary pancreatitis (inflammation of the pancreas) linked to PRSS1 mutations is approximately 70 times greater than that expected in the normal population, with lifetime risk of developing pancreatic cancer approximately 40% to 55%.[54] Patients with hereditary non-polyposis colorectal cancer (HNPCC or Lynch syndrome), which is most often caused by MLH1 or MSH2 mutations, have about a 9-fold increased risk of developing pancreatic cancer.[45,55] Recent studies have found that people with non-O blood groups (i.e., blood groups A, AB, and B) have a slightly increased risk of pancreatic cancer, though the mechanisms of this association are still unclear.[56-58]

Chronic pancreatitis (inflammation of the pancreas)

Accumulating evidence suggests that long-standing chronic pancreatitis is a strong risk factor for pancreatic cancer, though pancreatitis may also be an early indicator of pancreatic cancer.[54,59,60] After excluding the pancreatic cancer cases diagnosed within 2 years from chronic pancreatitis diagnosis, a review study reported a 6-fold increased risk of pancreatic cancer among patients with chronic pancreatitis.[54] The risk is especially strong in patients with rare types of pancreatitis, such as hereditary pancreatitis and tropical pancreatitis. The lag period between pancreatitis diagnosis and pancreatic cancer onset is usually about 10 to 20 years. Despite the strong association between chronic pancreatitis and pancreatic cancer, chronic pancreatitis is uncommon; moreover, only about 4% of these patients will develop pancreatic cancer within 20 years of diagnosis.[59]

Diabetes

About 25% of patients with pancreatic cancer have diabetes mellitus at diagnosis, and roughly another 40% have pre-diabetes (higher than normal blood glucose levels).[61,62] Compared with non-diabetic individuals, patients with long-term (≥ 5 years) type-II diabetes have a 50% increased risk of pancreatic cancer.[63] Pancreatic cancer can cause diabetes, and sometimes diabetes is an early sign of the tumor.[62] Elevated pancreatic cancer risk has also been reported among individuals with type-I diabetes.[64] Recent reports also suggest that hyperglycemia (high blood glucose), abnormal glucose metabolism, and insulin resistance are associated with increased risk of pancreatic cancer.[65-69]

Infection and other medical conditions

Several studies have detected an increased risk of pancreatic cancer among people with chronic infections with hepatitis B virus, hepatitis C virus,[70,71] and *Helicobacter pylori*.[72] Individuals with a history of cholecystectomy (surgical removal of the gallbladder)[73] or partial gastrectomy (partial surgical removal of the stomach)[74] have also been found to be at increased risk of developing pancreatic cancer. Other medical conditions that may increase risk include cystic fibrosis[75] and periodontal disease.[76]

Can Pancreatic Cancer Be Detected Early?

Early stage pancreatic cancer usually has no symptoms. When symptoms do occur, the tumor has usually spread to surrounding tissues or distant organs. Common symptoms of pancreatic cancer include mild abdominal discomfort, mid-back pain, jaundice (yellowing of the skin or whites of the eyes), and weight loss. Nausea and vomiting may occur among patients with more advanced disease. In the US, only about 15% to 20% of pancreatic cancer cases are diagnosed early enough to be eligible for surgery.

To date, there is no single, reliable test for the early detection of pancreatic cancer; therefore, screening the general population is not recommended by any health agency.[77] Existing screening programs have been limited to research settings with a focus on detecting precancerous lesions among high-risk individuals.[78]

The most frequently tested techniques for pancreatic cancer screening include endoscopic ultrasound (EUS), helical computed tomography (CT), magnetic resonance imaging (MRI), and endoscopic retrograde cholangiopancreatography (ERCP). Single use of EUS or various combinations of these imaging techniques are capable of detecting early pancreatic cancer or precancer in high-risk patients, such as those with chronic, hereditary, or tropical pancreatitis; Peutz-Jeghers syndrome; cystic fibrosis; or familial atypical multiple mole-melanoma.[79-81] However, it remains unclear whether screening high-risk populations is effective in

Table 2. Median Pancreatic Cancer Survival by Stage at Diagnosis

Stage	Median Survival*
IA	24.1 Months
IB	20.6 Months
IIA	15.4 Months
IIB	12.7 Months
III	10.6 Months
IV	4.5 Months

*Data from Bilimoria et al.[84]

reducing pancreatic cancer mortality. Therefore, pancreatic cancer screening should currently be limited to high-risk populations within a research setting.[78] Recent advances in understanding the molecular basis of cancer offer promise for the discovery of new methods for detecting pancreatic cancer early.

How Is Pancreatic Cancer Diagnosed?

When pancreatic cancer is suspected, patients will be asked to provide a full medical history and be given a physical exam mainly focused on the abdomen, but also of the skin and eyes for indications of jaundice (yellow coloring). Pancreatic cancer is typically diagnosed with the use of an imaging test, usually a CT scan, often with a contrast dye, given by mouth or through injection, to better outline abnormal areas.[46,82] This procedure is also often used to stage the tumor, with 70% to 85% accuracy for predicting whether or not the tumor can be surgically removed. If pancreatic cancer is highly suspected but a CT scan appears normal, additional diagnostic tests, such as endoscopic ultrasound or ERCP, may be performed. The ERCP technique is especially useful in patients with bile duct tumors[83] and endoscopic ultrasound can often detect small tumors missed by CT scan. A cancer diagnosis is typically confirmed with a biopsy – a procedure in which a small sample of the tumor is removed and viewed under a microscope. The most common type of biopsy to confirm pancreatic cancer is called a fine needle aspiration biopsy. The needle is inserted into the pancreas guided by an endoscopic ultrasound or CT scan images to obtain tissues for evaluation. However, a tissue diagnosis is not needed for patients who are scheduled for surgery. Due to the deep location of the pancreas and the medical complications of biopsy, pancreatic cancer is the least likely of all major cancers to be microscopically confirmed.

What Factors Influence Pancreatic Cancer Survival?

The prognosis (disease course and expected outcome) of pancreatic cancer is largely determined by the stage of disease at diagnosis, which is based on the tumor's size, whether there is lymph node involvement, and the extent of spread locally and to distant organs. Table 2 presents the characteristics and median survival time for each stage of invasive pancreatic cancer. The median survival ranges from 4.5 months for the most advanced stage to 24.1 months for the earliest stage.[84]

At present, surgery provides the only chance of prolonged survival for pancreatic cancer patients. Even for patients with a tumor that has been surgically removed (generally Stages I or II), the 5-year survival is only about 20% to 25%. Indications of a poor survival outcome include positive resection margins (cancer cells at the outer edge of the removed tissue), poor tumor differentiation (the tumor does not resemble pancreatic tissue), a large tumor size, lymph node involvement, high levels of preoperative carbohydrate (or cancer) antigen 19-9 (CA19-9), and persistently elevated levels of postoperative CA 19-9.[46,85-89] In addition, several molecular markers have been associated with poor outcome after surgery.[90,91] As these molecular markers were mainly evaluated in small studies, their value requires further validation in larger studies, and thus none have been routinely used in clinical practice.

How Is Pancreatic Cancer Treated?

Treatment

Patients with pancreatic cancer are best managed by a multidisciplinary team, including surgeons, medical and radiation oncologists, radiologists, gastroenterologists, pain management experts, nutritionists, social workers, and others. The treatment choice is largely determined by whether the tumor can be surgically removed. Surgery remains the only treatment that offers a chance of cure for pancreatic cancer patients.[92]

For those patients who are candidates for surgery (approximately 20% of all pancreatic cancer patients), the operative approaches include cephalic pancreatoduodenectomy (the Whipple procedure), distal pancreatectomy, or total pancreatectomy, depending on the location of the tumor (see sidebar on page 31). Postoperative (adjuvant) chemotherapy either alone or in combination with radiation has been proven to improve progression-free and overall survival in both randomized controlled trials and observational studies.[93,94] The role of radiation therapy by itself in the adjuvant setting remains unclear.[95] Treatment with chemotherapy or chemoradiotherapy prior to surgery (neoadjuvant) is an emerging strategy. The goal of neoadjuvant treatment is to increase the ability to successfully remove all of the tumor.[96] However, there is no evidence that neoadjuvant therapy is superior to adjuvant therapy, especially among those patients who clearly have resectable disease.[97] For this reason,

Pancreatic Cancer Treatment Options

Surgery

- Cephalic pancreatoduodenectomy (Whipple procedure) is the removal of the head of the pancreas, the gallbladder, part of the stomach, part of the small intestine, and the bile duct, retaining enough of the pancreas to produce digestive juices and insulin.
- Distal pancreatectomy is the removal of the body and the tail of the pancreas as well as the spleen.
- Total pancreatectomy is the removal of the whole pancreas, part of the stomach, part of the small intestine, the common bile duct, the gallbladder, the spleen, and nearby lymph nodes.

Chemotherapy is the use of drugs to kill cancer cells by preventing them from growing and dividing. Gemcitabine is usually the recommended first-line drug for pancreatic cancer patients. It can be given alone or in combination with other drugs.

Radiation therapy is the use of high-energy radiation to control or kill cancer cells. Radiation can be delivered by a machine outside the body (external beam radiation) or can come from a radioactive substance implanted in or near the cancer (internal radiation or brachytherapy). Brachytherapy is rarely used in treating pancreatic cancer.

Chemoradiation therapy combines chemotherapy and radiation therapy to increase the effects of both. The side effects of this combination therapy are more severe than either therapy alone.

Targeted therapy is the use of drugs or other substances to inhibit the growth of cancer cells by interfering with specific molecules involved in tumor progression. Erlotinib, which targets the epidermal growth factor receptor (EGER), may be used with gemcitabine among pancreatic cancer patients with advanced disease.

neoadjuvant treatment is considered more relevant for patients with locally advanced or borderline resectable disease.[97-99]

The treatment for patients with advanced disease focuses on managing symptoms and relieving pain and suffering (palliative care). Treatment options include chemotherapy alone or in combination with radiation. The combination of 5-FU, leucovorin, irinotecan, and oxaliplatin (FOLFIRINOX) can help prolong life in patients with advanced disease, though many patients are too ill to tolerate this regimen. Other treatment options include gemcitabine alone or in combination with a platinum agent, erlotinib (Tarceva), or fluoropyrimidine.[82]

Supportive care

Given the poor survival and persistent symptoms experienced by many pancreatic cancer patients who do not respond to treatment, care focusing on relieving and preventing suffering represents an important aspect of managing this disease. Palliative care should be offered at the initiation of any treatment regimen in order to relieve symptoms and side effects, which include pain, bile duct or gastric outlet obstruction, and loss of appetite. Palliative efforts may also include psychological support to relieve patients' stresses associated with pancreatic cancer diagnosis and treatment.

Opioid analgesics (morphine and similar drugs) are often needed to help reduce pain. Radiation may be given to help relieve pain from locally advanced disease. Another pain management approach is nerve block, whereby a pain specialist injects either an anesthetic or a medication to block or destroy the nerves. For example, abdominal pain can sometimes be treated effectively by endoscopic ultrasound or CT guided celiac plexus block.

If the tumor is blocking the bile duct, a stent (a thin tube) can be placed to relieve the blockage using nonsurgical approaches, such as ERCP and percutaneous transhepatic cholangiogram (PTC). If a patient develops gastric-outlet obstruction, treatment may include duodenal wall stents or PEG (percutaneous endoscopic gastrostomy) placement for decompression. Sometimes, a patient may need surgery to create a bypass (biliary bypass or gastric bypass) to manage obstructive jaundice and gastric outlet obstruction.

If the pancreas is not working well or has been partially or entirely removed, a special diet and specially prescribed enzymes may help the patient's digestion. Meeting with a nutritionist is also often very helpful for patients who are losing weight and have a poor appetite because of their disease.

What Is the American Cancer Society Doing about Pancreatic Cancer?

Research

The American Cancer Society, through its Extramural Grants program, funds individual investigators in medical schools, universities, research institutes, and hospitals throughout the United States. Currently, this program is funding $8,077,500 in pancreatic cancer research through 32 research grants. Ongoing research includes:

- Identifying new avenues of early detection and treatment through better understanding of the biological mechanisms of pancreatic cancer development, progression, and metastasis
- Determining the optimal sequencing strategy for pancreatic cancer treatment through mathematical decision analysis

- Examining new biomarkers for drug response to optimize the effectiveness of common chemotherapeutic agents, such as gemcitabine
- Testing new therapeutic agents for targeted therapy, such as PARP inhibitors and glutaminase inhibitors
- Exploring targeted delivery of pro-apoptotic therapeutics into pancreatic cancer cells
- Integrating immunotherapy into pancreatic cancer treatment regimens

The Society's intramural research program also conducts a wide range of research on pancreatic cancer. For example, researchers from the surveillance research program monitor trends in pancreatic cancer incidence and mortality, and recently published a study showing that socioeconomic disparities in pancreatic cancer death rates widened among working-age US populations during 1993-2007. Using data collected in the Society's Cancer Prevention Study II (CPS-II), Society epidemiologists have also examined the relationship between pancreatic cancer death and various factors, including alcohol consumption, carbohydrate intake, aspirin use, and reproductive patterns. In addition, the CPS-II Nutrition Cohort is part of a large international Pancreatic Cancer Cohort Consortium (PanScan), which aims to identify genetic factors, environmental exposures, and gene-environment interactions that contribute to the development of pancreatic cancer. To date, PanScan researchers have discovered four novel regions in the genome associated with risk for pancreatic cancer. In addition, many other epidemiological studies on environmental risk factors (including lifestyle factors) have been published.

Advocacy

The American Cancer Society Cancer Action Network℠ (ACS CAN), the nonprofit nonpartisan advocacy affiliate of the American Cancer Society, recognizes that cancer research is the engine behind our ongoing progress in the fight against cancer. Research offers hope to the millions of people who face cancer – for better treatments, for more opportunities to prevent and detect the disease early, and for improved quality of life for those already diagnosed. The National Cancer Institute (NCI) – one of the 27 institutes and centers that comprise the National Institutes of Health (NIH) – is the foundation of the nation's cancer research efforts. As a federal agency, NCI-funded research has played a role in every major advance in the fight against cancer over the past 70 years. That's why it is so important that the NCI continues to receive the government investment that it needs to support lifesaving research projects. Funding for pancreatic cancer research at NCI has increased from $73 million in 2007 to $100 million in 2011. Billions of dollars exist in the federal budget for medical research purposes, and ACS CAN is leading the effort to lobby our government for the crucial funds necessary for the clinical research that could lead to the prevention, early detection, and effective treatment of pancreatic cancer.

Resources outside the American Cancer Society

- **National Cancer Institute:** cancer.gov/cancertopics/types/pancreatic/
- **Pancreatic Cancer Action Network:** pancan.org/
- **The Lustgarten Foundation:** lustgarten.org/
- **Hirshberg Foundation for Pancreatic Cancer Research:** pancreatic.org/
- **National Pancreas Foundation:** pancreasfoundation.org/
- **Pancreatica Initiative:** pancreatica.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] The World Health Organization estimates that there are 6 million smoking-related premature deaths worldwide each year.[3]

Health Consequences of Smoking

Half of all those who continue to smoke will die from smoking-related diseases.[4] 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.[5,6] In addition, an estimated 8.6 million people suffer from chronic conditions related to smoking, such as chronic bronchitis, emphysema, and cardiovascular diseases.[7]

- Smoking accounts for at least 30% of all cancer deaths and 87% of lung cancer deaths.[1,8]
- 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.[1,9]
- The International Agency for Research on Cancer (IARC) recently concluded that there is limited evidence that tobacco smoking causes female breast cancer.[9]
- Smoking is a major cause of heart disease, cerebrovascular disease, chronic bronchitis, and emphysema, and is associated with gastric ulcers.[1,10]
- 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.[11]

Reducing Tobacco Use and Exposure

The US Surgeon General in 2000 outlined the goals and components of comprehensive statewide tobacco control programs.[12] 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.[13]

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 2012, 6 states allocated 50% or more of CDC-recommended funding levels for tobacco control programs.[14] States that have 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.[12,15] Recent federal initiatives in tobacco control, including national legislation ensuring coverage of clinical cessation services, regulation of tobacco products, tax increases, and increased tobacco control funding hold promise for reducing tobacco use. Provisions in the Affordable Care Act signed into law on March 23, 2010, 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 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.

Trends in 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 2011, there was a modest, but statistically significant, decline in smoking prevalence from 21% to 19%.[17,18] However, declines were not consistent from year-to-year and were not observed in all population subgroups.
- In 2011, approximately 43.8 million adults were current smokers, about 2 million fewer than in 2005.
- The proportion of daily smokers reporting light or intermittent smoking (less than 10 cigarettes/day) increased significantly between 2005 (16%) and 2011 (22%), whereas heavy smoking declined from 13% to 9%.[17,18]
- Although cigarette smoking became prevalent among men before women, the gender gap narrowed in the mid-1980s and has since remained constant.[19] As of 2011, there was a 4% absolute difference in smoking prevalence between white men (23%) and women (19%), an 8% difference between African American men (24%) and women (16%), an 8% difference between Hispanic men (17%) and women (9%) and a 9% difference between Asian men (15%) and women (6%).[18]
- Smoking is most common among the least educated. While the percentage of smokers has decreased at every level of educational attainment since 1983, college graduates had the greatest decline, from 21% to 9%, in 2011.[18,20] By contrast, among those with a high school diploma, prevalence decreased modestly from 34% to 24% during the same time period. Adults with a GED certificate (high school equivalency diploma) had the highest smoking rate (45%) in 2011.[18] Groups with a high school degree or less quit smoking at lower rates than higher educated groups between 1998 and 2008.[21]
- 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 in these two groups.[22]
- Although cigarette smoking among US high school students increased significantly from 28% in 1991 to 36% in 1997, the rate declined to 21% (male: 22%, female: 22%) by 2003.[23,24] Between 2003 and 2011, there has been no significant change in the smoking rate among high school males (20%) and females (16%).[25]

Smokeless Tobacco Products

Smokeless tobacco products include moist snuff, chewing tobacco, snus (a "spitless," moist powder tobacco pouch), dissolvable nicotine products (Orbs, Strips and 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 the tobacco multinationals.[26] 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. 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.[27,28] 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.[29,30]

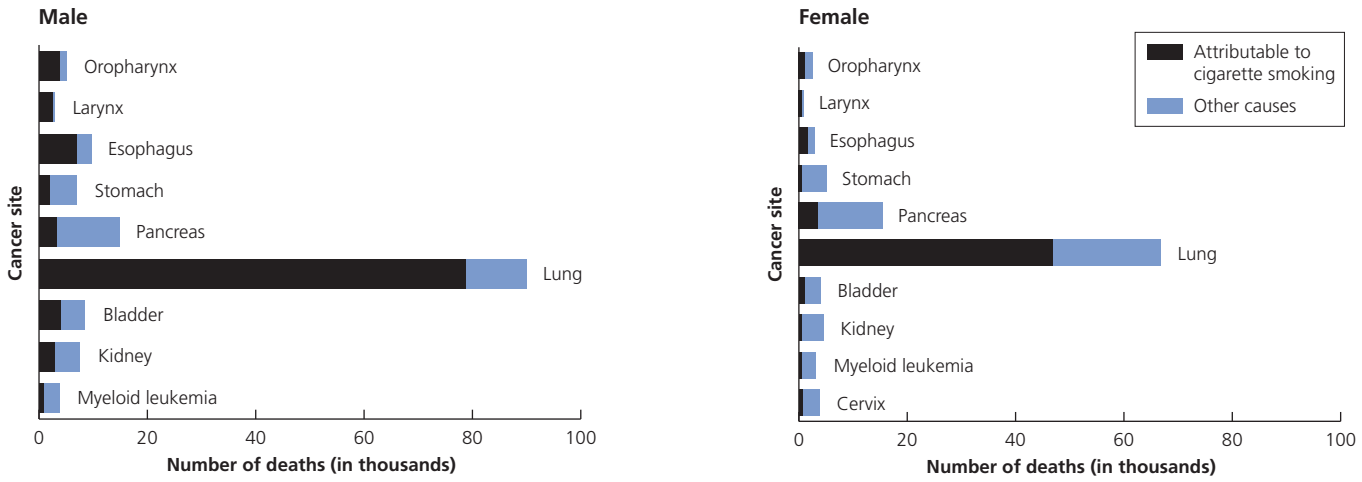
- Smokers who use smokeless products as a supplemental source of nicotine to postpone or avoid quitting will increase rather than decrease their risk of lung cancer.[31]
- Long-term use of snuff substantially increases the risk of cancers of the oral cavity, particularly cancers of the cheek and gum.[30]
- 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. [32,33]
- According to the 2010 National Health Interview Survey, 3% of adults 18 years of age and older (5% of men and 0.2% of women) were current users of smokeless products.[34]
- According to the 2010 National Survey on Drug Use and Health (NSDUH), whites 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 10% across states in 2011, with higher rates observed in the South and North-Central states.[36]
- Among high school students nationwide, the prevalence of current smokeless tobacco use (chewing tobacco, snuff, or dip) decreased from 1995 to 2003 (from 11% to 7%), but remained stable from 2003 to 2011 (7% to 8%). Current (2011) use was higher in males (13%) than females (2%) and higher in whites (9%) than African Americans (3%) and Hispanics (6%).[25]

Cigars

Cigar smoking has health consequences similar to those of cigarette smoking and smokeless tobacco.[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.[37]

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, 2013

- In 2010, 3% of adults 18 years of age and older (5% of men and 0.5% of women) were current users of cigars (smoked at least 50 cigars in their lifetime and now smoked some days or every day).[34]
- According to the 2010 NSDUH, African Americans and American Indians/Alaska Natives had the highest prevalence of past month cigar use, followed by, whites, Hispanics, and Asians.[35]
- Among states, cigar smoking prevalence among adults ranges from 2% to 5%.[38]
- In 2011, 13% of US high school students had smoked cigars, cigarillos, or little cigars at least once in the past 30 days.[25]
- Between 1997 and 2007, while sales of little cigars had increased by 240%, large cigar sales decreased by 6%.[39] Small cigars are similar in shape and size to cigarettes, but are not regulated or taxed like cigarettes, making them more affordable to youth.

Smoking Cessation

A US Surgeon General's Report outlined the benefits of smoking cessation: [40]

- 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.[41]

- In 2011, an estimated 49.5 million adults were former smokers, representing 53% of living persons who ever smoked.[34]
- Smokers with an undergraduate or graduate degree are more likely to quit than less educated smokers.[41] Among those who smoked in 2010, an estimated 20.6 million (or 47%) had stopped smoking at least one day during the preceding 12 months because they were trying to quit.[34]
- In 47 states and the District of Columbia, the majority of adults (50% or more) who ever smoked have quit smoking.[42]
- 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%).[25]

Tobacco dependence is a chronic disease; effective cessation treatments can double or triple smokers' chances of long-term abstinence.[43] 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.[38] Improving access by promoting available coverage for these treatments through government health programs, including Medicaid and Medicare, and private health insurance mandates can help reduce these disparities.

Secondhand Smoke

In 2006, the US Surgeon General published a comprehensive report titled *The Health Consequences of Involuntary Exposure to Tobacco Smoke*.[44] 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.[45] Numerous other scientific consensus groups have also reviewed data on the health effects of SHS.[44-50] 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 46,000 deaths annually from heart disease in people who are not current smokers.[6]
- SHS may cause coughing, wheezing, chest tightness, and reduced lung function in adult nonsmokers.[45]
- Some studies have reported an association between SHS exposure and breast cancer. The US Surgeon General has designated this evidence suggestive rather than conclusive.[45] 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 an extremely effective approach to prevent exposure to and harm from SHS.[51] 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%).[44]
- In the US, as of July 2012, 3,501 municipalities have passed smoke-free legislation and 36 states, the District of Columbia, the Northern Mariana islands, Puerto Rico, American Samoa and the US Virgin Islands have either implemented or enacted statewide smoking bans that prohibit smoking in workplaces and/or restaurants and/or bars.[54]
- In the US, as of July 2012, there were 774 100% smoke-free college campuses; of these, 562 are 100% tobacco-free (i.e., no forms of tobacco allowed).[55]
- Currently, 48% 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.[56]

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 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 $96.8 billion in productivity losses.[6]
- Annual smoking-attributable health care expenditures were estimated to increase $24 billion annually between 1997-2001 and 2000-2004.[6] Over the same time period, smoking-attributable productivity losses were estimated to increase $4.3 billion annually.[6,57]

Conclusion

Substantial progress has been made in reducing the disease burden from tobacco over the nearly 50 years since the 1964 Surgeon General's Report; smoking prevalence rates have 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 on our society. 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, residence, sex, and sexual orientation. The causes of health disparities within each of these groups are complex and include interrelated social, economic, cultural, and health system factors. However, disparities predominantly arise from inequities in work, wealth, income, education, housing, and overall standard of living, as well as social barriers to high-quality cancer prevention, early detection, and treatment services.

Socioeconomic Status

Persons 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 persons with lower SES. These disparities occur largely because persons 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 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 (low SES) as the overriding factor. According to the US Census Bureau, in 2010, more than 1 in 4 African Americans and Hispanics/Latinos lived below the poverty line, compared to 1 in 10 non-Hispanic whites. Moreover, 1 in 5 African Americans and 1 in 3 Hispanics/Latinos were uninsured, while only 1 in 10 non-Hispanic whites lacked health insurance.

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 large numbers 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 an increased 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 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. The death rate for cancer among African American males is 33% higher than among white males; for African American females, it is 16% higher than among white females. African American men have higher incidence and mortality rates than whites for each of the cancer sites listed in the table on page 43. For more information on cancer in African Americans, see *Cancer Facts & Figures for African Americans*, available online at cancer.org/statistics.

Hispanics: Hispanics have lower incidence rates for all cancers combined and for most common types of cancer compared to whites, but have higher rates of cancers associated with infection, such as liver, stomach, and uterine cervix. For example, Hispanic women have the highest incidence rate for cervical cancer, and rates of liver cancer are about twice as high in Hispanics as in whites. 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 have the lowest overall cancer incidence rates, as well as the lowest rates for most common cancer types. However, similar to Hispanics, this population has higher rates for many of the cancers related to infection. As shown in the table on page 43, they have the highest liver cancer incidence and death rates of all racial and ethnic groups in both men and women. Liver cancer incidence and death rates among Asian American and Pacific Islander men and women are about 2.5-fold higher than those among whites and 20% higher than those among Hispanics, who have the second-highest rates. (For more information on cancers related to infection, see *Cancer Facts & Figures 2005*, Special Section, available online at cancer.org.)

American Indians and Alaska Natives: Kidney cancer incidence and mortality rates are higher in American Indian and Alaska Native men and women than in any other racial or ethnic population – three times higher than those among Asian Americans/Pacific Islanders, who have the lowest rates. High prevalence of smoking and obesity likely contribute 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, are poorer, and have 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 44). Among both men and women, lung cancer death rates are more than 3-fold higher in Kentucky (100 and 56 per 100,000 in men and women, respectively) – the state with the highest rates – than in Utah (28 and 16 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 also reflect differences in environmental exposures, socioeconomic factors in 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 increase funding to $275 million for fiscal year 2013 to support continued growth 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.
- **Colorectal Cancer Prevention, Early Detection, and Treatment Act.** The Society and ACS CAN are advocating for the Colorectal Cancer Prevention, Early Detection, and Treatment Act, a national screening, treatment, and outreach program focused on increasing colorectal cancer screening rates in low-income, medically underserved populations.
- **Patient Navigation.** Patient navigation demonstration programs have shown navigation to be 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, 2005-2009

Incidence	White	African American	Asian American or Pacific Islander	American Indian or Alaska Native‡	Hispanic/ Latino
All sites					
Male	543.1	619.7	327.5	423.2	418.7
Female	424.0	396.8	286.2	360.3	333.2
Breast (female)	123.3	118.0	85.9	89.1	93.0
Colon & rectum					
Male	52.8	65.1	41.4	50.7	46.9
Female	39.2	48.0	32.1	41.1	33.3
Kidney & renal pelvis					
Male	21.2	23.3	10.1	29.0	19.8
Female	11.2	12.1	5.1	16.6	11.4
Liver & intrahepatic bile duct					
Male	9.1	15.0	21.6	16.4	17.5
Female	3.1	4.2	8.1	7.6	6.6
Lung & bronchus					
Male	82.3	99.3	49.4	67.4	45.4
Female	57.5	51.3	28.1	49.5	26.6
Prostate	141.0	228.7	77.2	98.8	124.9
Stomach					
Male	8.4	16.3	16.1	13.0	13.5
Female	4.0	8.2	9.3	6.4	8.1
Uterine cervix	7.8	10.4	7.2	10.1	11.8
Mortality					
All sites					
Male	216.7	288.3	132.6	184.9	146.4
Female	150.8	174.6	93.2	135.9	100.6
Breast (female)	22.4	31.6	11.9	16.6	14.9
Colon & rectum					
Male	19.5	29.8	13.1	18.8	15.3
Female	13.6	19.8	9.6	14.6	10.2
Kidney & renal pelvis					
Male	5.9	6.0	2.9	8.8	5.0
Female	2.7	2.6	1.3	4.1	2.3
Liver & intrahepatic bile duct					
Male	7.4	11.9	14.5	11.9	11.8
Female	3.1	4.0	6.1	5.9	5.3
Lung & bronchus					
Male	65.3	82.6	35.9	48.3	30.8
Female	40.8	38.0	18.5	33.2	14.1
Prostate	21.7	53.1	10.0	19.7	17.8
Stomach					
Male	4.3	10.3	9.0	8.3	7.4
Female	2.2	4.8	5.3	3.8	4.3
Uterine cervix	2.2	4.3	2.0	3.5	3.0

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

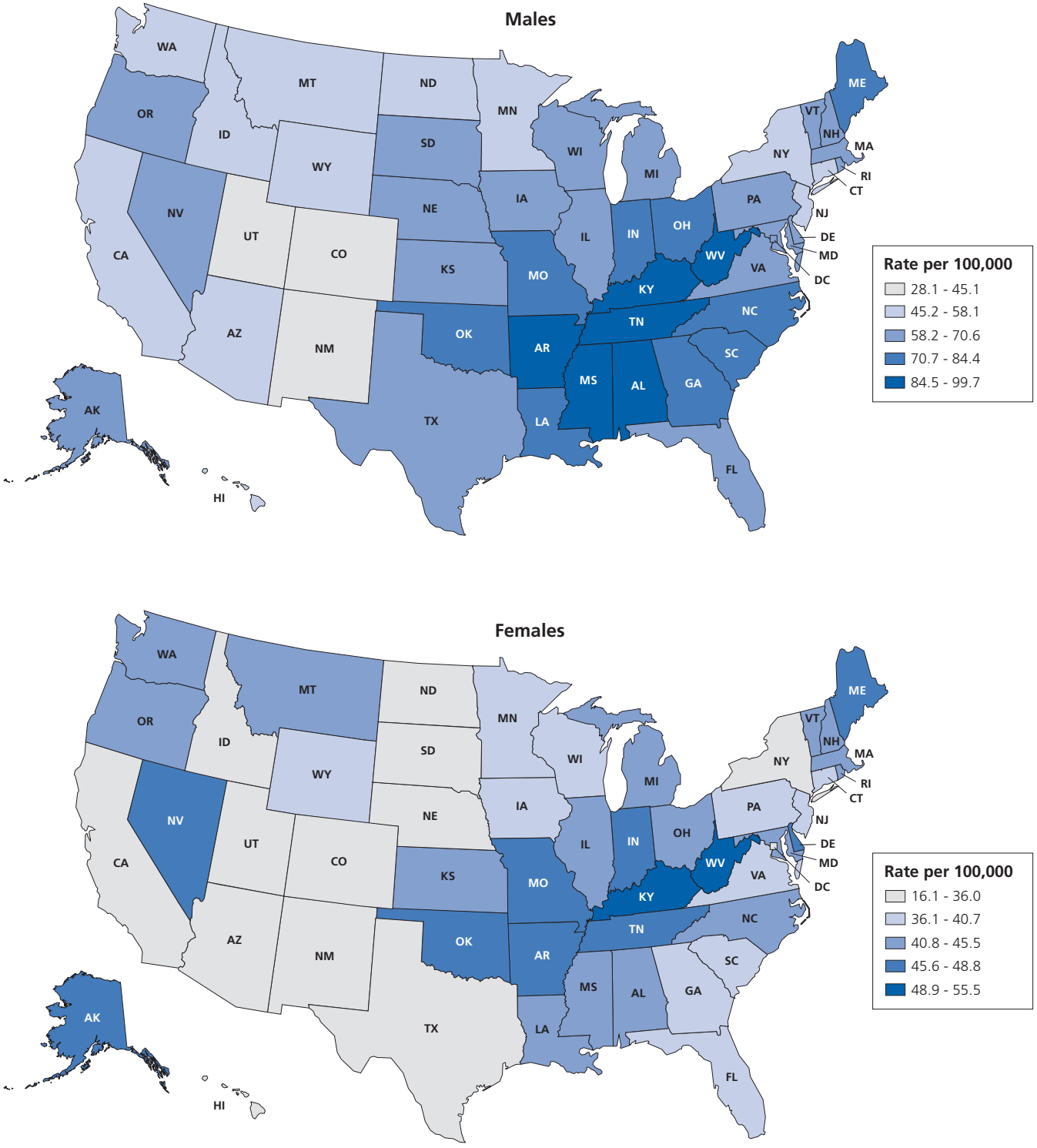
†Race and ethnicity categories are not mutually exclusive; persons of Hispanic/Latino origin may be of any race.

‡Data based on Contract Health Service Delivery Area counties.

Source: Jemal A, et al. Annual report to the nation on the status of cancer, 1975-2009, featuring the burden and trends in human papillomavirus (HPV)-associated cancers and HPV vaccination levels. *J Natl Cancer Inst.*2012. In press.

American Cancer Society, Surveillance Research, 2013

Geographic Patterns in Lung Cancer Death Rates* by State, US, 2005-2009



*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, 2013

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 not using tobacco products in reducing cancer risk. The American Cancer Society's nutrition and physical activity guidelines emphasize the importance of weight control, physical activity, 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 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, as well as lower their risk of heart disease and diabetes.

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 the United States, it has been estimated that overweight and obesity contribute to 14% to 20% of all cancer-related mortality. Overweight and obesity are clearly associated with increased risk for developing many cancers, including cancers of the breast in postmenopausal women, colon and rectum, endometrium, adenocarcinoma of the esophagus, kidney, and pancreas. Overweight and obesity may also be associated with increased risk of cancers of the liver, non-Hodgkin lymphoma, multiple myeloma, cervix, ovary, and aggressive prostate cancer, and obesity also likely increases the risk of cancer of the gallbladder. In addition, abdominal fatness is convincingly associated with colorectal cancer, and probably related to higher risk of pancreatic, endometrial, and postmenopausal breast 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 overall prevalence has stabilized in recent years, more than one-third of adults – 36% of both men and women – are currently obese. More than likely, these trends are already impacting cancer trends: 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 ages 2 to 19 years were obese; obesity prevalence was 24% in African Americans, 21% in Hispanics, and 14% in 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 increase incidence of cancer in the future.

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, even if currently inactive, can have many health benefits.

Living a physically active lifestyle is important to reduce the risk of a variety of types of cancer, as well as heart disease and diabetes. Scientific evidence indicates that physical activity may reduce the risk of several types of cancer, including cancers of the breast, colon, and endometrium, as well as advanced prostate cancer. Physical activity also indirectly reduces the risk of developing the many types of 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 is associated with a reduction in the risk of cancer recurrences and improved 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 Centers for Disease Control and Prevention (CDC) indicate that trends may be 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 processed meat and red 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.

Currrently, 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 showed no reduction in risk for cancer, at least in generally well-nourished populations.

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, and breast. 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, reduction of folic acid levels, 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

While many Americans would like to adopt a healthy lifestyle, many encounter substantial barriers to consuming healthy food and engaging in physical activity. 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; economic and time constraints, as well as other influences, have collectively contributed to increasing trends in obesity.

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 turning obesity trends around 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 education, 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 that are currently under way:

- Limit the availability, advertising, and marketing of foods and beverages of low nutritional value, particularly in schools.
- Strengthen nutrition standards in schools for foods and beverages served as part of school meal programs and for competitive foods and beverages served 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.
- Ensure that worksites have healthy food and beverage options and that physical environments 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 clean indoor air laws and increases in cigarette excise taxes are 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 maintain a healthy body weight and remain physically active.

Environmental Cancer Risks

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 2008, there were an estimated 12.7 million cases of cancer diagnosed and 7.6 million deaths from cancer 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 21.3 million new cancer cases and 13.1 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, and by 2030 this number is expected to increase to 8 million, 80% of whom will reside in low- and middle-income countries.

- Between 2002 and 2030, tobacco-attributable deaths are projected to decline by 9% in high-income countries, but are expected to double from 3.4 million to 6.8 million in low- and middle-income countries. For example, tobacco use is currently the number one killer in China, responsible for 1.2 million deaths annually. This number is expected to rise to 3.5 million deaths annually by the year 2030.
- Approximately 18% of the world's population – more than 1 billion men and 250 million women – smoke. In 32 countries, male smoking prevalence is greater than or equal to 45%: all but 5 of these are low- and middle-income countries.
- Data from the Global Youth Tobacco Survey conducted during 1999-2008 found that among youth 13 to 15 years of age, 12% of boys and 7% of girls reported smoking cigarettes, and 12% of boys and 8% of girls reported using other tobacco products. Data from 1999-2005 showed that in every region of the world, the ratio of male-to-female smoking among youth was smaller than the ratio reported among adults, reflecting a global trend of increased smoking among female youth.
- It has been estimated that in 2004, more than 600,000 nonsmokers worldwide died as a result of exposure to secondhand smoke and 40% of children were exposed to secondhand smoke.
- The use of smokeless tobacco accounts for a significant and growing portion of tobacco use throughout the world. The majority of smokeless tobacco is consumed in South Asia. However, consistent with trends in the US, the sales of smokeless tobacco products are growing at a rapid pace in high-income countries, even as smoking rates decline.
- As emerging and developing economies come to prominence and their health systems develop further, the medical costs of tobacco-related disease will continue to grow. In China, for example, the direct costs of smoking were $6.2 billion in 2008 (an increase of 154% compared to 2000), while the indirect costs of smoking were $22.7 billion in 2008 (an increase of 376% compared to 2000).
- Spending on tobacco products diverts resources from essential goods and services. For example, in India tobacco consumption impoverishes roughly 15 million people, and in Cambodia, the amount of money spent on one pack of premium cigarettes can buy as much as 3,500 food calories comprising a typical daily diet in that country.
- About 55% of the world's population was covered by one or more evidence-based tobacco control measures in 2010, up from less than 10% in 2008. The WHO estimates that 11% of the world's population lives in smoke-free environments.

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.[65] The FCTC features specific provisions to control both the global supply and demand for tobacco, including 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. As of August 2012, out of 195 eligible countries, 176 have ratified or acceded to the treaty representing approximately 88% of the world's population. 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.

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 American Cancer Society has established three integrated goals to reduce the global burden of cancer:

- **Make cancer control a political and public health priority.** According to the World Health Organization, noncommunicable diseases (NCDs) – such as cancer, heart disease and diabetes – claim more lives each year and account for about 60% of the world's deaths. About 28 million (80%) of these deaths occur in low- and middle-income countries, yet less than 3% of private and public funding for health is allocated to prevent and control cancer and other NCDs in these areas. The Society has become actively involved in working with global partners, including the Union for International Cancer Control (UICC), the International Diabetes Federation, the World Heart Federation, Lance Armstrong Foundation, and others to prioritize cancer and NCDs on the global health agenda.
- **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, including the Africa Tobacco Control Regional Initiative, 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. The partners on this project actively advocate for further tobacco control resources in sub-Saharan Africa and help establish mechanisms to protect existing laws from tobacco industry efforts to overturn them. In addition, the Society supports the development of research and technical capacity for tobacco control through partnerships with the University of Cape Town and the University of Pretoria. These projects focus on the advancement of taxation as a tobacco control tool, the economics of tobacco control, and the training of future public health practitioners.
- **Increase awareness about the burden of cancer and its leading risk factor, tobacco use.** 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 American Cancer Society provides cancer information to millions of individuals throughout the world on its Web site, cancer.org. More than 20% 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 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. By working relentlessly to bring cancer under control, 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 12 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 international program, and 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 three 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 Society helps people quit using tobacco through the American Cancer Society Quit For Life® Program, managed and operated by Alere Wellbeing. These two organizations have more than 35 years of combined experience in tobacco cessation coaching and have helped more than 1 million tobacco users quit. Together, they will help millions more make a plan to quit, realizing the American Cancer Society's mission to save lives and create a world with less cancer and more birthdays.

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

- **FreshStart®**, a group-based tobacco cessation counseling program 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 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
- **American Cancer Society Workplace Solutions Assessment,** 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
- **Active For Life℠**, a 10-week online program that uses individual and group strategies to help employees become more physically active

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. As of July 1, 2012, 48% of the US population was covered by comprehensive smoke-free workplace, restaurant, and bar laws. 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 American Cancer 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 appoximately 14 million US cancer survivors, the American Cancer Society is available anytime, day and 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 includes an interactive cancer resource center containing in-depth information on every major cancer type.

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 a variety of information sources for health care providers, including three clinical journals: *Cancer*, *Cancer Cytopathology*, and *CA: A Cancer Journal for Clinicians*. More information about free subscriptions and online access to *CA* and *Cancer Cytopathology* articles is available at cancer.org/journals. The American Cancer Society also collaborates with numerous community groups, nationwide health organizations, and large employers to deliver health information and encourage Americans to adopt healthy lifestyle habits through the Society's science-based worksite programs.

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 119 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 2011, approximately 89,000 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 some areas, primarily

where transportation assistance programs are difficult to sustain, the Society helps patients or their drivers via prepaid gas cards to help defray costs associated with transportation to treatment. In 2011, the American Cancer Society provided more than 1.4 million transportation services to more than 77,000 constituents. Our service requests for transportation assistance increased by 15% in 2011 over the previous year, and the number of rides that we provided in 2011 was up by 18%.

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 2011, the 31 Hope Lodge locations provided approximately 250,000 nights of free lodging to nearly 38,000 patients and caregivers – saving them $23 million in lodging expenses.

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.

Prostate cancer support: Men facing prostate cancer can find one-on-one or group support through the American Cancer Society Man To Man® program. The program also offers men the opportunity to educate their communities about prostate cancer and to advocate with lawmakers for stronger research and treatment policies.

Cancer education classes: People with cancer and their caregivers need help coping with the challenges of living with the disease. Doctors, nurses, social workers, and other health care professionals provide them with that help by conducting the American Cancer Society I Can Cope® educational classes to guide patients and their families through their cancer journey.

Hair-loss and mastectomy products: Some women wear wigs, hats, breast forms, and bras to help cope with the effects of mastectomy and hair loss. The American Cancer Society's *"tlc" Tender Loving Care*® is a magazine and catalog in one that offers informative articles and a line of products to help women who are battling cancer restore their appearance and self-esteem. 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: Look Good Feel Better® 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.

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 have "been there" through the American Cancer Society Cancer Survivors Network®. The online community is a welcoming and safe place that was created by and for cancer survivors and their families.

WhatNext™ is another free online support network developed in part by the American Cancer Society that helps cancer patients, survivors, and caregivers gain firsthand insight into living with cancer and connect with others facing a similar diagnosis.

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 American Cancer 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 937 research and training grants totaling more than $468 million as of August 28, 2012. 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, 46 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 monitored and disseminated 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 international 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 differences in the burden of cancer by socioeconomic status in the US, 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 state differences in colorectal cancer mortality, temporal trends in breast cancer incidence rates, and use of sunless tanning products by adolescents 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. Additional, related objectives include identifying critical gaps in quality patient care and taking leadership in policy and technical initiatives to address these gaps. The HSR program is uniquely positioned to respond rapidly to critical information needs by Society personnel, as well as national and international policy makers.

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.

International Tobacco Control Research

The predecessor of the International Tobacco Control Research Program (ITCRP), the International Tobacco Surveillance unit, was created in 1998 to support collaborative international tobacco surveillance efforts involving the Society, the WHO Tobacco Free Initiative, the World Bank, and the Centers for Disease Control and Prevention's (CDC) Office of Smoking and Health. Its special publications, the *Tobacco Control Country Profiles*, 1st and 2nd editions, were distributed during the 11th and 12th World Conference on Tobacco or Health in 2000 and in 2003, respectively.

Since 2006, the ITCRP has begun to focus on economic research in tobacco control, taking advantage of established partnerships with numerous academic and nonprofit organizations. In addition to original research, the program helps build capacity for the collection and analysis of economic data to provide the evidence base for tobacco control in low- and middle- income countries. To that end, the ITCRP received funding from the Bloomberg Global Initiative to Reduce Tobacco Use, the Bill & Melinda Gates Foundation, and grants from the National Institutes of Health Fogarty International Center.

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.

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 special populations, including minorities, the poor, rural populations, and other underserved groups. The BRC's ongoing projects include:

- Studies of the quality of life of cancer survivors, which include a nationwide longitudinal study and a cross-sectional study, that explore the physical and psychosocial adjustment to cancer and identify factors affecting quality of life
- Studies to identify and prioritize gaps in information and resources for cancer survivors as they transition from active treatment back to the community care setting
- 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 late and long-term effects of cancer and its treatment, and improve surveillance and screening practices to detect the return of cancer
- 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

- Efforts to establish and implement a process to measure the effective control of pain, other symptoms, and side effects for those who have been affected by cancer
- Studies of racial disparities and the role of sociocultural and neighborhood factors in cancer-related behaviors (smoking, poor diet, lack of exercise, and cancer screening) among a statewide sample of more than 1,000 African Americans in Georgia
- Studies investigating how social, psychological, and other factors impact smokers' motivation and ability to quit for the purposes of improving existing Society programs for smoking cessation (e.g., FreshStart, the Great American Smokeout®) and to develop new technology-based cessation interventions.

Statistics and Evaluation Center

The Statistics & Evaluation Center (SEC) provides expert statistical, survey, study design, evaluation, sampling and research consultation services to the American Cancer Society. Their mission is to improve Society programs, processes, and services based on good science. They strive to capture, analyze, and report data that are objective, valid, reliable, accurate, and timely – to provide a solid evidence base for decision making. High-quality evaluation produces the greatest benefit to cancer patients, their caregivers, and their families.

The SEC has two areas of focus – Statistics and Survey Research – that work independently or in tandem, depending on the nature of the project. SEC staff regularly interact with multiple stakeholders in addition to Society staff, including patients, caregivers, volunteers, and staff from partnering health care systems. The SEC is engaged in evaluations of many of the priority mission outcomes around survivorship, quality-of-life, prevention, early detection, and tobacco control, collaborating regularly with the Society's Health Promotions, Extramural Grants, Cancer Control Sciences, and Global Health departments. The SEC uses multiple methods, including a variety of quantitative and qualitative approaches, all of which help produce robust and effective findings.

The SEC, working within the Integrated Evaluation Team, developed a Strategic Leader Discussion Series which has fostered communication, integration, and collaboration, facilitating the systematic inclusion of evaluation into the planning cycle of many of the Society's transformation efforts (see below). The Center continues to provide leadership on evaluation efforts related to cancer prevention projects that utilize community health advisors on a large program funded by Walmart. They are also leading evaluations of the Dietitian-on-Call and the Patient Navigation Center of Excellence programs, as well as some focused studies around Hope Lodge facilities – including an innovative return-on-investment project. Finally, the SEC completed the third year of its pilot project around geo-mapping to support program decision making.

In the past year, a large fraction of SEC staff time has been engaged in support of the strategic and operational planning needed to transform the Society into an outcomes-focused organization. SEC staff actively participated on multiple national transformation workgroups, as well as provided many of these teams with data analysis and geo-maps.

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, 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 cancer a top national priority. In recent years, ACS CAN has worked to pass a number of laws at the federal, state, and local levels focused on preventing cancer and detecting it early, increasing research on ways to prevent and treat cancer, improving access to lifesaving screenings and treatment, and improving quality of life for cancer patients. Some recent advocacy accomplishments impacting cancer patients include:

- Passage and implementation of the Affordable Care Act (ACA) of 2010, comprehensive legislation that:
  - Prohibits insurance companies from denying insurance coverage based on a preexisting conditions (children starting in 2010, adults in 2014)
  - Prohibits insurance coverage from being rescinded when a patient gets sick
  - Removes lifetime limits from all insurance plans
  - Allows children and young adults to be covered under their parents' insurance plans until they turn 26
  - Makes coverage for routine care costs available to patients who take part in clinical trials
  - Establishes a National Institutes of Health Interagency Pain Research Advisory Committee to coordinate pain management research initiatives and an Institute of Medicine Pain Conference series that will be important to relieving cancer-related pain and other chronic pain conditions

- Establishes a National Prevention and Health Promotion Strategy; a National Prevention, Health Promotion and Public Health Council; and a Prevention and Public Health Fund with mandatory funding to prioritize, coordinate, oversee, and fund prevention-related activities nationwide
- Requires all new health insurance plans and Medicare to cover preventive services rated "A" or "B" by the US Preventive Services Task Force (USPTF) at no cost to patients (including breast, cervical, and colorectal cancer screening and smoking cessation treatment)
- Requires state Medicaid programs to provide pregnant women with tobacco cessation treatment at no cost
- Protects children and families against states rules that limit program eligibility or increase premiums or enrollment fees in Medicaid
- Provides funding to states to expand Medicaid coverage to low-income adults (below 133% of the federal poverty level)
- Saves states money in uncompensated care by replacing local dollars with new federal subsidies
- Prioritizes health disparities at the National Institutes of Health, establishes a network of federal offices of minority health, and creates an Office of Women's Health
- Enhances data collection and reporting to ensure racial and ethnic minorities are receiving appropriate, timely, and quality health care
- Authorizes grants to help states and local jurisdictions address health workforce needs
- Secures coverage for a new annual wellness visit with a personalized prevention plan and gradually reduces out-of-pocket costs for prescription drugs for Medicare beneficiaries
- Creates incentives for health care providers to deliver more coordinated and integrated care to beneficiaries enrolled in Medicare and Medicaid
- Requires chain restaurants to provide calorie information on menus and have other nutrition information available to consumers upon request; requires chain vending machine owners or operators to display calorie information for all products available for sale

Please refer to *The Affordable Care Act: How It Helps People with Cancer and their Families* for more information (http://action.acscan.org/site/DocServer/Affordable_Care_Act_Through_the_Cancer_Lens_Final.pdf?docID=18421).

- Supporting legislation that focuses on preventing cancer by reducing tobacco use, obesity prevalence, and sun exposure; improving nutrition; and increasing physical activity. By successfully working with partners, ACS CAN has:
  - Helped empower the FDA with authority over tobacco products
  - Helped pass comprehensive smoke-free laws in 23 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 $1.49 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
  - Begun implementing 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 health professions work force 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. The American Cancer Society Relay For Life is a life-changing event that gives everyone in communities across the globe a chance to celebrate the lives of people who have battled cancer, remember loved ones lost, and fight back against the disease, making it the world's largest movement to end cancer. 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. Making Strides Against Breast Cancer events unite communities to walk together, one million strong, as the most powerful force to end breast cancer. Dollars raised fund groundbreaking research, provide free resources and support to help people throughout their cancer journey, and ensures access to mammograms for women who need them.

Sources of Statistics

Estimated new cancer cases in 2013. The numbers of new US cancer cases in 2013 are projected using a two-step process. First, the total number of cases in each state is estimated using a spatiotemporal model based on incidence data from 49 states and the District of Columbia for the years 1995-2009 that met the North American Association of Central Cancer Registries' (NAACCR) high-quality data standard for incidence, which covers about 98% of the US population. This method considers geographic variations in sociodemographic and lifestyle factors, medical settings, and cancer screening behaviors as predictors of incidence, as well as accounting for expected delays in case reporting. Then, the number of new cases nationally and in each state is projected four years ahead using a temporal projection method. (For more information on the estimation of new cases, see "A" in Additional information on page 59.)

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 incidence rates were published in NAACCR's publication *Cancer Incidence in North America, 2005-2009*. (See "B" in Additional information, page 59, for full reference.) Trends in cancer incidence provided for selected cancer sites are based on incidence rates that have been adjusted for delays in reporting and were originally published in the *Surveillance, Epidemiology, and End Results (SEER) Cancer Statistics Review (CSR) 1975-2009*. (See "C" in Additional information, page 59, for full reference). Incidence rates that are not adjusted for delays in reporting may 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. Cancer incidence rates by race/ethnicity were obtained from NAACCR.

Estimated cancer deaths in 2013. The estimated numbers of US cancer deaths are calculated by fitting the numbers of cancer deaths for 1995-2009 to a statistical model that forecasts the numbers of deaths expected to occur in 2013. The estimated numbers of cancer deaths for each state are calculated similarly, using state-level data. For both US and state estimates, data on the numbers 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 59.)

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 are based on mortality data from 1992 to 2009 and were first published in the *CSR 1975-2009*. (See "C" in Additional information, page 59, for full reference.)

Important note about estimated cancer cases and deaths for the current year. The estimated numbers of new cancer cases and deaths in the current year are 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 1975-2009* and are for diagnosis years 2002 to 2008, with all patients followed through 2009. 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 7.1.0. (See "E" in Additional information, for full references.) One-year survival rates are based on cancer patients diagnosed from 2005 and 2008, 10-year survival rates are based on diagnoses from 1996 and 2008, and 15-year survival rates are based on diagnoses from 1991 and 2008; all patients were followed through 2009.

Probability of developing cancer. Probabilities of developing cancer are calculated using DevCan (Probability of Developing Cancer) software version 6.6.1, 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: 2005-2009. Volume Two: Registry-specific Cancer Incidence in the United States and Canada*. Springfield, IL: North American Association of Central Cancer Registries, Inc. May 2012. Available at naaccr.org/DataandPublications/CINAPubs.aspx.

C. Howlader N, Krapcho M, Neyman N, et al. (eds). *SEER Cancer Statistics Review, 1975-2009*. National Cancer Institute. Bethesda, MD, 2012. Available 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.

E. SEER 18 database: Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2011 Sub (1973-2009 varying) - Linked To County Attributes - Total U.S., 1969-2009 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2012, based on the November 2011 submission. SEER*Stat software: Surveillance Research Program, National Cancer Institute SEER*Stat software (www.seer.cancer.gov/seerstat) version 7.1.0.

F. DevCan: Probability of Developing or Dying of Cancer Software, Version 6.6.1; Statistical Research and Applications Branch, National Cancer Institute, April 2012. http://srab.cancer.gov/devcan

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

Cancer Site	Population	Test or Procedure	Frequency
Breast	Women, age 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 aged 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 aged 65+ who have had ≥3 consecutive negative Pap tests or ≥2 consecutive negative HPV and Pap tests within the last 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 ten-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 and may become available at some future time.

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