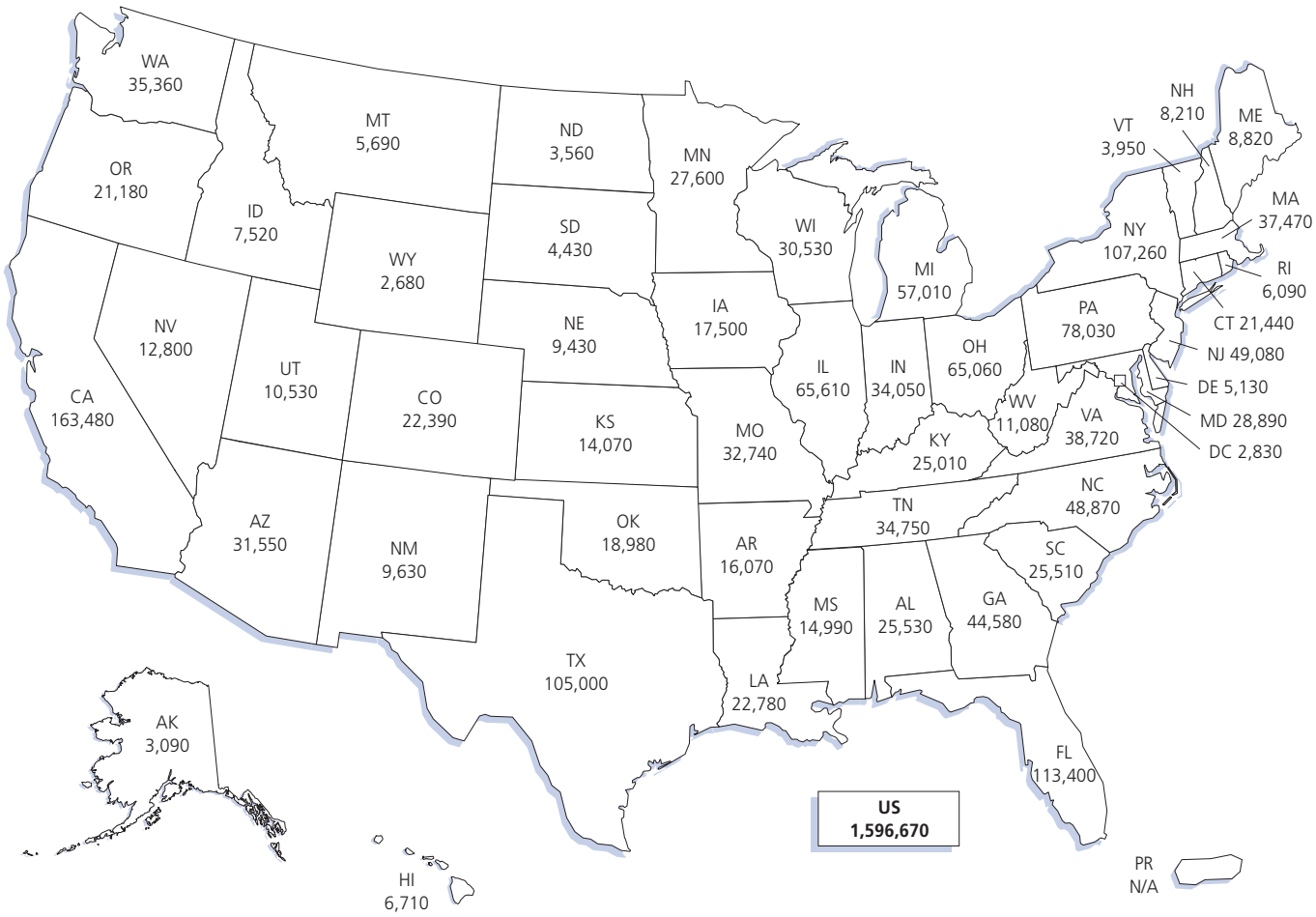
Cancer Facts & Figures 2011



Estimated number of new cancer cases for 2011, excluding basal 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:
Cancer Disparities and Premature Deaths
see page 24

American Cancer Society®

Contents

**Indicates a figure or table*

National Home Office: American Cancer Society Inc.
250 Williams Street, NW, Atlanta, GA 30303-1002
(404) 320-3333

This publication attempts to summarize current scientific information about cancer.
Except when specified, it does not represent the official policy of the American Cancer Society.

Suggested citation: American Cancer Society. *Cancer Facts & Figures 2011.* Atlanta: American Cancer Society; 2011.

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 carcinogenesis. 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?

All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. The American Cancer Society estimates that in 2011 about 171,600 cancer deaths are expected to be caused by tobacco use. Scientific evidence suggests that about one-third of the 571,950 cancer deaths expected to occur in 2011 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 hepatitis B virus (HBV), human papillomavirus (HPV), human immunodeficiency virus (HIV), *Helicobacter pylori (H. pylori),* and others, and could be prevented through behavioral changes, vaccines, or antibiotics. In addition, many of the more than 2 million skin cancers that are diagnosed annually could be prevented by protection from the sun's rays and avoiding indoor tanning.

Regular screening examinations by a health care professional can result in the detection and removal of precancerous growths, as well as the diagnosis of cancers at an early stage, when they are most treatable. Cancers of the cervix, colon, and rectum can be prevented by removal of precancerous tissue. Cancers that can be diagnosed early through screening include cancers of the breast, colon, rectum, cervix, prostate, oral cavity, and skin. However, screening has been shown to reduce mortality only for cancers of the breast, colon, rectum, and cervix. A heightened awareness of breast changes or skin changes may also result in detection of these tumors at earlier stages. Cancers that can be prevented or detected earlier by screening account for at least half of all new cancer cases.

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 78% 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, over the course of a lifetime, will develop or die from cancer. 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.

Relative risk is a measure of the strength of the relationship between risk factors and a particular 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 have about twice the risk of developing breast cancer, compared to 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, chemicals, and excessive exposure to sunlight.

How Many People Alive Today Have Ever Had Cancer?

The National Cancer Institute estimates that approximately 11.7 million Americans with a history of cancer were alive in January 2007. 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 1,596,670 new cancer cases are expected to be diagnosed in 2011. This estimate does not include carcinoma in situ (noninvasive cancer) of any site except urinary bladder, and does not include basal 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 2011, about 571,950 Americans are expected to die of cancer, more than 1,500 people a day. Cancer is the second most common cause of death in the US, exceeded only by heart disease. In the US, cancer accounts for nearly 1 of every 4 deaths.

What Percentage of People Survive Cancer?

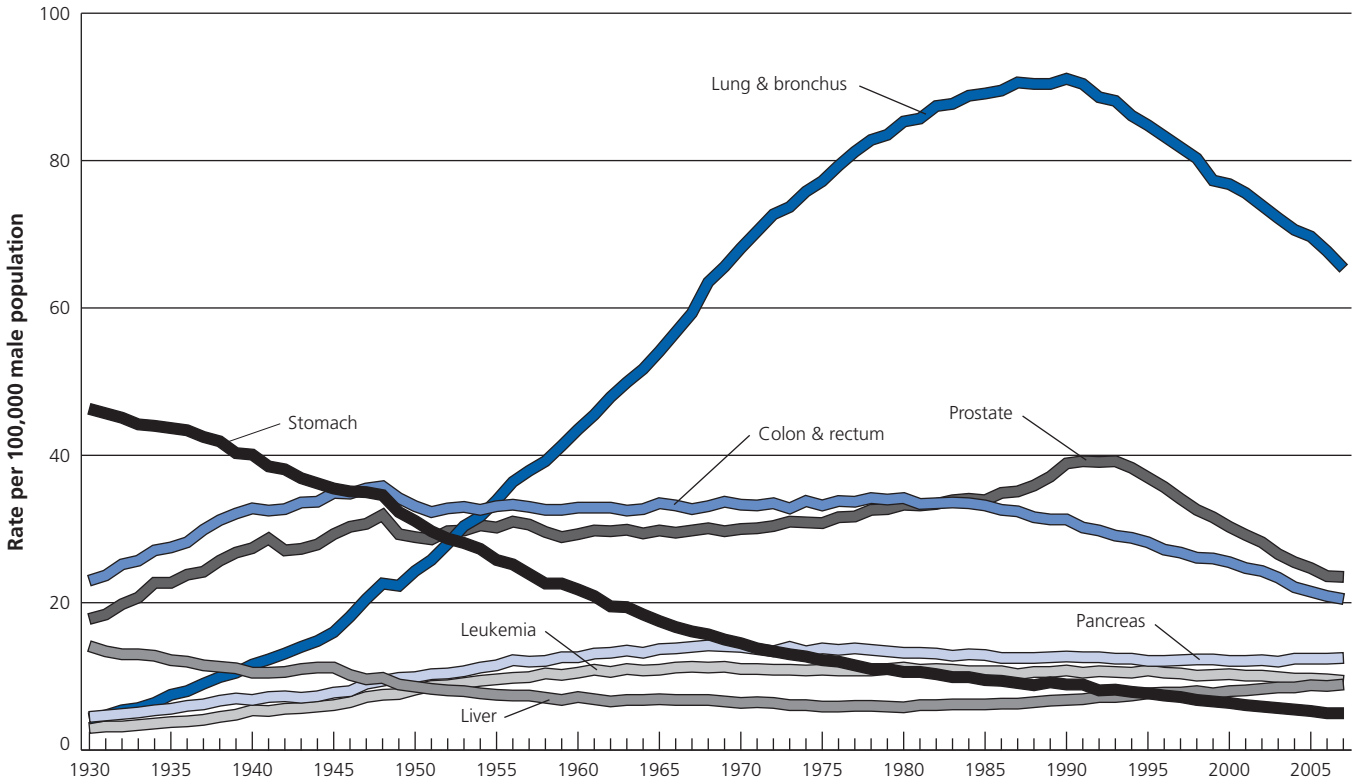
The 5-year relative survival rate for all cancers diagnosed between 1999 and 2006 is 68%, up from 50% in 1975-1977 (see page 18). The improvement in survival reflects progress in diagnosing certain cancers at an earlier stage and improvements in treatment. Survival statistics vary greatly by cancer type 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 1999 to 2006 and do not reflect recent advances in detection and treatment. Second, factors that influence survival, such as treatment protocols, additional illnesses, and biological or behavioral differences of each individual, cannot be taken into account in the estimation of relative survival rates. For more information about survival rates, see Sources of Statistics on page 53.

How Is Cancer Staged?

Staging describes the extent or spread of the disease at the time of diagnosis. Proper staging is essential in determining the choice of therapy and in assessing prognosis. A cancer's stage is

Age-adjusted Cancer Death Rates,* Males by Site, US, 1930-2007



*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 changes.

Source: US Mortality Data, 1960 to 2007, US Mortality Volumes, 1930 to 1959, National Center for Health Statistics, Centers for Disease Control and Prevention.

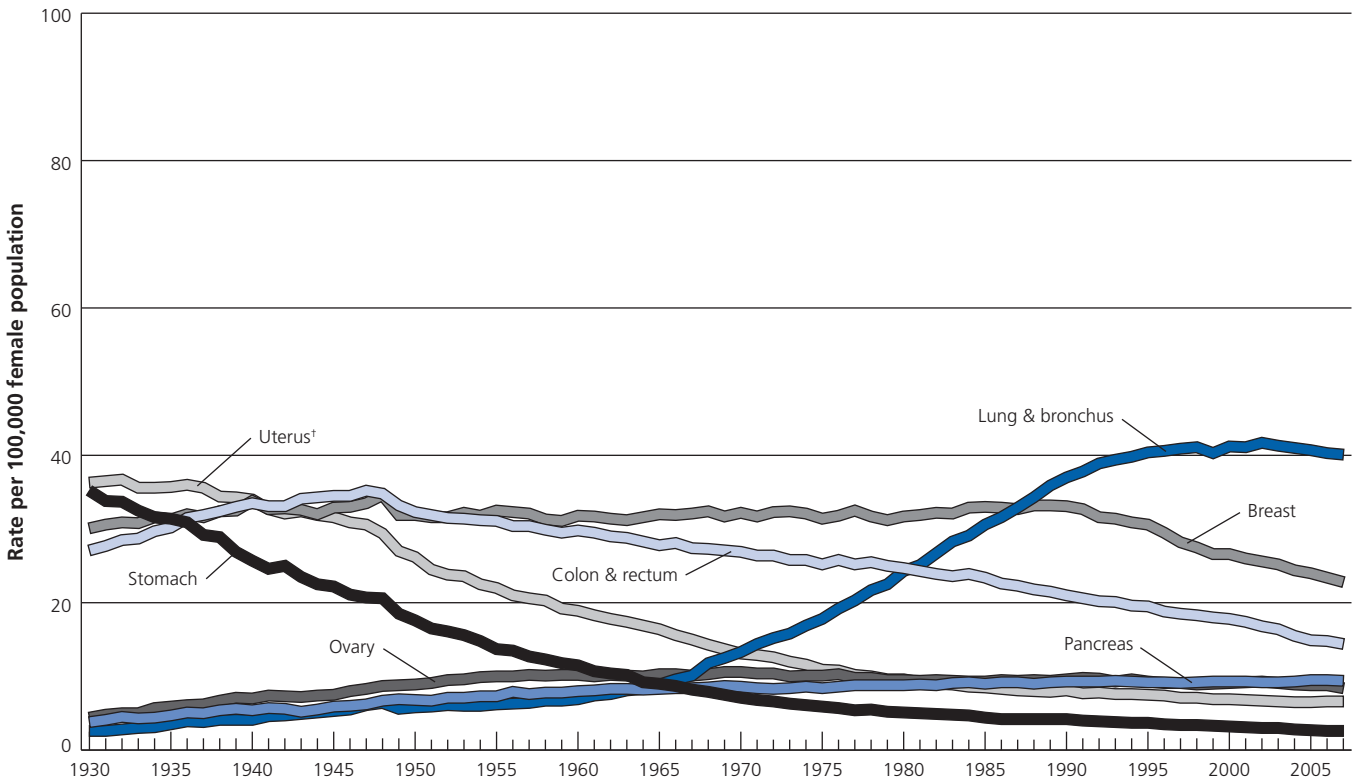
based on the primary tumor's size and whether it has spread to other areas of the body. A number of different staging systems are used to classify tumors. The TNM staging system assesses tumors in three ways: extent of the primary tumor (T), absence or presence of regional lymph node involvement (N), and absence or presence of distant metastases (M). Once the T, N, and M are determined, a stage of I, II, III, or IV is assigned, with stage I being early and stage IV being advanced disease. A different 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 the original layer of tissue, the cancer is invasive. (For a description of the other summary stage categories, see Five-year Relative Survival Rates by Stage at Diagnosis, 1999-2006, page 17.) As the molecular properties of cancer have become better understood, prognostic models have been developed for some cancer sites that incorporate biological markers and genetic features in addition to anatomical characteristics.

What Are the Costs of Cancer?

The National Institutes of Health estimates overall costs of cancer in 2010 at $263.8 billion: $102.8 billion for direct medical costs (total of all health expenditures); $20.9 billion for indirect morbidity costs (cost of lost productivity due to illness); and $140.1 billion for indirect mortality costs (cost of lost productivity due to premature death).

Lack of health insurance and other barriers prevents many Americans from receiving optimal health care. According to the US Census Bureau, almost 51 million Americans were uninsured in 2009; almost one-third of Hispanics (32%) and one in 10 children (17 years 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, 1930-2007



*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 changes.

Source: US Mortality Data, 1960 to 2007, US Mortality Volumes, 1930 to 1959, National Center for Health Statistics, Centers for Disease Control and Prevention.

Estimated New Cancer Cases and Deaths by Sex for All Sites, US, 2011*

	Estimated New Cases			Estimated Deaths		
	Both Sexes	**Male**	**Female**	**Both Sexes**	**Male**	**Female**
All Sites	1,596,670	822,300	774,370	571,950	300,430	271,520
Oral cavity & pharynx	39,400	27,710	11,690	7,900	5,460	2,440
Tongue	12,060	8,560	3,500	2,030	1,320	710
Mouth	11,510	6,950	4,560	1,790	1,130	660
Pharynx	13,580	10,600	2,980	2,430	1,740	690
Other oral cavity	2,250	1,600	650	1,650	1,270	380
Digestive system	277,570	151,540	126,030	139,250	79,020	60,230
Esophagus	16,980	13,450	3,530	14,710	11,910	2,800
Stomach	21,520	13,120	8,400	10,340	6,260	4,080
Small intestine	7,570	3,990	3,580	1,100	610	490
Colon†	101,340	48,940	52,400	49,380	25,250	24,130
Rectum	39,870	22,910	16,960			
Anus, anal canal, & anorectum	5,820	2,140	3,680	770	300	470
Liver & intrahepatic bile duct	26,190	19,260	6,930	19,590	13,260	6,330
Gallbladder & other biliary	9,250	3,990	5,260	3,300	1,230	2,070
Pancreas	44,030	22,050	21,980	37,660	19,360	18,300
Other digestive organs	5,000	1,690	3,310	2,400	840	1,560
Respiratory system	239,320	128,890	110,430	161,250	88,890	72,360
Larynx	12,740	10,160	2,580	3,560	2,840	720
Lung & bronchus	221,130	115,060	106,070	156,940	85,600	71,340
Other respiratory organs	5,450	3,670	1,780	750	450	300
Bones & joints	2,810	1,620	1,190	1,490	850	640
Soft tissue (including heart)	10,980	6,050	4,930	3,920	2,060	1,860
Skin (excluding basal & squamous)	76,330	43,890	32,440	11,980	8,080	3,900
Melanoma-skin	70,230	40,010	30,220	8,790	5,750	3,040
Other nonepithelial skin	6,100	3,880	2,220	3,190	2,330	860
Breast	232,620	2,140	230,480	39,970	450	39,520
Genital system	338,620	250,540	88,080	63,980	34,390	29,590
Uterine cervix	12,710		12,710	4,290		4,290
Uterine corpus	46,470		46,470	8,120		8,120
Ovary	21,990		21,990	15,460		15,460
Vulva	4,340		4,340	940		940
Vagina & other genital, female	2,570		2,570	780		780
Prostate	240,890	240,890		33,720	33,720	
Testis	8,290	8,290		350	350	
Penis & other genital, male	1,360	1,360		320	320	
Urinary system	132,900	90,750	42,150	28,970	19,460	9,510
Urinary bladder	69,250	52,020	17,230	14,990	10,670	4,320
Kidney & renal pelvis	60,920	37,120	23,800	13,120	8,270	4,850
Ureter & other urinary organs	2,730	1,610	1,120	860	520	340
Eye & orbit	2,570	1,270	1,300	240	130	110
Brain & other nervous system	22,340	12,260	10,080	13,110	7,440	5,670
Endocrine system	50,400	12,820	37,580	2,620	1,160	1,460
Thyroid	48,020	11,470	36,550	1,740	760	980
Other endocrine	2,380	1,350	1,030	880	400	480
Lymphoma	75,190	40,880	34,310	20,620	10,510	10,110
Hodgkin lymphoma	8,830	4,820	4,010	1,300	760	540
Non-Hodgkin lymphoma	66,360	36,060	30,300	19,320	9,750	9,570
Myeloma	20,520	11,400	9,120	10,610	5,770	4,840
Leukemia	44,600	25,320	19,280	21,780	12,740	9,040
Acute lymphocytic leukemia	5,730	3,320	2,410	1,420	780	640
Chronic lymphocytic leukemia	14,570	8,520	6,050	4,380	2,660	1,720
Acute myeloid leukemia	12,950	6,830	6,120	9,050	5,440	3,610
Chronic myeloid leukemia	5,150	3,000	2,150	270	100	170
Other leukemia‡	6,200	3,650	2,550	6,660	3,760	2,900
Other & unspecified primary sites‡	30,500	15,220	15,280	44,260	24,020	20,240

*Rounded to the nearest 10; estimated new cases exclude basal and squamous cell skin cancers and in situ carcinomas except urinary bladder. About 57,650 carcinoma in situ of the female breast and 53,360 melanoma in situ will be newly diagnosed in 2011. †Estimated deaths for colon and rectum cancers are combined. ‡More deaths than cases may reflect lack of specificity in recording underlying cause of death on death certificates and/or an undercount in the case estimate.

Source: Estimated new cases are based on 1995-2007 incidence rates from 46 states and the District of Columbia as reported by the North American Association of Central Cancer Registries (NAACCR), represesnting about 95% of the US population. Estimated deaths are based on data from US Mortality Data, 1969 to 2007, National Center for Health Statistics, Centers for Disease Control and Prevention.

Estimated New Cancer Cases for Select Sites by State, US, 2011*

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	25,530	3,700	210	2,310	550	590	4,240	1,260	960	3,680	930
Alaska	3,090	460	†	260	80	80	380	90	130	490	130
Arizona	31,550	4,240	220	2,620	800	780	3,820	1,330	1,220	4,660	1,530
Arkansas	16,070	2,100	130	1,550	370	420	2,660	500	650	2,400	650
California	163,480	25,510	1,520	13,880	4,730	4,760	17,660	8,250	7,070	25,030	6,810
Colorado	22,390	3,390	160	1,780	600	710	2,250	1,130	970	3,920	960
Connecticut	21,440	3,280	110	1,680	700	520	2,680	1,060	880	3,300	1,050
Delaware	5,130	810	†	430	150	120	780	240	200	840	230
Dist. of Columbia	2,830	500	†	240	80	70	360	70	100	580	90
Florida	113,400	15,330	900	10,180	2,960	3,440	17,150	5,260	4,720	16,780	5,490
Georgia	44,580	7,030	410	3,940	1,120	1,130	6,410	2,120	1,670	7,360	1,460
Hawaii	6,710	1,040	50	670	230	170	780	340	230	850	230
Idaho	7,520	1,030	50	620	210	240	870	340	310	1,320	350
Illinois	65,610	9,510	570	6,240	2,050	1,870	9,210	2,340	2,640	9,340	2,910
Indiana	34,050	4,760	260	3,290	1,010	970	5,520	1,410	1,390	4,580	1,440
Iowa	17,500	2,120	100	1,670	560	580	2,480	890	770	2,590	810
Kansas	14,070	1,890	90	1,300	440	430	1,990	710	620	1,870	580
Kentucky	25,010	3,470	210	2,420	690	650	4,860	1,510	1,040	3,220	1,020
Louisiana	22,780	2,940	220	2,220	470	620	3,630	630	930	3,640	870
Maine	8,820	1,280	50	770	300	260	1,400	400	370	1,240	500
Maryland	28,890	4,850	230	2,470	900	700	3,960	1,330	1,130	5,060	1,150
Massachusetts	37,470	5,640	200	3,000	1,210	970	4,970	1,740	1,550	5,470	1,870
Michigan	57,010	7,890	360	4,800	1,810	1,630	8,140	2,470	2,330	8,940	2,680
Minnesota	27,600	3,380	130	2,110	820	820	3,340	880	1,140	4,370	1,100
Mississippi	14,990	2,170	150	1,520	320	370	2,430	500	550	2,150	520
Missouri	32,740	4,100	230	3,150	960	880	5,470	1,310	1,300	4,230	1,370
Montana	5,690	760	†	480	150	170	750	190	240	1,020	280
Nebraska	9,430	1,240	50	930	310	290	1,270	430	430	1,290	410
Nevada	12,800	1,420	110	1,080	290	290	1,510	410	440	1,850	540
New Hampshire	8,210	1,190	†	650	260	210	1,110	410	330	1,200	410
New Jersey	49,080	7,360	430	4,290	1,630	1,360	6,210	2,430	2,140	7,840	2,390
New Mexico	9,630	1,310	80	820	240	320	980	400	370	1,420	360
New York	107,260	15,710	960	9,480	3,670	3,070	14,200	3,750	4,650	15,950	5,150
North Carolina	48,870	7,390	380	4,200	1,280	1,230	7,300	2,300	1,930	7,580	1,900
North Dakota	3,560	430	†	340	100	100	420	130	150	600	170
Ohio	65,060	8,970	480	5,850	2,080	1,690	10,060	2,620	2,660	9,190	2,890
Oklahoma	18,980	2,680	170	1,800	480	590	3,270	690	850	2,730	760
Oregon	21,180	3,360	130	1,730	630	560	2,860	1,230	940	3,250	1,020
Pennsylvania	78,030	10,570	540	7,360	2,620	2,090	10,900	3,240	3,340	11,500	3,920
Rhode Island	6,090	930	†	510	200	160	880	270	250	880	320
South Carolina	25,510	3,710	200	2,100	650	640	3,900	1,200	960	4,230	950
South Dakota	4,430	590	†	460	130	140	580	180	190	670	220
Tennessee	34,750	5,020	280	3,170	850	930	5,870	1,810	1,410	4,850	1,350
Texas	105,000	15,070	1,230	9,560	2,670	3,280	13,880	3,970	4,520	15,630	3,670
Utah	10,530	1,380	70	760	300	320	630	600	440	1,890	400
Vermont	3,950	590	†	320	130	100	530	210	160	610	190
Virginia	38,720	6,480	300	3,420	1,150	940	5,670	1,920	1,520	6,420	1,500
Washington	35,360	5,630	230	2,720	1,060	1,060	4,540	2,000	1,610	5,470	1,640
West Virginia	11,080	1,510	80	1,140	360	300	2,080	480	480	1,510	510
Wisconsin	30,530	4,430	190	2,690	1,060	960	4,020	1,160	1,390	4,900	1,450
Wyoming	2,680	360	†	230	70	70	310	110	120	490	130
United States	1,596,670	230,480	12,710	141,210	46,470	44,600	221,130	70,230	66,360	240,890	69,250

*Rounded to nearest 10. Excludes basal 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 Cancer Deaths for Select Sites by State, US, 2011*

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non-Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	10,210	210	700	930	350	320	3,210	310	290	600	710
Alaska	910	†	70	80	†	†	250	†	†	60	†
Arizona	10,820	290	760	1,020	420	400	2,660	340	330	690	640
Arkansas	6,460	140	440	580	240	210	2,030	190	150	440	330
California	56,030	1,480	3,980	4,780	2,200	2,700	12,450	2,050	1,630	4,010	4,330
Colorado	6,980	210	500	650	300	240	1,690	290	240	480	430
Connecticut	6,800	150	480	500	260	220	1,750	220	190	550	460
Delaware	1,930	†	120	160	60	60	590	50	50	120	110
Dist. of Columbia	920	†	80	90	†	†	210	†	†	70	80
Florida	40,980	790	2,690	3,370	1,570	1,410	11,460	1,310	1,020	2,610	2,160
Georgia	15,860	330	1,120	1,420	560	450	4,670	500	440	980	1,080
Hawaii	2,370	†	140	220	80	120	580	90	60	180	140
Idaho	2,570	90	160	210	120	70	630	90	70	200	210
Illinois	23,140	470	1,830	2,190	900	710	6,420	680	640	1,610	1,310
Indiana	12,960	340	870	1,090	520	350	4,020	420	350	810	690
Iowa	6,390	160	380	600	300	170	1,770	290	190	390	410
Kansas	5,370	140	370	480	300	150	1,600	190	150	340	290
Kentucky	9,750	190	590	850	320	250	3,420	300	220	550	410
Louisiana	8,360	210	610	900	300	360	2,480	270	220	540	480
Maine	3,180	80	170	260	110	90	960	80	80	200	170
Maryland	10,240	210	800	920	390	380	2,720	300	270	710	770
Massachusetts	12,910	270	760	980	470	460	3,490	360	370	940	640
Michigan	20,770	510	1,320	1,670	820	610	5,830	660	560	1,360	1,150
Minnesota	9,240	230	610	750	390	290	2,470	310	250	610	460
Mississippi	6,060	150	400	620	220	200	2,010	190	150	360	360
Missouri	12,700	280	870	1,060	510	390	3,970	450	300	830	540
Montana	2,000	60	110	170	90	50	570	80	60	120	140
Nebraska	3,510	90	200	350	140	90	900	140	90	200	280
Nevada	4,740	120	330	540	100	190	1,290	150	120	320	310
New Hampshire	2,690	70	190	200	100	80	770	60	60	200	160
New Jersey	16,370	330	1,260	1,510	610	470	4,160	630	470	1,140	1,100
New Mexico	3,460	80	240	340	120	160	800	120	90	230	270
New York	34,350	810	2,450	2,890	1,350	1,310	8,580	1,470	1,000	2,470	1,770
North Carolina	19,760	340	1,390	1,480	660	520	5,770	550	460	1,200	990
North Dakota	1,280	†	80	110	50	†	310	†	†	100	80
Ohio	24,900	540	1,730	2,170	910	700	7,210	830	600	1,550	1,260
Oklahoma	7,780	170	530	690	290	230	2,390	280	180	400	350
Oregon	7,550	210	490	700	280	240	2,110	320	240	540	470
Pennsylvania	28,560	540	1,970	2,440	1,080	870	7,960	1,090	800	2,070	1,920
Rhode Island	2,150	50	120	140	90	80	590	50	60	140	80
South Carolina	9,310	200	660	740	330	280	2,910	300	260	570	550
South Dakota	1,680	†	100	150	70	50	450	80	50	110	120
Tennessee	13,790	340	890	1,170	490	390	4,570	470	330	770	750
Texas	36,770	830	2,620	3,230	1,410	1,730	9,560	1,060	950	2,260	2,060
Utah	2,880	100	260	250	140	80	490	100	90	200	230
Vermont	1,290	†	100	110	60	†	360	†	†	80	60
Virginia	14,340	300	1,140	1,270	500	430	4,100	440	410	950	780
Washington	11,740	380	800	960	490	460	3,090	430	370	790	760
West Virginia	4,680	100	270	420	140	120	1,480	190	120	220	120
Wisconsin	11,440	260	690	860	480	340	2,940	390	330	730	600
Wyoming	1,020	†	60	110	†	†	260	50	†	70	60
United States	571,950	13,110	39,520	49,380	21,780	19,590	156,940	19,320	15,460	37,660	33,720

*Rounded to nearest 10. †Estimate is fewer than 50 deaths.

Note: State estimates may not add to US total due to rounding and exclusion of state estimates fewer than 50 deaths.

Source: US Mortality Data, 1969 to 2007, National Center for Health Statistics, Centers for Disease Control and Prevention.

Cancer Incidence Rates* by Site and State, US, 2003-2007

	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†	567.5	381.2	114.5	61.4	41.6	106.3	53.2	20.0	13.9	158.4	32.0	7.7
Alaska	512.0	423.5	128.6	56.8	44.3	84.2	63.5	22.1	16.7	133.4	37.5	7.8
Arizona	452.0	355.0	103.6	44.7	33.1	65.4	48.5	18.0	13.1	123.4	33.0	8.4
Arkansas	565.2	386.5	111.3	57.5	41.9	110.9	60.2	22.1	15.2	161.3	33.3	8.6
California	508.9	392.4	121.0	51.4	38.8	63.9	46.3	22.5	15.5	147.1	34.0	8.1
Colorado	503.6	393.8	122.4	49.8	38.6	58.8	45.3	21.7	16.0	158.9	33.3	8.5
Connecticut	589.3	456.3	134.5	59.4	44.4	80.5	60.3	26.0	18.1	163.5	46.3	12.5
Delaware	612.6	443.6	125.7	61.4	44.0	98.0	70.7	23.9	16.6	182.2	43.6	11.8
Dist. of Columbia‡	569.5	421.9	139.4	58.1	47.9	79.4	46.3	22.9	13.4	185.4	24.8	8.6
Florida	532.0	401.0	112.5	53.1	40.4	86.7	59.4	21.5	15.2	137.2	36.4	9.4
Georgia	562.7	393.2	118.5	56.9	41.2	98.8	53.9	21.1	14.3	162.0	32.7	7.9
Hawaii	493.8	386.8	120.6	59.5	40.1	69.2	40.5	19.4	12.4	131.6	25.8	6.5
Idaho	536.2	404.9	116.3	48.2	38.4	68.3	49.1	21.8	17.1	165.8	36.0	9.0
Illinois	576.7	430.3	122.6	65.6	47.3	91.2	59.4	24.2	16.2	157.0	40.2	10.5
Indiana	552.7	416.1	113.8	61.3	45.2	102.4	63.9	22.9	17.0	137.2	37.2	9.4
Iowa	557.2	429.2	122.4	61.9	48.0	89.3	54.2	25.2	18.1	141.8	41.4	9.3
Kansas	559.3	419.3	124.6	60.7	42.4	87.6	53.7	24.3	18.1	158.5	36.2	8.9
Kentucky	610.0	452.8	120.1	67.6	48.9	131.3	78.2	23.5	17.1	141.7	39.2	10.1
Louisiana†	616.4	409.0	118.8	66.7	46.0	107.8	58.9	23.5	16.6	174.5	35.4	8.5
Maine	618.9	466.2	128.8	61.6	47.2	99.1	66.6	24.6	18.8	166.2	49.8	13.9
Maryland‡	537.8	414.7	123.8	54.4	41.4	81.5	57.9	20.9	14.5	159.4	32.8	9.8
Massachusetts	594.0	456.8	131.7	60.5	43.9	82.2	63.1	24.5	16.9	164.6	45.9	12.7
Michigan	591.8	437.2	122.2	57.1	43.4	91.9	62.5	25.7	18.7	173.0	41.9	10.7
Minnesota	567.2	418.4	125.9	54.8	41.6	69.0	49.7	26.3	17.8	183.4	40.0	10.1
Mississippi†‡	589.5	383.7	109.7	64.1	46.3	114.5	54.9	20.6	13.8	170.8	29.4	7.3
Missouri	549.3	417.8	119.8	61.1	44.0	104.1	63.9	21.8	15.8	132.5	35.7	8.6
Montana	527.8	405.3	120.2	50.3	39.6	74.5	58.3	22.5	14.5	168.5	38.3	9.3
Nebraska	562.4	419.2	122.8	66.6	47.4	84.2	51.2	24.4	17.7	159.0	37.1	9.5
Nevada§	—	—	—	—	—	—	—	—	—	—	—	—
New Hampshire	578.8	454.6	130.1	56.0	43.1	82.5	62.4	23.5	18.1	155.7	46.8	13.3
New Jersey	598.2	451.2	128.4	62.6	46.0	78.3	56.3	25.6	17.7	172.4	46.7	12.1
New Mexico	474.8	365.1	109.3	48.2	35.9	55.7	38.7	18.3	14.3	144.4	26.2	7.3
New York	576.8	435.6	124.3	58.4	44.3	78.2	54.3	25.0	17.5	165.8	42.2	11.1
North Carolina	561.6	406.3	121.4	56.0	40.9	101.0	57.6	21.9	15.4	153.9	35.7	9.0
North Dakota	552.3	410.0	123.4	68.5	43.5	73.6	48.0	23.1	16.8	165.8	40.3	10.4
Ohio	548.4	418.6	119.9	60.0	44.5	96.1	59.7	23.1	16.4	145.5	38.8	9.5
Oklahoma	572.3	428.9	126.8	58.6	43.7	105.3	64.9	23.2	17.8	154.0	35.9	8.8
Oregon	527.1	428.4	130.2	51.8	39.9	77.1	60.1	24.0	16.6	146.8	38.7	9.9
Pennsylvania	590.0	447.4	123.9	63.9	47.4	90.0	57.1	25.0	17.5	158.1	44.9	11.3
Rhode Island	607.1	460.0	130.0	61.8	45.7	92.6	61.9	24.9	17.4	153.5	52.9	13.0
South Carolina	576.5	398.6	119.8	58.5	42.8	100.2	53.7	20.8	14.4	166.5	31.6	8.0
South Dakota	526.0	387.4	116.8	56.6	42.7	77.4	46.3	21.0	16.5	165.0	35.7	7.9
Tennessee‡	543.8	399.1	116.5	57.8	43.0	109.8	60.1	21.5	15.5	135.6	33.4	8.1
Texas†	539.1	389.6	113.3	56.3	39.1	86.0	50.9	22.5	16.0	145.2	30.2	7.3
Utah	483.4	342.4	108.1	44.4	31.6	36.2	23.2	22.6	16.1	178.8	28.8	5.9
Vermont	562.1	456.4	130.4	49.4	42.9	84.5	61.1	23.8	18.3	155.5	45.1	12.6
Virginia	539.1	391.9	122.1	54.2	41.0	88.5	53.8	20.8	13.9	159.1	33.8	8.5
Washington	559.5	436.8	130.3	51.2	38.6	76.1	59.3	27.0	18.2	161.7	40.3	9.8
West Virginia	582.5	439.9	115.3	68.0	48.7	116.3	71.3	24.0	17.3	140.1	39.7	11.0
Wisconsin	543.8	426.3	122.0	54.6	42.2	76.8	53.8	25.5	18.7	148.3	39.7	11.1
Wyoming	512.0	389.9	114.8	51.0	41.6	59.9	48.3	21.3	15.7	167.9	40.8	9.3
United States	552.5	414.7	120.7	57.1	42.4	84.9	55.6	23.2	16.3	153.5	37.7	9.6

* 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 rates for the US overall because its cancer registry did not achieve high-quality data standards for one or more years during 2003-2007 according to the North American Association of Central Cancer Registry (NAACCR) data quality indicators. §This state's registry did not submit incidence data to NAACCR for 2003-2007.

Source: NAACCR, 2010. 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.

Cancer Death Rates* by Site and State, US, 2003-2007

	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	263.8	159.9	24.8	23.6	15.1	92.2	41.7	8.6	5.7	12.7	9.2	30.1
Alaska	213.0	156.0	22.7	21.0	13.8	64.8	44.4	7.4	4.8	11.7	9.3	20.6
Arizona	190.6	135.4	21.3	18.5	12.5	54.1	34.9	7.7	4.9	11.0	7.7	21.0
Arkansas	255.5	164.9	24.4	23.4	15.7	93.2	47.5	8.9	5.3	12.6	9.4	27.1
California	198.7	145.2	22.8	18.8	13.5	51.4	34.5	8.3	5.2	11.6	9.3	23.6
Colorado	190.6	139.4	21.3	18.7	13.9	47.8	32.9	8.4	5.0	10.9	8.8	24.5
Connecticut	218.2	154.7	23.7	18.8	14.2	59.6	40.1	8.8	5.5	14.2	10.0	25.5
Delaware	241.4	168.4	24.6	22.3	16.0	76.4	50.4	9.2	5.0	11.2	9.5	26.1
Dist. of Columbia	258.1	162.2	28.3	24.4	17.6	69.1	34.9	8.8	4.1	15.5	10.4	41.7
Florida	211.0	145.3	22.1	18.9	13.4	66.2	40.6	8.3	5.1	11.7	8.5	20.5
Georgia	241.1	153.0	23.9	21.3	14.7	81.6	39.7	8.2	5.0	12.5	9.1	28.9
Hawaii	187.3	122.6	17.9	19.9	11.4	51.2	27.7	7.5	4.3	12.2	9.3	17.1
Idaho	202.3	146.6	21.6	17.2	13.7	53.4	35.4	8.4	6.2	11.5	10.3	27.5
Illinois	235.4	163.4	25.2	23.9	16.5	71.1	42.2	9.2	5.7	13.0	9.9	26.2
Indiana	249.4	166.7	24.5	24.0	15.7	83.9	47.6	10.0	6.0	13.1	9.4	25.6
Iowa	225.4	153.3	22.0	22.1	15.8	70.8	39.1	9.5	5.9	11.7	8.9	25.9
Kansas	225.2	154.1	24.0	21.6	15.0	72.3	41.2	9.7	6.0	12.5	9.4	22.6
Kentucky	275.0	177.6	24.2	25.2	17.6	105.2	56.0	9.6	6.0	12.5	9.4	25.8
Louisiana	270.7	171.5	27.7	26.3	16.9	89.7	45.6	9.4	5.8	13.6	10.7	28.8
Maine	245.0	169.5	22.6	20.8	16.3	76.9	48.7	9.4	5.6	12.9	9.9	25.4
Maryland	230.8	161.7	25.8	22.8	15.6	69.1	42.9	8.1	5.1	12.8	10.5	27.5
Massachusetts	230.5	159.4	22.9	21.1	14.8	65.5	43.8	8.9	5.7	13.4	10.2	24.6
Michigan	232.8	163.1	24.5	21.1	15.4	72.5	44.1	9.6	6.3	13.4	9.7	23.9
Minnesota	211.9	149.1	21.8	18.8	13.7	58.3	37.0	9.5	5.5	11.7	9.1	25.3
Mississippi	276.3	162.0	25.8	24.9	16.9	99.4	43.0	8.3	4.9	13.5	9.8	32.1
Missouri	245.7	164.9	25.8	22.5	15.6	84.3	46.6	8.9	5.6	12.9	9.5	23.6
Montana	211.2	156.5	21.4	18.1	14.3	60.7	43.3	8.7	6.1	12.1	8.8	27.8
Nebraska	218.8	148.0	22.4	23.1	15.7	65.6	35.6	9.1	6.2	12.1	8.4	24.5
Nevada	217.9	165.2	23.9	22.0	16.5	65.0	50.9	7.0	5.3	11.9	9.5	24.5
New Hampshire	227.2	162.2	23.1	21.0	14.8	65.5	44.7	8.7	5.5	12.4	11.2	26.2
New Jersey	222.5	163.2	27.0	23.3	16.7	61.5	39.7	8.9	5.8	13.1	9.8	23.9
New Mexico	194.8	138.0	22.1	19.2	13.3	46.1	29.9	7.4	4.9	11.2	9.1	25.4
New York	206.0	150.5	23.9	20.8	15.0	57.7	36.7	8.0	5.2	12.4	9.6	23.5
North Carolina	244.8	157.7	24.8	21.2	14.5	82.5	42.0	8.3	5.4	12.8	9.6	27.7
North Dakota	210.8	147.9	22.4	21.3	14.8	58.6	35.1	8.4	5.2	11.6	9.5	26.4
Ohio	249.1	168.3	26.6	23.6	16.8	80.3	45.3	9.6	5.9	12.9	9.6	26.3
Oklahoma	246.0	162.6	24.7	23.1	15.0	85.0	47.1	9.3	5.9	11.8	8.5	23.6
Oregon	219.9	161.7	23.2	19.3	14.8	64.2	45.5	9.5	6.2	12.4	10.0	26.0
Pennsylvania	239.6	164.0	25.6	23.6	16.1	71.4	40.4	9.6	6.2	13.4	9.9	25.0
Rhode Island	234.9	158.6	22.8	21.0	14.6	69.8	42.0	8.8	5.2	11.5	9.3	24.2
South Carolina	249.0	156.7	24.4	21.4	15.2	83.9	40.6	8.0	5.2	12.4	9.3	28.9
South Dakota	220.3	145.7	22.3	21.4	15.1	65.5	36.5	8.8	5.4	11.2	9.5	26.0
Tennessee	264.0	167.1	25.4	23.1	15.9	95.7	47.5	9.5	5.9	12.7	9.2	27.6
Texas	221.3	147.3	23.0	21.0	13.9	68.3	37.5	8.3	5.3	11.6	8.6	23.1
Utah	161.7	116.3	22.8	15.1	10.9	31.4	17.6	8.1	5.2	9.8	8.1	25.7
Vermont	215.3	156.7	23.5	20.5	15.4	61.8	42.5	8.5	5.1	10.8	8.9	25.2
Virginia	235.7	158.0	25.6	21.7	14.7	74.5	42.1	8.2	5.3	13.0	9.8	27.3
Washington	214.0	158.5	23.0	18.3	13.4	61.5	44.3	9.0	5.8	12.2	9.6	25.4
West Virginia	259.4	175.8	24.3	25.3	17.9	91.0	50.5	10.0	6.4	11.4	7.5	22.3
Wisconsin	223.5	154.5	22.6	19.9	14.0	62.3	38.5	9.3	6.0	12.6	9.4	27.1
Wyoming	204.6	155.2	23.4	20.1	16.0	55.6	38.4	8.3	6.8	12.3	10.7	21.8
United States	225.4	155.4	24.0	21.2	14.9	68.8	40.6	8.7	5.5	12.3	9.4	24.7

*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.

Selected Cancers

Breast

New Cases: An estimated 230,480 new cases of invasive breast cancer are expected to occur among women in the US during 2011; about 2,140 new cases are expected in men. Excluding cancers of the skin, breast cancer is the most frequently diagnosed cancer in women. The incidence rate for female breast cancer began to decline in 2000. The dramatic decrease 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. Since 2003, breast cancer incidence rates have been generally stable.

In addition to invasive breast cancer, 57,650 new cases of in situ breast cancer are expected to occur among women in 2011. Of these, approximately 85% will be ductal carcinoma in situ (DCIS). Since 1998, in situ breast cancer incidence rates have been stable in white women and increasing in African American women by 1.6% per year.

Deaths: An estimated 39,970 breast cancer deaths (39,520 women, 450 men) are expected in 2011. 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 1990, with larger decreases in women younger than 50 (a decrease of 3.2% per year) than in those 50 and older (2.0% per year). The decrease in breast cancer death rates represents progress in earlier detection, improved treatment, and more recently, decreased incidence.

Signs and symptoms: The earliest sign of breast cancer is often an abnormality detected on a mammogram, before it can be felt by the woman or a health care professional. Larger tumors may become evident as a painless mass. 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. Typically, breast pain results from benign conditions and is not an 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 combined estrogen and progestin hormone therapy, physical inactivity, and consumption of one or more alcoholic beverages per day. Medical findings that predict higher risk include high breast tissue density (a mammographic measure of the amount of glandular tissue relative to fatty tissue in the breast), high bone mineral density (routinely measured to identify women at increased risk for osteoporosis), and biopsy-confirmed hyperplasia (especially atypical hyperplasia). High-dose radiation to the chest, typically related to cancer treatment, also increases risk. Reproductive factors that increase risk include a long menstrual history (menstrual periods that start early and/or end late in life), recent use of oral contraceptives, never having children, and having one's first child after age 30.

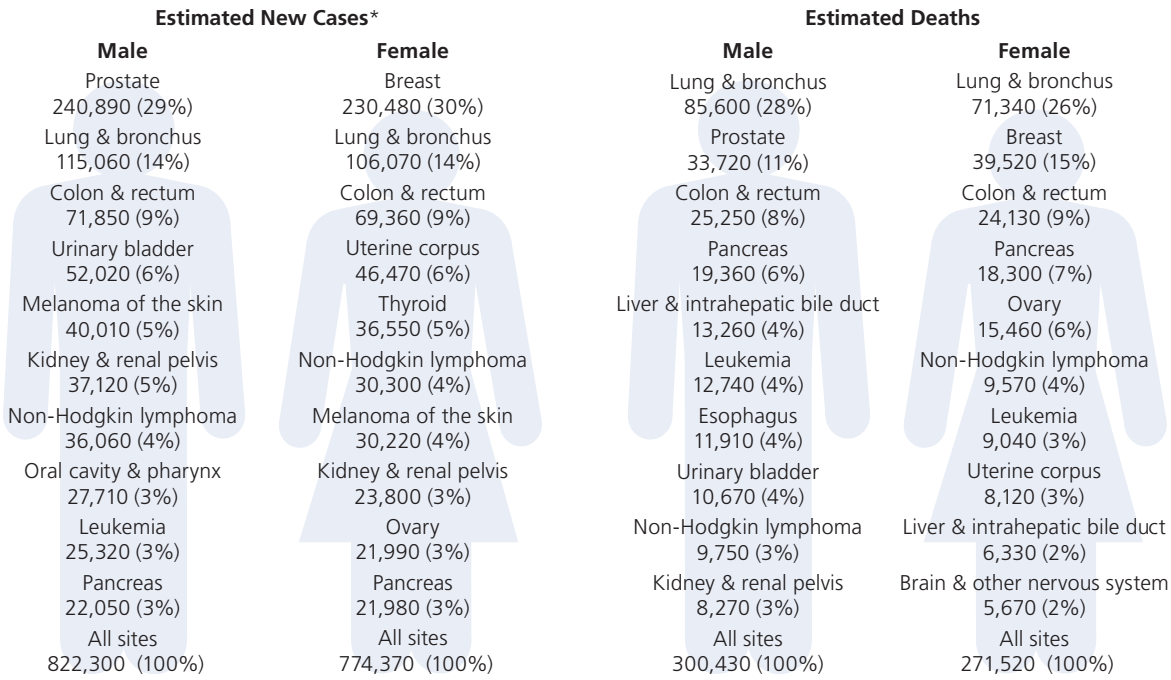
Risk is also increased by a personal or family history of breast cancer and inherited genetic mutations in the breast cancer susceptibility genes BRCA1 and BRCA2. Although these mutations account for approximately 5%-10% of all breast cancer cases, they are very rare in the general population (less than 1%), so widespread genetic testing is not recommended. Some population groups, such as individuals of Ashkenazi Jewish descent, have an increased prevalence of BRCA1 and BRCA2 mutation carriers. Women with a strong family history of breast and/or ovarian cancer should be offered counseling to determine if genetic testing is appropriate. Studies suggest that prophylactic removal of the ovaries and/or breasts in BRCA1 and BRCA2 mutation carriers decreases the risk of breast cancer considerably, although not all women who choose this surgery would have developed breast cancer. Women who consider these options should undergo counseling before reaching a decision. Male BRCA gene mutation carriers are also at increased risk for 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.

Research is ongoing to identify additional modifiable risk factors for breast cancer. The International Agency for Research on Cancer has concluded that there is limited evidence that tobacco smoking causes breast cancer. There is also some evidence that shift work, particularly at night, is associated with an increased risk of breast cancer.

Early detection: 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 saves lives and increases treatment options. Steady declines in breast cancer mortality among women since 1990 have been attributed to a combination of early detection and improvements in treatment. Mammography is a very accurate screening tool, both for women at average and increased risk; however, like most medical tests, it is not perfect. On average, mammography will detect about 80%-90% of breast cancers in women without symptoms. All suspicious abnormalities should be biopsied for a

Leading Sites of New Cancer Cases and Deaths – 2011 Estimates



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

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 Saslow et al. *CA Cancer J Clin* 2007; 57:75-89.) Concerted efforts should be made to improve access to health care and to encourage all women 40 and older to receive regular mammograms.

Treatment: Taking into account tumor size, extent of spread, and other characteristics, as well as patient preference, treatment usually involves lumpectomy (surgical removal of the tumor with clear margins) or mastectomy (surgical removal of the breast). For women whose cancer has not spread to the skin, chest wall, or distant organs, numerous studies have shown that long-term survival rates after lumpectomy plus radiation therapy are similar to survival rates after mastectomy. For women undergoing mastectomy, significant advances in reconstruction techniques provide several options for breast reconstruction, including the timing of the procedure (i.e., during mastectomy or in the time period following the procedure).

Removal 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 (SLNB), a procedure in which only the first lymph nodes to which cancer is likely to spread are removed, is as effective as and less damaging than full axillary node dissection, in which many underarm nodes are removed. For women with smaller tumors whose cancer has spread to only one or two nearby lymph nodes, the use of SLNB, in addition to treatment with whole-breast radiation and chemotherapy or hormone therapy, results in the same outcomes and fewer complications as axillary node dissection.

Treatment may also involve radiation therapy, chemotherapy (before or after surgery), hormone therapy (tamoxifen, aromatase inhibitors), or targeted therapy. Postmenopausal women with breast cancer that tests positive for hormone receptors benefit from treatment with an aromatase inhibitor (i.e., letrozole, anastrozole, or exemestane), either after, 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). After granting accelerated approval of bevacizumab (Avastin) for the treatment of metastatic breast cancer in 2008, the US Food and Drug Administration (FDA) began the process of removing approval of the drug in early 2011 because subsequent studies have shown minimal benefit combined with some potentially dangerous side effects.

It is recommended that all patients with ductal carcinoma in situ (DCIS) be treated to avoid the potential development of invasive cancer. Treatment options for DCIS include lumpectomy 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. 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 the ability to accurately group patients into risk categories that will allow the most successful outcomes with the minimum necessary treatment.

Survival: The 5-year relative survival rate for female breast cancer patients has improved from 63% in the early 1960s to 90% today. The survival rate 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 5-year survival is 84% or 23%, respectively. Relative survival continues to decline after 5 years; for all stages combined, rates at 10 and 15 years after diagnosis are 82% and 75%, respectively. Caution should be used when interpreting long-term survival rates since they represent patients who were diagnosed and treated up to 22 years ago. Improvements in diagnosis and treatment may result in a better outlook for more recently diagnosed patients.

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

New cases: An estimated 11,210 new cases are expected to occur among children 0 to 14 years of age in 2011. Childhood cancers are rare, representing less than 1% of all new cancer diagnoses. Overall, childhood cancer incidence rates have been increasing slightly by 0.6% per year since 1975.

Deaths: An estimated 1,320 cancer deaths are expected to occur among children 0 to 14 years of age in 2011, 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 53% since 1975. The substantial progress in childhood cancer is largely attributable to improvements in treatment and the high proportion of pediatric patients participating in clinical trials.

Early detection: Early symptoms are usually nonspecific. Parents should ensure that children have regular medical checkups and should be alert to any unusual symptoms that persist. Symptoms of childhood cancer include an unusual mass or swelling; unexplained paleness or loss of energy; sudden tendency to bruise; a persistent, localized pain; 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 specific symptoms include:

- Leukemia (34% of all childhood cancers), which may be recognized by bone and joint pain, weakness, bleeding, and fever
- Brain and other nervous system (27%), which in early stages may cause headaches, nausea, vomiting, blurred or double vision, dizziness, and difficulty in walking or handling objects
- Neuroblastoma (7%), a cancer of the nervous system most common in children younger than 5 years that 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 spread to bone marrow and other organs, and may cause swelling of lymph nodes in the neck, armpit, or groin; 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
- Retinoblastoma (3%), an eye cancer that is typically recognized because of discoloration of the eye pupil and usually occurs in children younger than 5 years
- Osteosarcoma (3%), a bone cancer that most commonly appears as sporadic pain in the affected bone that may worsen at night or with activity, with eventual progression to local swelling; most often occurs in adolescents
- Ewing sarcoma (1%), another type of cancer that usually arises in bone, appears as pain at the tumor site, and most often occurs in adolescents

(Proportions are provided 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, pediatric 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 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: For all childhood cancers combined, the 5-year relative survival rate has improved markedly over the past 30 years, from less than 50% before the 1970s to 80% today, due to new and improved treatments. However, rates vary considerably depending on cancer type and patient characteristics. For the most recent time period (1999-2006), the 5-year survival for Hodgkin lymphoma is 95%; Wilms tumor, 89%; non-Hodgkin lymphoma, 85%; leukemia, 82%; neuroblastoma, 73%; brain and other nervous

system, 71%; osteosarcoma, 70%; and rhabdomyosarcoma, 66%. Pediatric cancer patients may experience treatment-related side effects not only at the time of treatment, but several years after diagnosis as well. Late treatment effects include impairment in the function of specific organs, secondary cancers, and cognitive impairments. 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 new information about the late effects of cancer treatment; for more information, visit ccss.stjude.org/.

Colon and Rectum

New cases: An estimated 101,340 cases of colon and 39,870 cases of rectal cancer are expected to occur in 2011. 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 (from 66.3 cases per 100,000 persons in 1985 to 45.3 in 2007). The decline accelerated from 1998 to 2007 (2.9% per year in men and 2.2% per year in women), which has largely been attributed to increases in the use of colorectal cancer screening tests that allow the detection and removal of colorectal polyps before they progress to cancer. In contrast to the overall declines, among adults younger than 50 years, for whom screening is not recommended for those at average risk, colorectal cancer incidence rates have been increasing by 1.6% per year since 1998.

Deaths: An estimated 49,380 deaths from colorectal cancer are expected to occur in 2011, accounting for about 9% of all cancer deaths. Mortality rates for colorectal cancer have declined in both men and women over the past two decades; since 1998, the rate has declined by 2.8% per year in men and by 2.7% per year in women. This decrease reflects declining incidence rates and improvements in early detection and treatment.

Signs and symptoms: Early stage colorectal cancer does not usually have symptoms; therefore, screening is usually necessary to detect colorectal cancer in its early stages. Advanced disease may cause rectal bleeding, blood in the stool, a change in bowel habits, and cramping pain in the lower abdomen. In some cases, blood loss from the cancer leads to anemia (low red blood cells), causing symptoms such as weakness and excessive fatigue. Due to an increase in colorectal cancer incidence in younger adults in recent years, timely evaluation of symptoms consistent with colorectal cancer in adults under age 50 is especially important.

Risk factors: The risk of colorectal cancer increases with age; 90% of cases are diagnosed in individuals 50 years of age and older. Several modifiable factors are associated with increased risk of colorectal cancer. Among these are obesity, physical inactivity, a diet high in red or processed meat, alcohol consumption, long-term smoking, and possibly inadequate intake of fruits and vegetables. Consumption of milk and calcium and higher blood levels of vitamin D appear to decrease risk. Studies suggest that regular use of nonsteroidal anti-inflammatory drugs, such as aspirin, and menopausal hormone therapy also reduce colorectal cancer risk. However, these drugs are not recommended for the prevention of colorectal cancer because they can have serious adverse health effects.

Colorectal cancer risk is also increased by certain inherited genetic conditions (e.g., Lynch syndrome, also known as hereditary nonpolyposis colorectal cancer, and familial adenomatous polyposis [FAP]), a personal or family history of colorectal cancer and/or polyps, or a personal history of chronic inflammatory bowel disease. Studies have also found that individuals with type 2 diabetes are at higher risk of 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 result in the detection and removal of colorectal polyps before they become cancerous, as well as the detection of cancer that is at an early stage. 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 page 55 for the American Cancer Society's screening guidelines for colorectal cancer or the Society's *Colorectal Cancer Facts & Figures 2011-2013* on cancer.org/statistics.

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 wastes) 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. Three targeted monoclonal antibody therapies are approved by the FDA to treat metastatic colorectal cancer: bevacizumab (Avastin) blocks the growth of blood vessels to the tumor, and cetuximab (Erbitux) and panitumumab (Vectibix) both block the effects of hormone-like factors that promote cancer cell growth.

Survival: The 1- and 5-year relative survival rates for persons with colorectal cancer are 83% and 65%, respectively. Survival continues to decline beyond 5 years 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. After the cancer has spread regionally to involve adjacent organs or lymph nodes, the 5-year survival drops to 70%. When the disease has spread to distant organs, 5-year survival is 12%.

Kidney

New cases: An estimated 60,920 new cases of kidney (renal) cancer are expected to be diagnosed in 2011. Kidney cancer includes renal cell carcinoma (92%), renal pelvis carcinoma (7%), and Wilms tumor (1%), a childhood cancer that usually develops before age 5. (See Childhood Cancer, page 11, for information about Wilms tumor.) The incidence rate of kidney cancer has been increasing by 2.0% per year in men since 1992 and 3.0% per year in women since 1998, primarily due to a rapid increase in local stage disease. The increase has been attributed in part to incidental diagnosis during abdominal imaging, which has increased in the past two decades, as opposed to a true increase in cancer occurrence.

Deaths: An estimated 13,120 deaths from kidney cancer are expected to occur in 2011. Death rates for kidney cancer have been decreasing in women by 0.6% per year since 1992 and in men by 1.3% per year since 2002.

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

Risk factors: Tobacco use is a strong risk factor for kidney cancer, with the largest increased risk for cancer of the renal pelvis, particularly for 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 trichloroethylene, an industrial agent used as a metal degreaser and chemical additive. A small proportion of renal cell cancers are the result of rare hereditary conditions, such as von Hippel-Lindau disease.

Early detection: There are no reliable screening tests for people at average risk.

Treatment: Surgery (traditional or laparoscopic) 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. Until recently, immunotherapy (interferon-alpha and interleukin-2), which has intense side effects and generally modest survival benefits, was the main treatment option for late-stage disease. However, improved understanding of the biology of kidney cancer has led to the development of new targeted therapies that block the tumor's blood supply or target other parts of kidney cancer cells. Since 2005, six of these agents have been approved by the FDA for the treatment of metastatic disease: sorafenib (Nexavar), sunitinib (Sutent), temsirolimus (Torisel), everolimus (Afinitor), bevacizumab (Avastin), and pazopanib (Votrient).

Survival: The 1- and 5-year relative survival rates for cancers of the kidney and renal pelvis are 83% and 69%, respectively. More than half of cases are diagnosed at the local stage, for which the 5-year relative survival rate is 90%. Five-year survival is lower for renal pelvis (52%) than for renal cell (70%) carcinoma.

Leukemia

New cases: An estimated 44,600 new cases of leukemia are expected in 2011. Leukemia, a cancer of the bone marrow and blood, is classified into four groups according to cell type: acute lymphocytic (ALL), chronic lymphocytic (CLL), acute myeloid (AML), and chronic myeloid (CML). The most common type in children is ALL, accounting for three-fourths of leukemia cases among children and adolescents 0 to 19 years of age. Almost 90% of leukemia cases are diagnosed in adults 20 years of age and older, in whom the most common types are AML and CLL. Since 1992, leukemia incidence rates overall have been stable in males and increasing slightly (0.5% per year) in females.

Deaths: An estimated 21,780 deaths are expected to occur in 2011. Death rates for leukemia have been declining for the past several decades; since 2003, rates have declined by 0.9% per year among males and by 1.6% 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.

Risk factors: Exposure to ionizing radiation increases risk of several types of leukemia. 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 have higher incidence rates of leukemia. Some recent studies suggest that obesity may also be associated with an increased risk of leukemia. Family history is one of the strongest risk factors for CLL. Cigarette smoking and exposure to certain chemicals such as benzene, a component in gasoline and cigarette smoke, are risk factors for AML. Infection with human T-cell leukemia virus type I (HTLV-I) can cause a rare type of CLL called adult T-cell leukemia/lymphoma. The prevalence of

Probability (%) of Developing Invasive Cancers over Selected Age Intervals by Sex, US, 2005-2007*

		Birth to 39	40 to 59	60 to 69	70 and Older	Birth to Death
All sites†	Male	1.44 (1 in 69)	8.50 (1 in 12)	15.71 (1 in 6)	37.95 (1 in 3)	44.29 (1 in 2)
	Female	2.12 (1 in 47)	9.01 (1 in 11)	10.22 (1 in 10)	26.49 (1 in 4)	37.76 (1 in 3)
Urinary bladder‡	Male	0.02 (1 in 4,693)	0.38 (1 in 262)	0.93 (1 in 107)	3.67 (1 in 27)	3.80 (1 in 26)
	Female	0.01 (1 in 12,116)	0.12 (1 in 836)	0.26 (1 in 390)	0.98 (1 in 102)	1.16 (1 in 87)
Breast	Female	0.48 (1 in 207)	3.75 (1 in 27)	3.45 (1 in 29)	6.53 (1 in 15)	12.15 (1 in 8)
Colon & rectum	Male	0.08 (1 in 1,270)	0.91 (1 in 110)	1.46 (1 in 69)	4.38 (1 in 23)	5.30 (1 in 19)
	Female	0.08 (1 in 1,272)	0.72 (1 in 138)	1.05 (1 in 95)	4.00 (1 in 25)	4.97 (1 in 20)
Leukemia	Male	0.17 (1 in 598)	0.22 (1 in 462)	0.33 (1 in 302)	1.20 (1 in 83)	1.52 (1 in 66)
	Female	0.13 (1 in 759)	0.15 (1 in 688)	0.20 (1 in 494)	0.78 (1 in 128)	1.10 (1 in 91)
Lung & bronchus	Male	0.03 (1 in 3,646)	0.93 (1 in 108)	2.29 (1 in 44)	6.70 (1 in 15)	7.67 (1 in 13)
	Female	0.03 (1 in 3,185)	0.77 (1 in 130)	1.74 (1 in 57)	4.90 (1 in 20)	6.35 (1 in 16)
Melanoma of the skin§	Male	0.15 (1 in 656)	0.64 (1 in 157)	0.74 (1 in 136)	1.85 (1 in 54)	2.73 (1 in 37)
	Female	0.28 (1 in 353)	0.55 (1 in 181)	0.37 (1 in 267)	0.81 (1 in 123)	1.82 (1 in 55)
Non-Hodgkin lymphoma	Male	0.13 (1 in 782)	0.44 (1 in 226)	0.60 (1 in 168)	1.73 (1 in 58)	2.30 (1 in 43)
	Female	0.08 (1 in 1,179)	0.31 (1 in 318)	0.44 (1 in 229)	1.39 (1 in 72)	1.92 (1 in 52)
Prostate	Male	0.01 (1 in 8,517)	2.52 (1 in 40)	6.62 (1 in 15)	12.60 (1 in 8)	16.22 (1 in 6)
Uterine cervix	Female	0.15 (1 in 656)	0.27 (1 in 377)	0.13 (1 in 762)	0.18 (1 in 544)	0.68 (1 in 147)
Uterine corpus	Female	0.07 (1 in 1,423)	0.75 (1 in 134)	0.85 (1 in 117)	1.24 (1 in 81)	2.58 (1 in 39)

*For people free of cancer at beginning of age interval. Percentages and "1 in" numbers may not be equivalent due to rounding. †All sites excludes basal and squamous cell skin cancers and in situ cancers except urinary bladder. ‡Includes invasive and in situ cancer cases. §Statistic is for whites only.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.5.0. Statistical Research and Applications Branch, National Cancer Institute, 2010. srab.cancer.gov/devcan.

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 targeted drugs for the treatment of CML. These drugs are also sometimes used to treat a certain type of ALL. 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 24% for patients diagnosed with AML to 80% 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. From 1975-1977 to 1999-2006, the 5-year relative survival rate for ALL increased from 42% to 66% overall and from 58% to 89% among children. In large part due to the discovery of the targeted cancer drug Gleevec, 5-year survival rates for CML have increased from 33% for cases diagnosed during 1990-1992 to 55% for those diagnosed during 1999-2006.

Liver

New Cases: An estimated 26,190 new cases of liver cancer (including intrahepatic bile duct cancers) are expected to occur in the US during 2011. More than 80% of these cases are hepatocellular carcinoma (HCC), originating from hepatocytes, the predominant type of cell in the liver. The incidence of liver cancer has been increasing by 3.4% per year in men and by 3.0% per year in women since 1992. In contrast to most common cancer sites, incidence rates are highest among Asian Americans/Pacific Islanders and Hispanics.

Deaths: An estimated 19,590 liver cancer deaths (6,330 women, 13,260 men) are expected in 2011. Since 1998, death rates for liver cancer have increased by 2.1% per year in men and by 1.3% per year in women. Incidence and mortality rates are more than twice as high in men as 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, occurring in 50%-90% of patients.

Risk factors: In the US and other western countries, alcohol-related cirrhosis and possibly non-alcoholic 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 who were not vaccinated at birth; and for adults in high-risk groups, including health care workers. It is also recommended that all pregnant women be tested for HBV. In contrast to HBV, no vaccine is available against HCV. The Centers for Disease Control and Prevention (CDC) recommends routine HCV testing for individuals at high risk so that infected individuals can receive counseling in order to reduce the risk of HCV transmission to others. Other preventive measures for HCV infection include screening of donated blood, organs, and tissues; instituting infection control practices during all medical, surgical, and dental procedures; and needle-exchange programs for injecting drug users. Treatment of chronic HCV infection with interferon may reduce the risk of progression to cancer and is the subject of ongoing research. 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 (for example, those chronically infected with HBV or HCV) 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. Fewer surgical options exist for patients diagnosed at an advanced stage of the disease, often because the portion of the liver not affected by cancer is damaged as well. Patients whose tumors cannot be surgically removed may choose ablation (tumor destruction) or embolization, a procedure that cuts off blood flow to the tumor. 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 14%. Thirty-seven percent of patients are diagnosed at an early stage, for which five-year survival is 26%. Survival decreases to 9% and 3% for patients who are diagnosed at regional and distant stages of disease, respectively.

Lung and Bronchus

New cases: An estimated 221,130 new cases of lung cancer are expected in 2011, accounting for about 14% of cancer diagnoses. The incidence rate is declining significantly in men, from a high of 102.1 cases per 100,000 in 1984 to 71.8 cases in 2007. In women, the rate has begun to decrease after a long period of increase. Lung cancer is classified as small cell (14%) or non-small cell (85%) for the purposes of treatment.

Deaths: Lung cancer accounts for more deaths than any other cancer in both men and women. An estimated 156,940 deaths, accounting for about 27% of all cancer deaths, are expected to occur in 2011. Since 1987, more women have died each year from lung cancer than from breast cancer. The decrease in death rates that began in men in 1991 accelerated to 3.0% per year in 2005. Female lung cancer death rates have been decreasing by 0.9% per year since 2003 after continuously increasing since at least 1930. Gender differences in lung cancer mortality patterns reflect historical differences in uptake and reduction of cigarette smoking between men and women 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 quantity and duration of smoking. Cigar and pipe smoking also increase risk. Other risk factors include occupational or environmental exposure to secondhand smoke, radon, asbestos (particularly among smokers), certain metals (chromium, cadmium, arsenic), some organic chemicals, radiation, air pollution, and probably 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 younger age.

Early detection: Early detection by chest x-ray, analysis of cells in sputum, and fiber-optic examination of the bronchial passages has shown limited effectiveness in reducing lung cancer deaths. Newer tests, such as low-dose spiral computed tomography (CT) scans and molecular markers in sputum, have produced promising results in detecting lung cancers at earlier, more operable stages in high-risk patients. Early results from the National Lung Screening Trial, 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 results may not be applicable to the general population because this study cohort was comprised strictly of individuals with a history of heavy smoking – the equivalent of at least a pack of cigarettes per day for 30 years. In addition, the potential risks associated with screening, including cumulative radiation exposure from multiple CT scans, and unnecessary lung biopsy and surgery, have not yet been evaluated.

Treatment: Treatment options are determined by the type (small cell or non-small cell) and stage of cancer and include surgery, radiation therapy, chemotherapy, and targeted therapies such as bevacizumab (Avastin) and erlotinib (Tarceva). For localized cancers, surgery is usually the treatment of choice. Survival for most patients with early stage, non-small cell lung cancer is improved by giving chemotherapy 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 may benefit from the addition of targeted drugs such as bevacizumab (Avastin) or cetuximab (Erbitux) combined with chemotherapy. 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 35% in 1975-1979 to 43% in 2003-2006, largely due to improvements in surgical techniques and combined therapies. However, the 5-year survival rate for all stages combined is only 16%. The 5-year survival rate is 53% for cases detected when the disease is still localized, but only 15% of lung cancers are diagnosed at this early stage. The 5-year survival for small cell lung cancer (6%) is lower than that for non-small cell (17%).

Lymphoma

New cases: An estimated 75,190 new cases of lymphoma will occur in 2011. Lymphoma is cancer of the lymphocytes, or white blood cells, and is classified as Hodgkin (8,830 cases in 2011) or non-Hodgkin (66,360 cases in 2011). Non-Hodgkin lymphoma (NHL) encompasses a wide variety of disease subtypes for which incidence patterns vary; overall incidence has been stable since 1998 in both men and women. Rates for Hodgkin lymphoma have also remained stable since 1998.

Deaths: An estimated 20,620 deaths from lymphoma will occur in 2011 (Hodgkin lymphoma, 1,300; non-Hodgkin lymphoma, 19,320). Death rates for NHL have been decreasing in men since 1997 (by 3.0% per year) and in women since 1998 (by 3.6% per year) after increasing for most of the previous two decades. Death rates for Hodgkin lymphoma have been decreasing in both men and women for more than three decades.

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. In most cases of lymphoma the cause is unknown, although various risk factors associated with altered immune function have been identified. Non-Hodgkin lymphoma risk is elevated in persons with organ transplants who receive immune suppressants to prevent 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 children and young adults), is found in a number of autoimmune-related NHLs, and is also associated with some types of Hodgkin lymphoma. *H. pylori* infection increases the risk of gastric lymphoma. A family history of lymphoma and certain common genetic variations in immune response genes are associated with a modestly increased risk. Occupational and environmental exposures to certain chemicals are also associated with moderately increased 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 recurrence of some types of non-Hodgkin lymphoma, as are antibodies linked to a radioactive atom, such as ibritumomab tiuxetan (Zevalin) and tositumomab (Bexxar). High-dose chemotherapy with stem cell transplantation and low-dose chemotherapy with stem cell transplantation (called non-myeloablative) may be options if non-Hodgkin lymphoma persists or recurs after standard treatment.

Hodgkin lymphoma is usually treated with chemotherapy, radiation therapy, bone marrow or stem cell transplantation, or any combination thereof, depending on stage and cell type of the disease. Recent intermediate results from a clinical trial showed promise for an investigational targeted therapy (brentuximab vedotin) in high-risk Hodgkin patients whose disease had 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 80% and 67%, 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 81%, respectively.

Oral Cavity and Pharynx

New cases: An estimated 39,400 new cases of cancer of the oral cavity and pharynx are expected in 2011. Incidence rates are more than twice as high in men as in women. Since 1992, incidence rates have been declining annually by 1.4% in men and by 1.1% in women. However, recent studies have shown that incidence is increasing for oral cavity cancers associated with human papillomavirus (HPV) infection among white men younger than 50.

Five-year Relative Survival Rates* (%) by Stage at Diagnosis, 1999-2006

	All Stages	Local	Regional	Distant		All Stages	Local	Regional	Distant
Breast (female)	89	98	84	23	Ovary	46	94	73	28
Colon & rectum	65	90	70	12	Pancreas	6	23	9	2
Esophagus	17	37	19	3	Prostate	99	100	100	30
Kidney†	69	90	63	11	Stomach	26	63	27	3
Larynx	61	78	42	33	Testis	95	99	96	72
Liver‡	14	26	9	3	Thyroid	97	100	97	58
Lung & bronchus	16	53	24	4	Urinary bladder	79	73	36	6
Melanoma of the skin	91	98	62	16	Uterine cervix	70	91	58	17
Oral cavity & pharynx	61	83	55	32	Uterine corpus	83	96	68	17

*Rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 17 areas from 1999-2006, followed through 2007.
†Includes renal pelvis. ‡Includes intrahepatic bile duct.

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: Altekruse SF, Kosary CL, Krapcho M, et al. (eds). *SEER Cancer Statistics Review, 1975-2007*, National Cancer Institute, Bethesda, MD, www.seer.cancer.gov/csr/1975_2007/, 2010.

Deaths: An estimated 7,900 deaths from oral cavity and pharynx cancer are expected in 2011. Death rates have been decreasing continuously in both men and women over the past three decades.

Signs and symptoms: Symptoms may include a sore in the throat or mouth that bleeds easily and does not heal, a red or white patch that persists, a lump or thickening, 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.

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 detect premalignant abnormalities and cancer at an early stage, when they are most curable.

Treatment: Radiation therapy and surgery, separately or in combination, are standard treatments. In advanced disease, chemotherapy is added to surgery and/or radiation. Targeted therapy with cetuximab (Erbitux) may be combined with radiation in initial treatment or used alone 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 61% and 51%, respectively.

Ovary

New cases: An estimated 21,990 new cases of ovarian cancer are expected in the US in 2011. Ovarian cancer accounts for about 3% of all cancers among women. Incidence has been declining by 1.0% per year since 1992.

Deaths: An estimated 15,460 deaths are expected in 2011. Ovarian cancer causes more deaths than any other cancer of the female reproductive system. Death rates for ovarian cancer have been decreasing by 1.7% per year since 2002.

Signs and symptoms: Early ovarian cancer usually has no obvious symptoms, although women with early stage disease occasionally experience pelvic pain. Studies have indicated, however, 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 is enlargement of the abdomen, which is caused by the accumulation of fluid. Abnormal vaginal bleeding is rarely a symptom of ovarian cancer.

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 suggest that preventive surgery to remove the ovaries and fallopian tubes in these women can decrease the risk of ovarian cancers. A genetic condition called Lynch syndrome (also known as hereditary nonpolyposis colon cancer) is also associated with increased risk. The use of estrogen alone as postmenopausal hormone therapy has been shown to increase risk in several large studies.

Trends in 5-year Relative Survival Rates* (%) by Race and Year of Diagnosis, US, 1975-2006

	All races			White			African American		
	1975-77	1984-86	1999-2006	1975-77	1984-86	1999-2006	1975-77	1984-86	1999-2006
All sites	50	54	68†	51	55	69†	40	41	59†
Brain	24	29	36†	23	28	35†	27	32	41†
Breast (female)	75	79	90†	76	81	91†	62	65	78†
Colon	52	59	66†	52	60	67†	47	50	55†
Esophagus	5	10	19†	6	11	20†	3	9	13†
Hodgkin lymphoma	74	80	87†	74	80	88†	71	75	82†
Kidney	51	56	70†	51	56	70†	50	54	67†
Larynx	67	66	63†	68	68	65	59	53	49†
Leukemia	36	42	55†	36	43	56†	34	34	47†
Liver & bile duct	4	6	14†	4	6	14†	2	5	10†
Lung & bronchus	13	13	16†	13	14	17†	12	11	13†
Melanoma of the skin	83	87	93†	83	87	93†	60‡	70§	74‡
Myeloma	26	29	39†	26	27	39†	31	32	38†
Non-Hodgkin lymphoma	48	53	69†	49	54	71†	49	48	60†
Oral cavity & pharynx	53	55	63†	55	57	65†	36	36	45†
Ovary	37	40	45†	37	39	45†	43	41	37
Pancreas	3	3	6†	3	3	6†	2	5	5†
Prostate	69	76	100†	70	78	100†	61	66	97†
Rectum	49	57	69†	50	58	70†	45	46	60†
Stomach	16	18	27†	15	18	26†	16	20	26†
Testis	83	93	96†	83	93	97†	73‡#	87‡	87
Thyroid	93	94	97†	93	94	98†	91	90	95
Urinary bladder	74	78	81†	75	79	82†	51	61	66†
Uterine cervix	70	68	71	71	70	73	65	59	64
Uterine corpus	88	84	84†	89	85	86†	61	58	61

*Survival rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 9 areas from 1975-77, 1984-86, 1999 to 2006, and followed through 2007. †The difference in rates between 1975-1977 and 1999-2006 is statistically significant ($p < 0.05$). ‡The standard error of the survival rate is between 5 and 10 percentage points. §The standard error of the survival rate is greater than 10 percentage points. #Survival rate is for 1978-1980.

Source: Altekruse SF, Kosary CL, Krapcho M, et al (eds.). *SEER Cancer Statistics Review, 1975-2007*, National Cancer Institute, Bethesda, MD, seer.cancer.gov/csr/1975_2007/, 2010.

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 also appears to decrease risk.

Early detection: There is currently no sufficiently accurate screening test proven to be effective in 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 and women who have persistent, unexplained symptoms, the combination of a thorough pelvic exam, transvaginal ultrasound, and a blood test for the tumor marker CA125 may be offered. For women at average risk, transvaginal ultrasound and testing for the tumor marker CA125 may help in diagnosis but are not used for routine screening. However, a large clinical trial using these methods to assess the effect of ovarian cancer screening on mortality is currently 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) and the uterus (hysterectomy). 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, more complete surgical staging has been associated with better outcomes. For women with advanced disease, surgically removing all abdominal metastases enhances the effect of chemotherapy and helps improve survival. For women with stage III ovarian cancer that has been optimally debulked (removal of as much of the cancerous tissue as possible), studies have shown that chemotherapy administered both intravenously and directly into the abdomen improves survival. Studies have 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 almost twice as likely to survive 5 years (57%) following

diagnosis as women 65 and older (29%). Overall, the 1-, 5-, and 10-year relative survival of ovarian cancer patients is 75%, 46%, and 38%, respectively. If diagnosed at the localized stage, the 5-year survival rate is 94%; however, only 15% of all cases are detected at this stage, usually incidentally during another medical procedure. The majority of cases (62%) are diagnosed at distant stage. For women with regional and distant disease, 5-year survival rates are 73% and 28%, respectively.

Pancreas

New cases: An estimated 44,030 new cases of pancreatic cancer are expected to occur in the US in 2011. Since 1998, incidence rates of pancreatic cancer have been increasing by 0.8% per year in men and by 1.0% per year in women.

Deaths: An estimated 37,660 deaths are expected to occur in 2011. The death rate for pancreatic cancer increased from 2003 to 2007 by 0.7% per year in men and by 0.1% per year in women.

Signs and symptoms: Cancer of the pancreas often develops without early symptoms. Symptoms may include weight loss, pain in the upper abdomen that may radiate to the back, and occasionally glucose intolerance (high blood glucose levels). Tumors that develop near the common bile duct may cause a blockage that leads to jaundice (yellowing of the skin and eyes), which can sometimes allow the tumor to be diagnosed at an early stage.

Risk factors: Tobacco smoking and smokeless tobacco use increase the risk of pancreatic cancer; incidence rates are about twice as high for cigarette smokers as for nonsmokers. Risk also increases with a family history of pancreatic cancer and a personal history of pancreatitis, diabetes, obesity, and possibly alcohol consumption. Individuals with Lynch syndrome are also at increased risk. Though evidence is still accumulating, consumption of red meat may increase risk.

Early detection: At present, there is no method for the early detection of pancreatic cancer. The disease is usually asymptomatic at first; only 8% of cases are diagnosed at an early stage. Research is under way to identify better methods of early detection.

Treatment: Surgery, radiation therapy, and chemotherapy are treatment options that may extend survival and/or relieve symptoms in many patients, but seldom produce a cure. Less than 20% of patients are candidates for surgery because pancreatic cancer is usually detected after it has spread beyond the pancreas. For patients who do undergo surgery, adjuvant treatment with the chemotherapy drug gemcitabine lengthens survival. The targeted anticancer drug erlotinib (Tarceva) has demonstrated a small improvement in advanced pancreatic cancer survival when used along with gemcitabine. Clinical trials with several new agents, combined with radiation and surgery, may offer improved survival and should be considered as a treatment option.

Survival: For all stages combined, the 1- and 5-year relative survival rates are 26% and 6%, respectively. Even for those people diagnosed with local disease, the 5-year survival is only 23%.

Prostate

New cases: An estimated 240,890 new cases of prostate cancer will occur in the US during 2011. Prostate cancer is the most frequently diagnosed cancer in men. For reasons that remain unclear, incidence rates are significantly higher in African Americans than in whites. Incidence rates for prostate cancer changed substantially between the mid-1980s and mid-1990s, in large part reflecting changes in prostate cancer screening with the prostate-specific antigen (PSA) blood test. Since 1998, incidence rates have remained relatively stable.

Deaths: With an estimated 33,720 deaths in 2011, prostate cancer is the second-leading cause of cancer death in men. Prostate cancer death rates have been decreasing since the mid-1990s in both African Americans and whites. Although death rates have decreased more rapidly among African American than white men, rates in African Americans remain more than twice as high as those in whites.

Signs and symptoms: Early prostate cancer usually has no symptoms. With more advanced disease, men may experience weak or interrupted urine flow; 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 age, race/ethnicity, and family history of the disease. About 62% 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 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.

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, in December 2010, an advisory committee to the FDA recommended against approval for both

finasteride and dutasteride for the prevention of prostate cancer based on risk-benefit analyses. In contrast to previous findings, results from the Selenium and Vitamin E Cancer Prevention Trial showed that vitamin E and selenium do not appear to protect against prostate cancer. Some studies suggest that diets high in lycopene (e.g. tomatoes, especially those cooked in oil), may reduce the risk of prostate cancer.

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 of 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 to allow them to make a decision based on their personal values and preferences.

Results of two large clinical trials, one conducted in Europe and the other in the US, that were designed to determine the efficacy of PSA testing were published in 2009. The European study found a lower risk of death from prostate cancer among men receiving PSA screening while the US study did not. Further analyses of these studies are under way. See page 55 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 the cancer, as well as other medical conditions, and should be discussed with the individual's physician. The grade assigned to the tumor, typically called the Gleason score, indicates the likely aggressiveness of the cancer and ranges from 2 (nonaggressive) to 10 (very aggressive). Surgery (open, laparoscopic, or robotic-assisted), external beam radiation, or radioactive seed implants (brachytherapy) may be used to treat early stage disease; hormonal therapy may be added 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 suggests that careful observation ("active surveillance" or "watchful waiting"), 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. A newer 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 reinfused back into the body, where they attack the prostate cancer cells. The chemotherapy drug cabazitaxel (Jevtana) was approved in 2010 to treat metastatic prostate cancer that does not respond to other treatments.

Survival: More than 90% of all 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 69% to 99.6%. According to the most recent data, 10-year survival is 95% and 15-year survival is 82%. 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. According to one report, in 2006 an estimated 3.5 million cases of NMSC occurred and approximately 2.2 million people were treated for NMSC. Individuals with a history of NMSC are much more likely to develop subsequent NMSC than the general population. Most, but not all, of these forms of skin cancer are highly curable. Melanoma is responsible for most skin cancer deaths, though it accounts for less than 5% of all skin cancer cases, and is expected to be diagnosed in about 70,230 persons in 2011. Melanoma is 10 times more common in whites than in African Americans. Incidence rates are similar in men and women under 65 years, but are more than twice as high in men as in women 65 and older. Melanoma incidence rates have been increasing for at least 30 years. Since 1992, incidence rates among whites have increased by 2.8% per year in both men and women.

Deaths: An estimated 11,980 deaths (8,790 from melanoma and 3,190 from other nonepithelial skin cancers) will occur in 2011. The death rate for melanoma has been decreasing rapidly in whites younger than 50, by 3.0% per year since 1991 in men and by 2.2% per year since 1984 in women. In contrast, in those 50 and older, death rates have been increasing by 1.1% per year since 1989 in men and have been stable since 1990 in women.

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 occur over a few days are usually not cancer, but 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 cancer may appear as growing lumps, often with a rough surface, or as flat,

reddish patches that grow slowly. Another sign of basal and squamous cell 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 basal cell or squamous cell skin cancers.

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 15 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 humans" to definitively "carcinogenic to humans" after a reassessment of the scientific evidence.

Early detection: The best way to detect skin cancer early is to recognize changes in skin growths or the appearance of new growths. Adults should thoroughly examine their skin regularly, preferably once a month. 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 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 lymph node metastases are present. 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. Clinical trials have recently shown that two newer targeted drugs, ipilimumab and RG7204 (PLX4032), may extend survival in people with advanced melanoma.

Survival: Most basal 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 90%, respectively. For localized melanoma, the 5-year survival rate is 98%; 5-year survival rates for regional and distant stage diseases are 62% and 16%, respectively. About 84% of melanomas are diagnosed at a localized stage.

Thyroid

New cases: An estimated 48,020 new cases of thyroid cancer are expected to be diagnosed in 2011 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.

Deaths: An estimated 1,740 deaths from thyroid cancer are expected in 2011 in the US. Since 1998, the death rate for thyroid cancer has been increasing in men (by 1.1% per year) and stable in 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 in 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 detect 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 other nonmalignant thyroid condition, 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 (Chernobyl) has also been linked to increased risk of thyroid cancer, especially in children. Certain rare genetic syndromes also increase risk. Individuals who test positive for an abnormal gene that causes a hereditary form of aggressive thyroid cancer can decrease the chance of developing the disease by surgical removal of the thyroid gland. Unlike 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 method for the early detection of thyroid cancer. 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 are more aggressive and tend 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. Total removal of the thyroid gland (thyroidectomy) is recommended for most patients, and lymph node removal is recommended for some. Treatment with radioactive iodine (I131) after surgery may be recommended to destroy any remaining thyroid tissue. Hormone therapy is given to replace hormones normally produced by the thyroid gland after thyroidectomy 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 97%. However, survival varies markedly 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 58% for distant stage disease. By age, the survival rate for all stages combined progressively decreases from 99% for patients under 45 years of age to 82% for those 75 or older.

Urinary Bladder

New cases: An estimated 69,250 new cases of bladder cancer are expected to occur in 2011. Since 1992, bladder cancer incidence rates have been stable in both men and women. Bladder cancer incidence is about four times higher in men than in women and almost twice as high in white men as in African American men.

Deaths: An estimated 14,990 deaths will occur in 2011. Since 1998, mortality rates have been stable in men and decreasing slowly in women (by 0.4% per year).

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 important risk factor for bladder cancer. Smokers' risk of bladder cancer is approximately three-fold that of nonsmokers'. Smoking is estimated to cause about 46% of bladder cancer deaths among men and 27% among women. Workers in the dye, rubber, or leather industries and people who live in communities with high levels of arsenic in the drinking water also have increased risk.

Early detection: There is currently no screening method recommended for individuals 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 tests may be used to screen people at increased risk due to occupational exposure, or for 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. Superficial, localized cancers may also be treated by administering immunotherapy or chemotherapy directly into the bladder. Chemotherapy, alone or with radiation before cystectomy (bladder removal), has improved treatment results. 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 79%. Survival declines to 75% at 10 years and 71% 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 97%. Patients with invasive tumors diagnosed at a localized stage have a 5-year survival rate of 73%; 35% of cancers are detected at this early stage. For regional and distant stage disease, 5-year survival is 36% and 6%, respectively.

Uterine Cervix

New cases: An estimated 12,710 cases of invasive cervical cancer are expected to be diagnosed in 2011. Incidence rates have decreased over most of the past several decades in both white and African American women.

Deaths: An estimated 4,290 deaths from cervical cancer are expected in 2011. Mortality rates declined steadily from 1975 to 2003 due to prevention and early detection as a result of screening with the Pap test; however, since 2003 rates have remained stable.

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 primary cause of cervical cancer is infection with certain types of human papillomavirus (HPV). Women who begin having sex at an early age or who have many sexual partners are at increased risk for HPV infection and cervical cancer. However, a woman may be infected with HPV even if she has had only one sexual partner. Importantly, HPV infections

are common in healthy women and only rarely result in cervical cancer. Persistence of HPV infection and progression to cancer may be influenced by many factors, including immunosuppression, high parity (number of childbirths), and cigarette smoking. Long-term use of oral contraceptives is also associated with increased risk of cervical cancer.

Prevention: There are two vaccines approved for the prevention of the most common types of HPV infection that cause cervical cancer; Gardasil is recommended for use in females 9 to 26 years of age, and Cervarix in females 10 to 25 years of age. In December 2010, Gardasil was also approved for use in males 9 to 26 years of age to prevent anal cancer and associated precancerous lesions; approximately 90% of anal cancers have been linked to HPV infection. These vaccines cannot protect against established infections, nor do they protect against all HPV types.

Screening can prevent cervical cancer by detecting precancerous lesions. As screening has become more common, preinvasive 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 abnormal when no abnormal cells are present (false positive). DNA tests to detect HPV strains associated with cervical cancer may be used in conjunction with the Pap test, either as an additional screening test or when Pap test results are equivocal. Fortunately, most cervical precancers develop slowly, so nearly all 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. Liquid-based Pap tests may be used as an alternative to conventional Pap tests. See page 55 for the American Cancer Society's screening guidelines for the early detection of cervical cancer.

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 70%, 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 (50%) than in African Americans (43%) and in women younger than 50 (60%) than in women 50 and older (35%).

Uterine Corpus (Endometrium)

New cases: An estimated 46,470 cases of cancer of the uterine corpus (body of the uterus) are expected to be diagnosed in 2011. These usually occur in the endometrium (lining of the uterus). Since 1992, incidence rates of endometrial cancer have been stable in white women, but increasing in African American women by 1.7% per year.

Deaths: An estimated 8,120 deaths are expected in 2011. Similar to incidence, death rates for cancer of the uterine corpus have been stable in white women, but increasing in African American women by 0.8% per year since 1998.

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. Increased 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 use 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 colon cancer (HNPCC), and diabetes. Pregnancy, use of oral contraceptives, and physical activity provide protection against endometrial cancer.

Early detection: There is no standard or routine screening test for endometrial cancer. Most endometrial cancer (69%) 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 Lynch syndrome, or who are otherwise at high risk for endometrial cancer, should 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 83%, respectively. The 5-year survival rate is 96%, 68%, or 17%, 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: Cancer Disparities and Premature Deaths

Introduction

There has been remarkable progress in reducing cancer death rates in the United States. Between 1990 and 2007, the most recent year for which mortality data are available, overall cancer death rates decreased by about 22% in men and 14% in women, translating to the avoidance of 898,000 deaths from cancer. However, not all segments of the US population have benefitted equally from this progress.[1] Death rates in persons with lower socioeconomic status, as defined by education, occupation, or residence, showed little or no decrease, and even increased in some instances.[2-5] Similarly, the decreases in cancer death rates in minorities occurred later and were slower compared to those of whites. As a result, the gap in mortality rates between advantaged and disadvantaged segments of the US population has continued to widen.[2,6] For instance, in both black and white men aged 25-64, the cancer death rate was two times higher in the least educated compared to the most educated in 1993;[7] by 2007, this disparity had increased to a nearly three-fold difference.

Eliminating cancer disparities 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 is an overarching objective of the American Cancer Society's 2015 challenge goals.[8] Specifically, the aim is to reduce cancer incidence and mortality and increase cancer survival in disadvantaged groups to levels comparable to the general population.[8] The decennial US Department of Health and Human Services Healthy People Initiative, which began in 1979, also commits the nation to the goal of eliminating health disparities.[9] This goal remains ambitious to achieve, even for the collective resources of federal, state, and private health organizations.

This special section attempts to quantify the number of premature cancer deaths that could be avoided or delayed if we were to eliminate disparities by educational attainment and race. It also briefly addresses the causes of disparities, as well as strategies and current efforts by the Society and other government and private health agencies to eliminate health inequities. The purpose of this document is to stimulate concerted action on the part of communities, policy makers, and private and governmental health agencies toward reducing and ultimately eliminating disparities in the cancer burden.

What Causes Cancer Disparities?

The causes of cancer disparities within different socioeconomic or racial/ethnicity 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. In 1989, Dr. Samuel Broder, who was then director of the National Cancer Institute, suggested that "poverty is a carcinogen," a cancer-causing agent.

When educational attainment is used as an indicator of socioeconomic status (SES), persons with lower SES have a higher cancer burden compared to those with higher SES, regardless of demographic factors such as race/ethnicity, for all cancers combined and for the four major cancers (Table 1). The disparity is largest for lung cancer, for which death rates are 4 to 5 times higher in the least educated than in the most educated individuals.

Cancer death rates are affected by both incidence (risk of developing cancer) and survival after diagnosis. Persons with lower SES are more likely to engage in behaviors that increase cancer risk, such as tobacco use, physical inactivity, and poor diet (Table 2), partly because marketing strategies, such as those by tobacco companies, and also because of environmental or community barriers to opportunities for physical activity and access to fresh fruits and vegetables. Lower socioeconomic status is also associated with financial, structural, and personal obstacles 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.[10] For more information about the relationship between health insurance and cancer, see *Cancer Facts & Figures 2008*, Special Section, available online at cancer.org/statistics.

Similarly, much of the disparity in the cancer burden among racial and ethnic minorities largely reflects 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 2009, 1 in 4 African Americans and Hispanics/Latinos lived below the poverty line, compared to 1 in 11 non-Hispanic whites. Moreover, 1 in 5 African Americans and 1 in 3 Hispanics/Latinos or American Indian/Alaska Natives were uninsured, while only 1 in 8 non-Hispanic whites lacked health insurance (Figure 1).

Discrimination is another factor that contributes to racial/ethnic disparities in the cancer burden. 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.[11] Social inequalities, including discrimination,

Table 1. Cancer Death Rates* by Educational Attainment, Race/Ethnicity, and Sex, Ages 25-64, US, 2007

	Men				Women			
	All Races	Non-Hispanic African American	Non-Hispanic White	Hispanic	All Races	Non-Hispanic African American	Non-Hispanic White	Hispanic
All sites								
All education levels	104.36	170.43	101.68	51.00	90.75	126.43	89.42	54.03
< = 12 years of education	147.85	216.48	148.79	52.80	119.38	145.38	123.96	55.99
13-15 years of education	72.67	101.67	71.33	45.71	69.07	105.88	66.24	35.84
> = 16 years of education	55.92	76.90	56.48	37.05	59.13	86.18	57.79	58.68
RR (95% CI)	2.64 (2.53 - 2.76)	2.82 (2.40 - 3.30)	2.63 (2.52 - 2.76)	1.43 (1.06 - 1.92)	2.02 (1.94 - 2.10)	1.69 (1.49 - 1.90)	2.15 (2.05 - 2.25)	0.95 (0.69 - 1.32)
Absolute difference	91.94	139.58	92.32	15.75	60.25	59.20	66.17	-2.68
Lung								
All education levels	32.19	53.98	31.74	9.23	22.38	26.04	23.36	5.39
< = 12 years of education	51.63	73.01	53.49	9.40	33.86	33.20	37.71	5.43
13-15 years of education	20.54	28.26	20.48	6.85	15.28	20.22	15.29	4.42
> = 16 years of education	10.35	17.64	10.18	8.61	8.77	11.96	8.62	6.48
RR (95% CI)	4.99 (4.65 - 5.34)	4.14 (3.27 - 5.24)	5.26 (4.88 - 5.67)	1.09 (0.66 - 1.82)	3.86 (3.58 - 4.17)	2.78 (2.22 - 3.48)	4.38 (4.02 - 4.76)	0.84 (0.38 - 1.83)
Absolute difference	41.28	55.37	43.31	0.79	25.09	21.24	29.09	-1.05
Colorectal								
All education levels	10.10	19.00	9.43	5.52	7.38	12.58	6.95	5.03
< = 12 years of education	13.59	22.45	13.18	5.34	9.75	13.97	9.74	5.11
13-15 years of education	7.41	13.46	6.74	6.30	5.65	9.87	5.23	3.26
> = 16 years of education	6.22	10.37	6.05	3.80	4.73	9.81	4.43	4.60
RR (95% CI)	2.18 (2.00 - 2.39)	2.17 (1.663 - 2.87)	2.18 (1.97 - 2.41)	1.41 (0.67 - 2.96)	2.06 (1.86 - 2.29)	1.42 (1.11 - 1.83)	2.20 (1.95 - 2.48)	1.11 (0.47 - 2.60)
Absolute difference	7.37	12.08	7.13	1.54	5.02	4.16	5.31	0.51
Prostate								
All education levels	2.88	7.93	2.46	1.40				
< = 12 years of education	3.61	9.03	3.04	1.33				
13-15 years of education	2.16	5.51	1.81	1.85		N/A		
>= 16 years of education	2.17	5.99	2.05	0.82				
RR (95% CI)	1.66 (1.44 - 1.93)	1.51 (1.03 - 2.22)	1.48 (1.25 - 1.75)	1.61 (0.36 - 7.20)				
Absolute difference	1.44	3.04	0.99	0.51				
Breast								
All education levels					19.34	32.44	18.14	11.94
< = 12 years of education					22.12	33.53	21.41	11.93
13-15 years of education		N/A			16.23	31.17	14.60	7.97
> = 16 years of education					16.51	27.44	15.76	18.46
RR (95% CI)					1.34 (1.26 - 1.43)	1.22 (1.03 - 1.44)	1.36 (1.26 - 1.46)	0.65 (0.41 - 1.03)
Absolute difference					5.60	6.09	5.64	-6.52

RR=relative risk of cancer death among those with the lowest level of education, compared to those with the highest level; CI=confidence interval; NA=not applicable.

Education categories are defined based on 1989 death certificates. *Rates are for individuals 25-64 years at death, per 100,000, and age adjusted to the 2000 US standard population.

Data Source: National Center for Health Statistics.

Table 2. Prevalence (%) of Risk Factor Behaviors (Adults 18 and Older in 2009) and Cancer Screening* (2008) in the US

	Current Smoking†		Obesity‡		FOBT/ Endoscopy§	Mammogram (within the past 2 years)
	Men	Women	Men	Women	Men and Women ≥50 Yrs	Women ≥40 Yrs
Education¶						
<= 12 years	30.5	23.1	32.6	32.8	47.5	60.8
General Educational Development (GED)	53.2	44.7	37.0	38.6	54.9	65.9
Some college	24.1	20.3	32.5	30.5	56.3	69.1
Undergraduate degree	12.4	9.9	25.5	20.2	60.8	76.5
Graduate degree	4.9	6.3	19.0	17.2	69.5	80.1
Race/Ethnicity						
White (non-Hispanic)	24.5	19.8	27.5	24.7	56.0	68.0
African American (non-Hispanic)	23.9	19.2	33.1	42.8	48.9	67.7
Hispanic/Latino	19.0	9.8	32.0	30.4	37.2	61.5
American Indian/Alaska Native#	29.7	N/A	34.5	30.2	29.9	59.7
Asian (non-Hispanic)**	16.9	7.5	9.4	8.5	47.8	65.1
Immigration						
Born in US	25.0	19.9	29.5	28.0	55.0	67.6
Born in US territory	19.2	15.8	33.4	36.4	45.9	63.6
In US fewer than 10 years	16.7	5.2	14.9	13.5	28.0	49.7
In US 10 years or more	16.0	7.5	23.4	24.5	41.9	65.8
Health Insurance Coverage						
Uninsured	37.8	27.2	26.8	30.5	19.5	35.6
Insured	19.7	16.2	28.5	26.5	55.7	70.5

*Percentages are age adjusted to the 2000 US standard population. †Adults who reported having smoked at least 100 cigarettes and now smoke every day or some days. ‡Body mass index ≥30.0 kg/m2. §Either a fecal occult blood test (FOBT) within the past year, sigmoidoscopy within the past five years, or colonoscopy within the past 10 years. ¶Persons aged 25 years or older. #Estimates should be interpreted with caution because of the small sample sizes. **Does not include Native Hawaiians and other Pacific Islanders. N/A=Not available due to insufficient sample size.

Source: National Health Interview Survey, 2008, 2009, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, 2009, 2010.

American Cancer Society, Inc., Surveillance Research

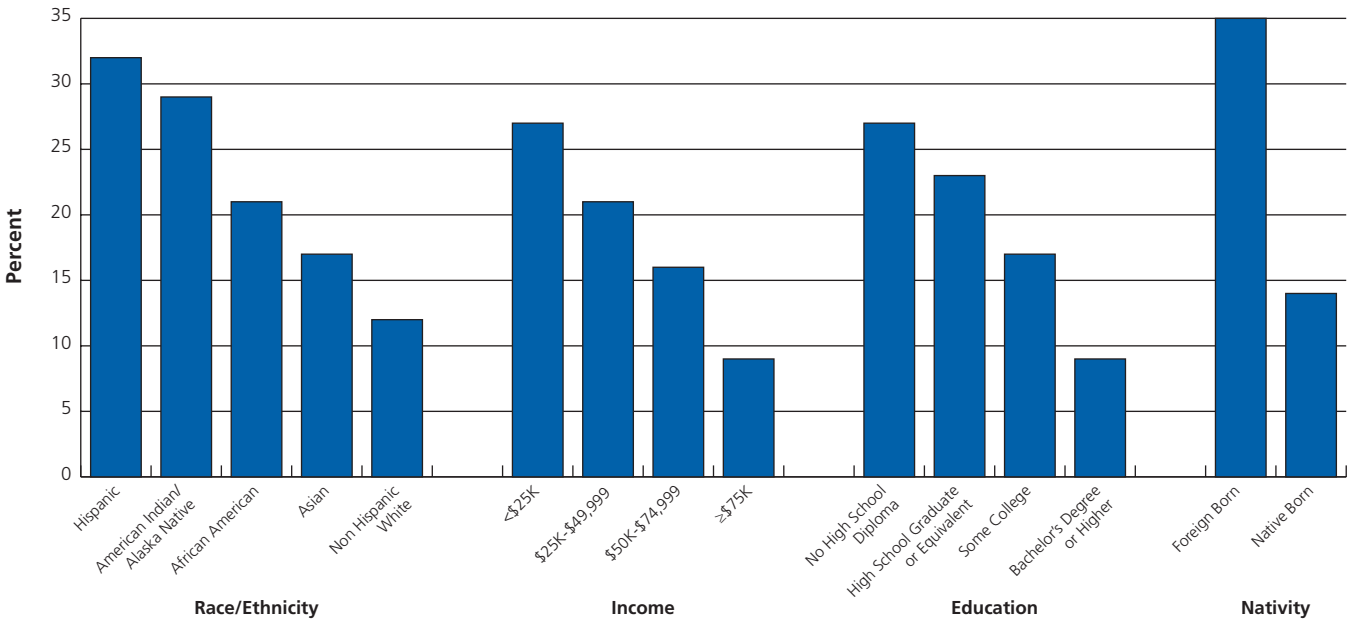
communication barriers, and provider assumptions, can affect interactions between patient and physician and contribute to miscommunication or delivery of substandard care.[12,13]

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 probably partly 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. Higher rates of cancers related to infectious agents (stomach, liver, uterine cervix) in populations that include a large number of recent immigrants, such as Hispanics and Asians, may reflect a higher prevalence of infection in the country of origin. Genetic factors may also explain some differences in cancer incidence. For example, women from population groups with an increased frequency of mutations or alterations in the breast cancer susceptibility genes (BRCA1 and BRCA2), such as women of Ashkenazi Jewish descent, have an increased risk of breast and ovarian cancers. 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 are thought to make a minor contribution to the disparate cancer burden between different racial/ethnic populations.[14] A more in-depth overview of cancer disparities within racial or socioeconomic groups can be found in *Cancer Facts & Figures 2004.*

How many cancer deaths could be avoided by eliminating racial or socioeconomic disparities?

In 2007, about 164,000 men and women aged 25-64 years died of cancer in the US. More than 60,000 (37%) of these deaths could have been avoided if all segments of the population had the same cancer death rates as the most educated whites (Figure 2; see sidebar on page 27 for calculation method). During the same

Figure 1. People without Health Insurance by Select Characteristics, US, 2009



American Cancer Society, Inc., Surveillance Research

year, about 24,560 African Americans aged 25-64 years died of cancer. If all African American men and women of this age were to have the same cancer death rates as the most educated African Americans, more than 10,000 (40%) deaths could have been avoided. In contrast, if all African American men and women were to have the same death rates as their white counterparts with the same level of education, about 5,000 (20%) cancer deaths among African Americans could have been avoided. Thus, among African Americans, eliminating socioeconomic disparities has the potential to avert twice as many cancer deaths as eliminating racial disparities. This underscores the importance of poverty in cancer disparities across all segments of the population. In addition, much of the disparity between African Americans and whites within the same level of education results from differences in risk factors and access to health care that cannot be captured in terms of educational attainment.

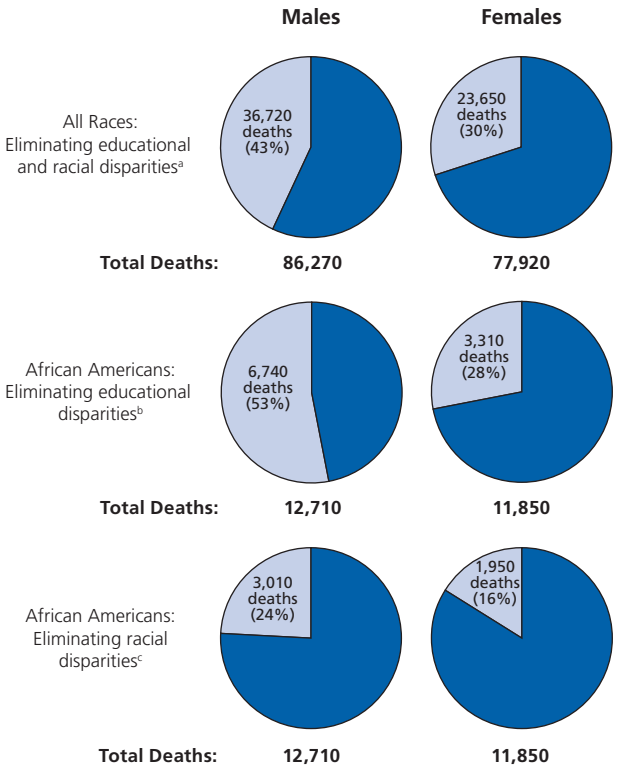
The estimated number of premature cancer deaths (deaths occurring between age 25-64) that could be avoided by eliminating socioeconomic and racial disparities was calculated by applying the age- and sex-specific cancer death rates of the most educated non-Hispanic whites in 2007 to all populations. Similarly, the age-, sex-, and educational attainment-specific cancer death rates of non-Hispanic whites in 2007 were applied to the corresponding population of African Americans in order to estimate the total number of premature cancer deaths that could be avoided in African Americans by eliminating racial disparities in cancer death rates.

What Are the Strategies to Reduce and/or Eliminate Cancer Disparities?

In principle, equal application of existing knowledge about cancer prevention, early detection, and treatment to all segments of the population can substantially reduce and ultimately eliminate cancer disparities. This will require a health care delivery system that emphasizes health promotion and wellness; provides access to prevention, early detection, and treatment for all; is culturally and linguistically competent; is geographically accessible; is capable of appropriate care in a timely manner; and includes diversity within the health care provider workforce. In addition, more research is needed to improve the methodology for public health interventions, including community-based, participatory research, and to better understand how the environment influences health behaviors, and how cancer treatment can be monitored to ensure that all patients receive optimal care. Information is still lacking about how to prevent, detect, and cure many cancers, such as prostate cancer, which disproportionately affects African Americans.

Health Promotion: Health promotion and disease prevention are cornerstones of a long, healthy, and productive life. Smoking and obesity are the two major risk factors for cancer in the US, accounting for about 30% and 15%-20%, respectively, of all cancer deaths.[15,16] Since the first Surgeon General's report on the health hazards of smoking was published in 1964, smoking prevalence among US adults has decreased by about 50%. This was possible because of the implementation of proven policies and interventions at the community and state level, including

Figure 2. Potential US* Cancer Deaths That Could Have Been Avoided by Eliminating Educational and/or Racial Disparities, Ages 25-64, 2007



*Excludes Rhode Island and Georgia. [a]Age-specific cancer death rates of the most educated non-Hispanic whites in 2007 were applied to all races. [b]Age-specific cancer death rates of the most educated African Americans in 2007 were applied to all African Americans. [c]Age- and educational attainment-specific cancer death rates of non-Hispanic whites in 2007 were applied to the corresponding population of African Americans.

increased cigarette prices, clean air laws banning smoking in public places that changed the social norms of smoking, restrictions of advertising and counteradvertising of tobacco products, and policies restricting youth access to cigarettes. Yet 20% of US adults 18 and older (45 million) are current smokers, with the prevalence ranging from 5% in men with graduate degrees to 53% in men with a GED certificate (Table 2). There is an opportunity for substantial reductions in smoking prevalence and the associated morbidity and mortality among high-risk populations through targeted intervention programs. Clinicians can also play a major role in promoting cessation and discouraging initiation of smoking in persons of lower SES, who are more likely to smoke.[17]

In contrast to smoking, the prevalence of obesity has more than doubled among adults (from 15% to 33%), and tripled among adolescents aged 12-19 years (from 5% to 15.5%) since the 1970s. Half of all African American and Hispanic women are obese, compared to 1 in 3 white women. Overweight and obesity are associated with an increased risk of developing many cancers, including cancers of the endometrium, colon, breast (occurring after menopause), esophagus, and kidney.[15,16]

Balanced caloric intake and a plant-based diet and regular physical activity are the best approaches to achieve and maintain a healthy body weight.[18,19] However, the physical environment often presents obstacles in the adoption of these healthy behaviors, especially in socioeconomically disadvantaged neighborhoods. Examples of community barriers to a healthy lifestyle include a high density of fast food restaurants, the absence of supermarkets with fresh fruits and vegetables, and a lack of parks, biking paths, and safe environments for physical activity. Affecting changes in social and physical environments requires public and community organizations working together to facilitate and promote policies that enable people to adopt and maintain healthy nutrition and engage in regular physical activity. Primary care physicians can and should counsel and assist patients who are overweight or obese in managing and controlling their body weight according to established guidelines.[20-22]

The US health care system emphasizes the diagnosis and treatment of diseases more than health promotion and prevention, in part because the compensation structure heavily favors the former. However, this may be changing with new health promotion and wellness initiatives at federal, state, and local governments and large private companies. As part of the Patient Protection and Affordable Care Act – health care reform legislation that was signed into law by President Obama in 2010 – annual wellness visits are now in place for Medicare beneficiaries. The federal government is also instituting model health promotion programs for its employees such as The Wellness Works program in the Office of Personnel Management. States with similar health promotion programs include Alabama, Washington, and Delaware.

Improving Access to Care: According to the US Census Bureau, more than 50.7 million Americans were uninsured in 2009.[23] Uninsured persons have limited access to health care across the cancer continuum, from prevention to early diagnosis, treatment, and palliative care. They are more likely to be diagnosed with an advanced stage of disease and less likely to receive early detection services and recommended treatment. A study by the American Cancer Society showed that uninsured or Medicaid-insured patients diagnosed with early stage colorectal cancer were less likely to survive five years than privately insured patients diagnosed with a more advanced stage of the disease.[24] This disparity likely reflects unequal treatment, generally poorer underlying health, and physical barriers to care, such as transportation to health facilities, among non-privately insured patients. It is important to note that many Medicaid patients are initially enrolled in the program at the time of cancer diagnosis, and were previously uninsured and without access to care. In addition, Medicaid beneficiaries are vulnerable to intermittent coverage loss because the Medicaid certification process requires frequent review and can disqualify individuals based on salary fluctuations. Therefore, even patients who were enrolled prior to

diagnosis may experience diminished access to care and consistent treatment.

Cultural Competence and Diversity of Workforce: Cultural competence is an important element in providing high-quality health care and preventive services. It reflects the ability to acquire and use knowledge about health-related beliefs, attitudes and practices, and communication patterns of clients and their families; increase community participation; and close the gaps in health status among diverse populations. For example, traditional values within the Hispanic culture emphasize the importance of family, respect, and personal familiarity. Increasing the number of minority health providers may substantially improve cultural competence and reduce language-access barriers (below). In addition, patients who are seen by health care providers of the same race or ethnic background report a higher level of satisfaction with their care and greater participation in decisions involving their health.[25,26] However, while African Americans, Hispanics, and Native Americans account for about 26% of the US population, only 6% of physicians are from these minority groups.[27] Therefore, more concerted effort is needed by public and private institutions to substantially increase the number of minority health care providers.

Language: In 2000, 47 million people (18% of the US population) spoke a language other than English at home, with Hispanics accounting for the majority of this population.[28] Proficiency in the English language is a major barrier to receiving adequate care for new immigrant patients or those who are not completely acculturated. For example, the colorectal cancer screening rate in persons who have resided in the US fewer than 10 years is half as high as the rate among those born in the US (28% compared to 55%). Several studies have shown that effective language services improve outcomes for patients with limited English proficiency by increasing satisfaction levels, use of health services, and compliance with recommended medical advice.[29]

Literacy: Illiteracy and health literacy are additional factors that affect access to and utilization of health care services.[30] Persons with low literacy are less likely to seek timely medical attention, to understand and follow the recommendations of their providers, and to successfully navigate the health care system.[31,32] According to the 2003 National Assessment of Adult Literacy (NAAL) survey, 14% of US adults 16 and older (30 million) had a below basic level of prose literacy, defined as the ability to use printed and written information to acquire knowledge and function in society. Individuals who did not graduate from high school, minorities (African Americans and Hispanics), the elderly, and those with disabilities were disproportionately represented in the below basic literacy level.

The health effects of illiteracy in the US have been considered by some as a silent epidemic largely because of lack of awareness among health care providers, despite its high prevalence.[32] Interventions that have been used or considered to alleviate this problem in doctors' offices include educational videotapes, color-coded medication schedules, simply written educational materials and reminders, and literacy screening, although the latter approach is thought to cause patient embarrassment and is time consuming for doctors.

Health literacy is the ability to read, understand, and act on health information. Tens of millions of adults are unable to understand health information brochures, medical test results, and dosage instructions for over-the-counter or prescription drugs. According to the latest NAAL survey, approximately 36% (77 million) of the US adult English-speaking population has basic or below basic health literacy skills, the majority of whom are native-born.[33] Similar to illiteracy, health literacy levels are low among the elderly, those who have lower education levels, and the poor.[34,35] People with low health literacy are more likely to report poorer health, are less likely to use preventive services, are at greater risk of hospitalization, and are associated with higher health care costs.[30,36]

Collection of Data on Socioeconomic Status

Collecting information on SES is extremely important in order to identify and monitor cancer disparities and evaluate the effectiveness of interventions. However, unlike in several European countries, information on SES is not routinely collected on medical records in the US, with the exception of recording educational attainment on death certificates. As a result, researchers in the US customarily use residential-based poverty rates, income, or educational attainment as a substitute for individual-level SES. Area-based SES is a very crude measure of individual SES because there is often a lack of uniformity among populations residing within the same geographic area, although neighborhood characteristics in and of themselves are contributing factors for disparities. Collection of individual indicators of SES (e.g., income, education) should be a core element of medical records in order to monitor progress in eliminating racial and socioeconomic health disparities.

What Is the American Cancer Society Doing to Reduce Cancer Disparities?

Over the past 30 years, the American Cancer Society has issued a number of special reports on cancer disparities, including *The Culture of Poverty, Cancer and the Poor: A Report to the Nation*, and *Cancer in the Socioeconomically Disadvantaged*. These reports concluded that poverty is the primary contributing factor to cancer disparities between racial and ethnic groups, that racial differences in biological or inherited characteristics are less important, and that people living in poverty lack access to health care and endure greater pain and suffering from cancer.

In June 2004, the Society adopted a strategic framework of information, prevention and detection, quality of life, and research that included strategies for reducing health care disparities.[37]

The Society has implemented many programs that focus on prevention and services designed to meet the needs of cancer survivors and their families. In terms of their potential impact on disparity reduction, nationally developed programs can be divided into three major categories:

1. Technology-based programs such as the Society's Web site (cancer.org), which provides downloadable versions of *Cancer Facts & Figures* publications, including those for African Americans and for Hispanics, and our cancer information hotline (1-800-227-2345), where trained Cancer Information Specialists are available by telephone, 24 hours a day, 7 days a week to provide the latest information, day-to-day help, and emotional support to people during their cancer experience.
2. Broad-based community initiatives offered through the American Cancer Society, such as the Patient Navigator Program, which helps patients and their families understand and make their way through the complex medical system to ensure treatment completion; the Reach To Recovery® program, a one-on-one breast cancer support program; Hope Lodge®, which provides temporary housing to patients and caregivers during treatment far from home; and Road To Recovery®, which provides cancer patients rides to and from treatment because lack of transportation is a key deterrent for underserved or low SES populations receiving adequate health care.[38] The Patient Navigator Program and Road To Recovery, in particular, have the potential to greatly reduce health care disparities and even achieve equity in treatment completion.
3. Select population programs available through the Society that address specific health disparities. Circle of Life℠ (COL), which trains American Indian and Alaskan Native (AIAN) women to contact family and friends about the importance of having regular mammograms, is currently offered in the Great Lakes (Indiana and Michigan) and Midwest (Iowa, Minnesota, South Dakota, and Wisconsin) Divisions. Let's Talk About It®, which was developed by the American Cancer Society in partnership with 100 Black Men of America, provides communities easy step-by-step ways to organize prostate cancer awareness events to empower African American men and their loved ones to reduce their risk of prostate cancer and make informed decisions about detecting and treating the disease. The program, which is currently available in the Midwest and East Central (Ohio and Pennsylvania) Divisions, utilizes the Society's revised prostate cancer screening guidelines and emphasizes informed decision making.

The availability of Society programs varies widely across the country because each Division makes its own strategic decisions in determining which programs and services best meet its population needs. Examples of select programs and services are shown in Table 3. They represent initiatives designed specifically to meet the prevention, access to care, and patient-support needs of communities, some of which are in partnership with other organizations and systems (such as worksites, health care centers, hospitals, and health plans). Select programs to reduce disparities by government and private public health agencies are listed in Table 4.

Research

The American Cancer Society has made the reduction of cancer health disparities a priority for research funding because of its overarching objective of eliminating disparities in cancer burden by 2015. Since 1999, the Society has funded 117 studies totaling $99 million devoted to the poor and medically underserved. In addition, the Society's intramural research department focuses substantial resources on community-based interventions and disparities research. To learn more, visit cancer.org/research.

Specific examples of ongoing intramural and extramural research addressing disparities include:

- Assessing the specific needs of African American breast cancer survivors through focus groups and surveys and using this information to develop programs and resources to educate and support African American breast cancer survivors
- A statewide representative sample of adults to examine African American-white disparities in cancer-risk factors in Georgia
- Investigating whether African Americans and whites who are diagnosed with colorectal cancer make changes in health behaviors (e.g., diet, physical activity, and dietary supplement use) and what effect these changes may have on cancer recurrence
- Researching treatment delays and the types of treatment received among African American breast cancer patients and exploring reasons for the less frequent treatment among African American women in an effort to improve breast cancer outcomes
- Monitoring racial, socioeconomic, and geographic disparities in the cancer burden, including differences in screening, stage at diagnosis, treatment, survival, and mortality
- Evaluating the usage and effectiveness of smoking cessation help lines in low socioeconomic and segregated African American communities, as well as examining smokers' preferences for various cessation treatments in order for the Society to target and increase use of cessation treatments within these communities
- Developing a mapping tool to identify and target underserved populations and assist the Society in more effectively allocating its programs and services

Table 3. Select Examples of American Cancer Society Programs[37]

Program	Program Description
Body and Soul	Faith-based initiative designed to reach priority populations such as African Americans and Latinos with linguistically appropriate and culturally competent health information and education
Circle Of Life	Program that trains Native American and Alaska Native women to contact family and friends about the importance of having regular mammograms. The program guidelines were developed to respect the values of native communities and in particular, to gain the support of tribal leaders at every phase.
Con Amor Aprendemos (With Love We Learn)	Program designed to raise awareness among Latino couples and clarify myths associated with HPV and cervical cancer. The program encourages culturally competent contact between participants and educators.
Deep South Network	Program implemented among African American communities to address the disparities in breast and cervical cancer mortality by encouraging coalition development, community empowerment, and utilizing community health advisors.
NYC Colon Cancer Screening Initiative (C5)	Partnership program between the NYC Department of Health and Mental Hygiene, NYC Council, the American Cancer Society, and 18 participating hospitals in New York City that assist in increasing colorectal cancer screening rates in the city, especially for the underserved, by funding screening colonoscopies to uninsured and underinsured New Yorkers; and to provide the Society's patient navigation services to cancer patients
Ozioma	National cancer information news service targeted toward African American and Latino populations. News releases are based on new cancer science and timely cancer topics.
Patient Navigator Program	Hospital-based service program employing individuals as patient navigators, serving as a barrier-reducing, focused intervention, in which services are provided to individual patients from all population groups for a defined episode of cancer-related care
Road To Recovery	Program that strives to improve the quality of life for all patients undergoing cancer care by providing transportation to their treatments and home again

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 insurance plans to provide coverage for essential, evidence-based preventive measures with no additional co-pays. As of January 2011, preventive services like colonoscopies are exempt from co-payments and deductibles under the Medicare program.
  - Eliminating discrimination based on health status and preexisting conditions, which has been so detrimental to cancer patients over the years
  - Increasing funding for community health centers, which provide comprehensive health care for everyone, regardless of the ability to pay
  - Requiring qualified health plans to provide materials in appropriate languages, as well as the development of a strategy for increasing access to language translation services

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

Table 4. Select External Initiatives in Eliminating Cancer Disparities

Program Name	Description	Population Served
National Cancer Institute Programs		
Community Networks Program (CPN)	Reduces cancer health disparities through community-based participatory education, training, and research among racial/ethnic minorities and underserved populations	25 institutions received $95 million in 5-year grants
Patient Navigation Research Program (PNRP)	Focus on developing and testing patient interventions with respect to disparities in screening and follow up for patients who are racial/ethnic minorities, of lower SES, and rural-area residents	Breast, cervical, prostate, and colorectal cancer patients
Community Cancer Centers Program (NCCCP)	A pilot program to build a community-based research platform to support basic, clinical, and population-based research on cancer prevention, screening, diagnosis, treatment, survivorship, and palliative care at hospitals	Patients of community-based hospitals
Community Clinical Oncology Program (CCOP)	A network for testing and validating medical interventions against cancer. It improves the quality of cancer care in local communities by disseminating research findings and boosts participation of minority and underserved populations in cancer clinical trials.	Cancer patients needing new treatments
Center to Reduce Cancer Health Disparities	• Initiates, integrates, and engages in collaborative research studies to promote cancer health disparities research and to identify innovative scientific opportunities to improve outcomes in communities • Leads NCI's efforts to train students and investigators from diverse populations to become competitive researchers in cancer and cancer health disparities research • Creates state-of-the-art regional networks and centers dedicated to cancer health disparities research and care through geographic program management	Populations experiencing a higher burden of cancer
Centers for Disease Control and Prevention (CDC) Programs		
National Breast and Cervical Cancer Early Detection Program (NBCCEDP)	Provides breast and cervical screening, diagnosis, and access to treatment to low-income, medically underserved, and uninsured women (especially minority women) through states, tribes, and territories	Women at risk for or diagnosed with breast, cervical cancers
National Comprehensive Cancer Control Program (NCCCP)	Provides seed funding and structure to develop and implement Comprehensive Cancer Control (CCC) plans. CCC communities pool resources to reduce the cancer burden by efforts to reduce risk, detect early, treat better, and improve survival.	Underserved communities
Colorectal Cancer Control Program (CRCCP)	Supports population-based screening efforts and provides colorectal screening services to low-income men and women aged 50-64 years who are underinsured or uninsured for screening	Low-income men and women
Racial and Ethnic Approaches to Community Health Across the US (REACH US)	CDC partners establish community-based programs and culturally appropriate interventions to eliminate health disparities.	Ethnic and racial minorities
Cancer Prevention and Control Research Network (CPCRN)	Accelerates the use of evidence-based cancer prevention and control in communities by advancing cancer prevention and control science and influencing public health and primary care practice.	Underserved populations
Independent Programs		
Project Brotherhood Colorectal Cancer Prevention	Culturally specific 12-hour curriculum to train barbers about colorectal cancer to increase screening rates among African American men. The program is funded by the American Cancer Society.	African American men
Intercultural Cancer Council (ICC)	Promotes policies, programs, partnerships, and research to eliminate the unequal burden of cancer in the US and its associated territories	Racial/ethnic minorities and the medically underserved
National Medical Association (NMA)	NMA partnered with the Society to develop and distribute culturally relevant patient and provider materials that focus on prevention, early detection, and treatment of breast, prostate, and colorectal cancers, and nutrition and physical activity.	African Americans and other underserved populations
National African American Tobacco Education Network (NAATEN)	A collaboration of national, state, and local organizations to eliminate tobacco use in the African American community	African Americans
African American Collaborative Obesity Research Network (AACORN)	Researchers and community-based partners dedicated to improving the quality and quantity of research addressing weight-related health issues in African American communities	African Americans
Susan G. Komen for the Cure Grants		
Career Catalyst in Disparities Research	Grants up to $450,000 over three years to foster independent careers in disparities research and support programs of research into disparities in breast cancer	All populations facing breast cancer disparities
Investigator Initiated Research	Grants of up to $200,000 per year for two to three years to explore new ideas and approaches leading to reductions in breast cancer mortality and/or incidence within the decade	All women
Post Baccalaureate in Disparities Research	Grants up to $135,000 per student over three years to support training very early in their career to allow them to begin to define meaningful career paths focused on disparities in breast cancer.	All populations facing breast cancer disparities
American Association for Cancer Research	AACR collaboration with focus on cancer prevention, cancer disparities, and ensuring ethical, standardized tissue sample storage and access for patients and researchers	All populations facing breast cancer disparities

- **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 recently celebrated its 20th anniversary, provides community-based breast and cervical cancer screening to low-income, uninsured, and underinsured women, about 50% of whom are from racial/ethnic minority groups.[39-41] Due to a large cut in funding, screening rates within the program declined to an all-time low 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 2012 to support continued growth and 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 and their families 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 Navigator Program.** The Society and ACS CAN continue to work with Congress to secure additional funding for the Patient Navigator Program, which helps patients in medically underserved communities work their way through the health care system, provides outreach and education for patients to encourage preventive screenings, and addresses needs that may impact compliance with screening and treatment. ACS CAN supports the Affordable Care Act's reauthorization of the Patient Navigator Program until 2015.

The Society and ACS CAN also are leading efforts to increase federal investment in cutting-edge biomedical and cancer research and treatments, and 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.

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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 5.4 million smoking-related premature deaths worldwide each year. The number of smoking-attributable deaths is almost evenly divided between industrialized and developing nations, and is greater in men (80%) than in women. More men die from smoking in developing nations than in industrialized nations.[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.[8,9]
- The risk of developing lung cancer is about 23 times higher in male smokers and 13 times higher in female smokers, compared to lifelong nonsmokers.[1]
- Smoking increases the risk of the following types of cancer: nasopharynx, nasal cavity and paranasal sinuses, lip, oral cavity, pharynx, larynx, lung, esophagus, pancreas, uterine cervix, ovary (mucinous), kidney, bladder, stomach, colorectum, and acute myeloid leukemia.[1,10]
- The International Agency for Research on Cancer (IARC) recently concluded that there is limited evidence that tobacco smoking causes female breast cancer.[10]
- Smoking is a major cause of heart disease, cerebrovascular disease, chronic bronchitis, and emphysema, and is associated with gastric ulcers.[1,9]
- 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 2011, 7 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 service coverage, 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 coverage of evidence-based cessation treatments, including pharmacotherapy and cessation counseling to previously uninsured individuals and Medicare recipients, while state Medicaid programs can no longer exempt cessation pharmacotherapy from prescription drug coverage starting in the year 2014. 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. As part of the federal Communities Putting Prevention to Work initiative, 21 communities received a total of $143 million exclusively focused on tobacco control, and additional funding was dedicated to this program in 2010 through the Prevention and Public Health Fund, created as part of the Affordable Care Act.

For more information about tobacco control, see the American Cancer Society's *Cancer Prevention & Early Detection Facts & Figures 2011*, available online at http://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%. Since 2004, smoking rates have changed little; in 2009 an estimated 21% of adults, or 46.6 million Americans, smoked cigarettes.[16,17]
- Although cigarette smoking became prevalent among men before women, the gender gap narrowed in the mid-1980s and has remained constant since then.[18] As of 2009, there was a 5% absolute difference in smoking prevalence between white men (25%) and women (20%), a 5% difference between African American men (24%) and women (19%), a 9% difference between Hispanic men (19%) and women (10%) and a 9% difference between Asian men (17%) and women (8%).[17]
- 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 2009. By contrast, among those with a high school diploma, prevalence decreased modestly from 34% to 29% during the same time period.[19] Adults

with a GED certificate (high school equivalency diploma) had the highest smoking rate (49%) in 2009.[17] Groups with a high school degree or less quit smoking at lower rates than higher educated groups between 1998 and 2008.[20]

- 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 has been substantially higher in African Americans, have converged in these two groups.[21]
- 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.[22,23] Since 2003, there has been no significant change in the smoking rate among high school males (20%) and females (19%).[24]

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. Tobacco companies are 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 that these products are as effective as proven cessation therapies. Use of any smokeless tobacco product is not considered a safe substitute for quitting. These products cause oral 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.[25]

- 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.[26]
- Long-term use of snuff substantially increases the risk of cancers of the oral cavity, particularly cancers of the cheek and gum.[25]
- According to the US Department of Agriculture, manufactured output of moist snuff has increased more than 83% in the past two decades, from 48 million pounds in 1991 to an estimated 88 million pounds in 2007.[27,28]
- In 2009, 3.5% of adults 18 years of age and older, 7% of men and 0.3% of women used smokeless products in the past month. Whites (5%) were more likely to use smokeless tobacco than African Americans (2 %), Hispanic/Latinos (1%), or Asians (1%).[29]
- Smokeless tobacco use (including snus use) varied from 1.3% to 9.1% across states, with higher rates observed in the South and North-Central states.[30]
- When smokeless tobacco was aggressively marketed in the US in the 1970s, use of these products increased among adolescent males, not among older smokers trying to quit.[31,32]
- Nationwide, 9% of high school students, 15% of males and 2% of females, were currently using chewing tobacco, snuff, or dip in 2009.[24]

Cigars

Cigar smoking has health consequences similar to those of cigarette smoking and smokeless tobacco.[33] 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.[33]

- In 2008, 5% of adults 18 years of age and older (9% of men and 2% of women) had smoked cigars in the past month. African Americans (8%) and American Indian/Alaska Natives (6%) had the highest prevalence of past month cigar use, followed by, whites (5%), Hispanics (5%), and Asians (1%).[29]
- Among states, cigar smoking prevalence among adults ranges from between 2.2% to 5.4%.[30]
- In 2009, 14% of US high school students had smoked cigars, cigarillos, or little cigars at least once in the past 30 days.[24]
- Between 1997 and 2007, while sales of little cigars had increased by 240%, large cigar sales decreased by 6%.[34] 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

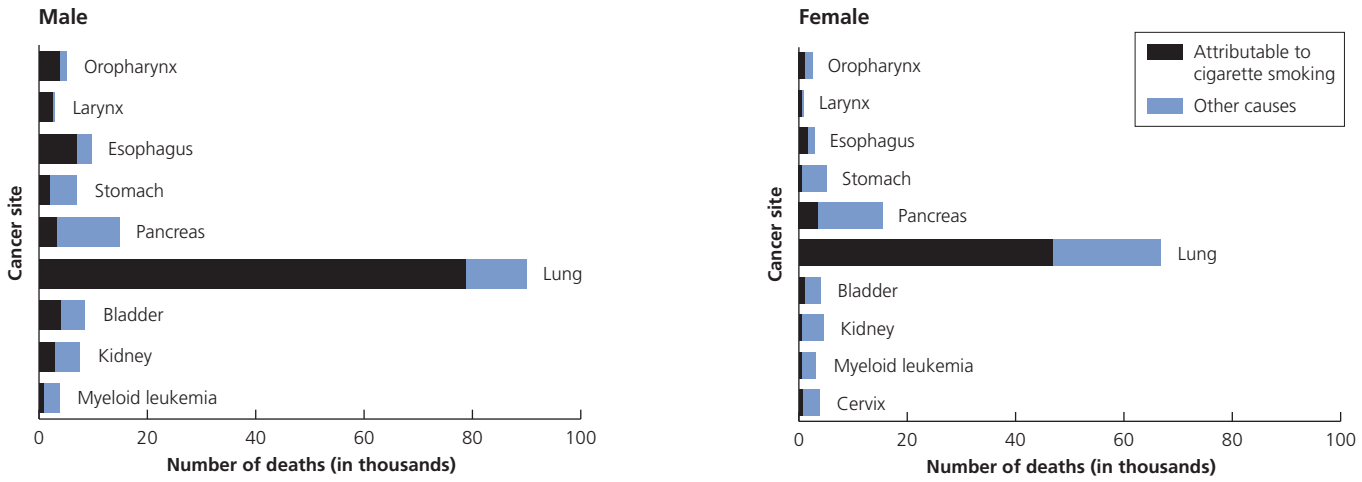
A US Surgeon General's Report outlined the benefits of smoking cessation:[35]

- People who quit, regardless of age, live longer than people who continue to smoke.
- Smokers who quit before 50 years of age cut their risk of dying in the next 15 years in half, compared to those who continue to smoke.
- 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.[20]

- In 2009, an estimated 49.9 million adults were former smokers, representing 52% of living persons who ever smoked.[36]
- Smokers with an undergraduate or graduate degree are more likely to quit than less educated smokers.[20]

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.

- Among those who smoked in 2009, an estimated 21.8 million (or 47%) had stopped smoking at least one day during the preceding 12 months because they were trying to quit.[36]
- In 46 states and the District of Columbia the majority of adults (50% or more) who ever smoked have quit smoking.[37]
- In 2009, among high school students who were current cigarette smokers, national data showed that one-half (51%) 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 (48%).[24]

Tobacco dependence is a chronic disease and should be treated with effective treatments that may double or triple smokers' chances of long-term abstinence.[38] 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.[30] Improving access to these services by promoting coverage for these treatments through government health programs, including Medicaid and Medicare, and private health insurance mandates can help reduce these disparities.

Secondhand Smoke

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.[17] Numerous scientific consensus groups have reviewed data on the health effects of SHS.[39-44] In 2006, the US Surgeon General published a comprehensive report titled *The Health Consequences of Involuntary Exposure to Tobacco Smoke*.[39] 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 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.[39]
- Some studies have reported an association between SHS exposure and breast cancer. The US Surgeon General has designated this evidence suggestive rather than conclusive.[39] 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. An additional benefit of smoke-free policies is the modification of smoking behaviors among current smokers. Momentum to regulate public smoking began to increase in 1990, and these laws have become increasingly common and comprehensive.[45]

- In the past decade, the largest decline in SHS exposure among nonsmokers occurred between 1999-2000 (52.5%) to 2001-2002 (41.7%), with estimates remaining relatively unchanged till present (2007-2008: 40.1%).[17]

- In the US, as of January 2011, 3,198 municipalities have passed smoke-free legislation, and 35 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.[46]
- Currently, approximately 79% of the US population is covered by a smoke-free policy or provision in workplaces and/or restaurants and/or bars.[46]
- Nationally, coverage of all indoor workers by smoke-free policies increased substantially from 1992-1993 (46%) to 2006-2007 (75%).[47]
- 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.[48]
- In addition to providing protection against harmful exposure to secondhand smoke, there is strong evidence that smoke-free policies decrease the prevalence of both adult and youth smoking.[49]

Costs of Tobacco

The number of people who die prematurely or suffer illness from tobacco use impose substantial health-related economic costs to 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, on average, resulted in more than $193 billion in annual health-related economic costs, including smoking-attributable medical economic costs and productivity losses.[6]
- Smoking-attributable health care expenditures totaled an estimated $96 billion annually between 2000 and 2004, up $24 billion from $75.5 billion spent during 1997 and 2001.[6]
- Smoking-attributable productivity losses in the US amounted to $96.8 billion annually during 2000-2004, up about $4.3 billion from the $92 billion lost annually during 1997-2001.[6, 50]

Worldwide Tobacco Use

During the past 25 years, while the prevalence of smoking has been slowly declining in the US and many other high-income countries, smoking rates have been increasing in many low- and middle-income nations, where about 85% of the world population resides.

- Tobacco is projected to cause more than175 million deaths between 2005 and 2030, increasing from 5.4 million in 2005 to 6.4 million in 2015 and 8.3 million in 2030.[51,52] Tobacco-attributable deaths are projected to decline by 9% between 2002-2030 in high-income countries, but to double from 3.4 million to 6.8 million in low- and middle-income countries in the same time period.[51]
- In 2003, the number of smokers in the world was estimated at about 1.3 billion (more than 1 billion men and 250 million women). This figure is expected to rise to at least 1.7 billion (1.2 billion men and 500 million women) by 2025, with the doubling in the number of female smokers making the greatest contribution to the increase.[53,54]
- Female smoking prevalence rates have peaked and are decreasing in most high-income countries, such as Australia, Canada, and the United Kingdom; however, in many Southern, central and, eastern European countries, female smoking rates show no evidence of decline or are increasing.[53] Female smoking rates in developing nations are expected to converge at 20%-25% by 2030.[55,56]
- Data from the Global Youth Tobacco Survey conducted during 2000-2007 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.[57] 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.[58]
- According to the World Health Organization (WHO), less than 10% of the world's population is covered by an evidence-based tobacco control measure.[59] The WHO estimates that 5% of the world's population is covered by smoke-free environments, 8% by cessation programs, 8% by health warnings on tobacco products, 9% by tobacco advertising bans, and 6% by taxation policies.[59]

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.[60] 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, smuggling, youth access, exposure to secondhand tobacco smoke, and environmental and agricultural impacts.[60] Parties to the treaty are expected to strengthen national legislation, enact effective tobacco control policies, and cooperate internationally to reduce global tobacco consumption.[61,62] As of January 2011, out of 195 eligible countries, 183 have signed the FCTC and 172 have ratified the treaty, representing approximately 87% of the world's population.[60] A number of major tobacco-producing nations, including Argentina, Indonesia, Malawi, the US, and Zimbabwe, have not ratified the treaty.[60]

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Nutrition and Physical Activity

It's been estimated that approximately one-third of the cancer deaths that occur in the US each year are due to poor nutrition and physical inactivity, including excess weight. Eating a healthy diet, being physically active on a regular basis, and maintaining a healthy body weight 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, and dietary patterns 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 an explicit Recommendation for Community Action to promote the availability of healthy food choices and opportunities for physical activity in schools, workplaces, and communities.

The following recommendations reflect the best nutrition and physical activity evidence available to help Americans reduce their risk not only of cancer, but also of heart disease and diabetes.

Recommendations for Individual Choices

1. Maintain a healthy weight throughout life.

- Balance caloric intake with physical activity.
- Avoid excessive weight gain throughout life.
- Achieve and maintain a healthy weight if currently overweight or obese.

In the US, overweight and obesity contribute to 14%-20% of all cancer-related mortality. Overweight and obesity are associated with increased risk for developing many cancers, including cancers of the breast in postmenopausal women, colon, endometrium, kidney, pancreas, and adenocarcinoma of the esophagus. Evidence is suggestive that obesity also increases risk for cancers of the gallbladder, thyroid, ovary, and cervix, as well as for myeloma, Hodgkin lymphoma, and aggressive forms of prostate cancer. Increasing evidence also suggests that being overweight increases the risk for cancer recurrence and decreases the likelihood of survival for many 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. The prevalence of obesity in the US more than doubled between 1976-1980 and 2003-2006. Although rates appear to have stabilized in the most recent time period (2007-2008), more than one-third of adults – more than 72 million people – are currently obese. These trends are likely 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 post-menopausal 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.

Similar to adults, obesity among adolescents has tripled over the past several decades. Increases occurred across race, ethnicity, and gender. As in adults, obesity prevalence stabilized between 2003-2006 and 2007-2008. Because overweight in youth tends to continue throughout life, efforts to establish healthy body weight patterns should begin in childhood. The increasing prevalence of overweight and obesity in preadolescents and adolescents may increase incidence of cancer in the future.

2. Adopt a physically active lifestyle.

- **Adults:** Engage in at least 30 minutes of moderate to vigorous physical activity, in addition to usual activities, on 5 or more days of the week. Forty-five to 60 minutes of intentional physical activity is preferable.
- **Children and adolescents:** Engage in at least 60 minutes per day of moderate to vigorous physical activity at least 5 days per week.

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. Physical activity is associated with a 20% to 30% reduction in the risk of colon cancer. Studies also show that physical activity reduces the risk of breast cancer, especially vigorous activity. 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 breast cancer recurrence, breast cancer-specific mortality, and all-cause mortality.

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 35% of youth meet recommendations.

3. Consume a healthy diet with an emphasis on plant sources.

- Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
- Eat 5 or more servings of a variety of vegetables and fruits each day.
- Choose whole grains in preference to processed (refined) grains.
- Limit consumption of processed and red meats.

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. Many epidemiologic studies have shown that populations that eat diets high in vegetables and fruits and low in animal fat, meat, and/or calories have reduced risk of some of the most common cancers. Moreover, evidence that a diet high in red and processed meats is associated with a higher risk of developing gastrointestinal cancers has increased over the years. 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 fats, refined grains, sodium and added sugars, and increase their consumption of fruits, vegetables, whole grains, and low-fat dairy products in order to meet the 2005 Dietary Guidelines for Americans.

At this time, individual nutritional supplements are not recommended for cancer prevention, as the results of recently completed randomized clinical trials of antioxidant supplements and selenium have shown no reduction in risk for cancer, at least in generally well-nourished populations. Results from ongoing studies of other nutrients are awaited before any recommendations can be made.

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 emphasizing a variety of vegetables, fruits, and whole grains, while limiting red and processed meats. 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 an established cause of cancers of the mouth, pharynx, larynx, esophagus, liver, 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's Recommendation for Community Action

While many Americans would like to adopt a healthy lifestyle, many encounter substantial barriers that make it difficult to make healthy food and physical activity choices. 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.

Because of the tremendous influence that the surrounding environment has on individual food and activity choices, the Society's nutrition and physical activity guidelines include a Recommendation for Community Action. Acknowledging that turning the 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. This includes implementing strategies that increase access to healthy foods in schools, workplaces, and communities, and that provide safe, enjoyable, and accessible environments for physical activity in schools and for transportation and recreation in communities.

Achieving this Recommendation 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 schools, worksites, and communities to halt and ultimately turn around the obesity trends. Following are some specific approaches that have been proposed:

- 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 the school meals program and for competitive foods and beverages served outside of the program.
- Increase and enforce physical education requirements in grades K-12.
- 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.
- Encourage restaurants to provide nutrition information on menus, especially calories.
- 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 throughout life.

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. They 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. Radon, for example, is a naturally occurring carcinogen present in soil and rock; however, occupational exposure occurs in underground mines and substantial exposures also occur in poorly ventilated basements in regions where radon soil emissions are high. Environmental (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 nutrition, physical activity, 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 corresponds 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 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 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 large, 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] For a list of substances listed in the *11th Report on Carcinogens* as 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/Publications/internrep/07-001.pdf. The American Cancer Society does not have a formal program to 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 throughout the world 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 man-made 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 21.4 million new cancer cases and 13.2 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 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 kills approximately 5 million people, and by 2030 this number is expected to increase to 10 million, 70% of whom will reside in low- and middle-income countries.

With nearly a century of experience in cancer control, the American Cancer Society is uniquely positioned to lead the global fight against cancer and tobacco, assisting and empowering the world's cancer societies and anti-tobacco advocates. The Society's Global Health and 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.** 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, Livestrong Foundation, and others to prioritize cancer and noncommunicable diseases (NCDs) on the global health agenda. We were among many nonprofits in the global health community to advocate for a special United Nations High-level Meeting on NCDs to take place in September 2011. NCDs account for more than 60% of the world's deaths, yet they receive less than 3% of the public and private funding for health. This historic meeting could be instrumental in balancing global health funding and advocating for the integration of low-cost interventions for cancer and other NCDs into existing health care systems.
- **Reduce tobacco use, with a particular focus on sub-Saharan Africa.** Through a $7 million (US) grant received from the Bill & Melinda Gates Foundation in 2010, the Society and its partners, including the Africa Tobacco Control Regional Initiative, 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.
- **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. Also, see the following publications available on cancer.org:

- *Global Cancer Facts & Figures 2nd Edition*
- *The Tobacco Atlas, Third 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 50% in the 1970s. Thanks to this progress, more than 11 million cancer survivors in the US will celebrate another birthday this year.

How the American Cancer Society Is Organized

The American Cancer Society consists of a National Home Office with 12 chartered Divisions and a local presence in nearly every community nationwide.

The National American Cancer Society

A National Assembly of volunteer representatives from each of the American Cancer Society's 12 Divisions elects a national volunteer Board of Directors and the nominating committee. In addition, the Assembly approves corporate bylaw changes and the organization's division of funds policy. The Board of Directors sets and approves strategic goals for the Society, ensures management accountability, approves Division charters and charter requirements, and provides stewardship of donated funds. The National Home Office is responsible for overall planning and coordination of the Society's programs, provides technical support and materials to Divisions and local offices, and administers the Society's research program.

American Cancer Society Divisions

The Society's 12 Divisions are responsible for program delivery and fundraising in their regions. They are governed by Division Boards of Directors composed of both medical and lay volunteers in their regions.

Local Offices

The Society has a presence in nearly every community nationwide, with local offices responsible for raising funds at the community level and delivering programs that help people stay well and get well from cancer, as well as rally communities to fight back against the disease.

Volunteers

More than 3 million volunteers carry out the Society's work in communities across the country. These dedicated people donate their time and talents in many ways to help bring cancer under control as early as possible. Some volunteers choose to educate people about things they can do to prevent cancer or find it early to stay well. Some choose to offer direct support to patients, like driving them to treatment or providing guidance and emotional support. Others work to make cancer a top priority for lawmakers and participate in local community events to raise funds and awareness to fight cancer. No matter how volunteers choose to fight back, they are all saving lives while fulfilling their own.

How the American Cancer Society Saves Lives

The American Cancer Society has set aggressive challenge goals to dramatically decrease cancer incidence and mortality rates by 2015 while increasing the quality of life for all cancer survivors. The Society is uniquely qualified to make a difference in the fight against cancer and to save more lives by continuing its leadership position in supporting high-impact research; improving the quality of life for those affected by cancer; preventing and detecting cancer; and reaching more people, including the medically underserved, with the reliable cancer-related information they need. Simply stated, the American Cancer Society saves lives by helping people stay well and get well, by finding cures, and by fighting back against cancer.

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 tobacco through the American Cancer Society Quit For Life® Program, managed and operated by Alere Wellbeing. The two organizations have 35 years of combined experience in tobacco cessation coaching and have helped more than 1 million tobacco users.

Choose You® is a national movement created by the American Cancer Society that encourages women to put their own health

first in the fight against cancer. The movement challenges women to make healthier choices and supports them in their commitment to eat right, get active, quit smoking, and get regular health checks.

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, an online resource of health awareness and cancer information that educates employees about the steps they can take to stay well and get well; *Healthy Living*, a monthly electronic newsletter produced by the American Cancer Society that teaches the importance of making healthy lifestyle choices; the 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; and 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 works with its nonprofit, nonpartisan advocacy affiliate, the American Cancer Society Cancer Action Network℠ (ACS CAN), to create healthier communities by protecting people from the dangers of secondhand smoke so they can stay well. As of January 1, 2011, 47.8% of the US population was covered by comprehensive smoke-free laws and 79.4% was covered by some sort of smoke-free law. In 2009, the Family Smoking Prevention and Tobacco Control Act was signed into law. A decade in the making, the law, grants the US Food and Drug Administration the authority to regulate the manufacturing, selling, and marketing of tobacco products. Strong implementation of the law is vital to reducing death and disease from tobacco products.

For the majority of Americans who do not smoke, the most important ways to reduce cancer risk are to maintain a healthy weight, be physically active on a regular basis, and eat a mostly plant-based diet, consisting of a variety of vegetables and fruit, whole grains, and limited amounts of red and processed meats. The Society publishes guidelines on nutrition and physical activity for cancer prevention in order to review the accumulating scientific evidence on diet and cancer; to synthesize this evidence into clear, informative recommendations for the general public; to promote healthy individual behaviors, as well as environments that support healthy eating and physical activity habits; and, ultimately, to reduce cancer risk. These guidelines form the foundation for the Society's communication, worksite, school, and community strategies designed to encourage and support people in making healthy lifestyle behavior changes.

Early Detection

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

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

Throughout its history, the 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 steady decline in breast cancer mortality rates since 1990. 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 1.6 million cancer patients diagnosed this year and more than 11 million US cancer survivors, the American Cancer Society is here every minute of every 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 far from home for treatment. The Society also connects people with others who have been through similar experiences to offer emotional support.

Help with 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. As the largest oncology-focused patient navigator program in the country, the Society has specially trained patient navigators at 140 cancer treatment facilities across the nation. Patient navigators work in cooperation with these facilities' staff to connect patients with information, resources, and support to decrease barriers and ultimately to improve health outcomes. In 2010, more than 82,000 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.

The Society's transportation grants program allows hospitals and community organizations to apply for resources to administer their own transportation programs. In some areas, primarily where transportation assistance programs are difficult to sustain, the Society helps patients or their drivers via pre-paid gas cards to help defray costs associated with transportation to treatment.

Lodging during treatment: When someone diagnosed with cancer must travel far 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, home-like, temporary lodging for patients and their caregivers close to treatment centers, thereby easing the emotional and financial burden of finding affordable lodging. In 2010, the 30 American Cancer Society Hope Lodge locations provided 225,000 nights of free lodging to more than 55,000 patients and caregivers – saving them $20 million in lodging expenses.

Breast cancer support: Breast cancer survivors provide one-on-one support, information, and inspiration to help people facing the disease cope with breast cancer through the American Cancer Society Reach To Recovery® program. Volunteer survivors are trained to respond in person or by telephone to people facing breast cancer diagnosis, treatment, recurrence, or recovery.

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 caretakers 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 *"tlc" Tender Loving Care*®, which is a magazine and catalog in one, offers helpful articles and a line of products to help women battling cancer restore their appearance and dignity at a difficult time. All proceeds from product sales go back into the Society's programs and services for patients and survivors.

Support during treatment: When women are in active cancer treatment, they want to look their best, and Look Good…Feel Better® helps them do just that. The free program, which is a collaboration of the American Cancer Society, the Personal Care Products Council Foundation, and the Professional Beauty Association | National Cosmetology Association, helps women learn beauty techniques to restore their self-image and cope with appearance-related side effects of cancer treatment. Certified beauty professionals, trained as Look Good…Feel Better volunteers, provide tips on makeup, skin care, nail care, and head coverings. Additional information and materials are 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.

Finding Cures

The goals of the American Cancer Society's research program are to determine the causes of cancer and to support efforts to prevent, detect, and cure the disease. The Society is the largest private funder of cancer research in the US, second only to the federal government in total dollars spent. The Society spends more than $130 million on research each year and has invested more than $3.6 billion in cancer research since the program began in 1946. The Society's comprehensive research program consisting of extramural grants, as well as intramural programs in epidemiology, surveillance and health policy research, behavioral 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 about 230 US medical schools and universities.

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, 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 research 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 the higher cancer mortality in the poor and medically underserved.

To date, 44 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 60 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 (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 women between 1959-1972 occurred only in smokers, and was the first to show a relationship between obesity and risk of 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 between cancer risk and obesity, physical activity, diet, aspirin use, and hormone use. 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 400 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 relationships between other potentially modifiable factors, such as physical inactivity, prolonged hormone use, and certain dietary factors, with cancer risk
- 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 the primary venues for recruiting and enrolling participants. Although similar large cohorts are being established in some European and Asian countries, there are currently no studies of this magnitude in the US; therefore, the data collected from CPS-3 participants will provide unique opportunities for research in the US.

Surveillance Research

Through the Surveillance Research program, the Society publishes the most current cancer statistics in *CA: A Cancer Journal for Clinicians* (caonline.amcancersoc.org), as well as a variety of *Cancer Facts & Figures* publications. These publications are the most widely cited sources for cancer statistics and are available in hard copy from 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*. In 2010, Surveillance Research collaborated with the Global Health department to publish *Global Cancer Facts & Figures 2nd Edition*, 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 the causes of cancer, the population burden in the US and abroad, and how differences in patient characteristics, such as race, age, and socioeconomic status, affect cancer incidence and mortality. Recent studies have focused on the relationship between education and cancer mortality, temporal trends in breast cancer mortality by state, and trends in colorectal cancer internationally and by socioeconomic status and age in the US.

Health Services Research

Interest in developing a Health Services Research (HSR) program within the American Cancer Society National Home Office began in the late 1990s, motivated by several factors including increasing disparities in the quality and outcomes of cancer care. These factors indicated the need to develop methods and systems to monitor quality of cancer care as well as interventions to improve cancer care and patient outcomes, issues of great importance to Society stakeholders. The HSR program was founded in 2006, and since that time the group has developed into a highly productive multidisciplinary research team consisting of five full-time and one part-time staff members, including both clinician and non-clinician staff.

The primary objective of the HSR program is to perform high-quality, high-impact research that supports the Society's mission and program initiatives. Additional, related objectives include identifying critical gaps in evaluating and improving quality of cancer 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. The HSR program analyzes cancer treatment patterns and outcomes and has examined the role of health insurance in explaining disparities in access to care, quality of care among patients with access, and outcomes such as morbidity and mortality.

To accomplish its objectives, HSR's work has primarily involved the use 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 HSR'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 HSR'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, 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, ITCRP received funding from the Bloomberg Global Initiative to Reduce Tobacco Use, the Gates Foundation, and a grant 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* will be 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. These studies include an ongoing, nationwide longitudinal study and a cross-sectional study, both of which explore the physical and psychosocial adjustment to cancer and identify factors affecting quality of life.
- 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. Several methods for the systematic collection of patient-reported symptom data are under consideration or in development.
- Studies of African American-white disparities in cancer-related behaviors among Georgians. One study investigates the role of sociocultural factors and neighborhood barriers in disparities in smoking, poor diet, lack of exercise, and cancer screening among a statewide sample of more than 1,000 African Americans.
- Studies investigating how social, psychological, and other factors impact smokers' motivation and ability to quit. Knowledge gained is used to improve existing Society programs for smoking cessation (e.g., FreshStart, Great American Smokeout®) or to develop new technology-based interventions for smokers who seek cessation assistance.

Statistics and Evaluation Center

The Statistics & Evaluation Center (SEC) provides expert statistical, survey, study design, and evaluative consultation services to the American Cancer Society National Home Office and its Divisions. The SEC has two groups, Statistics and Survey Research, that work independently or in tandem depending upon the nature of the project, the service to be rendered, or the problem to be solved. The SEC's mission is to improve the Society's programs and processes, based on good science. The center always seeks to capture data systematically, and objectively deliver valid, reliable, accurate, and timely information to its stakeholders for evidence-based decision-making.

SEC staff designs and conducts process and outcome evaluations of Society programs, projects, and initiatives, and conducts focus groups, structured/semi-structured interviews, and needs assessments. All evaluations are logic model driven. The SEC continues to be engaged in evaluations of the Society's national survivorship, quality-of-life, early detection, prevention, global health, and extramural grants funding programs. The center's professional staff is involved in multiple projects across the Society, where their extensive statistical, study design, survey research skills, and experience are applied to evaluation and quantitative problem solving. The results of these studies improve Society mission and income delivery.

In the past year, the SEC has worked with staff from the Health Promotions department to evaluate aspects of the Man To Man, Look Good ... Feel Better, I Can Cope, and Let's Talk About It® programs and on the evaluation of web matching technologies for use with the Reach To Recovery and Road To Recovery programs. In addition, the SEC has worked with the Extramural Grants program to evaluate the Society's collaboration with the Canary Foundation on innovation in cancer screening and detection technology.

SEC staff also worked with the Global Health program and the Surveillance and Health Policy Research program to successfully obtain a grant from the Gates Foundation to fund smoking cessation work in Africa. In addition, the center collaborated with the Society's Office of Health Disparities to design and pilot a geographic information system- (GIS) based decision support tool.

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, government action is constantly required. The American Cancer Society and its nonprofit, nonpartisan advocacy affiliate, the American Cancer Society Cancer Action Network (ACS CAN), use applied policy analysis, direct lobbying, grassroots action, and media outreach to ensure elected officials nationwide pass laws furthering the organizations' shared

mission to create a world with less cancer. Created in 2001, ACS CAN is the force behind a new movement uniting and empowering cancer patients, survivors, caregivers, and their families. ACS CAN is a community-based grassroots movement that unites cancer survivors and caregivers, volunteers and staff, health care professionals, researchers, public health organizations, and other partners. ACS CAN gives ordinary people extraordinary power to fight back against cancer. In recent years, the Society and ACS CAN have successfully partnered 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 of our recent advocacy accomplishments impacting cancer patients include:

- Passage of the Affordable Care Act (ACA) of 2010, comprehensive legislation that:
  - Prohibits insurance companies from denying insurance coverage based on a pre-existing 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 new funding to states to make expansions or improvements to Medicaid
  - Saves states money in uncompensated care by replacing local dollars with new federal subsidies
  - Expands coverage to all low-income adults below 133% of the federal poverty level eligible for Medicaid beginning in 2014
  - Prioritizes health disparities at the National Institutes of Health, establishes a network of federal-specific 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 and 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, and sun exposure, improving nutrition, and increasing physical activity. By successfully working with partners, the Society and ACS CAN have:
  - Empowered the FDA with authority over tobacco products, resulting in new federal tobacco regulations that ban "light," "low," and "mild" descriptors on cigarettes; ban sales to youth; and impose new labeling requirements for smokeless tobacco. We have also helped defend this authority against legal challenges in court.
  - Passed comprehensive smoke-free laws in 23 states and the District of Columbia that require all workplaces, restaurants, and bars to be smoke free, covering nearly half of the US population, and defended these laws in court
  - Increased taxes on tobacco products to an average state cigarette tax of $1.45 per pack
  - Continued our role as interveners 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

- Passed strong legislation to reauthorize the federal child nutrition programs, which improve school meals, establish nutrition standards for foods sold in schools outside of meal programs, and strengthen local wellness policies to include health, nutrition, and physical education
- Secured millions of dollars in new federal and state funding for cancer research, prevention, early detection, and education, and implemented comprehensive state cancer control plans and fought efforts to cut funding
- 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

- Improving quality of life for cancer patients by ensuring that patients and survivors receive the best cancer care that matches treatments to patient and family goals across their life course. The Society and ACS CAN have:
  - Fought for reauthorization of the Health Resources and Services Administration (HRSA) Patient Navigator Program, which supports health care outreach in medically underserved communities for cancer patients and others suffering from chronic diseases
  - Advocated for more balanced pain policies in multiple states and at the federal level to ensure patients and survivors have access to the pain medicines and care they need to ease their suffering from cancer-related pain
  - Advocated for federal legislation to promote patient- and family-centered quality cancer care, survivorship care planning, pain and symptom management, and care coordination to improve quality of life for patients, survivors, and their families
  - Monitored legal cases of employment discrimination brought by cancer survivors as a result of wrongful termination in the workplace

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. The Society, working together with ACS CAN and its grassroots movement, 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, Making Strides Against Breast Cancer, and DetermiNation events.

Sources of Statistics

New cancer cases. The estimated numbers of new US cancer cases in 2011 are projected using a spatio-temporal model based on incidence data from 46 states and the District of Columbia for the years 1995-2007 that met the North American Association of Central Cancer Registries' (NAACCR) high-quality data standard for incidence, which covers about 95% of the US population. This method considers geographic variations in socio-demographic and lifestyle factors, medical settings, and cancer screening behaviors as predictors of incidence, as well as accounting for expected delays in case reporting. (See "B" in Additional Information on page 54 for more detailed information.)

Incidence rates. Incidence rates are defined as the number of people per 100,000 who are diagnosed with cancer during a given time period. State incidence rates presented in this publication are published in NAACCR's publication *Cancer Incidence in North America, 2003-2007.* Trends in cancer incidence rates and incidence rates by race/ethnicity were originally published in the *SEER Cancer Statistics Review (CSR) 1975-2007* and/or the 2010 Annual Report to the Nation on the Status of Cancer. (See "D" in Additional Information on page 54 for full reference.) Incidence rates in this publication are age adjusted to the 2000 US standard population to allow comparisons across populations with different age distributions. Incidence trends described in this publication are based on delay-adjusted incidence rates. 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 non-hospital settings.

Cancer deaths. The estimated numbers of US cancer deaths are calculated by fitting the numbers of cancer deaths for 1969-2007 to a statistical model that forecasts the numbers of deaths expected to occur in 2011. 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.

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 for 1930-2007 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. The trends in cancer mortality rates reported in this publication were first published in the *CSR 1975-2007.* (See "C" in Additional Information 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. Incidence and mortality rates reported by the Surveillance, Epidemiology, and End Results (SEER) program and NCHS are more informative statistics to use when tracking cancer incidence and mortality trends for the US. Rates from state cancer registries are useful for tracking local trends.

Survival. Unless otherwise specified, 5-year relative survival rates are presented in this report for cancer patients diagnosed between 1999 and 2006, followed through 2007.

Relative survival rates are used to adjust for normal life expectancy (and events such as death from heart disease, accidents, and diseases of old age). Relative survival is calculated by dividing the percentage of observed 5-year survival for cancer patients by the 5-year survival expected for people in the general population who are similar to the patient group with respect to age, sex, race, and calendar year of observation. Five-year survival statistics presented in this publication were originally published in *CSR 1975-2007*. In addition to 5-year survival rates, 1-year, 10-year, and 15-year survival rates are presented for selected cancer sites. These survival statistics are generated using the National Cancer Institute's SEER 17 database and SEER*Stat software version 6.6.2. (See "G" in Additional Information.) One-year survival rates are based on cancer patients diagnosed between 2003 and 2006, 10-year survival rates are based on diagnoses between 1994 and 2006, and 15-year survival rates are based on diagnoses between 1989 and 2006; all patients were followed through 2007.

Probability of developing cancer. Probabilities of developing cancer are calculated using DevCan (Probability of Developing Cancer) software version 6.5.0, developed by the National Cancer Institute. (See "H" in Additional Information.) 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 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. For information on data collection methods used by the North American Association of Central Cancer Registries: Copeland G, Lake A, Firth R, et al. (eds). *Cancer in North America, 2003-2007. Volume One: Combined Cancer Incidence for the United States and Canada.* Springfield, IL: North American Association of Central Cancer Registries, Inc. June 2010. Available at naaccr.org.

B. For information on the methods used to estimate the numbers of new cancer cases: Pickle L, Hao Y, Jemal A, et al. *CA Cancer J Clin*. 2007; 57:30-42.

C. For information on data collection methods used by the SEER program: Altekruse SF, Kosary CL, Krapcho M, et al. (eds). *SEER Cancer Statistics Review, 1975-2007*. National Cancer Institute. Bethesda, MD, 2010. Available at seer.cancer.gov.

D. For information on cancer incidence trends reported herein: Kohler BA, Ward EM, et al. *J Natl Cancer Inst*. 2011; 103:1-23.

E. For information on data collection and processing methods used by NCHS: cdc.gov/nchs/deaths.htm.

F. For information on the methods used to estimate the number of cancer deaths: Tiwari, et al. *CA Cancer J Clin*. 2004; 54:30-40.

G. For information on the methods used to calculate relative survival rates: software – Surveillance Research Program, National Cancer Institute SEER*Stat software (seer.cancer.gov/seerstat) version 6.6.2; database – Surveillance, Epidemiology, and End Results (SEER) Program (seer.cancer.gov) SEER*Stat Database: Incidence – SEER 17 Regs Limited-Use, Nov 2009 Sub (1973-2007 varying) – Linked to County Attributes – Total US, 1969-2007 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2010, based on the November 2009 submission.

H. For information on the methods used to calculate the probability of developing cancer: DevCan 6.5.0. Probability of developing or dying of cancer. Statistical Research and Applications Branch, NCI, 2010. Available at: 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	Beginning in their early 20s, women should be told about the benefits and limitations of breast self-examination (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. It is acceptable for women to choose not to do BSE or to do BSE irregularly.
		Clinical breast examination	For women in their 20s and 30s, it is recommended that clinical breast examination (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 clinical breast examination as part of a periodic health examination, preferably annually.
		Mammography	Begin annual mammography at age 40.*
Colorectal†	Men and women, age 50+	*Tests that find polyps and cancer:* Flexible sigmoidoscopy,‡ or	Every five years, starting at age 50
		Colonoscopy, or	Every 10 years, starting at age 50
		Double-contrast barium enema (DCBE),‡ or	Every five years, starting at age 50
		CT colonography (virtual colonoscopy)‡	Every five years, starting at age 50
		Tests that mainly find cancer: 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
		Stool DNA test (sDNA)‡	Interval uncertain, starting at age 50
Prostate	Men, age 50+	Prostate-specific antigen test (PSA) with or without digital rectal exam (DRE)	Asymptomatic men who have at least a 10-year life expectancy should have an opportunity to make an informed decision with their health care provider about screening for prostate cancer after receiving information about the uncertainties, risks, and potential benefits associated with screening. Prostate cancer screening should not occur without an informed decision-making process.¶
Cervix	Women, age 18+	Pap test	Cervical cancer screening should begin approximately three years after a woman begins having vaginal intercourse, but no later than 21 years of age. Screening should be done every year with conventional Pap tests or every two years using liquid-based Pap tests. At or after age 30, women who have had three normal test results in a row may get screened every two to three years with cervical cytology (either conventional or liquid-based Pap test) alone, or every three years with an HPV DNA test plus cervical cytology. Women 70 years of age and older who have had three or more normal Pap tests and no abnormal Pap tests in the past 10 years and women who have had a total hysterectomy may choose to stop cervical cancer screening.
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.	
Cancer-related checkup	Men and women, age 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.

†Individuals with a personal or family history of colorectal cancer or adenomas, inflammatory bowel disease, or high-risk genetic syndromes should continue to follow the most recent recommendations for individuals at increased or high risk.

‡Colonoscopy should be done if test results are positive.

§For FOBT or FIT used as a screening test, the take-home multiple sample method should be used. A FOBT or FIT done during a digital rectal exam in the doctor's office is not adequate for screening.

¶Information should be provided to men about the benefits and limitations of testing so that an informed decision can be made with the clinician's assistance.

Chartered Divisions of the American Cancer Society, Inc.

California Division, Inc.
1710 Webster Street
Oakland, CA 94612
(510) 893-7900 (O)
(510) 835-8656 (F)

East Central Division, Inc.
Route 422 and Sipe Avenue
Hershey, PA 17033-0897
(717) 533-6144 (O)
(717) 534-1075 (F)

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(NJ, NY)
6725 Lyons Street
East Syracuse, NY 13057
(315) 437-7025 (O)
(315) 437-0540 (F)

Florida Division, Inc.
(including Puerto Rico operations)
3709 West Jetton Avenue
Tampa, FL 33629-5146
(813) 253-0541 (O)
(813) 254-5857 (F)

Puerto Rico
Calle Alverio #577
Esquina Sargento Medina
Hato Rey, PR 00918
(787) 764-2295 (O)
(787) 764-0553 (F)

Great Lakes Division, Inc.
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1755 Abbey Road
East Lansing, MI 48823-1907
(517) 332-2222 (O)
(517) 664-1498 (F)

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Seattle, WA 98109-1140
(206) 283-1152 (O)
(206) 285-3469 (F)

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(including Hawaii operations, KS, MO, NE, OK, TX)
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(512) 919-1844 (F)

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(808) 595-7502 (F)

Illinois Division, Inc.
225 N. Michigan Avenue
Suite 1200
Chicago, IL 60601
(312) 641-6150 (O)
(312) 641-3533 (F)

Mid-South Division, Inc.
(AL, AR, KY, LA, MS, TN)
1100 Ireland Way
Suite 300
Birmingham, AL 35205-7014
(205) 930-8860 (O)
(205) 930-8877 (F)

Midwest Division, Inc.
(IA, MN, SD, WI)
8364 Hickman Road
Suite D
Des Moines, IA 50325
(515) 253-0147 (O)
(515) 253-0806 (F)

New England Division, Inc.
(CT, ME, MA, NH, RI, VT)
30 Speen Street
Framingham, MA 01701-9376
(508) 270-4600 (O)
(508) 270-4699 (F)

South Atlantic Division, Inc.
(DE, GA, MD, NC, SC, VA, Washington, D.C., WV)
250 Williams Street
Atlanta, GA 30303
(404) 816-7800 (O)
(404) 816-9443 (F)

Acknowledgments

The production of this report would not have been possible without the efforts of: Terri Ades, MS; Rick Alteri, MD; Priti Bandi, MS; Evan Blecher, PhD; Durado Brooks, MD, MPH; Carolina Casares, MD, MPH; Melissa Center, MPH; Amy Chen, MD, MPH; Vilma Cokkinides, PhD, MSPH; Carol DeSantis, MPH; Ronit Elk, PhD; Ted Gansler, MD, MBA; Sue Gapstur, PhD; Tom Glynn, PhD; Keona Graves; Eric Jacobs, PhD; Joan Kramer, MD; Len Lichtenfeld, MD; Martha Linet, MD, MPH; Marj McCullough, ScD, RD; Brenda McNeal; Adriane Magro; Deepa Naishadham, MS; Dearell Niemeyer, MPH; Ken Portier, PhD; David Ringer, PhD, MPH; Hana Ross, PhD; Debbie Saslow, PhD; Scott Simpson; Rennie Sloan; Robert Smith, PhD; Kristen Sullivan, MS, MPH; Dana Wagner; Sophia Wang, PhD; Elizabeth Ward, PhD; Marty Weinstock, MD, PhD; Jiaquan Xu, MD; and Joe Zou.

Cancer Facts & Figures is an annual publication of the American Cancer Society, Atlanta, Georgia.

For more information, contact:
Ahmedin Jemal, DVM, PhD; Rebecca Siegel, MPH
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