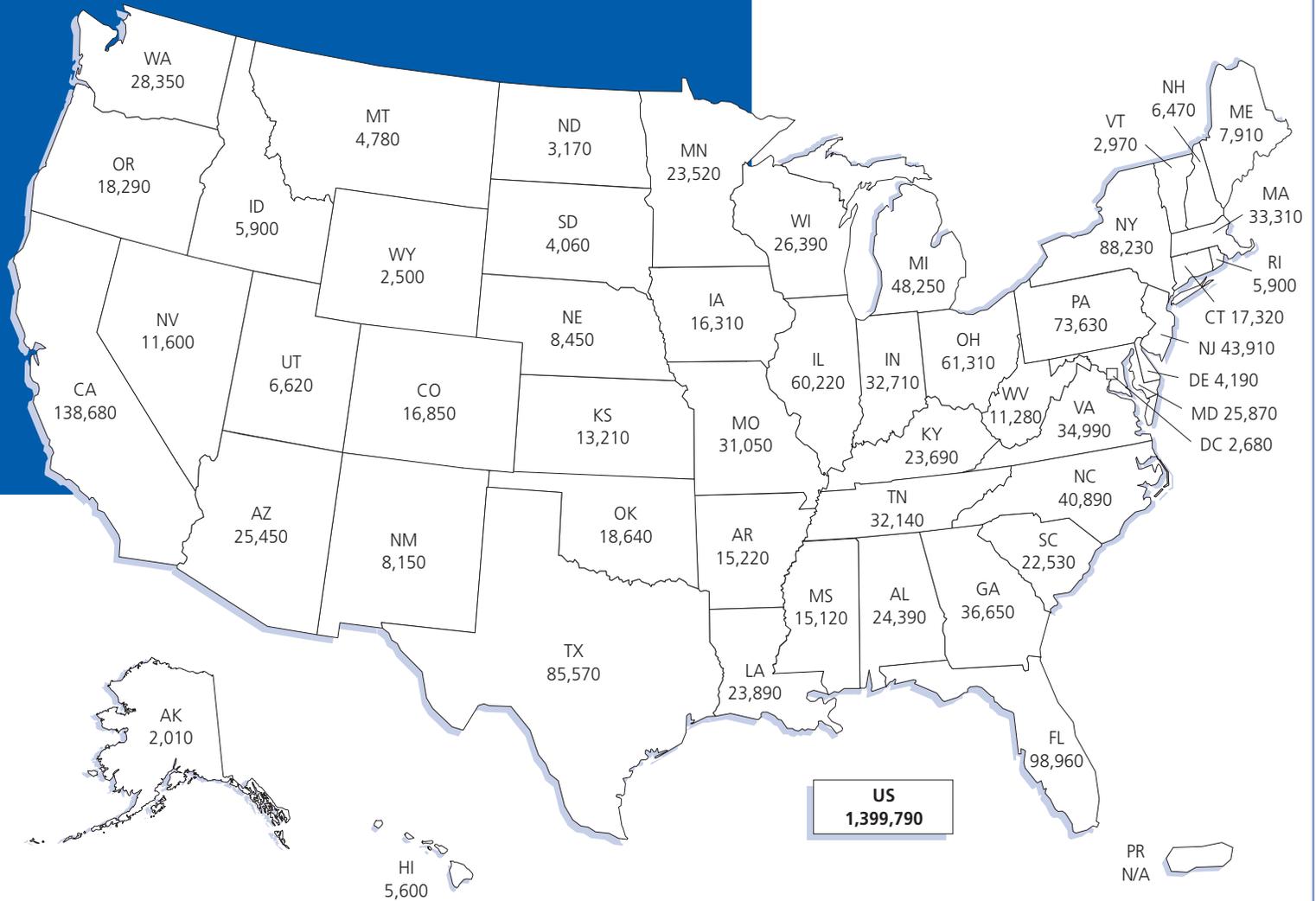


Cancer Facts & Figures 2006



Estimated number of new cancer cases for 2006, 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. They are calculated according to the distribution of estimated cancer deaths in 2006 by state. State estimates may not add to US total due to rounding.



Special Section:
**Environmental
 Pollutants and Cancer**
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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.

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Cancer: Basic 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, chemicals, radiation, and infectious organisms) 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 by surgery, radiation, chemotherapy, hormones, and immunotherapy.

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 2006 about 170,000 cancer deaths are expected to be caused by tobacco use.

Scientific evidence suggests that about one-third of the 564,830 cancer deaths expected to occur in 2006 will be related to nutrition, physical inactivity, and overweight or obesity, 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, and others, and could be prevented through behavioral changes, vaccines, or antibiotics. In addition, many of the more than 1 million skin cancers that are expected to be diagnosed in 2006 could have been prevented by protection from the sun's rays.

Regular screening examinations by a health care professional can result in the prevention of cervical and colorectal cancers through the discovery and removal of precursor lesions. Screening can detect cancers of the breast, colon, rectum, cervix, prostate, oral cavity, and skin at early stages. For most of these cancers, early detection has been proven to reduce mortality. 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. The 5-year relative survival rate for these cancers is about 86%, a percentage that reflects real reductions in mortality as well as earlier diagnosis because of screening.

Who Is at Risk of Developing Cancer?

Anyone can develop cancer. Since the risk of being diagnosed with cancer increases as individuals age, most

cases occur in adults who are middle-aged or older. About 76% of all cancers are diagnosed in persons 55 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 with women who do not have a family history.

All cancers involve the malfunction of genes that control cell growth and division. About 5% to 10% of all cancers are strongly hereditary, in that an inherited genetic alteration confers a very high risk of developing a particular cancer. However, most cancers do not result from inherited genes, but rather are the result of damage (mutations) to genes that occurs during one's lifetime. Mutations may result from internal factors, such as hormones or the digestion of nutrients within cells, or external factors, such as tobacco, chemicals, and sunlight. (These nonhereditary mutations are called somatic mutations.)

How Many People Alive Today Have Ever Had Cancer?

The National Cancer Institute estimates that approximately 10.1 million Americans with a history of cancer were alive in January 2002. 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 1,399,790 new cancer cases are expected to be diagnosed in 2006. 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. More than 1 million cases of basal and squamous cell skin cancers are expected to be diagnosed this year.

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

This year about 564,830 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 1 of every 4 deaths.

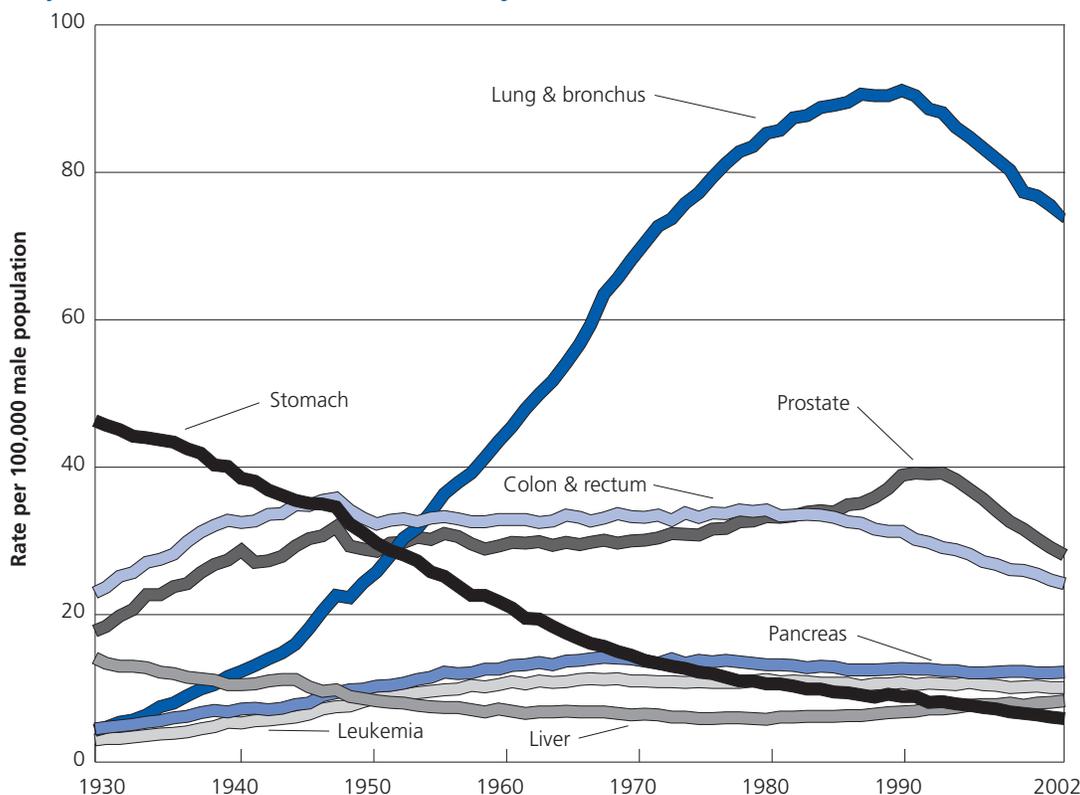
What Percentage of People Survive Cancer?

The 5-year relative survival rate for all cancers diagnosed between 1995 and 2001 is 65%, up from 50% in 1974-1976 (see page 18). The improvement in survival reflects progress in diagnosing certain cancers at an earlier stage and the use of new and/or improved treatments. Rates vary greatly by cancer type and stage at diagnosis. Relative survival compares survival among cancer patients to that of people not diagnosed with cancer, but 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 those 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 can affect survival beyond 5 years after diagnosis.

Although relative survival provides some indication about the average survival experience of cancer patients in a given population, it is less informative when used to predict individual prognosis and should be interpreted with caution. First, 5-year relative survival rates are based on patients who were diagnosed from 1995-2001 and do not reflect recent advances in detection and treatment. Second, information about prognostic factors that influence survival, other than stage at diagnosis, including treatment protocols, additional illnesses, biological differences, and behavioral characteristics of each individual, cannot be taken into account in the estimation of stage-specific survival rates. (For more information about survival rates, see Sources of Statistics on page 49.)

Age-Adjusted Cancer Death Rates,* Males by Site, US, 1930-2002



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

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

Source: US Mortality Public Use Data Tapes 1960 to 2002, US Mortality Volumes 1930 to 1959, National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2006

How Is Cancer Staged?

Staging is the process of describing the extent or spread of the disease at the time of diagnosis. It is essential in determining the choice of therapy and in assessing prognosis. A cancer's stage is based on the primary tumor's size and location in the body 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 stage and IV being advanced. 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 spread beyond the original layer of tissue, the cancer is invasive. See Five-Year Relative

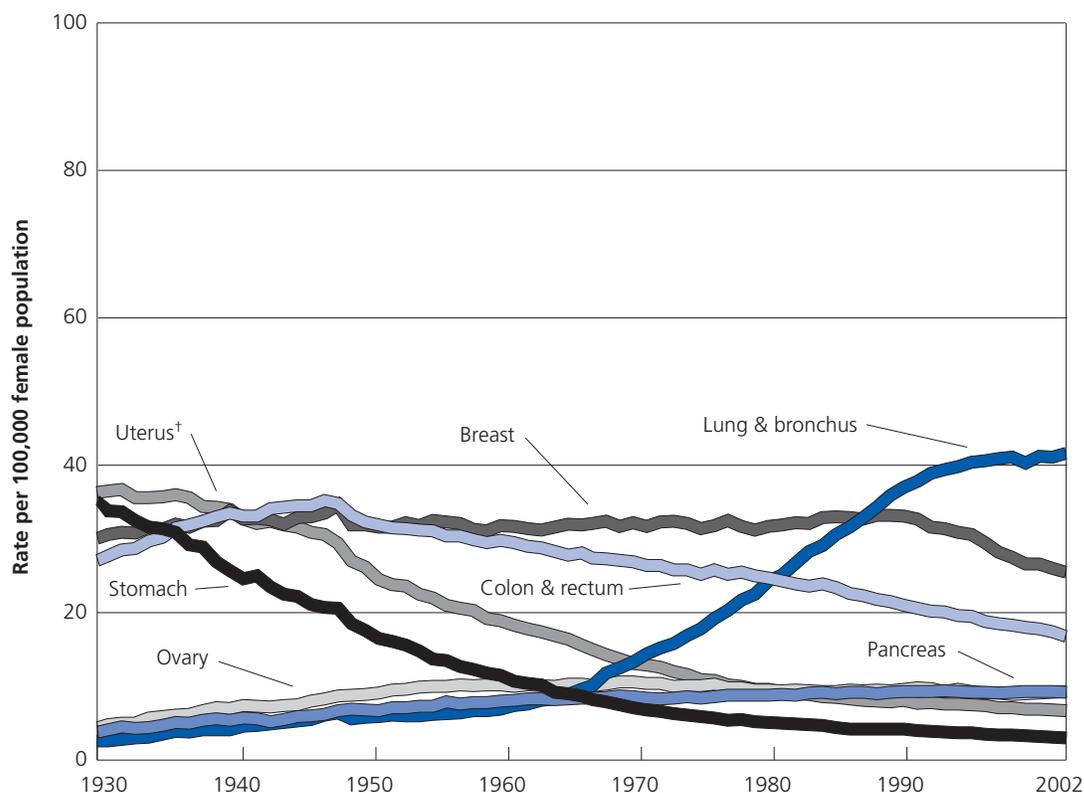
Survival Rates by Stage at Diagnosis, 1995-2001, page 17, for a description of the other summary stage categories.

What Are the Costs of Cancer?

The National Institutes of Health estimate overall costs for cancer in 2005 at \$209.9 billion: \$74.0 billion for direct medical costs (total of all health expenditures); \$17.5 billion for indirect morbidity costs (cost of lost productivity due to illness); and \$118.4 billion for indirect mortality costs (cost of lost productivity due to premature death).

Lack of health insurance and other barriers prevent many Americans from receiving optimal health care. According to the 2003 National Health Interview Survey data, about 17% of Americans younger than age 65 have no health insurance coverage, and 24% of persons 65 and older have Medicare coverage only. In that survey, nearly 20% of Americans aged 18-44 years reported not having a usual place to go for medical care.

Age-Adjusted Cancer Death Rates,* Females by Site, US, 1930-2002



*Per 100,000, age-adjusted to the 2000 US standard population. [†]Uterus cancer death rates are for uterine cervix and uterine corpus combined.

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

Source: US Mortality Public Use Data Tapes 1960 to 2002, US Mortality Volumes 1930 to 1959, National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2006

Estimated New Cancer Cases and Deaths by Sex for All Sites, US, 2006*

	Estimated New Cases			Estimated Deaths		
	Both Sexes	Male	Female	Both Sexes	Male	Female
All sites	1,399,790	720,280	679,510	564,830	291,270	273,560
Oral cavity & pharynx	30,990	20,180	10,810	7,430	5,050	2,380
Tongue	9,040	5,870	3,170	1,780	1,150	630
Mouth	10,230	5,440	4,790	1,870	1,100	770
Pharynx	8,950	6,820	2,130	2,110	1,540	570
Other oral cavity	2,770	2,050	720	1,670	1,260	410
Digestive system	263,060	137,630	125,430	136,180	75,210	60,970
Esophagus	14,550	11,260	3,290	13,770	10,730	3,040
Stomach	22,280	13,400	8,880	11,430	6,690	4,740
Small intestine	6,170	3,160	3,010	1,070	560	510
Colon†	106,680	49,220	57,460	55,170	27,870	27,300
Rectum	41,930	23,580	18,350			
Anus, anal canal, & anorectum	4,660	1,910	2,750	660	220	440
Liver & intrahepatic bile duct	18,510	12,600	5,910	16,200	10,840	5,360
Gallbladder & other biliary	8,570	3,720	4,850	3,260	1,280	1,980
Pancreas	33,730	17,150	16,580	32,300	16,090	16,210
Other digestive organs	5,980	1,630	4,350	2,320	930	1,390
Respiratory system	186,370	101,900	84,470	167,050	93,820	73,230
Larynx	9,510	7,700	1,810	3,740	2,950	790
Lung & bronchus	174,470	92,700	81,770	162,460	90,330	72,130
Other respiratory organs	2,390	1,500	890	850	540	310
Bones & joints	2,760	1,500	1,260	1,260	730	530
Soft tissue (including heart)	9,530	5,720	3,810	3,500	1,830	1,670
Skin (excluding basal & squamous)	68,780	38,360	30,420	10,710	6,990	3,720
Melanoma – skin	62,190	34,260	27,930	7,910	5,020	2,890
Other nonepithelial skin	6,590	4,100	2,490	2,800	1,970	830
Breast	214,640	1,720	212,920	41,430	460	40,970
Genital system	321,490	244,240	77,250	56,060	28,000	28,060
Uterine cervix	9,710		9,710	3,700		3,700
Uterine corpus	41,200		41,200	7,350		7,350
Ovary	20,180		20,180	15,310		15,310
Vulva	3,740		3,740	880		880
Vagina & other genital, female	2,420		2,420	820		820
Prostate	234,460	234,460		27,350	27,350	
Testis	8,250	8,250		370	370	
Penis & other genital, male	1,530	1,530		280	280	
Urinary system	102,740	70,940	31,800	26,670	17,530	9,140
Urinary bladder	61,420	44,690	16,730	13,060	8,990	4,070
Kidney & renal pelvis	38,890	24,650	14,240	12,840	8,130	4,710
Ureter & other urinary organs	2,430	1,600	830	770	410	360
Eye & orbit	2,360	1,230	1,130	230	110	120
Brain & other nervous system	18,820	10,730	8,090	12,820	7,260	5,560
Endocrine system	32,260	8,690	23,570	2,290	1,020	1,270
Thyroid	30,180	7,590	22,590	1,500	630	870
Other endocrine	2,080	1,100	980	790	390	400
Lymphoma	66,670	34,870	31,800	20,330	10,770	9,560
Hodgkin lymphoma	7,800	4,190	3,610	1,490	770	720
Non-Hodgkin lymphoma	58,870	30,680	28,190	18,840	10,000	8,840
Multiple myeloma	16,570	9,250	7,320	11,310	5,680	5,630
Leukemia	35,070	20,000	15,070	22,280	12,470	9,810
Acute lymphocytic leukemia	3,930	2,150	1,780	1,490	900	590
Chronic lymphocytic leukemia	10,020	6,280	3,740	4,660	2,590	2,070
Acute myeloid leukemia	11,930	6,350	5,580	9,040	5,090	3,950
Chronic myeloid leukemia	4,500	2,550	1,950	600	300	300
Other leukemia‡	4,690	2,670	2,020	6,490	3,590	2,900
Other & unspecified primary sites†	27,680	13,320	14,360	45,280	24,340	20,940

*Rounded to the nearest 10; estimated new cases exclude basal and squamous cell skin cancers and in situ carcinomas except urinary bladder. About 61,980 carcinoma in situ of the breast and 49,710 melanoma in situ will be newly diagnosed in 2006. †Estimated deaths for colon and rectum cancers are combined.

‡More deaths than cases suggests lack of specificity in recording underlying causes of death on death certificates.

Source: Estimates of new cases are based on incidence rates from 1979 to 2002, National Cancer Institute's Surveillance, Epidemiology, and End Results program, nine oldest registries. Estimates of deaths are based on data from US Mortality Public Use Data Tapes, 1969 to 2003, National Center for Health Statistics, Centers for Disease Control and Prevention, 2006.

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Estimated New Cancer Cases for Selected Cancer Sites by State, US, 2006*

State	All Cases	Female Breast	Uterine Cervix	Colon & Rectum	Uterine Corpus	Leukemia	Lung & Bronchus	Melanoma of the Skin	Non-Hodgkin Lymphoma	Prostate	Urinary Bladder
Alabama	24,390	3,740	180	2,400	670	550	3,530	940	1,030	4,030	800
Alaska	2,010	310	†	220	60	50	240	80	90	260	90
Arizona	25,450	3,740	180	2,690	500	630	3,140	1,340	1,060	4,290	1,180
Arkansas	15,220	2,030	160	1,670	390	390	2,350	550	660	2,830	520
California	138,680	21,200	940	14,820	4,370	3,450	14,900	6,290	5,840	27,520	6,160
Colorado	16,850	2,650	100	1,720	450	470	1,790	940	810	2,740	710
Connecticut	17,320	2,600	80	1,700	450	470	2,000	710	750	3,340	890
Delaware	4,190	570	†	430	110	130	550	240	190	690	190
Dist. of Columbia	2,680	470	†	300	170	50	290	80	120	510	240
Florida	98,960	13,360	680	9,970	2,520	2,660	13,280	4,870	4,060	18,090	4,700
Georgia	36,650	5,920	370	3,690	950	820	4,860	1,490	1,470	5,490	1,460
Hawaii	5,600	680	†	590	170	130	500	160	280	940	190
Idaho	5,900	940	50	570	170	170	670	390	280	1,200	330
Illinois	60,220	9,250	450	6,760	1,910	1,620	7,290	2,280	2,280	8,740	2,630
Indiana	32,710	4,680	180	3,390	1,070	820	4,620	1,420	1,410	4,890	1,360
Iowa	16,310	2,230	100	1,780	500	490	1,850	550	840	3,260	660
Kansas	13,210	2,080	80	1,510	340	390	1,650	550	720	1,890	610
Kentucky	23,690	3,220	180	2,450	500	520	3,760	1,180	970	2,570	890
Louisiana	23,890	4,000	160	2,690	450	540	3,170	790	870	3,000	750
Maine	7,910	1,040	†	810	220	160	1,030	390	280	1,460	420
Maryland	25,870	4,310	210	2,750	780	630	3,320	1,100	1,060	4,290	1,130
Massachusetts	33,310	4,680	80	3,420	1,010	770	4,070	1,570	1,310	5,230	1,790
Michigan	48,250	7,070	260	4,930	1,510	1,240	6,240	1,890	2,280	7,370	2,300
Minnesota	23,520	3,070	130	2,400	780	660	2,610	860	1,060	4,200	1,130
Mississippi	15,120	2,290	160	1,670	390	360	2,200	470	560	3,090	470
Missouri	31,050	4,570	180	3,290	900	790	4,130	1,420	1,590	3,940	1,180
Montana	4,780	620	†	480	170	140	620	310	220	940	240
Nebraska	8,450	1,200	50	1,020	280	250	1,000	390	370	1,370	330
Nevada	11,600	1,660	80	1,320	220	270	1,520	550	470	1,970	560
New Hampshire	6,470	940	†	650	170	160	770	390	310	1,200	380
New Jersey	43,910	8,110	340	4,850	1,680	1,100	4,960	1,890	1,870	7,720	1,690
New Mexico	8,150	1,090	50	860	220	190	820	390	370	1,800	380
New York	88,230	14,400	810	9,540	3,420	2,160	9,900	3,380	3,030	14,400	3,720
North Carolina	40,890	6,290	260	4,120	1,180	990	5,480	1,970	1,840	7,120	1,600
North Dakota	3,170	470	†	350	110	90	330	80	160	770	140
Ohio	61,310	9,610	390	6,730	1,850	1,540	7,900	2,520	2,190	9,340	3,150
Oklahoma	18,640	2,860	130	2,020	450	460	2,560	1,020	720	2,490	800
Oregon	18,290	2,810	130	1,890	450	420	2,290	1,020	1,090	3,000	1,030
Pennsylvania	73,630	12,320	310	8,000	2,470	1,700	8,450	3,140	3,410	13,290	3,620
Rhode Island	5,900	780	†	650	110	130	680	240	220	770	330
South Carolina	22,530	3,170	160	2,370	500	520	3,040	860	940	3,770	850
South Dakota	4,060	520	†	480	110	130	440	240	250	940	190
Tennessee	32,140	4,630	240	3,310	730	760	4,680	1,340	1,440	4,890	1,180
Texas	85,570	13,150	920	9,510	2,350	2,250	10,780	3,930	3,340	12,690	3,340
Utah	6,620	1,200	50	700	220	190	480	470	440	1,290	330
Vermont	2,970	520	†	350	110	80	390	160	190	510	190
Virginia	34,990	6,080	210	3,690	1,010	800	4,840	1,730	1,060	6,000	1,460
Washington	28,350	4,000	130	2,770	900	690	3,540	1,490	1,410	6,090	1,320
West Virginia	11,280	1,400	100	1,320	280	240	1,640	470	560	1,460	470
Wisconsin	26,390	4,000	100	2,770	840	770	3,040	1,260	870	4,460	1,270
Wyoming	2,500	260	†	300	60	60	290	160	120	510	90
United States	1,399,790	212,920	9,710	148,610	41,200	35,070	174,470	62,190	58,870	234,460	61,420

*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. They are calculated according to the distribution of estimated cancer deaths in 2006 by state. State estimates may not add up to US total due to rounding and exclusion of state estimates fewer than 50 cases.

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Estimated Cancer Deaths for Selected Cancer Sites by State, US, 2006*

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non- Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	9,840	210	720	890	350	290	3,290	330	270	530	470
Alaska	810	†	60	80	†	†	220	†	†	50	†
Arizona	10,270	250	720	1,000	400	310	2,920	340	280	530	500
Arkansas	6,140	150	390	620	250	100	2,190	210	120	310	330
California	55,960	1,480	4,080	5,500	2,190	2,230	13,870	1,870	1,650	3,310	3,210
Colorado	6,800	190	510	640	300	190	1,670	260	210	400	320
Connecticut	6,990	150	500	630	300	190	1,860	240	190	440	390
Delaware	1,690	†	110	160	80	†	510	60	50	100	80
Dist. of Columbia	1,080	†	90	110	†	†	270	†	†	70	60
Florida	39,930	830	2,570	3,700	1,690	1,180	12,370	1,300	1,050	2,300	2,110
Georgia	14,790	300	1,140	1,370	520	360	4,530	470	410	790	640
Hawaii	2,260	†	130	220	80	110	470	90	50	150	110
Idaho	2,380	80	180	210	110	50	620	90	50	130	140
Illinois	24,300	480	1,780	2,510	1,030	640	6,790	730	620	1,420	1,020
Indiana	13,200	320	900	1,260	520	280	4,300	450	360	720	570
Iowa	6,580	160	430	660	310	130	1,720	270	190	380	380
Kansas	5,330	140	400	560	250	130	1,540	230	150	300	220
Kentucky	9,560	180	620	910	330	220	3,500	310	220	450	300
Louisiana	9,640	200	770	1,000	340	320	2,950	280	220	520	350
Maine	3,190	80	200	300	100	70	960	90	90	180	170
Maryland	10,440	220	830	1,020	400	280	3,090	340	270	620	500
Massachusetts	13,440	280	900	1,270	490	380	3,790	420	360	860	610
Michigan	19,470	450	1,360	1,830	790	530	5,810	730	550	1,150	860
Minnesota	9,490	250	590	890	420	230	2,430	340	250	550	490
Mississippi	6,100	160	440	620	230	190	2,050	180	150	340	360
Missouri	12,530	270	880	1,220	500	320	3,850	510	330	680	460
Montana	1,930	50	120	180	90	†	580	70	60	100	110
Nebraska	3,410	80	230	380	160	70	930	120	100	170	160
Nevada	4,680	100	320	490	170	130	1,420	150	120	250	230
New Hampshire	2,610	60	180	240	100	70	720	100	60	140	140
New Jersey	17,720	310	1,560	1,800	700	470	4,620	600	510	1,050	900
New Mexico	3,290	70	210	320	120	140	760	120	90	180	210
New York	35,600	700	2,770	3,540	1,370	1,020	9,220	970	1,030	2,260	1,680
North Carolina	16,500	360	1,210	1,530	630	410	5,100	590	440	940	830
North Dakota	1,280	†	90	130	60	†	310	50	†	80	90
Ohio	24,740	540	1,850	2,500	980	600	7,360	700	640	1,330	1,090
Oklahoma	7,520	170	550	750	290	180	2,380	230	170	360	290
Oregon	7,380	200	540	700	270	180	2,130	350	220	420	350
Pennsylvania	29,710	550	2,370	2,970	1,080	780	7,870	1,090	820	1,690	1,550
Rhode Island	2,380	50	150	240	80	70	630	70	60	140	90
South Carolina	9,090	180	610	880	330	230	2,830	300	200	500	440
South Dakota	1,640	50	100	180	80	†	410	80	60	100	110
Tennessee	12,970	330	890	1,230	480	330	4,360	460	340	680	570
Texas	34,530	880	2,530	3,530	1,430	1,340	10,040	1,070	910	1,970	1,480
Utah	2,670	90	230	260	120	70	450	140	80	170	150
Vermont	1,200	†	100	130	50	†	360	60	†	70	60
Virginia	14,120	270	1,170	1,370	510	360	4,510	340	380	780	700
Washington	11,440	360	770	1,030	440	370	3,300	450	370	700	710
West Virginia	4,550	90	270	490	150	110	1,530	180	130	200	170
Wisconsin	10,650	260	770	1,030	490	300	2,830	280	300	660	520
Wyoming	1,010	†	50	110	†	†	270	†	†	50	60
United States	564,830	12,820	40,970	55,170	22,280	16,200	162,460	18,840	15,310	32,300	27,350

*Rounded to nearest 10. †Estimate is fewer than 50 deaths. **Note:** State estimates may not add up to US total due to rounding and exclusion of state estimates fewer than 50 deaths.

Source: US Mortality Public Use Data Tapes, 1969-2003, National Center for Health Statistics, Centers for Disease Control and Prevention, 2006.

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Cancer Incidence Rates by Site and State, US, 1998-2002*

State	All Sites		Breast	Colon & Rectum		Lung & Bronchus		Non-Hodgkin Lymphoma		Prostate	Urinary Bladder	
	Male	Female	Female	Male	Female	Male	Female	Male	Female	Male	Male	Female
Alabama†	520.5	365.2	116.7	60.1	41.9	111.0	49.6	18.6	13.3	135.1	29.3	7.0
Alaska†	552.4	430.5	135.8	64.4	55.0	85.9	61.9	24.3	16.4	169.0	37.9	8.3
Arizona†	468.2	370.0	120.3	54.4	38.8	72.7	49.0	19.0	13.7	123.5	35.9	9.0
Arkansas	526.0	372.1	120.7	59.8	43.3	113.8	54.6	20.0	15.0	145.5	33.6	7.8
California†	518.0	399.9	131.7	57.2	42.0	71.9	48.6	22.0	15.1	156.7	34.1	8.3
Colorado†	516.6	400.4	135.5	55.5	41.6	67.0	44.1	21.4	16.6	162.6	35.1	9.0
Connecticut†	597.9	450.5	143.2	70.5	51.9	86.0	56.8	24.5	17.0	177.8	45.8	12.3
Delaware†	581.3	432.8	130.1	66.7	50.2	96.9	59.5	21.6	16.5	171.5	37.9	10.5
Dist. of Columbia†	653.8	430.0	139.3	67.2	54.1	100.0	51.2	21.9	12.1	233.5	25.0	9.9
Florida†	564.5	416.9	125.9	64.6	47.9	95.8	60.5	22.4	15.7	155.7	40.7	10.5
Georgia	556.1	384.0	124.0	60.3	43.2	108.7	51.3	18.8	13.4	164.7	32.0	8.0
Hawaii†	479.9	381.3	131.7	66.1	43.4	68.5	37.5	18.6	13.1	129.9	22.9	5.3
Idaho†	526.8	397.5	130.5	52.7	40.1	71.3	44.2	20.9	17.2	170.5	38.6	8.2
Illinois†	577.2	427.4	132.9	72.1	51.0	97.1	55.8	23.2	16.0	162.4	39.7	10.2
Indiana†	542.5	415.6	128.2	69.2	49.6	108.0	58.8	21.6	15.6	135.7	36.4	9.2
Iowa†	557.0	426.0	132.1	73.9	54.6	90.1	49.4	22.5	16.8	154.9	38.8	9.4
Kansas†	-	-	-	-	-	-	-	-	-	-	-	-
Kentucky†	618.2	442.2	126.8	73.1	54.1	138.2	72.3	22.5	16.6	155.3	38.0	9.4
Louisiana†	611.2	400.9	123.4	73.5	49.4	115.0	56.2	21.8	15.5	177.3	34.0	8.2
Maine†	607.8	445.0	132.3	70.1	53.0	100.9	61.7	22.8	16.9	170.9	46.0	13.2
Maryland	588.6	425.8	131.8	64.9	47.9	90.1	57.0	20.5	14.1	185.5	35.1	9.4
Massachusetts†	595.0	451.7	142.5	70.1	50.8	86.5	60.4	22.6	16.4	180.4	45.7	12.7
Michigan†	613.3	433.8	132.4	64.6	47.9	95.8	58.5	22.9	17.0	200.6	42.7	10.7
Minnesota†	557.9	413.5	139.0	60.9	45.7	72.5	46.4	25.4	18.1	188.1	38.4	9.9
Mississippi†	-	-	-	-	-	-	-	-	-	-	-	-
Missouri†	538.7	407.5	126.5	69.7	48.8	105.2	58.3	22.7	15.9	136.5	35.6	8.6
Montana†	553.6	413.6	130.2	62.0	43.5	83.7	57.2	22.4	15.7	178.5	38.3	10.4
Nebraska†	546.1	413.9	134.1	69.9	49.9	82.4	46.3	22.9	17.1	163.8	37.7	8.7
Nevada†	522.6	411.3	119.7	60.4	44.6	94.0	71.2	19.6	13.7	139.7	41.3	11.1
New Hampshire	561.3	429.9	137.4	63.3	47.7	84.2	58.8	23.5	15.7	160.3	45.3	12.6
New Jersey†	629.0	450.2	136.1	75.5	53.7	87.6	55.4	25.8	18.1	201.2	45.5	12.0
New Mexico†	477.4	355.1	116.6	51.3	34.8	61.2	35.9	17.8	13.5	146.9	28.8	7.4
New York†	572.5	432.5	129.7	71.9	52.8	84.7	54.1	23.5	16.5	167.1	41.2	11.3
North Carolina	523.5	372.8	123.5	57.8	42.3	100.0	49.1	18.7	13.2	153.1	33.2	8.3
North Dakota	528.7	372.2	123.9	66.0	46.5	73.1	39.6	21.0	14.0	187.3	37.6	8.5
Ohio†	553.1	416.6	129.4	67.1	49.2	101.7	57.9	22.9	16.0	152.6	40.0	10.3
Oklahoma†	541.0	397.2	130.2	65.8	45.3	113.1	61.1	21.2	14.5	145.4	32.4	8.0
Oregon†	551.2	439.1	145.9	57.7	44.2	84.7	61.1	23.0	16.9	166.7	41.9	10.4
Pennsylvania†	597.5	435.8	131.6	74.6	52.3	93.7	53.4	24.5	16.9	174.2	44.2	11.5
Rhode Island†	632.7	450.6	132.3	75.5	52.4	101.3	61.9	23.1	17.1	178.8	53.0	14.3
South Carolina†	585.3	384.6	123.1	66.5	45.0	107.0	49.0	20.0	13.9	176.1	34.2	7.6
South Dakota (2001-2002)	538.9	386.1	130.9	67.7	47.3	73.0	38.3	18.0	14.8	182.9	42.8	8.2
Tennessee†	-	-	-	-	-	-	-	-	-	-	-	-
Texas	516.5	373.8	117.1	58.5	41.1	91.6	49.7	20.1	14.6	143.9	29.1	7.1
Utah†	481.9	350.3	120.2	48.3	37.7	42.3	21.5	23.3	14.9	181.0	31.5	7.3
Vermont†	-	-	-	-	-	-	-	-	-	-	-	-
Virginia	496.2	360.8	122.9	58.6	43.2	80.8	46.4	18.7	12.9	157.0	31.9	8.1
Washington†	578.9	450.0	149.5	60.3	43.7	86.6	60.7	25.3	17.5	178.3	42.4	10.1
West Virginia†	582.4	429.7	118.6	71.8	52.8	121.2	68.9	21.4	16.6	152.4	41.1	12.6
Wisconsin†	565.6	423.7	135.2	67.2	47.2	84.6	51.5	22.7	16.2	165.6	37.9	10.3
Wyoming	529.7	385.1	123.9	57.9	44.0	67.9	42.8	16.7	15.9	176.5	41.4	9.8
United States	561.4	418.2	131.0	65.9	47.9	90.1	54.6	22.6	16.0	163.8	38.9	10.0

*Per 100,000, age-adjusted to the 2000 US standard population. Not all states submitted data for all years. † This state's registry has submitted 5 years of data and passed rigorous criteria for each single year's data including: completeness of reporting, non-duplication of records, percent unknown in critical data fields, percent of cases registered with information from death certificates only, and internal consistency among data items. ‡ This state's registry did not submit incidence data to the North American Association of Central Cancer Registries (NAACCR) for 1998-2002.

Source: Cancer in North America: 1998-2002, Volume One: Incidence, NAACCR, based on data collected by cancer registries participating in NCI's SEER Program and CDC's National Program of Cancer Registries.

American Cancer Society, Surveillance Research, 2006

Cancer Death Rates by Site and State, US, 1998-2002*

State	All Sites		Breast	Colon & Rectum		Lung & Bronchus		Non-Hodgkin Lymphoma		Pancreas		Prostate
	Male	Female	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Alabama	285.8	166.3	26.5	24.4	16.0	98.4	39.3	9.3	6.3	13.1	9.3	38.3
Alaska	236.6	169.7	23.3	23.5	17.8	68.7	46.1	11.2	6.2	11.1	10.0	29.2
Arizona	211.1	148.9	24.5	21.0	14.4	60.4	37.8	9.4	6.6	10.5	8.1	25.8
Arkansas	276.7	167.4	24.6	25.7	18.3	102.6	44.8	10.7	6.5	12.1	9.0	33.0
California	217.1	156.8	25.1	21.0	15.2	59.8	37.9	9.6	6.1	11.3	9.0	27.1
Colorado	209.5	148.7	23.3	21.8	15.2	53.7	33.5	9.4	6.7	11.6	8.7	29.0
Connecticut	232.3	162.6	26.4	24.4	17.3	64.4	39.8	10.0	6.8	12.8	9.6	28.5
Delaware	259.7	179.5	28.3	25.2	17.8	83.1	46.6	9.9	6.7	13.0	9.4	30.0
Dist. of Columbia	308.2	195.6	36.1	31.6	23.2	81.2	41.2	8.7	4.8	14.6	10.8	51.0
Florida	231.9	156.0	24.3	22.4	15.8	74.0	42.1	9.7	6.1	11.4	8.6	25.5
Georgia	269.3	163.0	25.8	23.2	16.5	92.6	39.8	8.8	6.1	12.6	9.0	36.5
Hawaii	192.4	125.6	19.2	20.7	12.5	51.4	24.9	8.3	5.1	11.1	9.5	20.5
Idaho	215.7	152.3	25.3	20.9	14.0	59.3	33.5	9.0	7.2	10.3	8.9	31.8
Illinois	260.1	174.3	28.4	28.0	19.1	79.0	41.5	10.7	6.6	12.9	10.0	32.3
Indiana	271.6	176.9	27.0	27.6	19.1	92.4	46.7	11.6	7.3	12.4	9.3	31.8
Iowa	239.3	157.5	25.4	25.9	17.9	73.6	35.9	10.5	7.5	11.9	9.0	30.5
Kansas	236.8	158.4	25.5	23.8	16.6	75.3	38.8	10.7	7.2	12.1	8.3	28.8
Kentucky	297.7	181.3	27.1	28.7	19.5	114.0	53.7	10.7	7.0	11.9	8.7	30.7
Louisiana	300.1	181.4	29.7	30.6	18.9	99.5	44.9	10.4	7.2	14.8	10.4	36.4
Maine	264.1	178.3	24.5	26.9	19.2	80.2	47.3	10.6	6.9	13.0	9.4	29.6
Maryland	259.3	175.0	28.5	26.9	19.3	78.9	45.0	10.2	6.0	13.2	9.5	33.1
Massachusetts	255.3	172.8	27.1	27.6	18.5	72.3	43.7	10.1	7.0	12.7	10.1	30.7
Michigan	251.6	170.3	27.1	24.7	17.0	76.7	43.3	11.1	7.3	12.3	9.5	31.0
Minnesota	231.5	157.5	25.2	22.0	16.4	61.9	36.7	11.6	7.3	12.1	9.1	32.1
Mississippi	303.8	169.5	27.8	27.1	18.4	109.2	42.2	9.4	5.7	13.7	9.9	43.3
Missouri	260.8	172.6	26.8	26.2	18.3	88.8	45.7	10.9	7.3	12.4	9.1	28.1
Montana	239.6	163.3	24.5	23.9	14.7	70.2	42.7	9.7	6.2	11.5	8.2	31.3
Nebraska	229.6	156.4	24.1	25.4	18.8	70.1	35.5	10.2	7.0	11.6	8.5	27.3
Nevada	247.7	179.4	26.3	27.5	18.7	75.3	53.9	9.2	5.7	11.5	9.7	29.4
New Hampshire	252.7	170.2	26.2	27.0	17.8	70.9	45.3	11.2	6.5	12.5	9.6	29.4
New Jersey	249.9	176.9	29.5	27.4	19.4	71.0	40.8	10.9	7.0	12.7	10.1	29.9
New Mexico	209.5	144.1	23.0	21.2	14.6	51.5	29.0	7.9	5.5	10.9	8.8	29.4
New York	233.2	164.9	27.9	26.2	18.4	65.7	38.2	9.7	6.3	12.7	10.0	29.2
North Carolina	269.1	163.4	26.0	24.0	17.1	91.8	40.1	9.9	6.3	12.9	9.2	35.6
North Dakota	229.3	152.2	25.9	22.6	17.4	63.3	30.5	10.9	6.9	10.9	9.5	31.1
Ohio	266.3	176.3	28.7	27.6	19.2	85.8	44.5	11.4	7.4	11.6	9.0	31.0
Oklahoma	263.3	167.9	26.3	25.7	17.3	91.9	45.7	10.4	7.1	12.0	8.3	28.2
Oregon	237.9	171.7	26.0	22.7	15.5	70.1	47.4	10.8	7.4	11.8	9.6	31.0
Pennsylvania	257.0	172.5	28.1	28.0	19.4	76.7	40.4	10.9	7.1	12.6	9.1	30.7
Rhode Island	258.9	173.2	26.4	26.1	19.3	80.4	43.8	11.1	7.3	13.2	10.4	30.0
South Carolina	279.2	164.0	27.3	26.2	17.2	91.6	39.0	9.0	6.2	13.7	10.0	38.4
South Dakota	235.7	157.6	23.8	26.3	19.1	67.9	33.3	11.9	7.2	11.8	9.6	30.8
Tennessee	284.5	171.1	26.5	25.9	17.6	104.0	43.9	10.7	7.1	13.0	9.4	33.0
Texas	247.7	160.0	25.3	23.7	16.2	78.5	39.4	9.4	6.5	12.0	8.7	29.7
Utah	186.6	125.7	23.5	18.9	14.2	35.7	17.4	10.6	6.0	10.8	6.8	31.2
Vermont	243.6	166.3	26.2	25.9	18.9	73.1	39.3	11.3	8.0	13.0	8.6	28.6
Virginia	261.0	169.6	27.7	25.0	18.2	82.1	41.9	9.9	6.3	12.4	9.2	34.7
Washington	234.8	166.8	24.3	21.7	15.4	70.3	46.3	11.2	6.9	12.4	9.7	28.2
West Virginia	278.0	184.3	26.2	28.2	19.7	100.7	52.0	9.8	7.2	11.4	7.8	29.3
Wisconsin	242.0	161.4	25.9	24.9	16.6	66.9	37.3	11.0	6.8	12.3	9.5	31.8
Wyoming	225.6	162.1	23.2	21.6	19.4	63.6	39.8	6.4	6.3	12.1	7.6	33.8
United States	247.5	165.5	26.4	24.8	17.4	76.3	40.9	10.2	6.6	12.2	9.2	30.3

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

Source: US Mortality Public Use Tapes 1960-2002, National Center for Health Statistics, Centers for Disease Control and Prevention, 2005.

American Cancer Society, Surveillance Research, 2006

Selected Cancers

Breast

New cases: An estimated 212,920 new cases of invasive breast cancer are expected to occur among women in the US during 2006. Breast cancer is the most frequently diagnosed cancer in women. Breast cancer incidence rates increased rapidly in the 1980s, mainly due to increased use of mammography, which can detect breast cancers before they can be felt. The gradual increase since that time is confined to women aged 50 and older. About 1,720 new cases of breast cancer are expected in men in 2006.

In addition to invasive breast cancer, 61,980 new cases of in situ breast cancer are expected to occur among women in 2006. Of these, approximately 85% will be ductal carcinoma in situ (DCIS). The increase in detection of DCIS cases is a direct result of increased use of screening with mammography.

Deaths: An estimated 41,430 breast cancer deaths (40,970 women, 460 men) are expected in 2006. Breast cancer ranks second among cancer deaths in women (after lung cancer). Death rates from breast cancer declined by an average of 2.3% per year from 1990 to 2002 in all women combined, with larger decreases in younger (<50 years) women. These decreases are due to earlier detection through screening, increased awareness, and improved treatment.

Signs and symptoms: The earliest sign of breast cancer is usually 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 breast lump, thickening, swelling, distortion, tenderness, skin irritation, dimpling, nipple pain, scaliness, ulceration, retraction, or spontaneous discharge. Usually breast pain results from benign conditions and is not the first symptom of breast cancer.

Risk factors: Aside from being female, age is the most important factor affecting breast cancer risk. Risk is also increased by inherited genetic mutations (BRCA1 and BRCA2), a personal or family history of breast cancer, high breast tissue density (a mammographic measure of the amount of glandular tissue relative to fatty tissue in the breast), biopsy-confirmed hyperplasia (especially atypical hyperplasia), and high-dose radiation to the chest as a result of medical procedures. Reproductive factors that increase risk include a long menstrual history (menstrual periods that start early and/or end

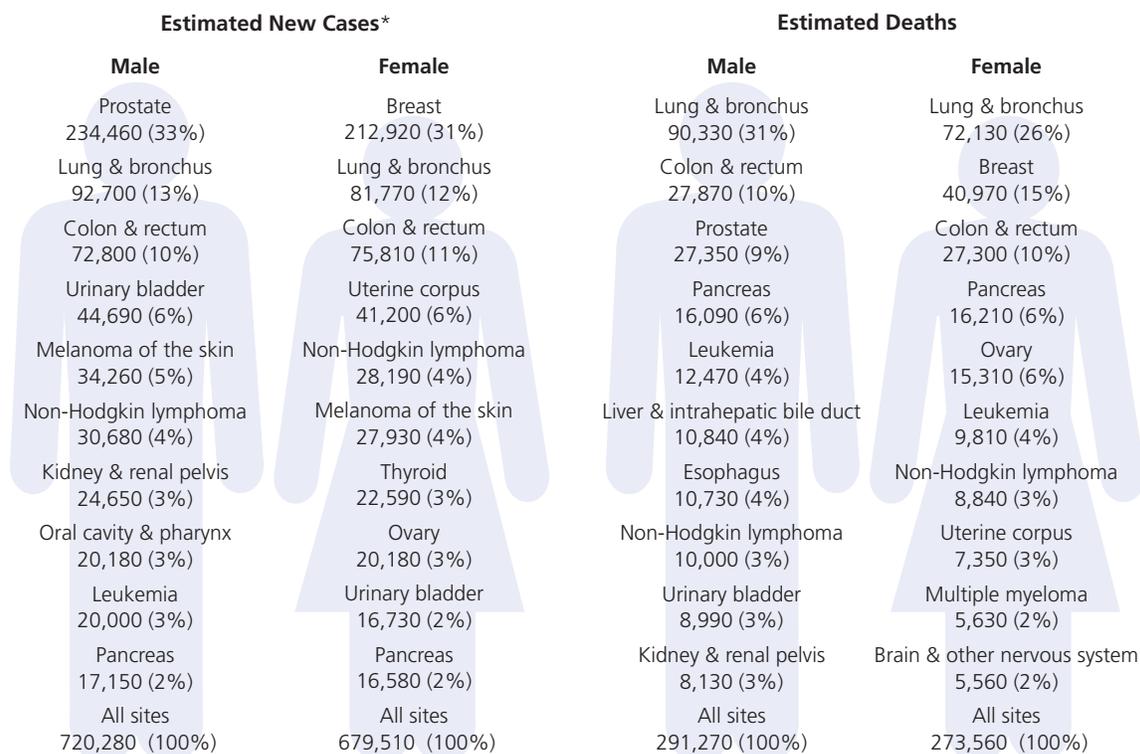
late in life), never having children, recent use of oral contraceptives, and having one's first child after age 30. Some potentially modifiable factors that increase risk include being overweight or obese after menopause, use of postmenopausal hormone therapy (especially combined estrogen and progestin therapy), physical inactivity, and consumption of one or more alcoholic beverages per day. Being overweight adversely affects survival for postmenopausal women.

Breastfeeding, moderate or vigorous physical activity, and maintaining a healthy body weight are all associated with lower risk of breast cancer. Current data indicate that tamoxifen decreases breast cancer risk in women at increased risk and that raloxifene decreases breast cancer risk in postmenopausal women taking the drug for osteoporosis. The National Cancer Institute is currently conducting one of the largest breast cancer prevention studies ever undertaken to compare the effects of tamoxifen and raloxifene in postmenopausal women who are at increased risk of breast cancer.

Cancer-causing mutations in the inherited susceptibility genes BRCA1 and BRCA2 account for approximately 5% to 10% of all breast cancer cases. Widespread testing for these mutations is not recommended because they are present in far less than 1% of the general population. However, women with a strong family history of breast and/or ovarian cancer should be offered counseling to determine if testing is an appropriate option. Recent studies suggest that prophylactic removal of the breasts and/or ovaries in BRCA1 and BRCA2 mutation carriers decreases the risk of breast cancer considerably, although not all women who choose this surgery would have developed these cancers. Women who consider these options should undergo counseling before reaching a decision.

Early detection: Mammography is especially valuable as an early detection tool because it can identify breast cancer at a stage when treatment may be more effective. Numerous studies have shown that early detection saves lives and increases treatment options. The recent declines in breast cancer mortality have been attributed to a combination of early detection and improvements in treatment. However, mammography also has limitations: it misses some cancers, and it sometimes leads to unnecessary additional testing in women who do not have breast cancer. All suspicious lumps should be biopsied for a definitive diagnosis. Several recent studies have shown that magnetic resonance imaging appears to be more sensitive than mammography in detecting

Leading Sites of New Cancer Cases and Deaths – 2006 Estimates



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

Note: Percentages may not total 100% due to rounding.

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tumors in women with an inherited susceptibility to breast cancer.

See page 52 for the American Cancer Society's screening guidelines for the early detection of breast cancer.

Treatment: Taking into account tumor size, stage, and other characteristics, in addition to patient preference, treatment may involve lumpectomy (local removal of the tumor) or mastectomy (surgical removal of the breast) with removal of some of the axillary (underarm) lymph nodes (to obtain accurate information on stage of disease); radiation therapy; chemotherapy; or hormone therapy (tamoxifen, aromatase inhibitors). Two or more methods are often used in combination.

Numerous studies have shown that, unless cancer has spread to the skin, chest wall, or distant organs, long-term survival rates after lumpectomy plus radiation therapy are similar to survival rates after modified radical mastectomy. Newer options such as sentinel lymph node biopsy, where selected lymph nodes are excised, may reduce the need for full axillary lymph node dissections, particularly in women who have small primary breast tumors and no clinical evidence of

lymph node involvement before surgery. Sentinel lymph node biopsy is preferable to axillary lymph node dissection because there is a lower risk for side effects, such as lymphedema, a swelling of the arm that can be painful and disabling. If a woman is eligible for sentinel lymph node biopsy and wishes to have this procedure done, she should have her breast cancer surgery done at a facility with a medical care team that is experienced with the technique. Significant advances in reconstruction techniques provide several options for breast reconstruction following mastectomy.

Monoclonal antibody immunotherapy with trastuzumab (Herceptin®) is sometimes used in women whose cancers test positive for HER2/neu (the protein that Herceptin is directed against) or when breast cancer returns or progresses during chemotherapy. There are currently clinical trials using Herceptin in combination with standard chemotherapy in newly diagnosed women whose tumor cells express high levels of HER2/neu. Patients should discuss possible options for the best management of their breast cancer with their physicians.

The exact percentage of mammographically detected ductal carcinoma in situ (DCIS) that would progress to invasive breast cancer without treatment is not known. However, statistical analyses of data from mammography screening trials suggest that the majority of such cancers will progress. Since there are no tests at this time that can reliably predict which DCIS will progress, it is recommended that all patients with DCIS be treated. Treatment options include lumpectomy (complete removal of tumor with clear margins) and radiation therapy, with or without tamoxifen, and mastectomy with or without tamoxifen.

Survival: The 5-year relative survival for localized breast cancer (cancer that has not spread to lymph nodes or other locations outside the breast) has increased from 80% in the 1950s to 98% today. If the cancer has spread regionally, the 5-year survival is 81%, and for women with distant metastases, the survival is 26%. Survival after a diagnosis of breast cancer continues to decline beyond 5 years. The survival rate at 10 years for all stages combined is 80% compared to 88% at 5 years. Caution should be used when interpreting 10-year survival rates since they represent detection and treatment circumstances 5 to 15 years ago, and may underestimate the expected survival based on current conditions.

For more information about breast cancer, please see the American Cancer Society's *Breast Cancer Facts & Figures 2005-2006* (8610.05) available online at www.cancer.org.

Childhood Cancer

New cases: An estimated 9,500 new cases are expected to occur among children aged 0-14 in 2006. Childhood cancers are rare.

Deaths: An estimated 1,560 deaths are expected to occur among children aged 0-14 in 2006, 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 from childhood cancer have declined by about 48% since 1975.

Early detection: Early symptoms are usually non-specific. Parents should make sure their children have regular medical checkups and should be alert to any unusual symptoms that persist. These include an unusual mass or swelling; unexplained paleness and 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.

Childhood cancers include:

- Leukemia (30%), which may be recognized by pain in the bone and joints, weakness, bleeding, and fever
- Brain and other nervous system (22.3%), which in early stages may cause headaches, nausea, vomiting, blurred or double vision, dizziness, and difficulty in walking or handling objects
- Neuroblastoma (7.3%), a cancer of the sympathetic nervous system that can appear anywhere but usually occurs as a swelling in the abdomen
- Wilms tumor (5.6%), a kidney cancer that may be recognized by a swelling or lump in the abdomen
- Hodgkin lymphoma (3.5%) and non-Hodgkin lymphoma (4.5%), 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 (3.1%), 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 (2.8%), an eye cancer, which usually occurs in children under the age of 4
- Osteosarcoma (2.4%), a bone cancer that often has no initial pain or symptoms until local swelling begins
- Ewing sarcoma (1.4%), another type of cancer that usually arises in bone

Treatment: Childhood cancers can be treated by a combination of therapies (surgery, radiation, chemotherapy) chosen based on the type and stage of the 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.

Survival: For all childhood cancers combined, 5-year relative survival has improved markedly over the past 30 years, from less than 50% before the 1970s to nearly 80% in the late 1990s, due to new and improved treatments. Rates vary considerably, however, depending on the specific type. For the most recent time period (1995-2001), 5-year survival for all sites combined is 79%; neuroblastoma, 66%; brain and other nervous system, 73%; bone and joint, 71%; leukemia, 80%; Wilms tumor, 92%; and Hodgkin lymphoma, 95%. Survivors of childhood cancer may experience treatment-related side

effects. Late treatment effects include organ malfunction, secondary cancers, and cognitive impairments. The Children's Oncology Group (COG) has recently developed long-term follow-up guidelines for screening and management of late effects in survivors of childhood cancer. For more on childhood cancer management, see the COG Web site at: <http://www.survivorshipguidelines.org>.

Colon and Rectum

New cases: An estimated 106,680 cases of colon and 41,930 cases of rectal cancer are expected to occur in 2006. Colorectal cancer is the third most common cancer in both men and women. Incidence rates decreased by 1.8% per year during 1998-2002. The recent decrease partly reflects increased screening and polyp removal, which prevents progression of polyps to cancer. Colorectal cancer incidence rates have been decreasing since 1985, from 66 to 52 per 100,000 in 2002.

Deaths: An estimated 55,170 deaths from colon and rectum cancer are expected to occur in 2006, accounting for about 10% of all cancer deaths. Mortality rates from colorectal cancer have declined in both men and women over the past two decades, at an average of 1.8% per year. This decrease reflects declining incidence rates and improvements in survival.

Signs and symptoms: Screening is 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.

Risk factors: The risk of colorectal cancer increases with age; more than 90% of cases are diagnosed in individuals older than 50. Risk is also increased by certain inherited genetic mutations (FAP and HNPCC), a personal or family history of colorectal cancer and/or polyps, or a personal history of inflammatory bowel disease. Several modifiable factors are associated with increased risk of colorectal cancer. Among these are obesity, physical inactivity, smoking, heavy alcohol consumption, a diet high in red or processed meat, and inadequate intake of fruits and vegetables. Studies indicate that men and women who are overweight are more likely to develop and die from colorectal cancer. Studies suggest that regular use of nonsteroidal anti-inflammatory drugs (such as aspirin), estrogen and progestin hormone therapy, and HMG Co-A reductase inhibitors (statin drugs taken to reduce cholesterol) may possibly reduce colorectal cancer risk. Currently, however, these drugs are not recommended for the prevention of cancer.

Early detection: Beginning at age 50, men and women who are at average risk for developing colorectal cancer should begin screening. The goal of screening is to detect and remove adenomatous polyps, precursor lesions for colorectal cancer, and detection of early-stage carcinomas. Screening reduces mortality both by decreasing incidence and by detecting a higher proportion of cancers at early, more treatable stages. See page 52 for the American Cancer Society's screening guidelines for colorectal cancer.

Treatment: Surgery is the most common treatment for colorectal cancer. For cancers that have not spread, surgical removal is often curative. A permanent colostomy (creation of an abdominal opening for elimination of body wastes) is very rarely needed for colon cancer and is infrequently required for rectal cancer. Chemotherapy alone, or in combination with radiation (for rectal cancer), is given before or after surgery to most patients whose cancer has penetrated the bowel wall deeply or spread to lymph nodes. Oxaliplatin in combination with 5-fluorouracil (5-FU) followed by leucovorin (LV) is a new chemotherapeutic regimen for persons with metastatic carcinoma of the colon or rectum. Combination, or adjuvant, chemotherapy for colon cancer is equally effective and no more toxic in otherwise healthy patients aged 70 and older than in younger patients. Two new targeted therapies approved by the FDA to treat metastatic colorectal cancer are Avastin® (bevacizumab), which blocks the growth of blood vessels to the tumor, and Erbitux® (cetuximab), which blocks the effects of hormone-like factors that promote cancer cell growth.

Survival: The 1- and 5-year relative survival for persons with colorectal cancer, for all stages combined, is 83% and 64%, 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, mostly due to low rates of screening. After the cancer has spread regionally to involve adjacent organs or lymph nodes, the 5-year survival drops to 68%. For persons with distant metastases, 5-year survival is 10%.

Leukemia

New cases: An estimated 35,070 new cases are expected in 2006, with slightly more cases of acute (15,860) than chronic (14,520) disease. Leukemia is diagnosed 10 times more often in adults than in children, although it is often thought of as primarily a childhood disease. Acute lymphocytic leukemia accounts for approximately 74%

How to Estimate Cancer Statistics Locally, 2006

To obtain the estimated number of...	All Sites	Multiply community population by:			
		Female Breast*	Colon & Rectum	Lung	Prostate*
New cancer cases	0.0047	0.0014	0.0005	0.0006	0.0016
Cancer deaths	0.0019	0.0003	0.0002	0.0005	0.0002
People who will eventually develop cancer	0.4156	0.1322	0.0566	0.0658	0.1793
People who will eventually die of cancer	0.2110	0.0291	0.0224	0.0537	0.0310

*For female breast cancer multiply by female population, and for prostate cancer multiply by male population.

Note: The American Cancer Society recommends using data from state cancer registries, when it is available, to more accurately estimate local cancer statistics. These registries count the number of cancers that occur in localities throughout each state. The method for calculating local statistics presented here provides only a rough approximation of the number of people in a specific community who may develop or die of cancer. These estimates should be used with caution because they do not reflect the age or racial characteristics of the population, access to detection and treatment, or exposure to risk factors.

Data source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.0, Statistical Research and Applications Branch, National Cancer Institute, 2005. <http://srab.cancer.gov/devcan>

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(2,600/3,520) of the leukemia cases among children (ages 0-19). In adults, the most common types are acute myeloid leukemia (approximately 11,770 cases) and chronic lymphocytic leukemia (approximately 9,560 cases). Although the incidence of acute myeloid leukemia has increased by an average of 1.8% per year since 1988, the incidence of chronic lymphocytic leukemia has decreased by 1.9% per year since 1992.

Deaths: An estimated 22,280 deaths are expected to occur in 2006. Death rates in males and females combined have decreased by about 0.6% per year since 1991.

Signs and symptoms: Symptoms may include fatigue, paleness, weight loss, repeated infections, fever, bruising easily, and nosebleeds or other hemorrhages. In children, these signs can appear suddenly. Chronic leukemia can progress slowly with few symptoms.

Risk factors: Leukemia more commonly occurs in males than in females. Persons with Down syndrome and certain other genetic abnormalities have higher incidence rates of leukemia. Cigarette smoking and exposure to certain chemicals such as benzene, a chemical in gasoline and cigarette smoke, are risk factors for myeloid leukemia. Exposure to ionizing radiation is a risk factor for several types of leukemia. Leukemia also may occur as a side effect of cancer treatment. Certain leukemias and lymphomas are caused by a retrovirus, human T-cell leukemia/lymphoma virus-I (HTLV-I).

Early detection: Because symptoms often resemble those of other, less serious conditions, leukemia can be difficult to diagnose early. 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 combinations or as single agents. Imatinib mesylate (Gleevec®) is a highly specific drug used for the treatment of chronic myeloid (or myelogenous) leukemia, which is diagnosed in about 4,500 people each year. Antibiotics and transfusions of blood components are used as supportive treatments. Under appropriate conditions, bone marrow transplantation may be useful in treating certain leukemias.

Survival: Relative survival in leukemia varies by type, ranging from 5-year survival rates of 20% for people with acute myeloid leukemia to 74% for people with chronic lymphocytic leukemia. Due to advances in treatment, there has been a dramatic improvement in survival for people with acute lymphocytic leukemia, from a 5-year relative survival rate of 38% in 1974-1976 to 65% in 1995-2001. Survival rates for children with acute lymphocytic leukemia have increased from 53% to 86% over the same period.

Lung and Bronchus

New cases: An estimated 174,470 new cases are expected in 2006, accounting for about 12% of cancer diagnoses. The incidence rate is declining significantly in men, from a high of 102.0 per 100,000 in 1984 to 77.8 in 2002. In women, the rate has been stable since 1998 after a long period of increase. Lung cancer is classified clinically as small cell (13%) or non-small cell (87%) for the purposes of treatment.

Deaths: Lung cancer is the most common cancer-related death in both men and women. An estimated 162,460 deaths, accounting for about 29% of all cancer deaths, are expected to occur in 2006. Since 1987, more women have died each year of lung cancer than from

Probability of Developing Invasive Cancers Over Selected Age Intervals by Sex, US, 2000 to 2002*

		Birth to 39 (%)	40 to 59 (%)	60 to 69 (%)	70 & Older (%)	Birth to Death (%)
All sites†	Male	1.43 (1 in 70)	8.57 (1 in 12)	16.46 (1 in 6)	39.61 (1 in 3)	45.67 (1 in 2)
	Female	1.99 (1 in 50)	9.06 (1 in 11)	10.54 (1 in 9)	26.72 (1 in 4)	38.09 (1 in 3)
Urinary bladder‡	Male	.02 (1 in 4375)	.40 (1 in 250)	.93 (1 in 108)	3.35 (1 in 30)	3.58 (1 in 28)
	Female	.01 (1 in 9513)	.12 (1 in 816)	.25 (1 in 402)	.96 (1 in 104)	1.14 (1 in 88)
Breast	Female	.48 (1 in 209)	4.11 (1 in 24)	3.82 (1 in 26)	7.13 (1 in 14)	13.22 (1 in 8)
Colon & rectum	Male	.07 (1 in 1399)	.90 (1 in 111)	1.66 (1 in 60)	4.94 (1 in 20)	5.84 (1 in 17)
	Female	.06 (1 in 1567)	.70 (1 in 143)	1.16 (1 in 86)	4.61 (1 in 22)	5.51 (1 in 18)
Leukemia	Male	.15 (1 in 650)	.22 (1 in 459)	.35 (1 in 284)	1.17 (1 in 85)	1.50 (1 in 67)
	Female	.13 (1 in 788)	.14 (1 in 721)	.19 (1 in 513)	.78 (1 in 129)	1.07 (1 in 93)
Lung & bronchus	Male	.03 (1 in 3244)	1.00 (1 in 100)	2.45 (1 in 41)	6.33 (1 in 16)	7.58 (1 in 13)
	Female	.03 (1 in 3103)	.80 (1 in 125)	1.68 (1 in 60)	4.17 (1 in 24)	5.72 (1 in 17)
Melanoma of skin	Male	.13 (1 in 800)	.51 (1 in 195)	.51 (1 in 195)	1.25 (1 in 80)	1.94 (1 in 52)
	Female	.21 (1 in 470)	.40 (1 in 248)	.26 (1 in 381)	.56 (1 in 178)	1.30 (1 in 77)
Non-Hodgkin lymphoma	Male	.14 (1 in 722)	.47 (1 in 215)	.56 (1 in 178)	1.57 (1 in 64)	2.18 (1 in 46)
	Female	.09 (1 in 1158)	.31 (1 in 320)	.42 (1 in 237)	1.29 (1 in 77)	1.82 (1 in 55)
Prostate	Male	.01 (1 in 10149)	2.66 (1 in 38)	7.19 (1 in 14)	14.51 (1 in 7)	17.93 (1 in 6)
Uterine cervix	Female	.15 (1 in 657)	.28 (1 in 353)	.15 (1 in 671)	.22 (1 in 464)	.74 (1 in 135)
Uterine corpus	Female	.06 (1 in 1641)	.72 (1 in 139)	.83 (1 in 120)	1.36 (1 in 74)	2.61 (1 in 38)

*For those free of cancer at beginning of age interval. Based on cancer cases diagnosed during 2000 to 2002.

†All sites exclude basal and squamous cell skin cancers and in situ cancers except urinary bladder.

‡Includes invasive and in situ cancer cases.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.0. Statistical Research and Applications Branch, National Cancer Institute, 2005. <http://srab.cancer.gov/devcan>

American Cancer Society, Surveillance Research, 2006

breast cancer. Death rates have continued to decline significantly in men from 1991 to 2002 by about 1.9% per year. Female lung cancer death rates are approaching a plateau after continuously increasing for several decades. These trends in lung cancer mortality reflect decreased smoking rates over the past 30 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. Other risk factors include secondhand smoke; occupational or environmental exposures to radon and asbestos (particularly among smokers), certain metals (chromium, cadmium, arsenic), some organic chemicals, and radiation; air pollution; and 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: Efforts at early detection have not yet been demonstrated to reduce mortality. Chest x-ray, analysis of cells in sputum, and fiberoptic examination of the bronchial passages have shown limited effectiveness

in improving survival. 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 when survival is better. However, there are considerable risks associated with lung biopsy and surgery that must be considered when evaluating the risks and benefits of screening. The National Lung Screening Trial (NLST) is a clinical trial to assess whether screening individuals at high risk for lung cancer with spiral CT or standard chest x-ray can reduce lung cancer deaths. The study, launched in 2002, represents a collaboration of the National Cancer Institute (NCI), the American College of Radiology Imaging Network, and the American Cancer Society.

Treatment: Treatment options are determined by the type (small cell, non-small cell) and stage of the cancer and include surgery, radiation therapy, chemotherapy, and targeted biological therapies, such as gefitinib (Iressa®) and erlotinib (Tarceva®). For localized cancers, surgery is usually the treatment of choice. Recent studies indicate that survival with early-stage non-small cell lung cancer is improved by chemotherapy following

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. Chemotherapy alone or combined with radiation is the treatment of choice for small cell lung cancer; on this regimen, a large percentage of patients experience remission, which is long lasting in some cases. According to a recent FDA public health advisory, gefitinib (Iressa), a drug that blocks activity of growth factor receptors and is used in the treatment of advanced non-small cell lung cancer, is now limited to patients who, in the opinion of their physicians, have benefited from its use. New patients should not be given gefitinib because it did not improve survival in two recent clinical trials. Several similar targeted therapies are currently being studied.

Survival: The 1-year relative survival for lung cancer has increased from 37% in 1975 to 42% in 1999-2001, largely due to improvements in surgical techniques and combined therapies. However, the 5-year survival rate for all stages combined is only 15%. The survival rate is 50% for cases detected when the disease is still localized; however, only 16% of lung cancers are diagnosed at this early stage.

Lymphoma

New cases: An estimated 66,670 new cases of lymphoma will occur in 2006, including 7,800 cases of Hodgkin lymphoma and 58,870 cases of non-Hodgkin lymphoma (NHL). Since the early 1970s, incidence rates for NHL have nearly doubled, in part because of AIDS-related NHL. More recently, increasing incidence is confined to women. Overall, incidence rates for Hodgkin lymphoma have stabilized over the past 20 years.

Deaths: An estimated 20,330 deaths will occur in 2006 (Hodgkin lymphoma, 1,490; non-Hodgkin lymphoma, 18,840).

Signs and symptoms: Symptoms may include enlarged lymph nodes, itching, night sweats, fatigue, weight loss, and intermittent fever.

Risk factors: A variety of risk factors have been identified, most of them associated with severely reduced immune function, but the causes of the majority of lymphomas are unknown. Non-Hodgkin lymphoma risk is elevated in persons with organ transplants who receive immune suppressants to prevent transplant rejection, in people with auto-immune conditions, and in people infected with human immunodeficiency virus (HIV), human T-cell leukemia/lymphoma virus-I

(HTLV-I), and probably hepatitis C virus (HCV). Epstein-Barr virus (EBV) causes Burkitt and some non-Hodgkin lymphomas and may be related to other lymphomas. H. pylori infection increases the risk of gastric lymphoma. Occupational exposures to herbicides, chlorinated organic compounds, and certain other chemicals appear to increase risk. A family history of lymphoma is linked to higher risk.

Treatment: Hodgkin lymphoma: Chemotherapy alone or with radiotherapy is useful for most patients. Non-Hodgkin lymphoma: Patients may be treated with radiation, chemotherapy, or with chemotherapy plus radiation, depending on the specific type and stage of the disease. Highly specific monoclonal antibodies (such as rituximab, Rituxan®) directed at lymphoma cells are used for initial treatment and recurrence of some types of non-Hodgkin lymphoma. High-dose chemotherapy with stem cell transplantation or low-dose chemotherapy with stem cell transplantation (called non-myeloablative) are options if non-Hodgkin lymphoma persists or recurs after standard treatment.

Survival: Survival varies widely by cell type and stage of disease. The 1-year relative survival for Hodgkin and non-Hodgkin lymphoma is 93% and 78%, respectively; the 5-year survival is 85% and 60%. Ten years after diagnosis, survival for Hodgkin and non-Hodgkin lymphoma declines to 80% and 49%, respectively.

Oral Cavity and Pharynx

New cases: An estimated 30,990 new cases are expected in 2006. Incidence rates are more than twice as high in men as in women, and are greatest in men who are older than 50. Incidence rates for cancer of the oral cavity and pharynx have continued to decline in both males and females.

Deaths: An estimated 7,430 deaths from oral cavity and pharynx cancer are expected in 2006. Death rates have been decreasing since 1975 in men and women combined, with rates declining more rapidly in the last decade.

Signs and symptoms: Symptoms may include a sore that bleeds easily and does not heal; a lump or thickening; and a red or white patch that persists. Difficulties in chewing, swallowing, or moving the tongue or jaws are often late symptoms.

Risk factors: Cigarette, cigar, or pipe smoking; use of smokeless tobacco; and excessive consumption of alcohol are risk factors.

Early detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Dentists and primary care physicians can identify abnormal changes in oral tissues and diagnose cancer at an early, curable stage.

Treatment: Radiation therapy and surgery are standard treatments. In advanced disease, chemotherapy may be a useful addition to surgery and/or radiation.

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 59% and 48%, respectively.

Ovary

New cases: An estimated 20,180 new cases are expected in the US in 2006. Ovarian cancer accounts for about 3% of all cancers among women and ranks second among gynecologic cancers, following cancer of the uterine corpus. During 1985-2002, ovarian cancer incidence declined at a rate of 0.7% per year.

Deaths: An estimated 15,310 deaths are expected in 2006. Ovarian cancer causes more deaths than any other cancer of the female reproductive system.

Signs and symptoms: The most common sign is enlargement of the abdomen, which is caused by accumulation of fluid. Abnormal vaginal bleeding occurs rarely. In women older than 40, persistent digestive disturbances (stomach discomfort, gas, distention) may indicate the need for an evaluation for ovarian cancer. Recent research has suggested that urinary symptoms may be another sign of ovarian cancer.

Risk factors: Risk for ovarian cancer increases with age and peaks in the late 70s. Pregnancy and the use of oral contraceptives reduce the risk of developing ovarian cancer. The use of estrogen alone as postmenopausal hormone therapy has been shown to increase risk in several large studies. Higher body weight may be associated with increased risk for ovarian cancer. Women who have had breast cancer or who have a family history of breast or ovarian cancer are at increased risk. Inherited mutations in BRCA1 or BRCA2 genes increase risk. Studies suggest that preventive surgery to remove the ovaries and fallopian tubes can decrease the risk of ovarian cancers in women with BRCA1 and BRCA2 mutations. Another genetic syndrome, hereditary nonpolyposis colon cancer, also has been associated with endometrial and ovarian cancer. Ovarian cancer incidence rates are highest in Western industrialized countries.

Early detection: Routine screening for women at average risk is not recommended because no sufficiently accurate screening tests are currently available. The pelvic examination can only occasionally detect ovarian cancer, generally when the disease is already in advanced stages. However, the combination of a thorough pelvic exam, transvaginal ultrasound, and a blood test for the tumor marker CA125 should be offered to women who are at high risk of ovarian cancer. These tests are also recommended for women who have symptoms. In women at average risk, transvaginal ultrasound and the tumor marker CA125 may help in diagnosis but are not used for routine screening. Promising research on specific patterns of proteins in the blood (proteomics) may lead to more sensitive screening tests in the future for women at high risk.

Treatment: Treatment options include surgery, chemotherapy, and occasionally radiation therapy. Surgery usually involves removal of the uterus (hysterectomy) and one or both ovaries and fallopian tubes (salpingo-oophorectomy). In some very early tumors, only the involved ovary will be removed, especially in younger women who wish to have children. In advanced disease, an aggressive attempt is made to remove all abdominal metastases to enhance the effect of chemotherapy. Studies suggest that women diagnosed with advanced-stage disease have a more successful treatment outcome under the care of a gynecological oncologist, a specialist in female reproductive cancers.

Survival: Relative survival varies by age; women younger than 65 are about twice as likely to survive 5 years following diagnosis than women 65 and older, 57% and 28%, respectively. Overall, the 1- and 5-year relative survival of new ovarian cancer patients is 76% and 45%, respectively. If diagnosed at the localized stage, the 5-year survival rate is 94%; however, only about 19% of all cases are detected at this stage. For women with regional and distant disease, 5-year survival rates are 68% and 29%, respectively. Apparent declines in survival rates from previous years are due to changes in classification of malignant ovarian tumors in the most recent revision of the International Classification of Diseases for Oncology.

Pancreas

New cases: An estimated 33,730 new cases are expected to occur in the US in 2006. Over the past 15 to 25 years, incidence rates of pancreatic cancer have changed very little in either men or women.

Five-Year Relative Survival Rates* by Stage at Diagnosis, 1995-2001

Site	All Stages %	Local %	Regional %	Distant %	Site	All Stages %	Local %	Regional %	Distant %
Breast (female)	88.2	97.9	81.3	26.1	Ovary [†]	44.6	93.6	68.1	29.1
Colon & rectum	64.1	90.4	67.9	9.7	Pancreas	4.6	16.4	7.0	1.8
Esophagus	14.9	31.4	13.8	2.7	Prostate [‡]	99.8	100.0	–	33.5
Kidney	64.6	90.6	60.	9.7	Stomach	23.2	58.0	21.9	3.1
Larynx	65.6	83.8	49.9	18.5	Testis	96.0	99.4	96.3	71.7
Liver [§]	9.0	19.0	6.8	3.4	Thyroid	96.6	99.5	96.4	60.0
Lung & bronchus	15.3	49.5	16.2	2.1	Urinary bladder	81.8	94.2	48.4	6.2
Melanoma of the skin	91.6	98.3	63.8	16.0	Uterine cervix	73.3	92.4	54.7	16.5
Oral cavity & pharynx	59.4	82.1	51.3	27.6	Uterine corpus	84.4	96.1	66.3	25.2

*Rates are adjusted for normal life expectancy and are based on cases diagnosed from 1995-2001, followed through 2002. [†]Recent changes in classification of ovarian cancer, specifically excluding borderline tumors, has affected 1995-2001 survival rates. [‡]The rate for local stage represents local and regional stages combined. [§]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: Surveillance, Epidemiology, and End Results Program, 1975-2002, Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, MD, 2005.

American Cancer Society, Surveillance Research, 2006

Deaths: An estimated 32,300 deaths are expected to occur in 2006. The death rate from pancreatic cancer has continued to decline since the 1970s in men, while it has leveled off in women after increasing from 1975 to 1984.

Signs and symptoms: Cancer of the pancreas often develops without early symptoms which, when present, can include weight loss, discomfort in the abdomen, and occasionally glucose intolerance. Tumors that develop near the common bile duct may cause blockage leading to jaundice (yellowing of the skin and eyes due to pigment accumulation). Sometimes this symptom allows the tumor to be diagnosed at an early stage.

Risk factors: Cigarette and cigar smoking increase the risk of pancreatic cancer; incidence rates are more than twice as high for smokers than nonsmokers. Risk also appears to increase with obesity, physical inactivity, chronic pancreatitis, diabetes, and cirrhosis. Pancreatic cancer rates are higher in countries whose populations eat a diet high in fat. Rates are slightly higher in males than in females.

Early detection: At present, only biopsy yields a definitive diagnosis. Because of the “silent” early course of the disease, the need for biopsy may become obvious only with advanced disease. Researchers are focusing on ways to diagnose pancreatic cancer before symptoms occur.

Treatment: Surgery, radiation therapy, and chemotherapy are treatment options that may extend survival and/or relieve symptoms in many patients, but they

seldom produce a cure. Clinical trials with several new agents may offer improved survival and should be considered an option.

Survival: For all stages combined, the 1-year relative survival rate is 24%, and the 5-year rate is about 5%. Even for those people diagnosed with local disease, the 5-year survival rate is only 16%.

Prostate

New cases: An estimated 234,460 new cases will occur in the US during 2006. Prostate cancer is the most frequently diagnosed cancer in men. Incidence rates are significantly higher in African American men than in white men. Incidence rates of prostate cancer have changed substantially over the last 20 years: rapidly increasing from 1988 to 1992, declining sharply from 1992 to 1995, and increasing modestly since 1995. These trends in large part reflect changes in the utilization of prostate-specific antigen (PSA) blood testing. Moderate increases in the last decade are most likely attributable to widespread PSA screening among men younger than 65. Prostate cancer incidence rates have leveled off in men 65 and older. Rates peaked in white men in 1992 (237.7 per 100,000 men) and in African American men in 1993 (342.4 per 100,000 men).

Deaths: With an estimated 27,350 deaths in 2006, prostate cancer is a leading cause of cancer death in men. Although death rates have been declining among white and African American men since the early 1990s,

Trends in 5-Year Relative Survival Rates* (%) by Race and Year of Diagnosis, US, 1974-2001

Site	Relative 5-Year Survival Rate (%)								
	White			African American			All Races		
	1974-76	1983-85	1995-2001	1974-76	1983-85	1995-2001	1974-76	1983-85	1995-2001
All cancers	51	54	66 [†]	39	40	56 [†]	50	53	65 [†]
Brain	22	26	33 [†]	26	32	38 [†]	22	27	33 [†]
Breast (female)	75	79	90 [†]	63	64	76 [†]	75	78	88 [†]
Colon	51	58	65 [†]	46	49	55 [†]	50	58	64 [†]
Esophagus	5	9	16 [†]	4	6	10 [†]	5	8	15 [†]
Hodgkin lymphoma	72	79	86 [†]	69	78	80 [†]	71	79	85 [†]
Kidney	52	56	65 [†]	49	55	64 [†]	52	56	65 [†]
Larynx	66	68	68	60	55	51	66	67	66
Leukemia	35	42	49 [†]	31	34	38	34	41	48 [†]
Liver [#]	4	6	9 [†]	1	4	5 [†]	4	6	9 [†]
Lung & bronchus	13	14	16 [†]	11	11	13 [†]	12	14	15 [†]
Melanoma of the skin	81	85	92 [†]	67 [‡]	74 [§]	76 [‡]	80	85	92 [†]
Multiple myeloma	24	27	32 [†]	28	31	33	25	28	32 [†]
Non-Hodgkin lymphoma	48	54	61 [†]	48	45	52	47	54	60 [†]
Oral cavity	55	56	62 [†]	36	35	40	54	54	59 [†]
Ovary [¶]	37	40	44 [†]	41	42	38	37	41	45 [†]
Pancreas	3	3	4 [†]	3	5	4 [†]	3	3	4 [†]
Prostate	68	76	100 [†]	58	64	97 [†]	67	75	100 [†]
Rectum	49	56	65 [†]	42	44	56 [†]	49	55	65 [†]
Stomach	15	16	21 [†]	16	19	23 [†]	15	17	23 [†]
Testis	79	91	96 [†]	76 [‡]	88 [‡]	88	79	91	96 [†]
Thyroid	92	93	97 [†]	88	91	95	92	93	97 [†]
Urinary bladder	74	78	83 [†]	48	60	64 [†]	73	78	82 [†]
Uterine cervix	70	71	75 [†]	64	61	66	69	69	73 [†]
Uterine corpus	89	85	86 [†]	62	55	62	88	83	84 [†]

*Survival rates are adjusted for normal life expectancy and are based on cases diagnosed from 1974-1976, 1983-1985, and 1995-2001, and followed through 2002. †The difference in rates between 1974-1976 and 1995-2001 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. ¶Recent changes in classification of ovarian cancer, namely excluding borderline tumors, have affected 1995-2001 survival rates. #Includes intrahepatic bile duct.

Source: Surveillance, Epidemiology, and End Results Program, 1975-2002, Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, MD, 2005.

American Cancer Society, Surveillance Research, 2006

rates in African American men remain more than twice as high as rates in white men.

Signs and symptoms: Early prostate cancer usually has no symptoms. With more advanced disease, individuals 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. Continual pain in the lower back, pelvis, or upper thighs may be an indication of metastatic disease. Many of these symptoms, however, are similar to those caused by benign conditions.

Risk factors: The only well-established risk factors for prostate cancer are age, ethnicity, and family history of the disease. More than 65% of all prostate cancer cases are diagnosed in men 65 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 and is rare in Asia and South America. Recent genetic studies suggest that strong familial predisposition may be responsible for 5%-10% of prostate cancers. International studies suggest that a diet high in saturated fat may also be a risk factor. There is some evidence that the risk of dying from prostate cancer may increase with obesity.

Early detection: The PSA blood test, which detects a protein made by the prostate called prostate-specific antigen, and the digital rectal examination should be offered to men at average risk, beginning at age 50. Individuals at high risk of developing prostate cancer (African Americans or men with a strong family history)

should begin screening at age 45. At this time, there is insufficient data to recommend for or against early prostate cancer testing in men at average risk of developing the disease. All men should be given information about the benefits and limitations of testing so they can make informed decisions. See page 52 for the American Cancer Society's screening guidelines concerning the early detection of prostate cancer.

Treatment: Treatment options vary depending on age, stage of the cancer, and other medical conditions, and should be discussed with the individual's physician. Surgery and external beam radiation or radioactive seed implants, called brachytherapy, may be used to treat early-stage disease. Hormonal therapy, chemotherapy, and radiation (or combinations of these treatments) are used for metastatic disease and as supplemental or additional therapies for early-stage disease. Hormone treatment may control prostate cancer for long periods by shrinking the size of the tumor, thus relieving pain and other symptoms. Careful observation ("watchful waiting") rather than immediate treatment may be appropriate for older individuals with limited life expectancy and/or less aggressive tumors.

Survival: More than 90% of all prostate cancers are discovered in the local and regional stages; the 5-year relative survival rate for patients whose tumors are diagnosed at these stages approaches 100%. Over the past 20 years, the 5-year survival rate for all stages combined has increased from 67% to nearly 100%. According to the most recent data, relative 10-year survival is 93%, and 15-year survival is 77%. The dramatic improvements in survival, particularly at 5 years, are partly attributable to earlier diagnosis but also to some improvements in treatment.

Skin

New cases: More than 1 million cases of basal cell or squamous cell cancers occur annually. Most, but not all, of these forms of skin cancer are highly curable. The most serious form of skin cancer is melanoma, which is expected to be diagnosed in about 62,190 persons in 2006. During the 1970s, the incidence rate of melanoma increased rapidly at about 6% per year. Since 1980, however, the rate of increase has slowed to a little less than 3% per year. Melanoma is primarily a disease of whites; rates are more than 10 times higher in whites than in African Americans. Another form of skin cancer, Kaposi sarcoma, was once common among AIDS patients but has become rare since the introduction of protease inhibitors.

Deaths: An estimated 10,710 deaths, 7,910 from melanoma and 2,800 from other non-epithelial skin cancers, will occur this year. After increasing for several decades, the death rate for melanoma has decreased since 1998 in white men. The mortality rate has been decreasing since 1988 in white women.

Signs and symptoms: Important warning signs of melanoma include changes in size, shape, or color of a skin lesion or the appearance of a new growth on the skin. Changes that occur over a few days are generally innocuous, but changes that progress over a month or more should be evaluated by your doctor. Basal cell carcinomas may appear as flat, firm, pale areas 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 prior melanoma, one or more family members who had melanoma, and moles (especially if there are many, or if they are unusual or large). Other risk factors for all types of skin cancer include sun sensitivity (sunburning easily; difficulty tanning; natural blonde or red hair color); a history of excessive sun exposure, including sunburns; use of tanning booths; diseases that suppress the immune system; a past history of basal cell or squamous cell skin cancers; and occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radium.

Prevention: Limit or avoid exposure to the sun during the midday hours (10 a.m.- 4 p.m.). When outdoors, wear a hat that shades the face, neck, and ears, a long-sleeved shirt, and long pants. Wear sunglasses to protect the skin around the eyes. Use a sunscreen with a sun protection factor (SPF) of 15 or higher. Children in particular should be protected from the sun because severe sunburns in childhood may greatly increase risk of melanoma in later life. Avoid tanning beds and sun lamps, which provide an additional source of UV radiation.

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 examine their skin regularly. Suspicious lesions or progressive change in a lesion's appearance or size should be evaluated promptly by a physician. Melanomas often start as small, mole-like growths that increase in size and 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).

Treatment: 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 is also an option in some cases. For malignant melanoma, the primary growth must also be adequately excised, in addition to one or more nearby lymph nodes for staging. Removal and microscopic examination of all suspicious skin lesions are essential. Advanced cases of melanoma are treated with immunotherapy or chemotherapy.

Survival: Most basal and squamous cell cancers can be cured if the cancer is detected and treated early. If detected in its earliest stages and treated properly, melanoma is also highly curable. 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 92% and 89%, respectively. For localized melanoma, the 5-year survival rate is 98%; 5-year survival rates for regional and distant stage diseases are 64% and 16%, respectively. About 83% of melanomas are diagnosed at a localized stage.

Urinary Bladder

New cases: An estimated 61,420 new cases are expected to occur in 2006. Bladder cancer incidence rates among men and women combined leveled off from 1987 to 2002, after increasing by 0.8% per year from 1975 to 1987. Bladder cancer incidence is nearly four times higher in men than in women and almost two times higher in whites than in African Americans.

Deaths: An estimated 13,060 deaths will occur in 2006. Mortality rates among African Americans have continued to decrease since the late 1970s, while rates among whites have stabilized since the late 1980s.

Signs and symptoms: Symptoms may include blood in the urine and increased frequency of urination.

Risk factors: Smoking is the greatest risk factor for bladder cancer. Smokers experience twice the risk of bladder cancer than nonsmokers. Smoking is estimated

to cause about 48% of bladder cancer deaths among men and 28% among women. Workers in the dye, rubber, or leather industries and communities with high levels of arsenic in drinking water also have increased risk. Drinking more fluids and eating more vegetables may lower the risk of bladder cancer.

Early detection: Bladder cancer is diagnosed by examination of cells in the urine under a microscope, 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 are not recommended for screening people at average risk, but are used for 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 some treatment results.

Survival: For all stages combined, the 5-year relative survival rate is 82%. When diagnosed at a localized stage, the 5-year survival rate is 94%; 75% of cancers are detected at this early stage. For regional and distant stages, 5-year survival rates are 48% and 6%, respectively. Beyond 5 years, survival continues to decline, with a rate of 77% at 10 years and 73% at 15 years after diagnosis.

Uterine Cervix

New cases: An estimated 9,710 cases of invasive cervical cancer are expected to be diagnosed in 2006. Incidence rates have decreased steadily over the past several decades in both white and African American women. As Pap screening has become more common, pre-invasive lesions of the cervix are detected far more frequently than invasive cancer.

Deaths: An estimated 3,700 deaths from cervical cancer are expected in 2006. Mortality rates have declined steadily over the past several decades due to prevention and early detection by screening.

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. 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 the infection and progression to cancer may be influenced by many factors, such as immunosuppression, cigarette smoking, and nutritional factors. Research in HPV vaccine development holds promise for cervical cancer in terms of both therapeutic and prophylactic use. Two vaccines are currently in phase III clinical trials for the prevention of HPV infection.

Early detection: The Pap test 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. Their results sometimes appear normal even when a woman has abnormal cells of the cervix, and likewise, sometimes appear abnormal when there are no abnormal lesions on the cervix. Fortunately, most cervical precancers develop slowly, so nearly all cases can be prevented if a woman is screened regularly. See page 52 for the American Cancer Society's screening guidelines for the early detection of cervical cancer.

Treatment: Pre-invasive 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 generally are treated by surgery, radiation, or both, as well as chemotherapy in some cases.

Survival: Relative survival for women with pre-invasive lesions is nearly 100%. Relative 1-year and 5-year survival for cervical cancer patients is 88% and 73%, respectively. When detected at an early stage, invasive cervical cancer is one of the most successfully treated cancers with a 5-year survival rate of 92% for localized cancers. Whites are more likely than African Americans to have their cancers diagnosed at this early stage. Invasive cervical cancers are diagnosed at a localized stage in 56% of white women and 48% of African American women.

Uterine Corpus (Endometrium)

New cases: An estimated 41,200 cases of cancer of the uterine corpus (body of the uterus), usually in the endometrium (lining of the uterus), are expected to be diagnosed in 2006. After increasing from 1988 to 1997, incidence rates of endometrial cancer leveled off through 2002.

Deaths: An estimated 7,350 deaths are expected in 2006. Death rates from cancer of the uterine corpus have stabilized since 1997, after decreasing from 1975-1997.

Signs and symptoms: Abnormal uterine bleeding or spotting is a frequent early sign. Pain and systemic symptoms are late signs.

Risk factors: High cumulative exposure to estrogen is a strong risk factor for endometrial cancer. Factors that dramatically increase estrogen exposure include estrogen replacement therapy (without use of progestin) and obesity. In addition, risk is increased with tamoxifen use, early menarche (onset of menstruation), late menopause, never having children, and a history of polycystic ovary syndrome. Progesterone plus estrogen replacement therapy (called hormone replacement therapy, or HRT) has been shown to largely offset the increased risk related to using only estrogen. Research has not implicated estrogen exposures in the development of other types of uterine corpus cancer that are more aggressive and have a poorer prognosis. Other risk factors for uterine corpus cancer include infertility and hereditary nonpolyposis colon cancer (HNPCC). Pregnancy and the use of oral contraceptives provide protection against endometrial cancer.

Early detection: Most endometrial cancer is diagnosed at an early stage because of postmenopausal bleeding. All women are encouraged to report any unexpected bleeding or spotting to their physicians. Annual screening for endometrial cancer with endometrial biopsy beginning at age 35 should be offered to women with or at risk for HNPCC.

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

Survival: The 1-year relative survival rate for uterine corpus cancer is 94%. The 5-year survival rate is 96%, 66%, and 25%, if the cancer is diagnosed at local, regional, or distant stages, respectively. Relative survival rates for whites exceed those for African Americans by at least 10 percentage points at every stage.

Special Section: Environmental Pollutants and Cancer

Introduction

Environmental pollution in relation to cancer is a topic of considerable public interest and scientific debate. There are two major classes of factors that influence the incidence of cancer: hereditary factors and acquired (environmental) factors. Hereditary factors come from our parents and cannot be modified. Environmental factors are potentially modifiable. They include tobacco use, poor nutrition, inactivity, obesity, certain infectious agents, certain medical treatments, sunlight, cancer-causing agents that occur naturally in food, cancer-causing agents in the workplace, and cancer-causing agents that exist as pollutants in our air, water, and soil.

These environmental factors account for an estimated 75%-80% of cancer cases and deaths in the US. Exposure to pollutants 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 pollutants is small compared to the cancer burden from tobacco smoking (30%) and the combination of nutrition, physical activity and obesity (35%), the relationship between pollution and cancer is important for several reasons.

First, even a small percentage of cancers can represent many deaths: 6% of cancer deaths in the United States each year corresponds to approximately 33,900 deaths. Second, exposure to occupational and environmental pollutants is borne disproportionately by lower-income workers and communities, contributing to disparities in the cancer burden across the population. For example, it was epidemics of occupationally related cancer, primarily among industrial workers, that led to identification of a number of chemicals known to cause cancer in humans. Finally, although considerable research has been done to understand the relationships between environmental pollutants 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.

While this special section focuses on the relationship between environmental pollutants, particularly air pollutants, and cancer, pollution may adversely affect the health of humans and ecosystems in many other ways. Cancer is only one dimension of environmental health. Environmental pollution may have other serious consequences for human health, including developmental or reproductive toxicity, respiratory and cardiovascular disease. The progress made in reducing exposures to occupational carcinogens and some air and water pollutants in the United States since the 1970s has been substantial, and 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.

What Is a Carcinogen?

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). It is now known that such agents or exposures can increase risks of cancer by acting in several different ways throughout the continuum of molecular and biological events that may eventually result in a tumor.

A carcinogen like ultraviolet light can damage DNA and directly affect the structure or function of critical genes in the genetic material of a cell, either by causing mutations or inactivating or activating genes that control cell differentiation and survival. Some carcinogens, such as estrogens, act by increasing the rate of cell division that, in turn, may increase the odds of survival and proliferation of genetically damaged cells. The genetic material in cells is constantly being damaged and repaired, even in the absence of man-made pollutants because of factors such as inflammation and energy metabolism.¹ Exposure to external carcinogens adds to this background burden and increases the likelihood that some of these errors will not be corrected before the cell divides and no longer recognizes the damage as abnormal.

Exposure to pollutants can result from inhalation of contaminants in air, intake of contaminated food or water, or by absorption following direct contact of skin or mucous membranes. The probability that exposure to

a carcinogen will result in development of a cancer depends on many things. In general, the intensity and duration of exposure strongly influences eventual risk, but the relative importance of these factors, as well as other circumstances that affect risk, may vary by carcinogen and cancer site. For example, the lung cancer risk from cigarette smoking is influenced more by the duration of smoking than by the number of cigarettes smoked per day, whereas the breast cancer risk from high-dose radiation depends mostly on the intensity of exposure as well as the age at exposure.

In this special section, we focus on cancer related to air pollutants. The lung is usually the most important route of entry for airborne pollutants.² Once inhaled, pollutants can affect the lung itself, as in the case of tobacco smoke, asbestos, radon, and several metals, such as cadmium and arsenic. Some inhaled carcinogens, however, can also induce tumors in distant organs, such as the liver or bladder, because of the transport of inhaled pollutants throughout the body after absorption through the lung or other organs.

Occupational Exposures

Studies of occupational exposures have yielded important information about cancer risks associated with pollutants. This is because workplace exposures are often considerably higher than those in the general environment and because exposed occupational groups can be clearly identified and followed for long periods of time. Many of the chemicals known to cause cancer in humans were identified through studies of workers. Such studies, for example, identified the carcinogenic risks of arsenic, asbestos, cadmium, chromates, chloromethyl ethers, coke oven emissions, nickel, polycyclic aromatic hydrocarbons, and radon. Two of these substances may pose special hazards for the general public: asbestos and radon.

Asbestos

Asbestos is a group of naturally occurring minerals that contains fibrous silicates that are highly resistant to heat and chemical degradation. Asbestos was widely used in the US and other industrialized countries even after definitive epidemiological evidence of carcinogenicity was published in the 1950s and 1960s. Government regulation ended asbestos production and use in the US after 1980.

Asbestos is an established cause of lung cancer, asbestosis (a serious nonmalignant lung disease), and malignant mesothelioma, a rare cancer that can affect

the lining of the chest, abdominal cavity, and covering of the heart. Workers exposed to asbestos in several occupations – including asbestos mining, production, and application of asbestos insulation – have greatly increased risks of all three conditions. In addition, environmental exposures to asbestos, usually resulting from living near an asbestos mine or natural outcropping of asbestos-containing rock, have been linked with mesothelioma.

Nearly all cases of mesothelioma are attributable to asbestos exposure. However, most of the increased cancer cases among workers exposed to asbestos are from lung cancer rather than mesothelioma, and there is a strong interaction between tobacco smoking, asbestos exposure, and lung cancer.² (Interaction means that cigarette smokers who are exposed to asbestos have a greater risk of developing lung cancer than would be expected from either smoking or asbestos alone.) Other cancer sites, such as the pharynx, larynx, esophagus, stomach, and colorectum are associated with asbestos exposure in some studies, although the increase in risk is substantially less than for lung cancer and causality is less certain.³

Asbestos products remain in most buildings constructed between 1930 and 1975, as well as in older buildings that were repaired or altered prior to 1975. This source of asbestos can present a danger during renovations or demolition, because the asbestos-containing materials (such as insulation) can become a dust and be inhaled. Because of the hazards associated with the continued presence of asbestos, there are federal programs for asbestos abatement. Contractors involved in the removal, enclosure, or encapsulation of asbestos must be specially licensed and must comply with federal, state, and local laws. The US Environmental Protection Agency (EPA) also describes how buildings containing asbestos should be maintained to minimize exposures (see: <http://www.epa.gov/asbestos/buildings.html>).

Although use of asbestos has declined in many developed countries, its use continues to present a hazard in other parts of the world. More than 70% of the world's asbestos production is used in Eastern Europe, Latin America, and Asia.⁴ Non-occupational (household or residential) sources of exposure to asbestos can arise from dust brought home on the clothing of workers exposed to asbestos-containing products. Residential exposure can also occur from asbestos mining or manufacturing or erosion of asbestos or asbestos-containing rocks.⁵

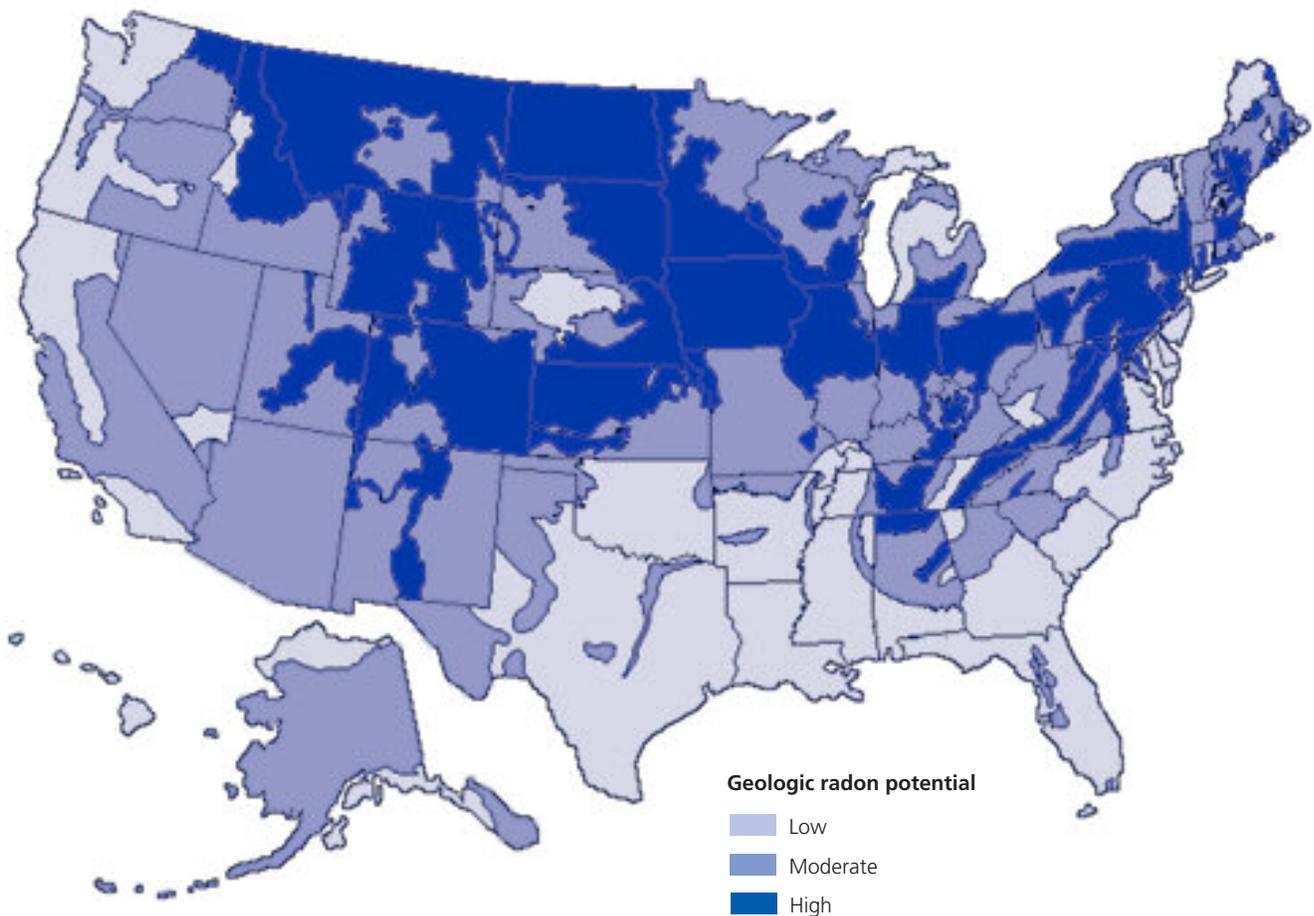
Radon

Radon is an inert (i.e., not chemically reactive) gas that is produced naturally from radium in the decay of uranium. Two of the decay products of radon (called radon daughters) emit α particles when they decay. Unlike x-rays, α particles cannot penetrate very far into human tissue, but can cause local damage to tissues because of their high energy and mass. When radon daughters are inhaled and undergo nuclear decay in the lung, the α particles can damage genetic material in the cells lining the lung, potentially resulting in lung cancer.² Since uranium occurs in soil and rock throughout the world, radon exposure is universal. The level of uranium present in rock and soil, however, varies considerably throughout the US (Figure 1) and the world. Once produced, radon can diffuse through cracks in walls and presents a hazard if it accumulates in basements and unventilated underground spaces. It was found to cause lung cancer in studies of underground miners who were

exposed to very high concentrations. Studies of miners provide good information on the relationship between increasing radon exposure and lung cancer risk at high levels of exposure.⁶

Average radon concentrations in the indoor air of most homes are considerably lower than those in uranium mines, although this varies widely.² Within buildings, radon levels are usually highest in the basement. In regions where radon emissions from soil are higher, houses with poorly ventilated basements can yield substantial exposures. The EPA sets recommended levels for maximum concentration of radon in homes, and provides information about how it is measured and how levels can be reduced (for more information, see: <http://www.epa.gov/radon/pubs/consguid.html>). The EPA standard was initially set based on extrapolation from high occupational exposures to the generally much lower residential exposures. Researchers have subsequently confirmed the reliability of these risk

Figure 1. Generalized Geologic Radon Potential of the United States



Source: US Geologic Survey: <http://energy.cr.usgs.gov/radon/usrnpot.gif>

American Cancer Society, Surveillance Research, 2006

estimates by combining the results of multiple studies of indoor radon exposures. The observed risk of lung cancer from indoor radon exposures approximates that which was predicted by studies of uranium miners exposed at much higher doses.

In 1998, the Biological Effects of Ionizing Radiation (BEIR VI) Committee of the National Research Council estimated that between 10% and 14% of lung cancer deaths in the US could be attributed to radon.⁷ Most of the radon-related lung cancers occur among smokers, although an estimated 2,100-2,900 of the 11,000 deaths from lung cancer among nonsmokers in the US each year are estimated to be radon-related.

Indoor Air Pollution

Indoor air pollution (exposures that occur inside buildings) results from pollutants that enter buildings from ambient or outside air, as well as pollutants that may result from interior sources, such as stoves, heating, products used in building materials and furnishings, and ventilation systems. Thus, depending upon the pollutant, its concentration in residential or office settings may be higher or lower than outdoor concentrations. Because of the large amount of time Americans spend indoors, virtually the entire population is exposed.

Some indoor air contaminants are known to increase cancer risk, including radon and secondhand tobacco smoke. Exposure to deteriorating insulation or other asbestos-containing products can disperse fibers in the home. Other sources of pollution include combustion of oil, gas, kerosene, coal, wood, and tobacco products; building materials and furnishings, products used for household cleaning, maintenance, and pest control; and chemical and microbial contaminants from central heating and cooling systems and humidification devices.⁸ Most indoor contaminants are not associated with cancer.

Secondhand tobacco smoke

Secondhand exposure to tobacco smoke affects nonsmokers in environments where others are smoking. Secondhand smoke is a complex mixture that contains both sidestream smoke – the material emitted from smoldering tobacco products between puffs – and exhaled mainstream smoke. It contains most of the 4,000 chemicals and at least 50 known carcinogens generated during active smoking, although at lower concentrations.⁹

Numerous studies have documented increased risk of lung cancer among nonsmokers exposed to secondhand

smoke at work and at home. An analysis combining results of 46 epidemiological studies of spousal exposure and 19 studies of workplace exposure estimated that the relative risk for lung cancer was 1.24 for a nonsmoking woman exposed to her husband's smoking and 1.16 for a nonsmoking woman exposed in the workplace compared to a nonsmoking woman with no exposure to secondhand smoke.¹⁰ Secondhand smoke exposure at home or at work is also associated with an increased risk of death from heart disease. It was recently estimated that exposure to secondhand smoke causes approximately 35,000 heart disease deaths and 3,000 lung cancer deaths among nonsmokers in the United States every year.¹¹

Implementing policies that establish smoke-free environments is the most effective way to reduce secondhand smoke exposure among nonsmokers. Fifteen states and numerous municipalities now restrict public smoking in restaurants, workplaces, and/or bars. (For more information on secondhand smoke, see page 38.)

Burning of solid fuel for heating and cooking

In some countries, a major source of indoor air pollution is wood or other fuel used for heating and cooking. Very high lung cancer rates have been observed among nonsmoking women in regions of China where unventilated indoor coal stoves traditionally have been used for cooking and heating.⁵ Combustion products of coal include fine particulates, sulfur dioxide, arsenic, and polycyclic aromatic hydrocarbons.

Fumes from cooking oil are another source of indoor air pollution.¹² Burning of crude biomass fuels, such as crop residues, animal dung, and wood, for cooking and heating has not been associated with lung cancer, but results in high levels of indoor air pollution and increased risk for acute respiratory infections and chronic obstructive pulmonary disease.⁸

Outdoor Air Pollution

Outdoor (ambient) air pollution is a highly complex and variable mixture. Exposures to ambient air pollution at current levels in the US and other countries have been associated with numerous effects on health, including respiratory problems, premature mortality, hospitalization for heart and nonmalignant lung diseases, and lung cancer. The sources of pollutants in ambient air include such mobile sources as cars, buses, planes, trucks, and trains. Large stationary sources of air pollution include factories, fossil-fuel-powered electrical generating plants, incinerators, recycling facilities, and metal

smelting. Some smaller but still significant sources include dry cleaning processes and degreasing operations. In addition, there are important natural sources such as windblown dust storms and wildfires.¹³

As the federal entity charged with primary responsibility for regulation of air pollutants, the EPA has set national air quality standards for six principal air pollutants (also called the criteria pollutants): nitrogen dioxide, ozone, sulfur dioxide, particulate matter, carbon monoxide, and lead. However, many urban areas in the US fail to meet EPA's air quality standards for ozone and/or particulate air pollution (Figure 2).¹³ A separate set of EPA regulations pertains to hazardous air pollutants, or air toxics.

Particulate air pollution

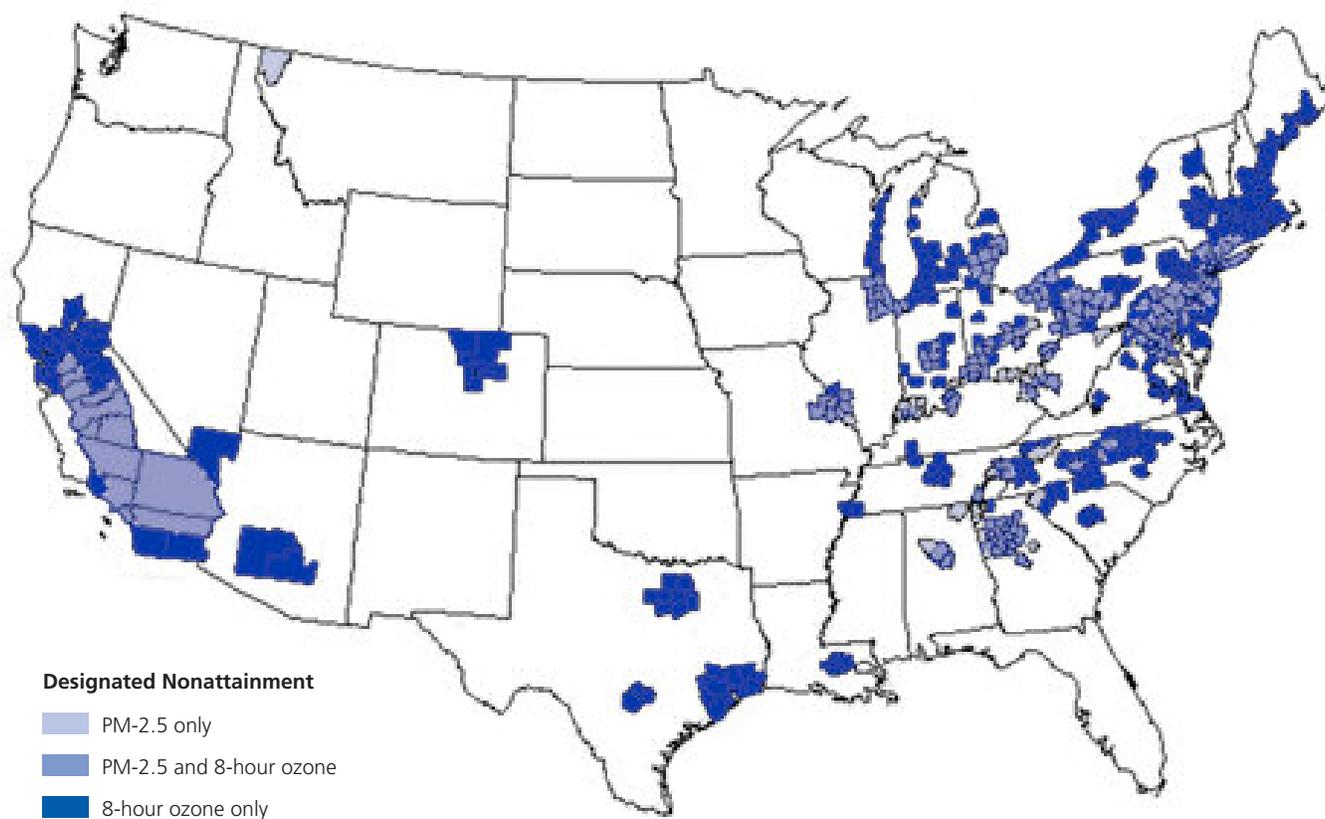
Particulate matter (PM) is a general term for a mixture of solid particles and liquid droplets found in the air. PM is defined by size, with some particles large enough to

be seen as dust or dirt, while others are so small that they can be seen only with an electron microscope. Only particulates which are less than or equal to 10 micrometers (um) in diameter (about one-seventh the diameter of a human hair) are small enough to be inhaled. These particulates are further subdivided into fine particulates, with a diameter of 2.5 um or less, and coarse particulates, with a diameter of 2.5 to 10 um. Exposure to fine particulates appears to be more related to cancer than exposure to coarse particulates.

In many industrialized countries, motor vehicle exhaust represents the most widespread source of air pollution, including ozone-producing volatile organic chemicals (VOCs) and fine particulates.¹⁴ Coal-fired power plants are an important source of sulfur dioxide, and the byproducts of sulfur dioxide are a major component of fine air particles in the Eastern United States.¹³

American Cancer Society epidemiologists have collaborated with air pollution experts to assess the health

Figure 2. Counties That Fail to Meet EPA Standards for PM-2.5 and/or 8-Hour Ozone



Several counties have only a portion of their county designated nonattainment. These counties are represented as whole counties on the map.

Source: US Environmental Protection Agency: <http://www.epa.gov/oar/oaqps/greenbk/mappm25o3.html>

American Cancer Society, Surveillance Research, 2006

effects of exposure to outdoor air pollution in the Society's Cancer Prevention Study II (CPS II) cohort. The first study, published in 1995, examined information about air pollution levels for 151 US metropolitan areas in which study participants were residing, as well as information about individual risk factors, such as cigarette smoking.¹⁵ The study found that people living in the most polluted areas had higher death rates from all causes, nonmalignant heart and lung disease, and lung cancer than those in the least polluted areas. Results of this study contributed to the decision by the US EPA to issue more stringent standards in 1997, reducing concentrations of pollutants, including the first standard for fine particulates.

An updated and expanded analysis of the ACS study was published in 2002.¹⁶ This study estimated that each 10 $\mu\text{g}/\text{m}^3$ elevation in fine particulate air pollution (PM_{2.5}) was associated with a 4%, 6%, and 8% increased risk of all-cause, heart and lung disease, and lung cancer mortality, respectively, although the lung cancer estimates are the least precise.¹⁷

Ozone

Ground-level ozone is the main chemical component of "smog." Ozone is formed by the reaction of volatile organic compounds (VOCs) and nitrogen oxides in the presence of heat and sunlight. These are most often produced by the incomplete combustion of gasoline and other fuels, and are thus highly associated with traffic. Ozone exposure has not been linked to cancer. However, exposure to high levels of ozone has been linked to respiratory diseases as well as damage to vegetation and ecosystems.

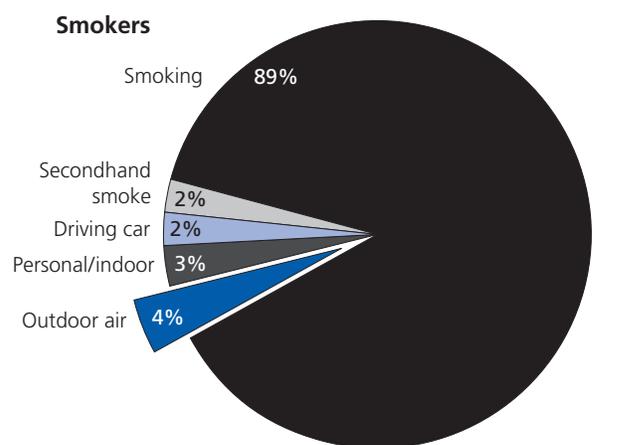
Hazardous air pollutants

In addition to the six criteria air pollutants mentioned above, there are additional toxic pollutants which the EPA regulates. Air toxics are released from motor vehicles and other sources. For example, when a car is refueled, gases escape from liquid gasoline and form a vapor in a process called vaporization or evaporation. To reduce such releases and exposures, gas stations are now required to install vapor recovery systems at the pump. Air toxics are also released from stationary sources, such as oil refineries, dry cleaners, and auto paint shops.

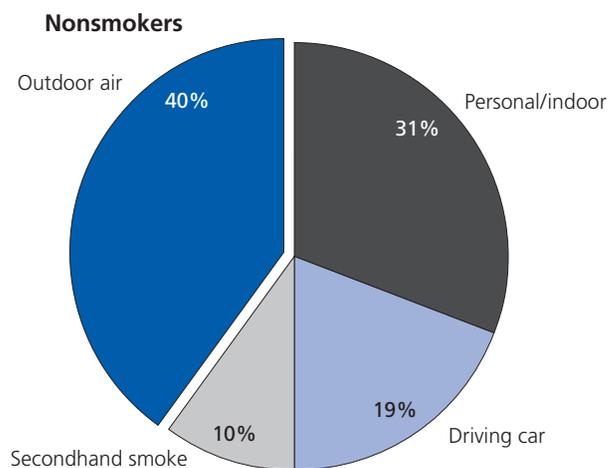
Some of the 188 substances on the list of air toxic pollutants have been found to cause cancer in animals or humans. Benzene has long been recognized as a human carcinogen because of strong evidence that high levels of occupational exposure increase risk of leukemia.

Benzene is derived from gasoline combustion and other combustion sources in the environment. Elevated benzene exposures occur in proximity to certain industries, such as oil refineries, as well as in the homes of smokers, the interiors of automobiles and buses, and in the vicinity of gasoline stations and heavily traveled highways.¹⁷ The overwhelming source of benzene exposure for smokers is cigarette smoke. Smokers have an average benzene body burden about 6 to 10 times that of nonsmokers and receive about 90% of their benzene exposure from smoking (Figure 3).¹⁷

Figure 3. Sources of Benzene Exposure



A typical smoker takes in roughly 2 mg benzene/day; about 1.8 mg is delivered by mainstream smoke (55 $\mu\text{g}/\text{cigarette}$ x 32 cigarettes per day).



A typical nonsmoker inhales about 0.2 mg benzene/day, assuming an average exposure of 15 $\mu\text{g}/\text{m}^3$ and an alveolar respiration rate of 14 m^3/day . Outdoor air contributes about 40% of that amount, assuming an average outdoor level of 6 $\mu\text{g}/\text{m}^3$. The remaining 9 $\mu\text{g}/\text{m}^3$ are split between driving (100 min. at 30-40 $\mu\text{g}/\text{m}^3$), indoor sources such as automobile vapor emissions in attached garages or storage of gasoline or kerosene in the garage or the basement, and environmental tobacco smoke exposures at home or work.

Source: EPA TEAM Studies.¹⁷

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Although epidemiologic studies do not provide direct evidence that exposure to benzene at levels present in urban air, motor vehicles, or gasoline stations increases the risk of leukemia, benzene in cigarette smoke is thought to be a factor in the increased relative risk of leukemia in smokers.¹⁸

A number of studies have investigated whether the proximity of residential neighborhoods to busy roads or gasoline stations increases risk of childhood leukemia, but results have been inconsistent.¹⁹ Studies of leukemia in adults with occupational exposure to gasoline fumes and motor vehicle exhaust have generally not found elevated risks. For many years, estimates of leukemia risk associated with low levels of benzene exposure had a wide range of uncertainty because the only exposure-response data in humans came from a single study of 1,136 men with very high exposures.²⁰ More recently, a study of a large (more than 70,000) occupationally exposed population in China demonstrated an increased risk of leukemia at lower levels of exposure, including exposure at the current US occupational standard – one part per million (1 ppm) – for 40 years.²¹ A separate study in China found decreased numbers of white blood cells (an indication of toxicity to blood and bone marrow) associated with shorter term (1-2 years) exposures as low as 1 ppm.²² Average benzene concentrations in outdoor air are considerably lower, in the range of 0.0003 to 0.006 ppm.¹⁷

Diesel particulate matter and diesel exhaust from internal combustion engines are also listed by the EPA as hazardous air pollutants. Diesel fuel has been used in cars, trucks, locomotives, and other mechanized machinery for over 100 years. It is estimated that approximately 1.4 million US workers are exposed to diesel exhaust through their occupation, and it is also a component of urban air pollution.²³ High levels of diesel particulate exposure produce lung cancer in rats, although some argue that this may be due to very high exposures overwhelming the mechanisms that clear foreign substances from the lung. Research is continuing on this issue.

Most studies of occupational groups with high exposures, such as truck drivers and railroad workers, find an elevated risk of lung cancer. The potential carcinogenicity of diesel exhaust has been reviewed by the US National Toxicology Program and classified as “reasonably anticipated to be a human carcinogen.”²³ Measures to reduce diesel emissions from mobile sources include use of low sulfur fuel, pollution controls

on vehicles, reduced idling times, and use of alternative fuels, such as compressed natural gas.²⁴

The EPA takes a two-phase approach to reducing emissions of air toxics from large sources of air pollution.²⁵ The first phase is a “technology-based” approach, where EPA develops standards for controlling the emissions of air toxics from a particular industry (or “source category”). These Maximum Achievable Control Technology (MACT) standards are based on emission levels that are already being achieved by the better controlled and lower emitting sources in an industry. In the second phase, EPA is required to assess the remaining health risks from each source category within 8 years of setting the MACT standards to determine whether the MACT standards appropriately protect public health. Using this “risk-based” approach, EPA must make a determination whether more health-protective standards are necessary.

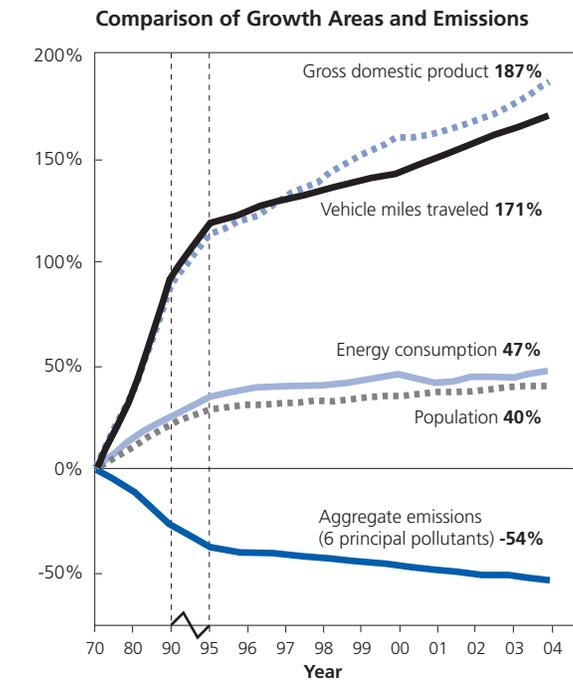
Progress in Reducing Air Pollution

Since 1970, considerable progress has been made in controlling air pollution in the US. For example, the aggregate emissions of the six principal air pollutants decreased 54% between 1970 and 2004, while gross domestic product increased 187%, vehicle miles traveled increased 171%, energy consumption increased 47%, and population increased 40% (Figure 4). Nonetheless, in 2002, 146 million people lived in counties with pollution levels above at least one of the National Ambient Air Quality Standards.¹³

Stratospheric ozone

While ground-level ozone is harmful to health, stratospheric ozone (located 6 to 30 miles above the earth) protects living organisms from harmful ultraviolet radiation (UV-B) from the sun. Certain chemicals emitted from commercial air conditioners, refrigerators, insulating foam, and some industrial processes can cause this protective ozone layer to break down, increasing the amount of UV-B radiation that reaches the earth’s surface. In humans, UV-B radiation is linked to skin cancer, including melanoma. In 1989, the US and 28 other countries signed the Montreal Protocol, a treaty that recognized the international nature of ozone depletion and committed the world to limiting the production of ozone-depleting substances. Today, more than 180 nations have signed the protocol. In the US, the Clean Air Act Amendments established a US regulatory program to protect the stratospheric ozone layer, and in January, 1996, US production of many ozone-depleting

Figure 4. Air Emission Trends, 1970-2004



Source: US Environmental Protection Agency: http://www.epa.gov/airtrends/2005/econ_emissions.html.
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substances, including chlorofluorocarbons, carbon tetrachloride, and methyl chloroform, virtually ended.¹³

How Carcinogens Are Identified

Carcinogens are usually identified on the basis of epidemiologic 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, as noted above, exposures are often higher among workers and they can be followed for long periods of time. Some of our 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).

Important epidemiologic studies have been done to examine the relationship between exposure to potentially carcinogenic substances in the general population and risk of cancer, but such studies are much more difficult, often because of uncertainties about exposure and the challenge of long-term follow up. Moreover, relying upon epidemiological information to

determine cancer risks does not fulfill the public health goal of prevention. Thus, for the past 40 years, the US and many 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 allow us to take prudent public health actions prior to collecting data from exposed populations.

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 when tested in well-conducted 2-year bioassays.²⁶ Moreover, between 25% and 30% of established human carcinogens were first identified through animal bioassays. Since animal tests necessarily use high-dose exposures, in most cases, human risk assessment requires extrapolating the exposure-response relationship observed in rodent bioassays to predict effects in humans at lower doses. Typically, regulatory agencies in the United States 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 National Toxicology Program 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.²⁷ For a list of substances listed in the *11th Report on Carcinogens* as known or reasonably anticipated to be human carcinogens, see: <http://ntp.niehs.nih.gov/ntp/roc/toc11.html>.

The International Agency for Research on Cancer is a branch of the World Health Organization that regularly convenes scientific consensus groups to evaluate the carcinogenic potential of chemicals. 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, see: <http://www.cie.iarc.fr/>.

Although the relatively small risks associated with low-level exposure to carcinogens in air or water are difficult to detect in epidemiologic 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.²⁷

What Is the American Cancer Society’s Role?

Cancer prevention is central to the mission of the American Cancer Society that states:

“The American Cancer Society is the nationwide, community-based voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives, and diminishing suffering from cancer through research, education, advocacy, and service.” With respect to cancer prevention, the major focus of the Society’s efforts is to reduce the use of tobacco products, promote a healthy diet and physical activity, and encourage the use of screening tests that may prevent cancer or detect it at an early, treatable stage because the Society believes that these activities have the greatest potential to reduce the burden of cancer in our lifetimes.

Although the Society does not play a direct role in the identification and classification of carcinogens, it does provide information and guidance on environmental cancer risks. For example, the Society provides summary information on its web site about topics related to environmental pollutants, and directs readers who want more detailed information to other sources. In the legislative arena, advocating for smoke-free legislation to reduce indoor air pollution is an important priority for the American Cancer Society. The Society has also supported national and state laws, such as the Clean Air Act and particulate matter standard, designed to safeguard the public from cancer-causing substances in outdoor air and water. The Society has established an Environmental Advisory Committee which convenes twice a year to provide advice on scientific and policy issues related to environmental pollution.

The Society’s Divisions are also responsive to local concerns. In some Divisions, issues related to environmental pollution are of high interest to constituents, and the Division receives frequent requests to participate in coalitions or endorse state legislation. The California Division has established a Cancer and the Environment Workgroup, with the support of the National Home Office, to provide advice on these issues.

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Cancer in Racial and Ethnic Minorities

Overall, African Americans are more likely to develop and die from cancer than any other racial or ethnic population. The death rate from cancer among African American males is 40% higher than that among white males; for African American females, it is 18% higher. African Americans have a higher mortality rate than whites for each of the major cancer sites (colorectal, male lung, female breast, and prostate), as well as a higher incidence rate for all of these cancers except female

breast. While other minority populations have lower incidence rates for the major cancer sites, they generally have higher rates for cancer of the uterine cervix, liver, and stomach. For example, the incidence of liver cancer for 1998-2002 was nearly twice as high in Asian American and Pacific Islander men as in African American men, and nearly three times that of whites. The incidence rate of cervical cancer is highest in Hispanic/Latina women. (For more information on causes of stomach, cervix, and liver cancer, see *Cancer Facts & Figures 2005* (5008.05), Special Section, available online at www.cancer.org.)

Racial and ethnic minorities face numerous obstacles to receiving equal access to prevention, early detection, and

Incidence and Mortality Rates* by Site, Race, and Ethnicity, US, 1998-2002

Incidence	White	African American	Asian American and Pacific Islander	American Indian and Alaska Native	Hispanic/Latino [†]
All sites					
Males	556.4	682.6	383.5	255.4	420.7
Females	429.3	398.5	303.6	220.5	310.9
Breast (female)	141.1	119.4	96.6	54.8	89.9
Colon & rectum					
Males	61.7	72.5	56.0	36.7	48.3
Females	45.3	56.0	39.7	32.2	32.3
Lung & bronchus					
Males	76.7	113.9	59.4	42.6	44.6
Females	51.1	55.2	28.3	23.6	23.3
Prostate	169.0	272.0	101.4	50.3	141.9
Stomach					
Males	10.7	17.7	21.0	15.9	17.2
Females	5.0	9.6	12.0	9.1	10.1
Liver & bile duct					
Males	7.4	12.1	21.4	8.7	14.1
Females	2.9	3.7	7.9	5.2	6.1
Uterine cervix	8.7	11.1	8.9	4.9	15.8
Mortality	White	African American	Asian American and Pacific Islander	American Indian and Alaska Native	Hispanic/Latino [†]
All sites					
Males	242.5	339.4	148.0	159.7	171.4
Females	164.5	194.3	99.4	113.8	111.0
Breast (female)	25.9	34.7	12.7	13.8	16.7
Colon & rectum					
Males	24.3	34.0	15.8	16.2	17.7
Females	16.8	24.1	10.6	11.8	11.6
Lung & bronchus					
Males	75.2	101.3	39.4	47.0	38.7
Females	41.8	39.9	18.8	27.1	14.8
Prostate	27.7	68.1	12.1	18.3	23.0
Stomach					
Males	5.6	12.8	11.2	7.3	9.5
Females	2.8	6.3	6.8	4.1	5.3
Liver & bile duct					
Males	6.2	9.5	15.4	7.9	10.7
Females	2.7	3.8	6.5	4.3	5.1
Uterine cervix	2.5	5.3	2.7	2.6	3.5

*Per 100,000, age-adjusted to the 2000 US standard population. †Hispanic/Latinos are not mutually exclusive from whites, African Americans, Asian Americans and Pacific Islanders, and American Indians and Alaska Natives.

Source: Ries LAG, Eisner MP, Kosary CL, Hankey BF, Miller BA, Clegg L, Mariotto A, Feuer EJ, Edwards BK (eds). *SEER Cancer Statistics Review, 1975-2002*, National Cancer Institute, Bethesda, Maryland. http://seer.cancer.gov/csr/1975_2002/, 2005.

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quality treatment. Many lack health insurance, live in rural or inner-city communities, have low incomes, and experience language barriers, racial bias, and stereotyping. Poverty is a critical factor because it influences the prevalence of underlying risk factors for cancer (such as tobacco use and obesity) as well as access to services. Compared with 8% of whites, 24% of African Americans and 22% of Hispanics/Latinos live below the poverty line. Moreover, 20% of African Americans and 32% of Hispanics/Latinos are uninsured, while only 11% of whites lack health insurance. Importantly, poor and uninsured people are more likely to be treated for cancer at late stages of disease, more likely to receive substandard clinical care and services, and are more likely to die from cancer. Consequently, the 5-year relative survival rate for all cancers is lower for African Americans (56%) than it is for whites (66%).

Social inequalities, such as racial discrimination, can affect the interactions between patients and physicians and contribute to reduced access to high-quality care. Opportunities to reduce cancer disparities exist across

the entire cancer spectrum, from primary prevention to palliative care. (For more information about cancer disparities, please see *Cancer Facts & Figures 2004*, Special Section (5008.04), available online at www.cancer.org.)

Not all differences in cancer risks and rates among population groups result from the inequities described here. Cancer risks and rates may also be influenced by cultural and genetic factors that decrease or increase risk. For example, women from cultures where early marriage is encouraged are likely to have a lower risk of breast cancer because they begin having children at an earlier age, which lowers breast cancer risk. Individuals who don't smoke or who maintain a vegetarian diet because of cultural or religious beliefs will experience a lower risk of many cancers. Genetic factors may explain some differences. For example, women from population groups with an increased frequency of mutations in the BRCA1 and BRCA2 genes, including women of Ashkenazi Jewish descent, have an increased risk of breast and ovarian cancer. Genetic factors may also play a role in the elevated risk of prostate cancer among African American men.

The International 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. Better prevention, early detection, and advances in treatment have helped some developed nations lower incidence and mortality rates for certain cancers, but in most parts of the world, cancer is a growing problem. Cancer killed 6.7 million people around the world in 2002, and this figure is expected to rise to 10.3 million in 2020.

Today, most cancers are linked to a few controllable factors – tobacco use, poor diet, lack of exercise, and infectious diseases. Tobacco use is the number one cause of cancer and the number one cause of preventable death throughout the world. If current trends continue, 650 million people alive today will eventually die of tobacco-related diseases, including cancers of the lung, esophagus, and bladder. In the developed world, poor diets, inadequate physical activity, and obesity are second only to tobacco as causes of cancer. As these unhealthy lifestyle behaviors spread to other parts of the world, cancers of the

colon, breast, and prostate are rising to levels now seen in industrialized countries. At the same time, cancers linked to infectious agents – including cervix, stomach, and liver cancers – remain a serious threat throughout the developing world. Although the vast majority of these deaths could be avoided with the implementation of widespread programs in prevention, early detection, and access to effective treatment, the resources necessary to achieve this are not available, particularly in developing countries.

The American Cancer Society collaborates with other cancer-related organizations worldwide in the global fight against cancer, especially in the developing world where survival rates are low and resources are limited. Its international mission includes:

- Capacity building for cancer organizations
- Tobacco control
- Information exchange and delivery
- Cancer research

Working with key partners, such as the International Union Against Cancer (UICC) and the World Health Organization (WHO), the American Cancer Society is expanding its efforts to address the rising cancer burden throughout the world.

Cancer Around the World, 2002, Death Rates* per 100,000 Population for 50 Countries

Country	All Sites		Colon & Rectum		Liver		Lung & Bronchus	
	Male	Female	Male	Female	Male	Female	Male	Female
United States	152.6 (30)	111.9 (16)	15.2 (29)	11.6 (24)	4.4 (31)	2.0 (37)	48.7 (16)	26.8 (2)
Australia	147.1 (33)	99.0 (31)	18.7 (16)	13.3 (15)	3.4 (42)	1.5 (45)	34.7 (30)	13.8 (12)
Austria	156.0 (28)	106.7 (22)	20.1 (9)	13.9 (11)	7.1 (19)	2.5 (27)	37.7 (28)	12.1 (17)
Azerbaijan	132.7 (41)	80.2 (47)	3.8 (50)	2.8 (50)	3.3 (45)	2.0 (37)	28.1 (38)	5.1 (44)
Bulgaria	139.5 (39)	86.3 (41)	17.1 (25)	11.4 (25)	7.3 (17)	3.2 (20)	39.1 (25)	6.9 (35)
Canada	156.6 (27)	114.3 (15)	16.1 (27)	11.7 (23)	3.8 (38)	1.7 (42)	48.5 (17)	25.6 (3)
Chile	148.9 (31)	114.4 (14)	7.7 (39)	7.8 (37)	6.6 (21)	4.1 (13)	21.0 (42)	7.6 (31)
China	159.8 (23)	86.7 (40)	7.9 (37)	5.3 (45)	35.3 (1)	13.3 (1)	36.7 (29)	16.3 (9)
Colombia	141.1 (36)	122.5 (8)	7.3 (40)	7.6 (38)	7.6 (15)	7.1 (4)	19.9 (43)	10.0 (21)
Croatia	212.6 (5)	104.6 (25)	23.4 (6)	13.0 (17)	7.3 (17)	3.2 (20)	65.3 (4)	9.7 (23)
Cuba	139.8 (38)	100.2 (29)	10.7 (35)	13.5 (14)	4.2 (35)	3.8 (16)	38.0 (26)	16.2 (10)
Czech Republic	216.4 (4)	126.6 (5)	34.0 (2)	18.0 (4)	7.7 (14)	3.6 (18)	61.8 (7)	12.8 (15)
Denmark	179.2 (15)	148.1 (2)	23.3 (7)	19.2 (2)	3.4 (42)	2.3 (32)	45.2 (20)	27.8 (1)
Estonia	201.7 (8)	106.3 (23)	17.9 (22)	12.6 (18)	3.6 (41)	1.6 (44)	62.2 (6)	7.3 (34)
Finland	130.2 (43)	93.0 (37)	11.5 (34)	9.8 (33)	4.2 (35)	3.0 (24)	34.4 (32)	8.2 (27)
France	191.7 (12)	96.3 (33)	18.2 (18)	11.8 (22)	11.4 (8)	2.5 (27)	47.5 (18)	8.0 (30)
Germany	161.8 (21)	110.4 (18)	19.9 (12)	15.7 (7)	4.9 (28)	2.1 (36)	42.4 (23)	10.8 (19)
Greece	148.2 (32)	81.9 (45)	9.7 (36)	8.0 (36)	11.3 (9)	5.1 (8)	49.8 (14)	7.6 (31)
Hungary	271.4 (1)	145.1 (3)	35.6 (1)	21.2 (1)	7.8 (13)	3.8 (16)	83.9 (1)	22.3 (5)
Iceland	145.8 (34)	118.6 (11)	12.8 (32)	13.2 (16)	4.3 (33)	2.2 (33)	33.1 (34)	25.2 (4)
Ireland	168.4 (18)	123.7 (6)	23.6 (5)	13.7 (12)	3.4 (42)	1.7 (42)	37.9 (27)	18.1 (8)
Israel	132.6 (42)	105.0 (24)	18.8 (15)	14.6 (8)	3.0 (46)	2.2 (33)	26.9 (39)	8.6 (25)
Italy	170.9 (17)	95.2 (34)	16.5 (26)	10.9 (31)	12.6 (6)	4.8 (10)	50.1 (13)	8.5 (26)
Japan	154.3 (29)	82.2 (44)	17.3 (24)	11.1 (29)	21.0 (4)	6.7 (6)	32.4 (36)	9.6 (24)
Kazakhstan	221.2 (3)	120.1 (9)	6.2 (44)	5.1 (46)	12.5 (7)	4.8 (10)	66.8 (3)	10.0 (21)
Latvia	196.6 (10)	101.4 (28)	18.0 (20)	12.3 (20)	4.4 (31)	2.0 (37)	58.9 (9)	6.3 (38)
Lithuania	194.4 (11)	100.1 (30)	18.0 (20)	11.3 (27)	3.8 (38)	1.8 (41)	55.9 (11)	5.3 (42)
Macedonia	145.6 (35)	89.6 (38)	12.3 (33)	8.4 (35)	7.4 (16)	3.9 (14)	41.5 (24)	7.5 (33)
Mali	86.0 (49)	98.8 (32)	4.7 (48)	4.3 (47)	29.3 (2)	13.2 (2)	2.8 (50)	0.1 (50)
Mauritius	83.3 (50)	60.6 (49)	6.0 (45)	4.0 (49)	4.6 (30)	2.4 (29)	16.1 (46)	4.3 (47)
Mexico	92.3 (48)	86.0 (42)	4.5 (49)	4.1 (48)	7.1 (19)	7.0 (5)	16.6 (45)	6.6 (37)
Moldova	141.1 (36)	84.0 (43)	16.1 (27)	10.5 (32)	8.4 (11)	3.1 (23)	33.3 (33)	6.0 (40)
New Zealand	159.7 (24)	127.0 (4)	23.2 (8)	18.5 (3)	3.8 (38)	1.3 (48)	34.7 (30)	19.0 (7)
Norway	156.7 (26)	109.1 (20)	20.1 (9)	16.8 (5)	2.0 (50)	1.3 (48)	32.7 (35)	13.5 (13)
Poland	203.5 (7)	110.6 (17)	18.2 (18)	11.4 (25)	4.3 (33)	3.2 (20)	68.4 (2)	12.3 (16)
Portugal	160.2 (22)	87.3 (39)	20.0 (11)	11.9 (21)	5.5 (27)	1.9 (40)	29.9 (37)	5.3 (42)
Romania	159.4 (25)	93.7 (36)	13.6 (31)	9.0 (34)	8.8 (10)	3.9 (14)	47.1 (19)	8.1 (29)
Russian Federation	205.0 (6)	101.6 (27)	18.9 (13)	13.6 (13)	5.8 (25)	2.6 (26)	63.0 (5)	6.2 (39)
Saudi Arabia	92.5 (47)	74.2 (48)	6.0 (45)	5.5 (43)	13.7 (5)	5.3 (7)	9.6 (48)	2.6 (48)
Slovakia	224.5 (2)	110.3 (19)	33.2 (3)	16.0 (6)	6.6 (21)	2.9 (25)	59.9 (8)	8.2 (27)
Slovenia	200.6 (9)	117.1 (13)	24.1 (4)	14.0 (10)	6.6 (21)	2.4 (29)	54.0 (12)	11.9 (18)
South African Republic	163.6 (19)	107.6 (21)	7.9 (37)	6.4 (40)	5.8 (25)	2.2 (33)	23.0 (40)	6.9 (35)
Spain	173.6 (16)	81.9 (45)	18.5 (17)	11.3 (27)	8.4 (11)	3.3 (19)	49.2 (15)	4.7 (46)
Sweden	135.1 (40)	102.8 (26)	14.9 (30)	11.1 (29)	4.2 (35)	2.4 (29)	22.6 (41)	12.9 (14)
The Netherlands	181.6 (14)	119.8 (10)	18.9 (13)	14.4 (9)	2.5 (48)	1.3 (48)	57.6 (10)	15.6 (11)
Turkey	107.8 (45)	58.7 (50)	5.8 (47)	5.4 (44)	2.5 (48)	1.4 (47)	44.1 (21)	4.9 (45)
Uganda	123.6 (44)	118.5 (12)	7.0 (41)	6.2 (41)	6.1 (24)	5.0 (9)	3.3 (49)	2.1 (49)
United Kingdom	162.3 (20)	122.7 (7)	17.5 (23)	12.4 (19)	2.8 (47)	1.5 (45)	42.9 (22)	21.1 (6)
Venezuela	101.5 (46)	95.1 (35)	6.4 (43)	6.7 (39)	4.8 (29)	4.3 (12)	18.1 (44)	10.2 (20)
Zimbabwe	183.6 (13)	165.4 (1)	6.5 (42)	6.2 (41)	25.4 (3)	10.5 (3)	12.0 (47)	5.8 (41)

Note: Figures in parentheses are in order of rank within site and gender group.

*Rates are age-adjusted to the World Health Organization world standard population.

Cancer Around the World (continued)

Country	Breast Female	Prostate Male	Uterus		Esophagus		Stomach	
			Cervix	Corpus	Male	Female	Male	Female
United States	19.0 (18)	15.8 (28)	2.3 (44)	2.6 (18)	5.1 (21)	1.2 (23)	4.0 (50)	2.2 (50)
Australia	18.4 (22)	17.7 (22)	1.7 (50)	1.6 (40)	4.9 (24)	1.8 (14)	5.7 (47)	2.8 (48)
Austria	20.6 (12)	18.4 (17)	4.1 (29)	2.5 (19)	3.8 (34)	0.7 (37)	10.3 (28)	6.5 (23)
Azerbaijan	13.7 (39)	4.5 (49)	2.8 (38)	6.0 (2)	10.1 (6)	6.1 (6)	30.0 (5)	13.1 (7)
Bulgaria	16.0 (33)	8.9 (39)	8.0 (13)	2.8 (14)	2.4 (44)	0.5 (44)	15.0 (21)	7.6 (19)
Canada	21.1 (11)	16.6 (25)	2.5 (40)	1.9 (32)	4.7 (26)	1.3 (21)	5.9 (46)	2.8 (48)
Chile	13.1 (42)	20.8 (10)	10.9 (9)	1.3 (44)	7.4 (13)	3.4 (9)	32.5 (3)	13.2 (6)
China	5.5 (50)	1.0 (50)	3.8 (30)	0.4 (49)	21.6 (1)	9.6 (3)	32.7 (2)	15.1 (4)
Colombia	12.5 (44)	21.6 (9)	18.2 (5)	1.5 (42)	4.7 (26)	2.1 (12)	27.8 (7)	15.7 (2)
Croatia	20.0 (14)	13.5 (32)	5.0 (24)	2.5 (19)	5.8 (18)	0.8 (33)	19.4 (13)	8.0 (18)
Cuba	14.6 (37)	26.4 (4)	8.3 (12)	5.8 (3)	4.4 (32)	1.4 (18)	6.9 (43)	3.6 (42)
Czech Republic	20.0 (14)	17.2 (24)	5.5 (23)	4.6 (5)	4.7 (26)	0.7 (37)	12.1 (24)	6.4 (25)
Denmark	27.8 (1)	22.6 (7)	5.0 (24)	2.9 (12)	7.0 (14)	1.9 (13)	5.4 (48)	3.3 (45)
Estonia	20.4 (13)	17.6 (23)	6.6 (20)	3.6 (7)	4.6 (31)	0.4 (48)	24.1 (8)	11.4 (9)
Finland	17.4 (28)	18.0 (20)	1.8 (49)	2.7 (17)	2.5 (43)	1.2 (23)	7.9 (40)	4.5 (36)
France	21.5 (10)	18.2 (19)	3.1 (35)	2.2 (26)	8.6 (9)	1.2 (23)	7.0 (42)	3.1 (46)
Germany	21.6 (9)	15.8 (28)	3.8 (30)	1.9 (32)	5.0 (23)	1.0 (28)	10.3 (28)	6.4 (25)
Greece	15.4 (36)	11.2 (37)	2.5 (40)	1.3 (44)	1.3 (50)	0.4 (48)	8.9 (35)	4.3 (37)
Hungary	24.6 (4)	18.4 (17)	6.7 (19)	4.1 (6)	9.1 (7)	1.3 (21)	18.2 (14)	8.5 (16)
Iceland	19.6 (16)	23.0 (6)	4.7 (26)	1.9 (32)	4.7 (26)	1.6 (16)	9.0 (34)	3.5 (43)
Ireland	25.5 (3)	19.7 (14)	3.5 (32)	1.6 (40)	7.9 (11)	4.0 (8)	8.5 (38)	4.8 (34)
Israel	24.0 (7)	13.4 (33)	2.3 (44)	2.2 (26)	1.6 (48)	0.8 (33)	8.9 (35)	4.7 (35)
Italy	18.9 (19)	12.2 (36)	2.2 (47)	2.2 (26)	3.4 (35)	0.7 (37)	12.6 (23)	6.5 (23)
Japan	8.3 (49)	5.7 (45)	2.8 (38)	1.3 (44)	7.5 (12)	1.1 (27)	28.7 (6)	12.7 (8)
Kazakhstan	18.7 (20)	6.0 (43)	7.9 (14)	7.4 (1)	19.1 (3)	10.0 (2)	34.7 (1)	15.4 (3)
Latvia	18.5 (21)	13.4 (33)	7.4 (18)	3.2 (10)	5.6 (19)	0.6 (41)	22.2 (10)	10.4 (10)
Lithuania	17.6 (27)	16.6 (25)	9.0 (11)	3.6 (7)	6.0 (17)	0.6 (41)	22.4 (9)	9.7 (12)
Macedonia	17.7 (25)	8.7 (40)	7.6 (17)	2.1 (29)	1.4 (49)	0.4 (48)	20.3 (11)	8.7 (15)
Mali	13.1 (42)	6.0 (43)	28.4 (3)	0.6 (48)	2.8 (40)	1.4 (18)	16.1 (20)	18.3 (1)
Mauritius	9.3 (48)	7.5 (42)	10.2 (10)	0.1 (50)	3.4 (35)	1.5 (17)	10.1 (30)	5.1 (32)
Mexico	10.5 (46)	14.8 (31)	14.1 (7)	1.9 (32)	1.9 (47)	0.7 (37)	9.9 (31)	7.2 (20)
Moldova	17.7 (25)	4.7 (48)	7.8 (15)	2.9 (12)	2.7 (42)	0.6 (41)	17.8 (15)	7.1 (21)
New Zealand	24.5 (5)	20.3 (11)	3.2 (34)	2.5 (19)	4.4 (32)	1.8 (14)	8.0 (39)	4.1 (38)
Norway	17.9 (24)	28.4 (2)	3.5 (32)	2.3 (24)	3.3 (38)	0.9 (29)	9.4 (32)	5.0 (33)
Poland	15.5 (35)	12.4 (35)	7.8 (15)	2.8 (14)	4.7 (26)	0.8 (33)	16.6 (18)	6.2 (28)
Portugal	17.0 (30)	19.9 (12)	4.5 (28)	1.9 (32)	5.6 (19)	0.9 (29)	20.3 (11)	10.1 (11)
Romania	16.7 (31)	9.0 (38)	13.0 (8)	2.0 (30)	2.8 (40)	0.5 (44)	17.0 (16)	6.6 (22)
Russian Federation	18.0 (23)	8.2 (41)	6.5 (21)	3.6 (7)	6.9 (15)	1.2 (23)	31.8 (4)	13.5 (5)
Saudi Arabia	10.9 (45)	5.3 (46)	2.5 (40)	1.8 (38)	3.4 (35)	2.9 (10)	4.9 (49)	3.0 (47)
Slovakia	19.3 (17)	16.5 (27)	6.1 (22)	5.1 (4)	8.2 (10)	0.5 (44)	16.6 (18)	6.4 (25)
Slovenia	22.1 (8)	18.8 (16)	4.7 (26)	3.0 (11)	4.8 (25)	0.9 (29)	17.0 (16)	8.2 (17)
South African Republic	16.4 (32)	22.6 (7)	21.0 (4)	1.5 (42)	19.2 (2)	6.9 (5)	7.6 (41)	3.4 (44)
Spain	15.9 (34)	14.9 (30)	2.2 (47)	2.4 (22)	5.1 (21)	0.5 (44)	11.4 (25)	5.4 (29)
Sweden	17.3 (29)	27.7 (3)	3.1 (35)	2.3 (24)	3.3 (38)	0.9 (29)	6.8 (44)	3.8 (41)
The Netherlands	27.5 (2)	19.7 (14)	2.3 (44)	2.4 (22)	6.8 (16)	2.2 (11)	9.1 (33)	4.1 (38)
Turkey	9.7 (47)	5.0 (47)	2.4 (43)	2.0 (30)	2.0 (46)	1.4 (18)	10.4 (26)	5.4 (29)
Uganda	13.4 (40)	32.5 (1)	29.2 (2)	1.2 (47)	12.5 (5)	11.3 (1)	6.6 (45)	5.2 (31)
United Kingdom	24.3 (6)	17.9 (21)	3.1 (35)	1.8 (38)	9.0 (8)	4.1 (7)	8.7 (37)	4.0 (40)
Venezuela	13.4 (40)	19.8 (13)	16.8 (6)	1.9 (32)	2.4 (44)	0.8 (33)	14.5 (22)	9.3 (13)
Zimbabwe	14.1 (38)	23.5 (5)	43.1 (1)	2.8 (14)	17.6 (4)	8.4 (4)	10.4 (26)	9.1 (14)

Source: Ferlay J, Bray F, Pisani P, Parkin, DM. GLOBOCAN 2002: Cancer Incidence, Mortality and Prevalence Worldwide IARC CancerBase No. 5, version 2.0. IARC Press, Lyon, 2004.

American Cancer Society, Surveillance Research, 2006

Tobacco Use

Smoking remains the most preventable cause of death in our society. Since the first Surgeon General's report on smoking and health was published in 1964, there have been more than 12 million premature deaths attributable to smoking in the United States.¹ Worldwide in 2000 alone, about 4.8 million smoking-related premature deaths occurred. The number of deaths was almost evenly divided between industrialized and developing nations and was greater in men (80% of smoking-attributable deaths) than in women. More men die from smoking in developing nations (2.02 million) than in industrialized nations (1.81 million).²

Health Consequences of Smoking

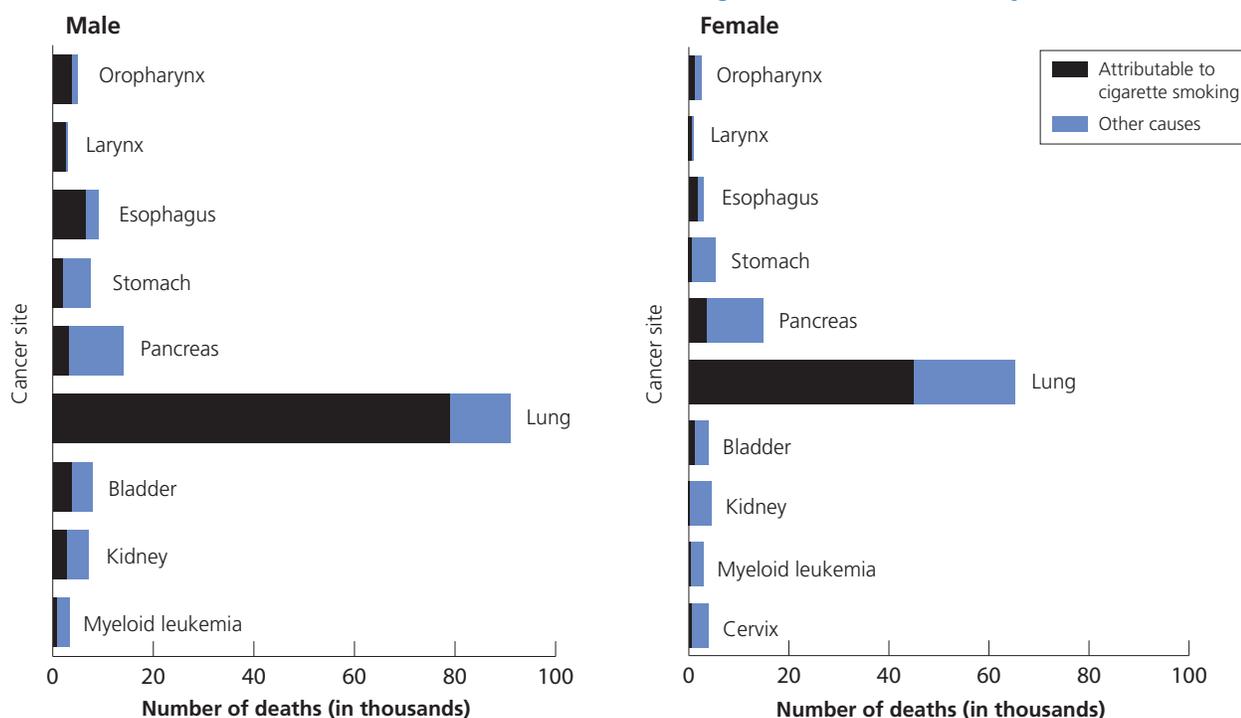
Half of all Americans who continue to smoke will die from smoking-related diseases.³ In the United States, tobacco use is responsible for nearly one in five deaths; this amounted to an estimated 438,000 premature deaths each year between 1997-2001.^{4,6} In addition, an estimated 8.6 million persons suffer from smoking-caused chronic conditions (chronic bronchitis, emphysema, and other 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 is associated with increased risk for at least 15 types of cancer: nasopharynx, nasal cavity and paranasal sinuses, lip, oral cavity, pharynx, larynx, lung, esophagus, pancreas, uterine cervix, kidney, bladder, stomach, and acute myeloid leukemia.¹
- 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 no different in smokers of "light" or "low-tar" yield cigarettes.¹⁰

Reducing Tobacco Use and Exposure

A recent US Surgeon General's report on reducing tobacco use outlined the goals and components of comprehensive statewide tobacco control programs.¹¹ The goal of comprehensive tobacco control programs is to reduce disease, disability, and death related to tobacco use by preventing the initiation of tobacco use

Annual Number of Cancer Deaths Attributable to Smoking, Males and Females, by Site, US, 1997-2001



Source: Centers for Disease Control and Prevention, Annual smoking-attributable mortality, years of potential life lost, and productivity losses – United States, 1997-2001. *MMWR Morb Mortal Wkly Rep.* 2005;54(25):625-628.

American Cancer Society, Surveillance Research, 2006

among youth, promoting quitting among young people and adults, eliminating nonsmokers' exposure to second-hand smoke, and identifying and eliminating the disparities related to tobacco use and its effects among different population groups.¹² The Centers for Disease Control and Prevention has recommended funding guidelines for comprehensive tobacco use prevention and cessation programs for all 50 states and the District of Columbia. In 2004, only four states (Arkansas, Delaware, Maine, and Mississippi) invested at least the minimum per capita amount recommended for tobacco control programs.¹³ With adequate funding levels, comprehensive tobacco control programs in some states (e.g., California, Massachusetts, Florida, and Maine) have reduced smoking rates and saved states millions of dollars in tobacco-related health care costs.^{11,14} (For more information about tobacco control, please see *Cancer Prevention and Early Detection Facts & Figures 2005* (8600.05), available online at www.cancer.org.)

Trends in Smoking

- Cigarette smoking among adults aged 18 and older declined 48% between 1965 and 2003 – from 42% to 22%; nevertheless, an estimated 45 million Americans are current smokers.¹⁵⁻¹⁷
- Although cigarette smoking became prevalent among men before women, the gender gap narrowed in the mid-1980s and has since remained constant.¹⁸ As of 2003, there was a 3% difference in smoking prevalence between white men and women, and a difference of 7% between African American men and women.¹⁷
- While the percent of smokers decreased for all levels of educational attainment between 1983 and 2003, college graduates achieved the greatest decline of 43% (21% to 12%). Among adults without a high school education, the percentage decreased 34% from 41% to 27%.^{15,17}
- Annual per capita cigarette consumption among US adults continues to decline, peaking in 1963 at 4,345 cigarettes per capita, and declining to 1,791 in 2004, a net reduction of 59%.^{19,20}
- Although cigarette smoking among US high school students increased significantly from 1991 (28%) to 1997 (36%), it declined dramatically to 22% by 2004.²¹⁻²³
- In 1997, nearly one-half (48%) of male high school students and more than one-third (36%) of female students reported using some form of tobacco – cigarettes, cigars, or smokeless tobacco – in the past

month. The percentages declined to 32% for male students and 25% for female students in 2004.^{22,24,25}

Spit Tobacco

In 1986, the US Surgeon General concluded that chewing tobacco and snuff are not safe substitutes for smoking cigarettes or cigars, as these products cause various cancers and noncancerous oral conditions, and can lead to nicotine addiction.²⁶

- There is no evidence that switching to snuff or chewing tobacco is more effective or as safe in helping smokers quit as conventional cessation therapies.²⁷
- The risk of cancer of the cheek and gums may increase nearly 50-fold among long-term snuff users.²⁶
- According to the US Department of Agriculture, US output of moist snuff has increased more than 50% in the past decade from 48 million pounds in 1991 to 72 million pounds in 2003.^{19,20}
- In 2003, about 3% of US adults used smokeless tobacco in the past month: 7% of men and 1% of women. American Indian/Alaska Natives (8%) and whites (4%) were more likely to use smokeless tobacco than African Americans (2%), Native Hawaiian and Pacific Islanders (2%), or Hispanics/Latinos (1%).²⁸
- Nationwide, 11% of US male high school students and 1% of female high school students were currently using chewing tobacco, snuff, or dip in 2004. White students (8%) were more likely to use smokeless tobacco than Hispanics/Latinos (4%), Asian (2%), or African American (2%) students.²⁸

Cigars

The consumption of large cigars and cigarillos increased 146% from 1993 to 2004.²⁰ An estimated 5.3 billion large cigars and cigarillos were expected to be consumed in 2004.²⁰ Small-cigar production increased from 1.5 billion pounds in 1997 to 2.6 billion in 2003.²⁰

- According to a state-based survey in 1998, the median percentage of adults aged 18 years and older who ever smoked cigars was 40%.²⁹ More men than women had ever smoked cigars in all 50 states.³⁰
- In 2003, the percentage of adults aged 18 and older who had smoked cigars in the past month was 6%.²⁹
- Nationwide, 13% of US high school students had smoked cigars, cigarillos, or little cigars on at least one of the past 30 days. In 2001, seven major cigar manufacturers began to provide five rotating health

warnings on labels of cigars sold in the US. The companies agreed to the warnings in June 2000 to settle a lawsuit brought by the Federal Trade Commission for failure to warn consumers of the dangers of cigar smoking. Cigar smoking has health consequences and hazards similar to those of cigarettes and smokeless tobacco such as:³¹

- Cancer of the lung, oral cavity, larynx, esophagus, and probably pancreas
- Four to 10 times the risk of dying from laryngeal, oral, or esophageal cancers compared with nonsmokers

Smoking Cessation

In 1990, the US Surgeon General outlined the benefits of smoking cessation:³²

- People who quit, regardless of age, live longer than people who continue to smoke.
- Smokers who quit before age 50 cut their risk of dying in the next 15 years in half compared with 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 coronary heart disease and cardiovascular disease.

Among adults 18 and older in 2003, national data showed:^{16,17}

- An estimated 45.9 million adults were former smokers, representing 50.3% of persons who ever smoked.
- Among those who smoke, an estimated 15.1 million (or 41.1%) had stopped smoking at least one day during the preceding 12 months because they were trying to quit.
- Of smokers who had smoked every day or some days during the preceding year, 47% quit and maintained abstinence for 3-12 months.³³

In 2003, among US high school students who were current cigarette smokers, national data showed that more than one-half (54%) had tried to quit smoking cigarettes during the 12 months preceding the survey, with female students (56%) more likely than male students (52%) to have made a quit attempt.³⁴

Secondhand Smoke

Secondhand smoke, or environmental tobacco smoke (ETS), contains numerous human carcinogens for which there is no safe level of exposure. Scientific consensus groups have repeatedly reviewed the data on ETS. These include the US Environmental Protection Agency,³⁵ California Environmental Protection Agency,^{36,37} and the National Institute of Environmental Sciences' National Toxicology Program.³⁸ Public policies to protect people from secondhand smoke are based on the following detrimental effects of ETS:

- Each year, about 3,000 nonsmoking adults die of lung cancer as a result of breathing secondhand smoke.⁶
- ETS causes an estimated 35,000 deaths from heart disease in people who are not current smokers.⁶
- ETS causes coughing, phlegm, chest discomfort, and reduced lung function in nonsmokers.³⁵
- Each year, exposure to secondhand smoke causes 150,000 to 300,000 lower respiratory tract infections (such as pneumonia and bronchitis) in US infants and children younger than 18 months of age. These infections result in 7,500 to 15,000 hospitalizations every year.³⁵
- Secondhand smoke increases the number of asthma attacks and the severity of asthma in about 200,000 to 1 million asthmatic children.³⁵
- Some studies report an association between ETS exposure and increased risk of breast cancer. This evidence is currently being evaluated by the US Surgeon General.
- Secondhand smoke contains over 4,000 substances, more than 50 of which are known or suspected to cause cancer in humans and animals and many of which are strong irritants.³⁵

Momentum to regulate public smoking began to increase in 1990. Government and private business policies that limit smoking in public workplaces have become increasingly common and restrictive.³⁹ Forty-five states have approved some form of clean indoor air law affecting public places. Presently in the US, over 2,000 municipalities have passed smoke-free legislation and 15 states (Delaware, Massachusetts, New York, California, Connecticut, Florida, Idaho, Rhode Island, Maine, South Dakota, Utah, North Dakota, Vermont, Montana, and Washington) have implemented statewide smoking bans that prohibit smoking in workplaces and/or restaurants and/or bars.⁴⁰

- During 1998-1999, 79% of worksites with at least 50 or more employees had formal policies that prohibited smoking or limited it to separately ventilated areas.⁴¹
- In 1999, about 69% of US indoor workers were covered by a smoke-free workplace policy. However, the proportion of workers covered by such policies varied widely. Food preparation and service occupations workers (43%) had the lowest rate of coverage among all occupational groups examined.⁴²

Worldwide Tobacco Use

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

- In 1998, developing countries consumed 67% of the world's tobacco. With consumption increasing at an average annual rate of 1.7%, the developing world will consume 71% of the world's tobacco by 2010. About 80% of the projected increase will occur in East Asia, particularly China.⁴³
- In 2003, the number of smokers in the world was estimated at about 1.3 billion people (more than 1 billion men, 250 million women). This figure is expected to rise to at least 1.7 billion (1.2 billion men, 500 million women) by 2025, with the doubling in the number of female smokers making the greatest contribution to the increase.⁴⁴
- Female smoking prevalence rates have peaked in a handful of economically developed countries, such as Australia, Canada, the United Kingdom, and the United States, but in most countries, female smoking rates are still increasing or show no evidence of decline.⁴⁵ Female smoking rates in both developing and developed nations are expected to converge at 20%-25% by 2030.^{45,46}
- Based on current patterns, smoking-attributable diseases will kill about 650 million of the world's 1.3 billion smokers alive today.^{47,48}
- In 2000, there were about 4.8 million smoking-related premature deaths worldwide, nearly evenly divided between developed (2.43 million deaths) and developing (2.41 million deaths) nations.²
- In a series of surveys among youth aged 13-15 conducted in 77 countries and territories between 1998 and 2002, 15% of boys and 6.6% of girls reported smoking cigarettes, and 10.9% of boys and 7.4% of girls reported using other tobacco products.⁴⁹ In every region of the world, the ratio of male to female smoking among youth was lower than the ratio reported among adults, reflecting a global trend of increased smoking among female youth.⁴⁹

To curtail the tobacco pandemic, the 192 member states of the World Health Assembly unanimously adopted the first global public health treaty, the Framework Convention on Tobacco Control (FCTC) on May 21, 2003. The treaty was ratified by a requisite of 40 countries on November 30, 2004, and subsequently entered into force as a legally binding accord for all ratifying states on February 27, 2005.⁵⁰ It 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.⁵¹ Parties to the treaty are expected to strengthen national legislation, enact effective tobacco control policies, and cooperate internationally to reduce global tobacco consumption.⁵²

Costs of Tobacco

The number of people who prematurely die or suffer illness from tobacco use results in substantial health-related economic costs to society. In the US, smoking causes 3.3 million years of potential life lost for men and 2.2 million years of potential life lost for women. Smoking, on average, reduces life expectancy by approximately 14 years.⁶ Additional data showed:⁶

- Smoking caused more than \$167 billion in annual health-related economic costs, including adult mortality-related productivity costs, adult medical expenditures, and medical expenditures for newborns.
- Mortality-related productivity losses in the US amounted to \$92 billion annually during 1997-2001,⁶ up about \$10 billion from \$81.9 billion annually during 1995-1999.⁵
- Smoking-related medical costs totaled \$75.5 billion in 1998, and accounted for 8% of personal health care medical expenditures. This translates to \$1,623 in excess medical expenditures per adult smoker in 1999.⁶
- Smoking-attributable costs for newborns were \$366 million in 1996 or \$704 per maternal smoker.⁵
- In 2001, states spent an estimated \$12 billion treating smoking-attributable diseases.⁵³

- Each pack of cigarettes sold in 1999 cost society \$3.45 in medical care due to smoking and \$3.73 in productivity losses, for a total of \$7.18 per pack.
- A recent review of the cost of treating smoking-attributable diseases in the US showed that they range from 6%-8% of personal health expenditures.⁵⁴

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Nutrition and Physical Activity

Scientific evidence suggests that about one-third of the cancer deaths that occur in the US each year are due to nutrition and physical activity factors, including excess weight. For the majority of Americans who do not use tobacco, dietary choices and physical activity are the most important modifiable determinants of cancer risk.

Evidence also indicates that, although inherited genes do influence cancer risk, heredity alone explains only a fraction of all cancers. Most of the variation in cancer risk across populations cannot currently be explained by inherited factors; behavioral factors such as cigarette smoking, certain dietary patterns, physical activity, and weight control can substantially affect the risk of developing cancer. These factors modify cancer risk at all stages of its development.

The American Cancer Society reviews and updates its nutrition and physical activity guidelines every 5 years. The Society's most recent guidelines, published in 2001, emphasize the importance of dietary patterns, physical activity, and weight control in reducing cancer risk. Because it is clear that the social environment in which people live, work, play, and go to school is a powerful influence on diet and activity habits, the Society included, for the first time, an explicit *Recommendation for Community Action* to promote the availability of healthy food choices and opportunities for physical activity in schools, worksites, 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 of heart disease and diabetes as well.

Recommendations for Individual Choices

1. Eat a variety of healthy foods, with an emphasis on plant sources.

- Eat 5 or more servings of a variety of vegetables and fruits each day.
- Choose whole grains instead of processed (refined) grains and sugar.
- Limit consumption of red meats, especially high-fat and processed meats.
- Choose foods that help maintain a healthy weight.

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. 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, overnutrition and energy imbalance, or the amount and distribution of body fat at particular stages of life affect one'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 and to decrease consumption of processed foods.

2. Adopt a physically active lifestyle.

- **Adults:** Engage in moderate activity for 30 minutes or more on 5 or more days of the week; 45 minutes or more of moderate to vigorous activity on 5 or more days per week may further enhance reductions in the risk of breast and colon cancers.
- **Children and adolescents:** Engage in at least 60 minutes per day of moderate to vigorous physical activity.

Scientific evidence indicates that physical activity may reduce the risk of certain cancers as well as provide other important health benefits. Regular physical activity contributes to the maintenance of a healthy body weight by balancing caloric intake with energy expenditure. Other mechanisms by which physical activity may help to prevent certain cancers may involve both direct and indirect effects. For colon cancer, physical activity accelerates the movement of food through the intestine, thereby reducing the length of time that the bowel lining is exposed to potential carcinogens. For breast cancer, vigorous physical activity may decrease the exposure of breast tissue to circulating estrogen. Physical activity may also affect cancers of the colon, breast, and other sites by improving energy metabolism and reducing circulating concentrations of insulin and related growth factors. Physical activity helps to prevent type 2 diabetes, which is associated with increased risk of cancers of the colon, pancreas, and possibly other sites. The benefits of physical activity go far beyond reducing the risk of

cancer. They include reducing the risk of heart disease, high blood pressure, diabetes, osteoporosis, falls, stress, and depression.

3. Maintain a healthy weight throughout life.

- Balance caloric intake with physical activity.
- Lose weight if currently overweight or obese.

Overweight and obesity are associated with increased risk for several cancer sites, including breast (among postmenopausal women), colon, rectum, endometrium, adenocarcinoma of the esophagus, gallbladder, pancreas, liver, gastric cardia, and kidney. The best way to achieve a healthy body weight is to balance energy intake (food intake) with energy expenditure (metabolism and physical activity). Excess body fat can be reduced by restricting caloric intake and increasing physical activity. Caloric intake can be reduced by decreasing the size of food portions and limiting the intake of high-calorie foods (e.g., those high in fat and refined sugars such as fried foods, cookies, cakes, candy, ice cream, and soft drinks). Such foods should be replaced with more healthy vegetables and fruits, whole grains, and beans. While too few people lose and maintain significant weight loss to directly study the impact of weight loss on subsequent cancer risk, weight loss is associated with reduced levels of circulating hormones that are associated with increased cancer risk. Therefore, people who are overweight should be encouraged to achieve and maintain a healthy weight.

Because overweight in youth tends to continue throughout life, efforts to establish a healthy weight and healthy patterns of weight gain should begin in childhood. The increasing prevalence of overweight and obesity in pre-adolescents and adolescents may increase incidence of cancer in the future.

4. If you drink alcoholic beverages, limit consumption.

People who drink alcohol should limit their intake to no more than 2 drinks per day for men and 1 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 intake of more than 2 drinks per day. Regular consumption of even a few drinks per week has been associated with an 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 Recommendation for Community Action

Public, private, and community organizations should work to create social and physical environments that support the adoption and maintenance of healthy nutrition and physical activity behaviors.

- Increase access to healthy foods in schools, worksites, and communities.
- Provide safe, enjoyable, and accessible environments for physical activity in schools and for transportation and recreation in communities.

Because the Society recognizes that individual choices about diet and physical activity are strongly affected by the surrounding environment, it included a first-ever recommendation for community action in the current edition of *Nutrition and Physical Activity Guidelines for Cancer Prevention*. The Society recommends that public, private, and community organizations work together to increase access to healthy foods in schools, worksites, and communities; to provide safe, enjoyable, and accessible environments for physical activity in schools; and to offer transportation and recreation in communities. Achieving this recommendation will require multiple strategies and bold action, ranging from the implementation of community and worksite health promotion programs to policies that affect community planning, transportation, school-based physical education, and food services. The tobacco control experience has shown that policy and environmental changes at national, state, and local levels are critical to achieving changes in individual behavior. Measures such as clean 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.

The American Cancer Society

In 1913, 10 physicians and five laypeople founded the American Society for the Control of Cancer. Its stated purpose was to disseminate knowledge about cancer symptoms, treatment, and prevention; to investigate conditions under which cancer was found; and to compile cancer statistics. Later renamed the American Cancer Society, Inc., the organization now includes more than two million Americans working together to conquer cancer.

Since its inception nearly a century ago, the American Cancer Society has made significant contributions to our country's progress against cancer. The Society's work in cancer research, education, advocacy, and service has yielded remarkable strides in cancer prevention, early detection, treatment, and patient quality of life. As a result, overall cancer mortality has steadily declined since the early 1990s, and the five-year survival rate is now 65%, up from 50% in the 1970s. Today, more than ever, our goal of eliminating cancer as a major health threat is within reach.

How the American Cancer Society Is Organized

The American Cancer Society consists of a National Home Office with 13 chartered Divisions and a local presence in almost all communities nationwide.

The National Society. A National Assembly of volunteer representation from each Division approves Division charters and elects a national volunteer Board of Directors. The Board of Directors sets and approves strategic goals for the Society, ensures management accountability, 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 13 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. More than 3,400 local offices nationwide raise funds at the community level and deliver cancer

prevention, early detection, and patient services programs.

Volunteers. More than two million volunteers carry out the Society's work in communities across the country. These dedicated volunteers donate their time and talents to further cancer research; educate the public about early detection and prevention; advocate for responsible cancer legislation in the local, state, and federal governments; serve cancer patients and their families; and raise funds for the fight against cancer.

How the American Cancer Society Fights Cancer

The Society has set challenge goals for 2015 to dramatically decrease both incidence and mortality rates from cancer while increasing the quality of life for all cancer survivors. The Society is uniquely qualified to make a difference in the fight against cancer by continuing a 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 cancer-related information they need.

Research

The aim of the American Cancer Society's research program is to determine the causes of cancer and to support efforts to prevent, detect, and cure the disease. The Society is the largest source of private, nonprofit cancer research funds in the US, second only to the federal government in total dollars spent.

In 2005, the Society spent an estimated \$125 million on research and health professional training, and has invested approximately \$3 billion in cancer research since the program began in 1946. The Society's comprehensive research program consists of three components: extramural grants, intramural epidemiology and surveillance research, and the intramural behavioral research center. Intramural research programs are led by the Society's own staff scientists.

Extramural Grants

The American Cancer Society's extramural grants program supports the best research in a wide range of cancer-related disciplines at approximately 115 of the top US medical schools and universities. Grant applications are solicited through a nationwide competition and are subjected to a rigorous external peer review, ensuring that only the most promising research is funded.

The Society most often funds investigators early in their research careers, a time when they are less likely to receive funding from the federal government. The Society's priorities focus on needs that are unmet by other funding organizations, such as the current targeted research area of cancer in the poor and medically underserved. Thirty-eight Nobel Prize winners received grant support from the Society early in their careers.

Epidemiology and Surveillance Research

For 60 years, the Society's intramural epidemiologic research program has evaluated trends in cancer incidence, mortality, and survival. Through this program, the Society publishes the most current statistic and trend information in a variety of *Cancer Facts & Figures* publications. These publications are the most widely cited source for cancer statistics and are available in hard copy or online through the Society's Web site at www.cancer.org.

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 progress related to cancer prevention and control in the US. Internationally, the Society collaborates with the World Health Organization to monitor tobacco consumption, production, and trade in 197 countries.

Society researchers also conduct large prospective studies to identify factors that cause or prevent cancer. Three such studies have been conducted over the past 50 years:

- Hammond-Horn Study (188,000 men studied from 1952-1955 in 9 states)
- Cancer Prevention Study I (CPS-I, 1 million people studied from 1959-1972 in 25 states)
- Cancer Prevention Study II (CPS-II, an ongoing study of 1.2 million people enrolled in 1982 in 50 states)

A third Cancer Prevention Study is slated to begin in 2006. More than 300 scientific publications resulting from these studies have identified the contributions of lifestyle (smoking, nutrition, obesity, etc.), family history, illnesses, medications, and environmental exposures to various cancers.

Additional information about the Cancer Prevention Studies, including copies of questionnaires and publication citations, is available at www.cancer.org.

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 as an intramural department.

The Center's research has focused on five aspects of the cancer experience, from prevention, through detection and screening, treatment, to survivorship, and end-of-life issues. It also focuses on special populations, including minorities, the poor, rural populations, and other underserved groups. The Center's ongoing research projects include:

- An extensive, nationwide longitudinal study of adult cancer survivors to determine the unmet psychosocial needs of survivors and their loved ones, to identify factors that affect their quality of life, to evaluate programs intended to meet their needs, and to examine late effects, including second cancers.
- A large-scale, nationwide, cross-sectional study of cancer survivors who are two, five, and 10 years from their initial diagnosis and treatment. This study will evaluate cancer survivors' quality of life and provide data on survivors at several different time-points since diagnosis.
- Two family caregiver studies explore the impact of the family's involvement in cancer care on the quality of life of the cancer survivor and the family caregiver. The first study identifies the prevalence of the family's involvement in cancer care and the unmet needs of caregivers at two and five years after diagnosis, and examines the impact on the caregiver's quality of life and health behaviors. The second longitudinal study follows cancer patients and their caregivers from the time of diagnosis and examines the behavioral, physical, psychological, and spiritual adjustment of the patients and their family caregivers across various ethnic groups.
- A study to test the Patient/Provider/System Theoretical Model (PPSTM) for cancer screening in federally funded primary care centers, which provide care for many underserved populations. Through partnership with researchers from the National Center for Primary Care, this project seeks to identify factors that influence screening behaviors (patients) and screening recommendations (providers, health care systems).

- A study of cancer knowledge, attitudes, beliefs, and risk perceptions among college students. Through partnerships with selected historically black colleges/universities and faculty liaisons, this study aims to gather baseline information from students and campus health centers. The long-term goal of this research is to enhance knowledge and awareness of cancer risk reduction strategies and early detection.

Education

The American Cancer Society's education efforts are aimed at informing the public and health professionals about opportunities to reduce cancer risk and increase cancer survival.

Prevention

Primary cancer prevention means taking the necessary precautions to prevent the occurrence of cancer. The Society's prevention programs focus on preventing the use of tobacco products; highlighting the relationship between diet, physical activity, and cancer; and reducing the risk of skin cancer.

The American Cancer Society collaborates with several national groups to implement comprehensive tobacco control programs. The Society's tobacco control efforts include:

- Reducing tobacco advertising and promotions directed at young people
- Increasing funding to support comprehensive tobacco control programs and tobacco-related research
- Reducing secondhand smoke exposure
- Providing access to cessation programs for people who wish to quit, including a science-based, telephone counseling service
- Increasing tobacco taxes to offset the health care costs associated with tobacco use
- Supporting global partnerships to reduce tobacco-related deaths and diseases

Eating well, being physically active, and maintaining a healthy weight are also important ways to reduce cancer risk. The Society publishes its Guidelines on Nutrition and Physical Activity for Cancer Prevention to help people reduce their cancer risk through a healthy diet and physical activity. The Society has also developed a number of science-based programs that encourage people to maintain a healthy weight through proper diet and exercise.

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 recommendations for cancers of the breast, cervix, colon and rectum, information and guidance related to testing for early prostate and lung cancer, and general recommendations for a cancer-related checkup to examine the thyroid, mouth, skin, lymph nodes, and testicles.

Throughout its history, the American Cancer Society has implemented a number of aggressive public awareness campaigns targeting the public and health care professionals. Campaigns to increase usage of the Pap test and mammography have led to a 70 percent 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. In 2005, the Society launched a multimedia campaign to encourage adults aged 50 and older to get tested for colon cancer. The Society also continues to encourage the early detection of breast cancer through public awareness and other efforts targeting poor and underserved communities.

Treatment

In addition to providing comprehensive information about all available cancer treatments, the Society collaborates with organizations such as the National Comprehensive Cancer Network (NCCN), an alliance of 19 of the country's leading cancer centers, to ensure that people with cancer receive the highest quality care. Through this alliance, the Society produces treatment guidelines for cancer patients and physicians and works with NCCN to translate Clinical Practice Guidelines in Oncology into easy-to-understand booklets for patients and their families. These booklets help guide cancer patients to appropriate treatment and assist them in understanding the treatment process so that they become well-informed partners in their treatment.

Information Delivery

Information on cancer across the cancer continuum, from prevention to survivorship, is available to the public 24 hours a day, seven days a week, through the Society's 1-800 number (1-800-ACS-2345) and public Web site, www.cancer.org. The site includes an inter-

active 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 online at www.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*, as well as several cancer-related and clinical oncology books. More information about free subscriptions and online access to *CA* and *Cancer Cytopathology* articles can be found at www.cancer.org/bookstore.

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.

Advocacy

Many of the most important cancer decisions are made not just in the doctor's office, but also in state houses, in Congress, and in the White House. Government officials make decisions every day about health issues that affect people's lives. The American Cancer Society works with all levels of government, advocating for stronger policies, laws, and regulations that will reduce the burden of cancer.

The Society's advocacy initiatives rely on the combined efforts of a community-based grassroots network of cancer survivors and caregivers, Society volunteers and staff, health care professionals, public health organizations, and other collaborative partners. Through grassroots action, direct lobbying, and applied policy analysis, the Society has become an established leader on cancer issues and a respected voice for the cancer community before Congress and the Administration.

The Society's advocacy work is a core, underlying strategy for realizing its four leadership roles:

- **Support high-impact research.** The federal government is the largest source of funding for cancer research. Thanks in part to Society advocacy efforts, Congress doubled the NIH budget over a 5-year period (1998-2003), affording exciting new opportunities for cancer discovery. The Society continues its advocacy work in this area to ensure that the federal government continues and expands its support for cancer research.

- **Prevent and detect cancer early.** The American Cancer Society also advocates for federal programs that ensure that all Americans, regardless of income level, have access to lifesaving prevention, early detection, and treatment programs. For example, the Society successfully lobbied Congress for millions of dollars in additional funding for the Centers for Disease Control and Prevention's (CDC) National Breast and Cervical Cancer Early Detection Program (NBCCEDP), which helps low-income uninsured and underinsured women get tested for breast and cervical cancer. In addition, the Society helped secure the passage and implementation in all 50 states and the District of Columbia of the Breast and Cervical Cancer Prevention and Treatment Act, the treatment companion legislation of NBCCEDP. However, the NBCCEDP only serves 1 out of 5 eligible women due to limited funding. The Society is working hard to reauthorize the program and to expand federal and state funding to ensure access for more women who are eligible for the program. The Society is aggressively advocating for programs and policies on the federal, state, and local levels to help prevent and detect colorectal, breast, and cervical cancers at an early stage when treatment is more effective.

- **Support better decisions through information.** The Society was the lead organization working with Congress to pass "patient navigator" legislation to reduce barriers and expand access to care for low-income populations and other medically underserved communities. Signed into law on June 29, 2005 by President George W. Bush, this legislation will provide grant monies to health care entities to set up navigator programs to offer the assistance of a patient navigator who is skilled in providing culturally relevant information, conducting outreach in medically underserved communities, and navigating individuals through the complex health care system.

- **Improve quality of life.** Providing adequate pain and symptom control, as well as other aspects of palliative care, from the time of diagnosis throughout the balance of life has become increasingly important to eliminate suffering and measurably improve the quality of life for cancer patients and their families. The Society has been working in many states to establish policies that support palliative care, with particular focus on pain and symptom management, and to repeal policies that prevent cancer patients from being able to adequately control their pain and other symptoms.

Patient/Survivor Services

For the almost 1.4 million patients diagnosed this year and the more than 10 million cancer survivors alive today, the American Cancer Society offers a range of services to help patients and their families through cancer treatment, recovery, and beyond. From comprehensive cancer information that helps patients understand their disease and their treatment options to community programs that ease the physical, psychological and financial burdens of cancer, the American Cancer Society stands ready to help 24 hours a day, seven days a week, via 1-800-ACS-2345 and www.cancer.org.

The following are descriptions of American Cancer Society programs that can be found in many communities across the country:

Cancer Survivors NetworkSM: Created by and for cancer survivors and their families, this online community offers unique opportunities for people with cancer and their loved ones to find and connect with others like themselves. It's a welcoming, safe place for people to find hope and inspiration from others who have "been there."

I Can Cope[®]: Educational classes for adults with cancer and their loved ones are conducted in a supportive environment by doctors, nurses, social workers, and other health care professionals. Participants gain practical knowledge and skills to help them cope with the challenges of living with cancer.

Hope Lodge[®]: For patients whose best hope for a cure is far from home, this nurturing, home-like environment provides free housing close to major hospitals and cancer centers for cancer patients undergoing treatment and their caregivers.

"tlc"TM or Tender Loving Care[®]: A magazine and catalog in one, "tlc" helps women battling cancer restore their appearance and dignity with information and one-stop, private shopping for products that address special appearance-related needs, such as wigs, prostheses, hats, and other products.

Look Good...Feel Better[®]: A collaboration between the American Cancer Society; the Cosmetic, Toiletry, and Fragrance Association Foundation; and the National Cosmetology Association, this free service helps women in active treatment learn beauty techniques to restore their self-image and cope with appearance-related side effects. Certified beauty professionals provide tips on makeup, skin care, nail care, and head coverings.

Transportation solutions: The American Cancer Society can assist cancer patients and their families with finding transportation to and from treatment facilities. In some areas, trained American Cancer Society volunteer drivers donate their time and resources to take patients to and from their appointments.

Reach to Recovery[®]: Breast cancer survivors provide one-on-one support, information and inspiration to help individuals cope with breast cancer. Volunteer survivors are trained to respond in person or by telephone to individuals facing breast cancer diagnosis, treatment, recurrence, or recovery.

Man to Man[®]: This comfortable, community-based education and support program offers individual and group support and information to men with prostate cancer. Man to Man also offers men the opportunity to educate their communities about prostate cancer and to advocate with lawmakers for stronger research and treatment policies.

Children's camps: In some areas, the Society sponsors camps for child cancer survivors. These camps are equipped to handle the special needs of children undergoing treatment and the needs of the cancer survivor.

Scholarships: Fighting cancer can be an enormous financial and emotional hardship, especially on young people. In an effort to ease this burden, many American Cancer Society Divisions offer college scholarships to young cancer survivors to help them pursue higher education.

How the American Cancer Society Fights Cancer Globally

Cancer is a global burden. Now, more than ever before, the American Cancer Society is successfully working to reduce suffering and save lives from cancer for people across the globe. With 90 years of experience in cancer control, the American Cancer Society is uniquely positioned to assist and empower the world's cancer societies. The Society's expertise in volunteerism, governance, fundraising, and community-based cancer control and prevention is highly valued by developing societies and can be shared easily and inexpensively. With effective and sustainable training and support, cancer societies can play a significant role in helping people adopt healthy lifestyle choices; they can provide cancer patients and their families with high-quality cancer information; and they can advocate on behalf of policies and laws that advance cancer control efforts.

Sources of Statistics

Cancer deaths. The estimated numbers of US cancer deaths are calculated by fitting the numbers of cancer deaths for 1969 through 2003 to a statistical model which forecasts the numbers of deaths that are expected to occur in 2006. 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.

We discourage the use of our estimates to track year-to-year changes in cancer deaths because the numbers are model-based and can vary considerably from year to year, particularly for less common cancers and for smaller states. Mortality rates reported by NCHS are generally more informative statistics to use when tracking cancer mortality trends because they are based on the actual number of deaths for the most recent year available.

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 through 2002 and population data from the US Census Bureau. Unless otherwise indicated, 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 only be compared to other statistics that are age-adjusted to the US 2000 standard population.

New cancer cases. The estimated numbers of new US cancer cases are calculated by estimating the numbers of cancer cases that occurred each year from 1979 through 2002 and fitting these estimates to a statistical model which forecasts the numbers of cases that are expected to occur in 2006. Estimates of the numbers of cancer cases for 1979 through 2002 are used rather than actual case counts because case data are not available for all 50 states and the District of Columbia.

The estimated numbers of cases for 1979 through 2002 are calculated using cancer incidence rates from the regions of the US included in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program and population data collected by the US Census Bureau.

State case estimates are calculated by apportioning the total US case estimates for 2006 by state, based on the state distribution of estimated cancer deaths for 2006.

Like the method used to calculate cancer deaths, the methods used to estimate new US and state cases for the upcoming year can produce numbers that vary considerably from year to year, particularly for less common cancers and for smaller states. For this reason, we discourage the use of our estimates to track year-to-year changes in cancer occurrence. Incidence rates reported by SEER are generally more informative statistics to use when tracking cancer incidence trends for the US, and rates from state cancer registries are useful for tracking local trends.

Incidence rates. Incidence rates are defined as the number of people per 100,000 who are diagnosed with cancers during a given time period. For this publication, incidence rates for the US were calculated using data on cancer cases collected by SEER and population data collected by the US Census Bureau. State incidence rates presented in this publication are published in the North American Association of Central Cancer Registries' publication *Cancer Incidence in North America, 1998-2002*. Incidence rates for the US by race/ethnicity were originally published in *SEER Cancer Statistics Review, 1975-2002 (CSR)*. Unless otherwise indicated, incidence rates in this publication are age-adjusted to the 2000 US standard population to allow comparisons across populations that have different age distributions. Note that because of delays in reporting cancer cases to the National Cancer Institute (NCI), cancer incidence rates for the most recent diagnosis years may be underestimated. Cancers most affected by reporting delays are melanoma of the skin and prostate, which are frequently diagnosed in nonhospital settings. Delay-adjusted trends for selected cancer sites are reported in *CSR, 1975-2002*.

Survival. Unless otherwise specified, five-year relative survival rates are presented in this report for cancer patients diagnosed between 1995 and 2001, followed through 2002. 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). These rates are calculated by dividing observed 5-year survival rates for cancer patients by 5-year survival rates 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 *SEER Cancer Statistics Review, 1975-2002*. In addition to 5-year survival rates, we also presented 1-year, 10-year, and 15-year survival rates for selected cancer sites. One-year survival rates are based on cancer patients diagnosed between 1999 and 2001, 10-year survival rates are based on diagnoses between 1990 and 2001, and 15-year survival rates are based on diagnoses between 1985 and 2001. All patients were followed through 2002.

Probability of developing cancer. Probabilities of developing cancer are calculated using DevCan (Probability of Developing Cancer Software) developed by the NCI. 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 and processing methods used by the National Center for Health

Statistics: <http://www.cdc.gov/nchs/about/major/dvs/mortdata.htm>. Accessed August 20, 2005.

B. For information on data collection methods used by the National Cancer Institute's Surveillance, Epidemiology, and End Results program: Ries LAG, Eisner MP, Kosary CL, et al. (eds). *SEER Cancer Statistic Review, 1975-2002*. National Cancer Institute. Bethesda, MD, 2005. Available at: http://seer.cancer.gov/csr/1975_2002/. Accessed August 20, 2005.

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

D. For information on the methods used to estimate the numbers of new cancer cases: Wingo PA, Landis S, Parker S, Bolden S, Heath CW. Using cancer registry and vital statistics data to estimate the number of new cancer cases and deaths in the US for the upcoming year. *J Reg Management*. 1998;25(2):43-51.

E. For information on the methods used to calculate the probability of developing cancer: DevCan 6.0. Probability of developing or dying of cancer. Statistical Research and Applications Branch, NCI. Available at: <http://srab.cancer.gov/devcan/>.

Factors That Influence Cancer Rates

Age-Adjustment to the Year 2000 Standard

Epidemiologists use a statistical method called "age-adjustment" to compare groups of people with different age compositions. This is especially important when examining cancer rates since cancer is generally a disease of older people. For example, without adjusting for age, it would be inaccurate to compare the cancer rates of the state of Florida, which has a large elderly population, to that of Alaska, which has a younger population. Without adjusting for age, it would appear that the cancer rates for Florida are much higher than Alaska. However, once the ages are adjusted, it appears their rates are similar.

Since the publication of *Cancer Facts & Figures 2003*, the Society has used the Year 2000 Standard for age-adjustment. This is a change from statistics previously published by the American Cancer Society. Prior to 2003, most age-adjusted rates were standardized to the 1970 census, although some were based on the 1980 census or even the 1940 census. This change has also been adopted by federal agencies that publish statistics. The new age standard applies to data from calendar year 1999 and forward. The change also requires a recalculation of age-adjusted rates for previous years to allow valid comparisons between current and past years.

The purpose of shifting to the Year 2000 Standard is to more accurately reflect contemporary incidence and mortality rates, given the aging of the US population. On average, Americans are living longer because of the decline in infectious and cardiovascular diseases. Greater longevity allows more people to reach the age

when cancer and other chronic diseases become more common. Using the Year 2000 Standard in age-adjustment instead of the 1970 or 1940 standards allows age-adjusted rates to be closer to the actual, unadjusted rate in the population.

The effect of changing to the Year 2000 Standard will vary from cancer to cancer, depending on the age at which a particular cancer usually occurs. For all cancers combined, the average annual age-adjusted incidence rate for 1995-1999 will increase approximately 20% when adjusted to the Year 2000 compared to the Year 1970 Standard. For cancers that occur mostly at older ages, such as colon cancer, the Year 2000 Standard will increase incidence by up to 25%, whereas for cancers such as acute lymphocytic leukemia, the new standard will decrease the incidence by about 7%. These changes are caused by the increased representation of older ages (for all cancers combined and colon cancer) or by the decreased representation of younger ages (for acute lymphocytic leukemia) in the Year 2000 Standard compared to the Year 1970 Standard.

It is important to note that in no case will the actual number of cases/deaths or age-specific rates change, only the age-standardized rates that are weighted to the different age distribution.

Change in Population Estimates

Cancer rates are also affected by changes in population estimates, which are the basis for calculating rates for new cancer cases and deaths. The Census Bureau updates and revises population estimates every year. The bureau calculates “intercensal” estimates after a new census is completed – for example, using information from both the 1990 and 2000 censuses, the bureau obtains better estimates for the 1990s. These revisions are based on the most recent census information and on the best available demographic data reflecting components of population change (namely, births, deaths, net internal migration, and net international immigration). Thus, it is customary to recalculate cancer rates based on the revised population estimates. In less populated areas, such as rural counties, or in adjacent urban and suburban areas where there was substantial migration of residents from the more populous urban area to the less populous suburban one between censuses, a change in the population estimates can affect the county rate by as much as 20%. This is in contrast with large counties, where a small change in a large population estimate will not affect rates nearly as much. More information about the influence of change in population count on US cancer rates is available on the NCI Web site (<http://www.cancer.gov/newscenter/pressreleases/Census2000>).

Screening Guidelines

For the Early Detection of Cancer in Asymptomatic People

Site	Recommendation
Breast	<ul style="list-style-type: none">• Yearly mammograms are recommended starting at age 40. The age at which screening should be stopped should be individualized by considering the potential risks and benefits of screening in the context of overall health status and longevity.• Clinical breast exam should be part of a periodic health exam, about every 3 years for women in their 20s and 30s, and every year for women 40 and older.• Women should know how their breasts normally feel and report any breast change promptly to their health care providers. Breast self-exam is an option for women starting in their 20s.• Women at increased risk (e.g., family history, genetic tendency, past breast cancer) should talk with their doctors about the benefits and limitations of starting mammography screening earlier, having additional tests (i.e., breast ultrasound and MRI), or having more frequent exams.
Colon & rectum	<p>Beginning at age 50, men and women should begin screening with 1 of the examination schedules below:</p> <ul style="list-style-type: none">• A fecal occult blood test (FOBT) or fecal immunochemical test (FIT) every year• A flexible sigmoidoscopy (FSIG) every 5 years• Annual FOBT or FIT and flexible sigmoidoscopy every 5 years*• A double-contrast barium enema every 5 years• A colonoscopy every 10 years <p><i>*Combined testing is preferred over either annual FOBT or FIT, or FSIG every 5 years, alone. People who are at moderate or high risk for colorectal cancer should talk with a doctor about a different testing schedule.</i></p>
Prostate	<p>The PSA test and the digital rectal examination should be offered annually, beginning at age 50, to men who have a life expectancy of at least 10 years. Men at high risk (African American men and men with a strong family history of 1 or more first-degree relatives diagnosed with prostate cancer at an early age) should begin testing at age 45. For both men at average risk and high risk, information should be provided about what is known and what is uncertain about the benefits and limitations of early detection and treatment of prostate cancer so that they can make an informed decision about testing.</p>
Uterus	<p>Cervix: Screening should begin approximately 3 years after a woman begins having vaginal intercourse, but no later than 21 years of age. Screening should be done every year with regular Pap tests or every 2 years using liquid-based tests. At or after age 30, women who have had 3 normal test results in a row may get screened every 2 to 3 years. Alternatively, cervical cancer screening with HPV DNA testing and conventional or liquid-based cytology could be performed every 3 years. However, doctors may suggest a woman get screened more often if she has certain risk factors, such as HIV infection or a weak immune system. Women 70 years and older who have had 3 or more consecutive normal Pap tests in the last 10 years may choose to stop cervical cancer screening. Screening after total hysterectomy (with removal of the cervix) is not necessary unless the surgery was done as a treatment for cervical cancer.</p> <p>Endometrium: The American Cancer Society recommends that at the time of menopause all women should be informed about the risks and symptoms of endometrial cancer, and strongly encouraged to report any unexpected bleeding or spotting to their physicians. Annual screening for endometrial cancer with endometrial biopsy beginning at age 35 should be offered to women with or at risk for hereditary nonpolyposis colon cancer (HNPCC).</p>
Cancer-related checkup	<p>For individuals undergoing periodic health examinations, a cancer-related checkup should include health counseling, and, depending on a person's age and gender, might include examinations for cancers of the thyroid, oral cavity, skin, lymph nodes, testes, and ovaries, as well as for some nonmalignant diseases.</p>

American Cancer Society guidelines for early cancer detection are assessed annually in order to identify whether there is new scientific evidence sufficient to warrant a reevaluation of current recommendations. If evidence is sufficiently compelling to consider a change or clarification in a current guideline or the development of a new guideline, a formal procedure is initiated. Guidelines are formally evaluated every 5 years regardless of whether new evidence suggests a change in the existing recommendations. There are 9 steps in this procedure, and these "guidelines for guideline development" were formally established to provide a specific methodology for science and expert judgment to form the underpinnings of specific statements and recommendations from the Society. These procedures constitute a deliberate process to ensure that all Society recommendations have the same methodological and evidence-based process at their core. This process also employs a system for rating strength and consistency of evidence that is similar to that employed by the Agency for Health Care Research and Quality (AHCRO) and the US Preventive Services Task Force (USPSTF).

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The American Cancer Society is the nationwide community-based voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives, and diminishing suffering from cancer, through research, education, advocacy, and service.

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