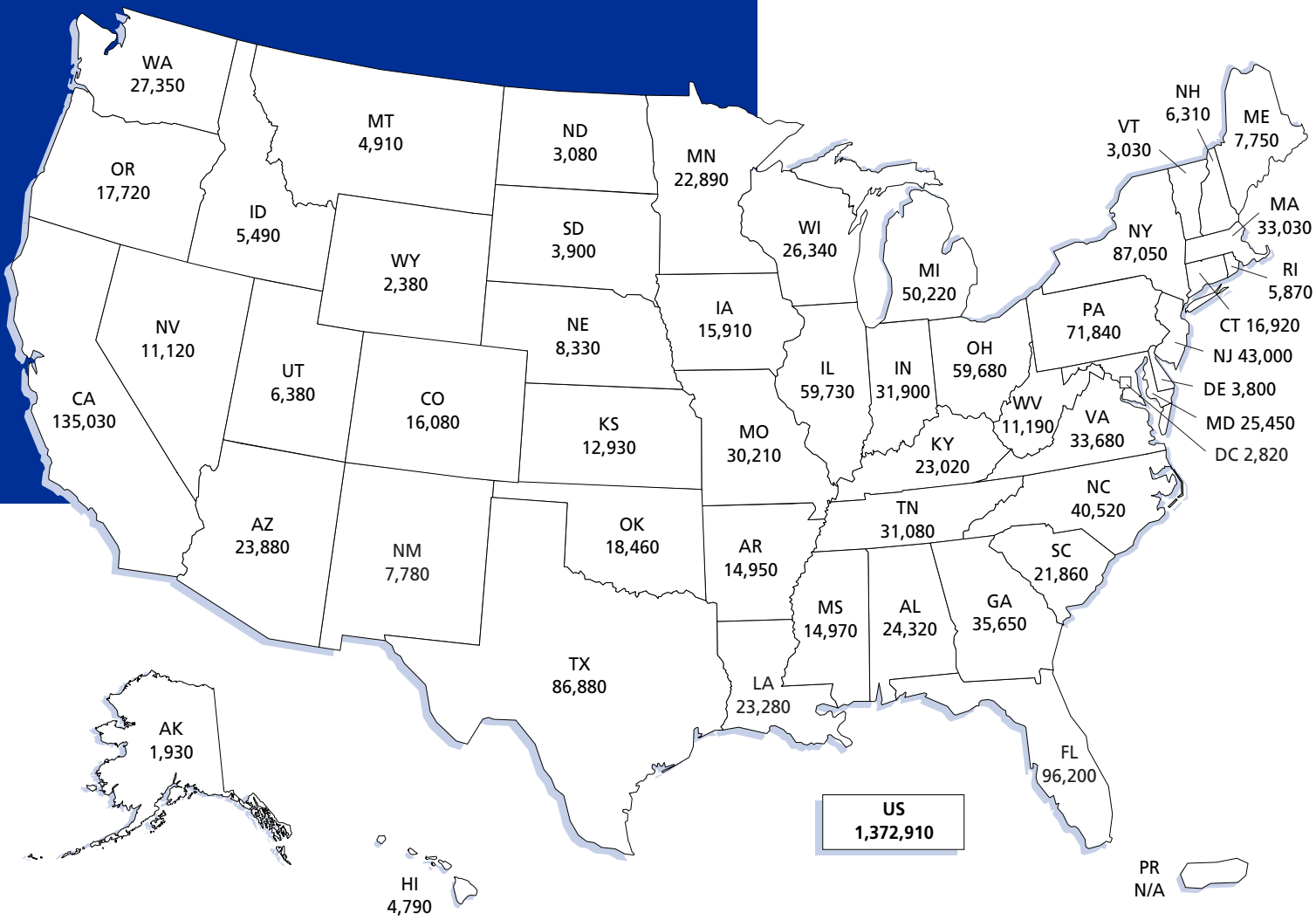
Cancer Facts & Figures 2005



Estimated number of new cancer cases for 2005, 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 2005 by state. State estimates may not add to US total due to rounding.

American Cancer Society®

Special Section:
Cancers Linked to Infectious Diseases
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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 2005 more than 175,000 cancer deaths are expected to be caused by tobacco use.

Scientific evidence suggests that about one-third of the 570,280 cancer deaths expected to occur in 2005 will be related to nutrition, physical inactivity, and overweight or obesity, and thus could also be prevented. Certain cancers are related to infectious exposures, e.g., hepatitis B virus (HBV), human papillomavirus (HPV), human immunodeficiency virus (HIV), helicobacter, and others, and could be prevented through behavioral changes, vaccines, or antibiotics (See Special Section, page 22). In addition, many of the more than 1 million skin cancers that are expected to be diagnosed in 2005 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 when treatment is more likely to be successful. 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 about half of all new cancer cases. The 5-year relative survival rate for these cancers is about 85%, a percentage that has been improving as more Americans receive regular cancer screening. If all of these cancers were diagnosed at a localized stage through regular cancer screenings, 5-year survival would increase to about 95%.

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 affect adults beginning in middle age. 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 the 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 exposure or trait. For example, male smokers are about 20 times more likely to develop lung cancer than nonsmokers, so their relative risk is 20. Most relative risks are not this large. For example, women who have a first-degree (mother, sister, or daughter) family 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 clearly hereditary, in that an inherited genetic alteration predisposes the person to a very high risk of particular cancers. The remainder of cancers are not hereditary, but result from damage to genes (mutations) that occurs throughout one's lifetime, either due to 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 9.8 million Americans with a history of cancer were alive in January 2001. 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 1,372,910 new cancer cases are expected to be diagnosed in 2005. 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?

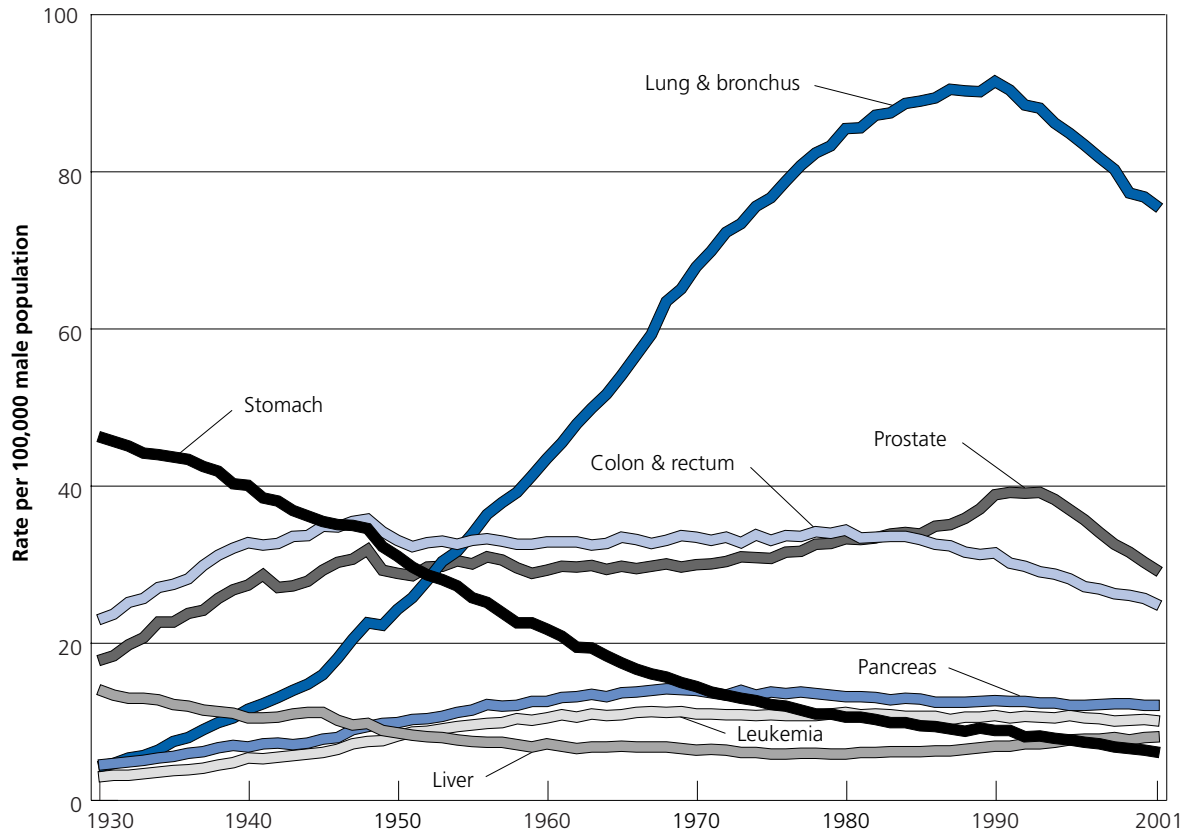
This year about 570,280 Americans are expected to die of cancer, more than 1,500 people a day. Cancer is the second leading cause of death in the US, exceeded only by heart disease. In the US, cancer causes 1 of every 4 deaths.

What Percentage of People Survive Cancer?

The 5-year relative survival rate for all cancers diagnosed between 1995 and 2000 is 64%, up from 50% in 1974-1976 (see page 18), due in part to progress in early detection and improved or new treatments. Rates vary greatly by cancer type and stage at diagnosis. After adjusting for normal life expectancy (factors such as dying from heart disease, accidents, and diseases of old age), the 5-year relative survival rate represents persons who are living 5 years after diagnosis, whether disease-free, in remission, or under treatment with evidence of cancer. While 5-year relative survival rates are useful in monitoring progress in the early detection and treatment of cancer, they do not represent the proportion of people who are cured permanently, since cancer can affect survival beyond 5 years after diagnosis.

Although these rates provide some indication about the average survival experience of cancer patients in a given population, they are less informative when used to predict individual prognoses and should be interpreted with caution. First, 5-year relative survival rates are based on patients who were diagnosed from 1995-2000 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

Age-Adjusted Cancer Death Rates,* Males by Site, US, 1930-2001



*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 cancers of the liver, lung & bronchus, and colon & rectum are affected by these coding changes.
Source: US Mortality Public Use Data Tapes 1960-2001, US Mortality Volumes 1930-1959, National Center for Health Statistics, Centers for Disease Control and Prevention, 2004.
American Cancer Society, Surveillance Research, 2005

stage-specific survival rates. (For more information about survival rates, see Sources of Statistics on page 57.)

How Is Cancer Staged?

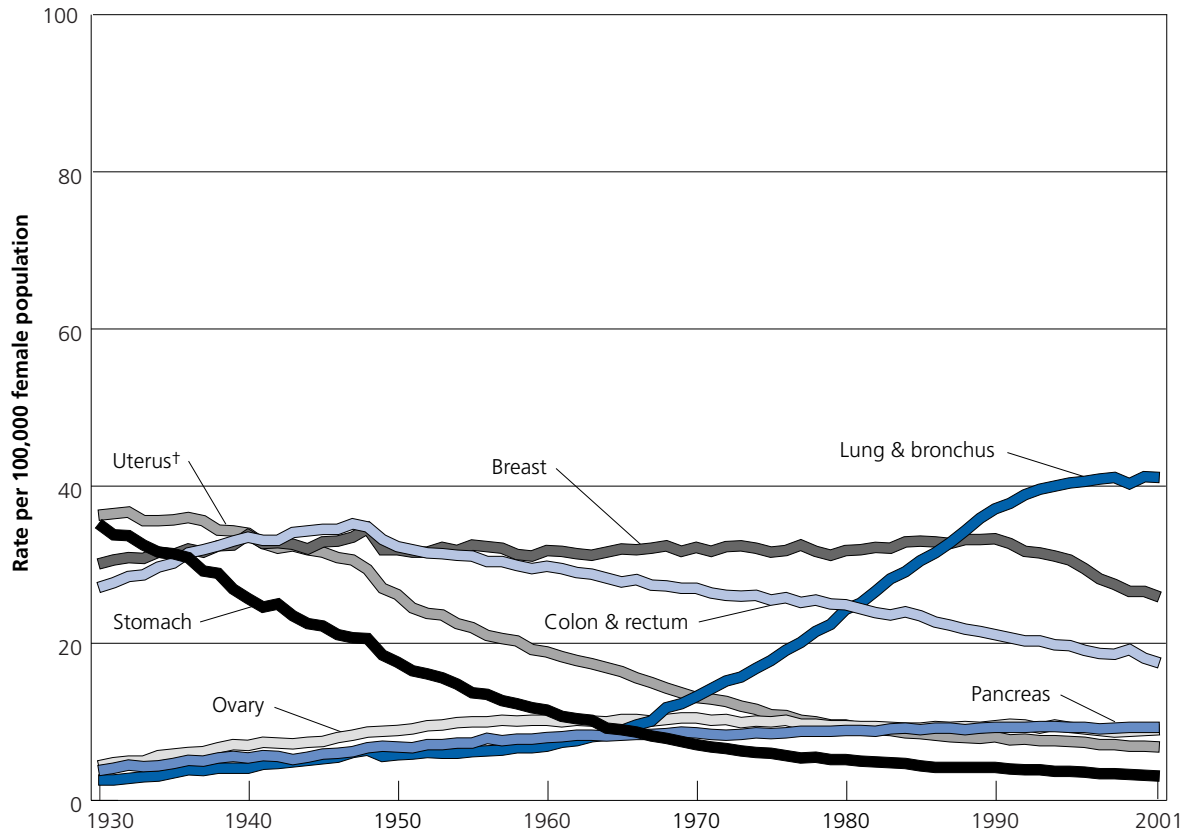
Staging is the process of describing the extent or spread of the disease at the time of diagnosis. It is essential in determining the choice of therapy and in assessing prognosis. A cancer's stage is based on the primary tumor's size and location in the body and whether it has spread to other areas of 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. Summary staging (in situ, local, regional, and distant) is useful 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, 1995-2000, 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 2004 at $189.8 billion: $69.4 billion for direct medical costs (total of all health expenditures); $16.9 billion for indirect morbidity costs (cost of lost productivity due to illness); and $103.5 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 under age 65 have no health insurance coverage, and about one-third of persons 65 and older have Medicare coverage only. Nearly 27% and 20% of Americans aged 18-24 and 25-44 years, respectively, reported not having a usual place to go for medical care.

Age-Adjusted Cancer Death Rates,* Females by Site, US, 1930-2001



*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 cancers of the lung & bronchus, colon & rectum, and ovary are affected by these coding changes.
Source: US Mortality Public Use Data Tapes 1960-2001, US Mortality Volumes 1930-1959, National Center for Health Statistics, Centers for Disease Control and Prevention, 2004.

American Cancer Society, Surveillance Research, 2005

Estimated New Cancer Cases and Deaths by Sex for All Sites, US, 2005*

	Estimated New Cases			Estimated Deaths		
	Both Sexes	**Male**	**Female**	**Both Sexes**	**Male**	**Female**
All sites	1,372,910	710,040	662,870	570,280	295,280	275,000
Oral cavity & pharynx	29,370	19,100	10,270	7,320	4,910	2,410
Tongue	7,660	5,050	2,610	1,730	1,120	610
Mouth	10,070	5,370	4,700	1,890	1,100	790
Pharynx	8,590	6,520	2,070	2,130	1,490	640
Other oral cavity	3,050	2,160	890	1,570	1,200	370
Digestive system	253,500	134,370	119,130	136,060	75,020	61,040
Esophagus	14,520	11,220	3,300	13,570	10,530	3,040
Stomach	21,860	13,510	8,350	11,550	6,770	4,780
Small intestine	5,420	2,840	2,580	1,070	580	490
Colon†	104,950	48,290	56,660	56,290	28,540	27,750
Rectum	40,340	23,530	16,810			
Anus, anal canal, & anorectum	3,990	1,750	2,240	620	230	390
Liver & intrahepatic bile duct	17,550	12,130	5,420	15,420	10,330	5,090
Gallbladder & other biliary	7,480	3,330	4,150	3,340	1,270	2,070
Pancreas	32,180	16,100	16,080	31,800	15,820	15,980
Other digestive organs	5,210	1,670	3,540	2,400	950	1,450
Respiratory system	184,800	102,420	82,380	168,140	93,990	74,150
Larynx	9,880	7,920	1,960	3,770	2,960	810
Lung & bronchus	172,570	93,010	79,560	163,510	90,490	73,020
Other respiratory organs	2,350	1,490	860	860	540	320
Bones & joints	2,570	1,480	1,090	1,210	670	540
Soft tissue (including heart)	9,420	5,530	3,890	3,490	1,910	1,580
Skin (excluding basal & squamous)	66,000	37,580	28,420	10,590	6,920	3,670
Melanoma – skin	59,580	33,580	26,000	7,770	4,910	2,860
Other nonepithelial skin	6,420	4,000	2,420	2,820	2,010	810
Breast	212,930	1,690	211,240	40,870	460	40,410
Genital system	321,050	241,570	79,480	59,920	31,010	28,910
Uterine cervix	10,370		10,370	3,710		3,710
Uterine corpus	40,880		40,880	7,310		7,310
Ovary	22,220		22,220	16,210		16,210
Vulva	3,870		3,870	870		870
Vagina & other genital, female	2,140		2,140	810		810
Prostate	232,090	232,090		30,350	30,350	
Testis	8,010	8,010		390	390	
Penis & other genital, male	1,470	1,470		270	270	
Urinary system	101,880	71,090	30,790	26,590	17,420	9,170
Urinary bladder	63,210	47,010	16,200	13,180	8,970	4,210
Kidney & renal pelvis	36,160	22,490	13,670	12,660	8,020	4,640
Ureter & other urinary organs	2,510	1,590	920	750	430	320
Eye & orbit	2,120	1,090	1,030	230	110	120
Brain & other nervous system	18,500	10,620	7,880	12,760	7,280	5,480
Endocrine system	27,650	7,550	20,100	2,370	1,080	1,290
Thyroid	25,690	6,500	19,190	1,490	630	860
Other endocrine	1,960	1,050	910	880	450	430
Lymphoma	63,740	33,050	30,690	20,610	10,930	9,680
Hodgkin lymphoma	7,350	3,980	3,370	1,410	780	630
Non-Hodgkin lymphoma	56,390	29,070	27,320	19,200	10,150	9,050
Multiple myeloma	15,980	8,600	7,380	11,300	5,660	5,640
Leukemia	34,810	19,640	15,170	22,570	12,540	10,030
Acute lymphocytic leukemia	3,970	2,180	1,790	1,490	850	640
Chronic lymphocytic leukemia	9,730	5,780	3,950	4,600	2,520	2,080
Acute myeloid leukemia	11,960	6,530	5,430	9,000	5,040	3,960
Chronic myeloid leukemia	4,600	2,640	1,960	850	430	420
Other leukemia‡	4,550	2,510	2,040	6,630	3,700	2,930
Other & unspecified primary sites‡	28,590	14,660	13,930	46,250	25,370	20,880

*Rounded to the nearest 10; excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder. About 58,490 carcinoma in situ of the breast and 46,170 melanoma in situ will be newly diagnosed in 2005. †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 2001, 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 2002, National Center for Health Statistics, Centers for Disease Control and Prevention, 2004.

Estimated New Cancer Cases for Selected Cancer Sites by State, US, 2005*

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	24,320	3,820	200	2,300	670	560	3,340	920	940	4,360	860
Alaska	1,930	260	†	210	60	50	220	80	90	310	100
Arizona	23,880	3,760	200	2,500	500	620	2,870	1,300	1,060	3,900	1,200
Arkansas	14,950	2,090	170	1,630	340	400	2,530	540	650	2,060	620
California	135,030	21,170	1,090	14,070	4,250	3,380	15,150	5,440	5,700	25,010	6,380
Colorado	16,080	2,560	80	1,650	450	460	1,750	920	880	2,680	720
Connecticut	16,920	2,720	220	1,680	500	400	1,950	690	730	3,360	860
Delaware	3,800	630	†	410	110	120	490	230	210	610	190
Dist. of Columbia	2,820	520	†	340	170	50	310	80	90	610	140
Florida	96,200	13,430	730	9,860	2,520	2,620	13,130	4,600	3,470	19,650	4,890
Georgia	35,650	5,850	360	3,480	890	820	4,800	1,610	1,380	5,660	1,530
Hawaii	4,790	680	60	540	170	120	510	150	260	920	190
Idaho	5,490	940	60	540	170	150	630	380	210	1,150	340
Illinois	59,730	9,300	500	6,610	2,010	1,620	7,220	2,300	2,200	9,410	2,640
Indiana	31,900	4,600	170	3,410	1,010	820	4,410	1,460	1,410	4,890	1,390
Iowa	15,910	2,300	110	1,700	500	480	1,790	540	760	3,060	670
Kansas	12,930	1,990	80	1,570	390	350	1,630	540	650	2,060	720
Kentucky	23,020	3,290	220	2,350	500	490	3,680	1,150	970	2,520	910
Louisiana	23,280	3,870	220	2,580	500	540	3,090	770	1,060	3,440	770
Maine	7,750	890	†	800	220	150	990	380	260	1,300	430
Maryland	25,450	4,390	220	2,760	780	680	3,210	1,070	1,030	4,210	1,150
Massachusetts	33,030	4,910	110	3,560	1,010	770	4,010	1,530	1,260	5,350	1,870
Michigan	50,220	7,210	340	4,830	1,450	1,250	6,110	1,840	2,140	7,650	2,350
Minnesota	22,890	3,240	110	2,220	670	660	2,620	1,000	1,380	4,360	1,150
Mississippi	14,970	2,350	140	1,630	340	370	2,180	460	530	3,210	480
Missouri	30,210	4,550	170	3,230	840	830	4,070	1,460	1,530	3,060	1,150
Montana	4,910	680	†	460	170	140	620	230	210	990	240
Nebraska	8,330	1,200	60	1,030	280	250	1,000	380	380	1,380	340
Nevada	11,120	1,620	80	1,240	220	260	1,530	540	440	1,990	530
New Hampshire	6,310	890	†	620	170	170	790	310	320	1,150	380
New Jersey	43,000	7,740	340	4,670	1,790	1,100	4,830	1,920	1,760	6,420	2,060
New Mexico	7,780	990	60	880	280	170	760	310	320	1,680	340
New York	87,050	14,430	840	9,700	3,240	2,170	9,870	3,220	2,940	14,220	4,320
North Carolina	40,520	6,330	310	4,100	1,170	990	5,520	1,920	1,760	6,810	1,580
North Dakota	3,080	520	†	360	110	110	330	80	180	610	140
Ohio	59,680	9,670	390	6,500	1,850	1,510	7,790	2,450	1,970	10,860	3,070
Oklahoma	18,460	2,820	140	2,010	450	460	2,580	1,000	680	2,450	820
Oregon	17,720	2,610	140	1,760	450	420	2,160	1,000	1,000	2,980	1,010
Pennsylvania	71,840	11,340	390	8,130	2,570	1,630	8,470	2,990	2,880	13,150	3,600
Rhode Island	5,870	780	60	650	110	120	720	310	290	840	340
South Carolina	21,860	3,290	170	2,300	500	510	2,880	770	940	4,210	860
South Dakota	3,900	520	†	460	110	110	430	150	230	920	190
Tennessee	31,080	4,230	280	3,150	730	760	4,630	1,300	1,350	4,280	1,150
Texas	86,880	12,860	1,030	9,270	2,400	2,250	11,210	3,830	3,050	13,380	3,410
Utah	6,380	1,150	†	670	220	220	460	460	380	1,150	290
Vermont	3,030	470	†	340	110	90	390	150	180	460	190
Virginia	33,680	6,010	200	3,560	1,010	830	4,400	1,610	1,170	5,740	1,390
Washington	27,350	3,920	110	2,660	890	720	3,440	1,380	1,410	5,510	1,250
West Virginia	11,190	1,410	110	1,260	280	220	1,700	460	500	1,450	580
Wisconsin	26,340	4,130	80	2,760	840	770	3,060	1,230	1,120	4,050	1,340
Wyoming	2,380	260	†	280	60	60	280	150	90	610	100
United States	1,372,910	211,240	10,370	145,290	40,880	34,810	172,570	59,580	56,390	232,090	63,210

*Rounded to nearest 10. Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder. †Estimate is 50 or fewer 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 2005 by state. State estimates may not add up to US total due to rounding and exclusion of state estimates fewer than 50 cases.

Estimated Cancer Deaths for Selected Cancer Sites by State, US, 2005*

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non-Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	10,100	210	730	890	360	290	3,160	320	300	530	570
Alaska	800	†	50	80	†	†	210	†	†	50	†
Arizona	9,920	240	720	970	400	290	2,720	360	290	550	510
Arkansas	6,210	160	400	630	260	200	2,400	220	160	310	270
California	56,090	1,460	4,050	5,450	2,190	2,070	14,350	1,940	1,720	31,50	3,270
Colorado	6,680	180	490	640	300	170	1,660	300	220	400	350
Connecticut	7,030	140	520	650	260	170	1,850	250	200	430	440
Delaware	1,580	†	120	160	80	†	460	70	50	100	80
Dist. of Columbia	1,170	†	100	130	†	†	290	†	†	60	80
Florida	39,960	930	2,570	3,820	1,700	1,110	12,440	1,180	1,120	2,250	2,570
Georgia	14,810	300	1,120	1,350	530	340	4,550	470	420	770	740
Hawaii	1,990	†	130	210	80	100	480	90	50	150	120
Idaho	2,280	70	180	210	100	50	600	70	80	130	150
Illinois	24,810	480	1,780	2,560	1,050	680	6,840	750	650	1,470	1,230
Indiana	13,250	320	880	1,320	530	250	4,180	480	380	690	640
Iowa	6,610	160	440	660	310	120	1,700	260	210	390	400
Kansas	5,370	130	380	610	230	120	1,540	220	160	290	270
Kentucky	9,560	160	630	910	320	200	3,490	330	230	420	330
Louisiana	9,670	190	740	1,000	350	310	2,930	360	220	520	450
Maine	3,220	80	170	310	100	70	940	90	100	180	170
Maryland	10,570	200	840	1,070	440	260	3,040	350	310	590	550
Massachusetts	13,720	280	940	1,380	500	370	3,800	430	380	850	700
Michigan	20,860	450	1,380	1,870	810	530	5,790	730	590	1,140	1,000
Minnesota	9,510	250	620	860	430	210	2,480	470	270	550	570
Mississippi	6,220	170	450	630	240	150	2,070	180	160	330	420
Missouri	12,550	260	870	1,250	540	290	3,860	520	340	670	400
Montana	2,040	50	130	180	90	50	590	70	70	100	130
Nebraska	3,460	90	230	400	160	60	950	130	100	180	180
Nevada	4,620	90	310	480	170	120	1,450	150	120	230	260
New Hampshire	2,620	70	170	240	110	70	750	110	60	140	150
New Jersey	17,860	320	1,480	1,810	710	410	4,580	600	540	1,050	840
New Mexico	3,230	70	190	340	110	130	720	110	90	180	220
New York	36,160	720	2,760	3,760	1,410	1,010	9,350	1,000	1,080	2,270	1,860
North Carolina	16,830	340	1,210	1,590	640	380	5,230	600	470	910	890
North Dakota	1,280	†	100	140	70	†	310	60	†	80	80
Ohio	24,790	530	1,850	2,520	980	570	7,380	670	660	1,300	1,420
Oklahoma	7,670	170	540	780	300	170	2,440	230	180	360	320
Oregon	7,360	190	500	680	270	160	2,050	340	240	410	390
Pennsylvania	29,840	520	2,170	3,150	1,060	730	8,030	980	880	1,670	1,720
Rhode Island	2,440	50	150	250	80	60	680	100	60	140	110
South Carolina	9,080	180	630	890	330	220	2,730	320	190	510	550
South Dakota	1,620	50	100	180	70	†	410	80	60	90	120
Tennessee	12,910	320	810	1,220	490	300	4,390	460	350	680	560
Texas	36,090	910	2,460	3,590	1,460	1,280	10,620	1,040	960	1,950	1,750
Utah	2,650	90	220	260	140	60	440	130	90	170	150
Vermont	1,260	†	90	130	60	†	370	60	†	70	60
Virginia	13,990	270	1,150	1,380	540	340	4,170	400	400	750	750
Washington	11,360	350	750	1,030	470	340	3,260	480	390	690	720
West Virginia	4,650	90	270	490	140	110	1,610	170	140	200	190
Wisconsin	10,940	260	790	1,070	500	290	2,900	380	320	650	530
Wyoming	990	†	50	110	†	†	270	†	†	50	80
United States	570,280	12,760	40,410	56,290	22,570	15,420	163,510	19,200	16,210	31,800	30,350

*Rounded to nearest 10. †Estimate is 50 or fewer 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, 1969-2002, National Center for Health Statistics, Centers for Disease Control and Prevention, 2004.

Cancer Incidence Rates by Site and State, US, 1997-2001*

	All Sites		Breast	Colon & Rectum		Lung & Bronchus		Non-Hodgkin Lymphoma		Prostate	Urinary Bladder	
State	**Male**	**Female**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Male**	**Female**
Alabama	505.5	353.6	114.4	58.6	41.2	111.3	46.8	17.8	12.9	128.7	28.8	6.8
Alaska†	560.5	441.9	139.0	66.8	54.2	91.2	63.1	24.1	16.8	164.5	42.1	9.9
Arizona†	466.3	370.3	121.9	54.5	39.2	72.1	48.9	18.7	13.9	128.0	35.8	9.0
Arkansas	533.7	380.4	122.5	59.7	43.7	116.7	55.0	19.5	14.4	144.0	34.3	7.8
California	525.4	394.8	133.1	58.8	42.9	74.4	49.5	22.2	15.2	157.6	34.5	8.5
Colorado†	518.2	400.2	135.8	57.2	41.6	66.9	43.5	21.2	16.4	163.1	34.9	8.9
Connecticut	594.0	449.3	143.8	70.9	52.2	86.4	55.9	24.7	17.0	174.0	46.6	12.5
Delaware†	566.2	433.0	134.0	68.4	51.8	103.3	60.9	21.2	16.4	165.1	22.3	5.6
Dist. of Columbia†	667.7	437.8	143.3	68.8	58.1	105.5	53.0	20.1	11.8	239.4	25.6	10.0
Florida†	569.1	419.8	126.5	66.1	48.7	97.4	60.6	22.5	15.6	154.8	40.8	10.6
Georgia	540.7	373.5	121.7	58.6	41.6	107.3	49.9	18.1	13.0	159.6	31.2	7.9
Hawaii†	483.7	384.4	134.2	66.8	42.9	69.7	38.1	18.9	12.8	131.6	21.7	5.8
Idaho†	520.0	396.9	130.0	52.6	42.0	72.3	44.0	20.3	17.1	167.9	38.1	8.1
Illinois†	573.5	425.4	133.4	72.4	51.3	98.1	54.8	22.8	16.0	160.5	39.0	10.2
Indiana	532.0	408.3	127.4	68.3	49.4	106.9	56.7	20.8	15.5	132.9	36.6	9.3
Iowa†	557.2	421.9	131.5	75.6	54.5	92.1	48.4	22.6	16.7	153.2	39.0	8.8
Kansas‡	–	–	–	–	–	–	–	–	–	–	–	–
Kentucky†	615.3	440.3	127.2	73.1	53.9	139.5	70.9	21.9	16.4	154.6	37.9	9.5
Louisiana†	606.1	397.7	122.9	73.2	49.0	116.8	55.6	21.3	15.4	173.8	33.9	8.2
Maine†	602.5	442.1	131.4	68.7	52.6	101.6	61.5	23.0	16.0	169.5	45.7	13.3
Maryland	565.0	411.9	132.9	65.2	48.4	90.8	55.6	20.1	14.2	177.6	34.6	9.6
Massachusetts†	605.2	448.1	143.4	72.0	51.2	90.4	59.6	22.8	16.1	183.0	46.4	12.6
Michigan†	615.4	435.3	133.5	66.0	48.1	97.7	58.3	23.2	17.0	198.2	42.8	10.7
Minnesota†	554.3	410.3	138.5	62.1	46.1	73.2	45.1	25.0	17.9	184.5	38.2	9.6
Mississippi‡	–	–	–	–	–	–	–	–	–	–	–	–
Missouri	539.3	409.7	126.7	70.1	49.9	105.7	58.1	22.3	15.7	137.0	35.3	8.5
Montana†	552.7	416.1	133.4	63.3	43.9	85.2	57.7	22.8	15.8	172.7	38.8	10.1
Nebraska†	545.9	408.6	132.1	71.3	49.8	84.4	46.3	22.2	17.1	162.4	37.3	8.4
Nevada	486.9	395.8	113.8	57.8	43.8	93.4	70.5	16.9	12.1	121.6	39.1	10.8
New Hampshire	555.0	422.1	135.4	64.9	47.3	87.0	57.3	23.1	14.7	155.1	44.0	11.8
New Jersey†	628.7	452.3	138.2	77.2	54.2	90.1	55.4	25.9	18.5	198.0	45.6	12.0
New Mexico†	470.7	352.9	116.2	50.5	35.8	60.9	36.1	17.8	12.8	146.5	27.6	7.6
New York†	568.1	432.7	130.9	73.6	53.9	86.0	53.9	23.5	16.6	162.9	40.9	11.3
North Carolina	525.3	370.3	123.2	57.3	42.0	101.9	48.3	18.7	13.1	152.5	32.9	8.2
North Dakota	486.4	341.3	117.4	61.4	42.5	66.8	36.2	18.8	11.2	171.0	36.9	7.9
Ohio	553.6	420.5	131.5	68.3	49.8	103.6	58.0	23.0	16.2	150.0	40.3	10.2
Oklahoma†	534.8	393.5	128.5	65.7	44.8	113.3	59.0	20.6	14.6	141.7	32.4	7.8
Oregon†	546.3	435.2	145.8	58.0	43.7	85.4	60.5	22.5	16.6	164.5	41.8	10.4
Pennsylvania‡	–	–	–	–	–	–	–	–	–	–	–	–
Rhode Island†	634.9	453.3	131.7	76.4	55.4	102.8	61.6	24.4	17.5	177.9	52.7	13.9
South Carolina†	576.7	381.0	123.2	65.8	44.9	106.1	48.3	19.5	13.5	174.2	33.9	7.3
South Dakota (2001)	492.5	350.0	125.5	61.4	41.9	74.1	37.3	15.3	13.4	180.2	36.0	8.3
Tennessee‡	–	–	–	–	–	–	–	–	–	–	–	–
Texas	528.2	377.3	118.9	60.3	42.6	96.4	50.6	20.6	14.4	148.4	29.9	7.4
Utah†	478.1	346.1	119.4	48.3	36.9	42.7	21.8	23.1	14.5	180.0	31.6	7.1
Vermont‡	–	–	–	–	–	–	–	–		–	–	–
Virginia	498.7	362.5	123.7	60.0	43.6	84.4	46.2	18.8	13.0	155.0	31.4	8.1
Washington†	579.1	449.8	148.8	62.1	44.5	87.9	60.7	24.9	17.6	175.6	42.6	9.8
West Virginia†	583.9	430.3	119.2	71.7	52.7	124.3	68.5	21.1	16.3	149.3	41.2	12.3
Wisconsin†	573.3	425.5	135.6	71.6	50.5	86.8	50.7	23.0	16.1	166.3	38.3	10.5
Wyoming†	536.2	386.6	121.5	59.7	43.5	70.5	44.0	17.0	16.3	177.9	38.5	10.0
United States	566.1	420.0	132.2	67.1	48.7	90.0	54.0	22.7	16.1	166.7	39.0	10.1

*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 didn't submit incidence data to the North American Association of Central Cancer Registries (NAACCR) for 1997-2001.

Sources: Cancer in North America: 1997-2001, Volume One: Incidence, Volume Three: NAACCR Combined Incidence, North American Association of Central Cancer Registries.

American Cancer Society, Surveillance Research, 2005

Cancer Death Rates by Site and State, US, 1997-2001*

	All Sites		Breast	Colon & Rectum		Lung & Bronchus		Non-Hodgkin Lymphoma		Pancreas		Prostate
State	**Male**	**Female**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
Alabama	290.4	167.1	26.6	24.2	16.4	100.2	38.5	9.4	6.4	12.8	9.6	40.1
Alaska	235.5	172.4	23.9	24.0	17.6	70.7	46.9	10.2	6.4	12.1	10.0	25.1
Arizona	212.3	150.5	25.2	20.9	14.6	61.6	37.7	9.5	6.4	10.6	8.1	26.7
Arkansas	277.3	167.9	25.1	25.3	17.9	103.6	43.6	11.1	7.0	12.1	9.0	33.6
California	221.3	158.9	25.7	21.6	15.5	61.5	38.5	9.9	6.3	11.4	8.9	28.0
Colorado	210.9	148.0	23.6	21.8	15.3	53.8	32.9	9.6	6.8	11.7	8.5	29.6
Connecticut	234.7	165.5	27.2	24.7	17.5	65.9	40.2	10.2	7.2	12.5	9.7	28.6
Delaware	265.5	186.6	30.0	25.1	19.3	85.8	47.9	10.0	7.1	13.0	9.9	32.4
Dist. of Columbia	310.7	198.7	37.3	31.8	23.0	82.1	42.2	8.3	5.0	15.5	11.2	49.9
Florida	236.2	157.7	24.7	22.8	16.2	75.7	42.2	10.1	6.3	11.4	8.8	26.9
Georgia	272.5	164.1	26.5	23.0	16.6	93.7	40.0	9.1	6.2	12.5	9.0	38.0
Hawaii	195.7	127.7	19.7	20.1	12.3	53.1	26.9	9.0	5.3	11.5	9.3	21.2
Idaho	220.0	151.6	25.5	21.8	14.5	61.0	33.5	10.1	7.3	10.0	8.6	32.3
Illinois	263.5	175.3	29.2	28.6	19.3	80.3	41.1	11.0	6.8	12.8	9.9	33.6
Indiana	274.2	176.8	27.4	27.8	19.6	93.3	45.9	11.6	7.5	12.6	9.1	33.5
Iowa	241.2	157.4	25.5	27.3	18.7	74.4	35.9	10.4	7.4	12.2	8.5	31.2
Kansas	239.2	157.5	25.3	23.8	16.7	78.2	38.0	11.0	7.4	12.2	8.6	28.8
Kentucky	298.9	180.9	27.1	28.5	19.2	114.5	52.5	11.0	7.1	11.9	8.6	32.3
Louisiana	303.8	183.5	29.9	30.4	19.0	101.2	45.0	10.5	7.3	15.2	10.4	38.1
Maine	264.7	179.1	25.1	26.9	20.0	80.6	46.8	11.3	7.2	13.0	9.3	30.3
Maryland	265.3	177.1	28.8	28.0	20.0	81.1	44.7	10.3	6.4	13.1	9.6	34.6
Massachusetts	258.3	173.9	27.8	28.2	18.7	73.2	43.5	10.3	7.2	12.5	10.0	31.7
Michigan	255.7	171.4	27.5	25.7	17.4	78.1	43.0	11.3	7.5	12.3	9.6	33.0
Minnesota	234.2	157.9	25.9	22.7	16.5	62.9	35.7	11.9	7.6	12.1	9.1	32.9
Mississippi	306.7	169.2	28.2	26.8	18.1	111.1	41.7	9.3	5.9	13.9	9.8	43.2
Missouri	262.4	173.2	26.9	26.3	18.8	89.5	45.7	11.0	7.3	12.0	9.1	29.4
Montana	244.4	161.4	23.6	24.5	14.9	70.2	42.1	10.9	6.8	11.7	8.2	34.2
Nebraska	231.6	154.1	24.4	26.1	18.3	71.8	34.7	10.3	7.3	11.5	8.1	28.7
Nevada	249.5	179.3	26.4	27.6	19.0	78.3	54.1	9.7	5.6	10.7	9.6	29.8
New Hampshire	256.7	172.3	27.1	27.9	19.3	73.2	44.3	11.6	6.3	12.9	10.0	30.0
New Jersey	255.2	179.7	30.5	28.0	19.7	73.1	41.3	11.2	7.2	12.7	10.2	31.5
New Mexico	209.0	145.7	23.4	20.9	15.1	52.4	29.9	8.1	5.7	10.6	8.4	29.7
New York	238.3	167.2	28.9	27.1	18.9	67.2	38.0	10.1	6.7	12.9	9.9	30.4
North Carolina	272.7	163.4	26.5	24.2	17.2	94.0	39.6	10.0	6.3	12.8	9.2	36.9
North Dakota	234.0	151.5	25.9	24.4	16.3	63.5	31.2	11.3	6.8	10.8	9.5	32.4
Ohio	269.3	176.9	29.0	28.3	19.8	86.7	44.0	11.8	7.7	11.9	8.9	32.2
Oklahoma	265.2	168.1	26.4	25.8	17.6	93.6	45.3	10.4	7.4	12.0	8.3	29.6
Oregon	240.9	171.4	26.3	22.9	15.9	72.8	46.7	10.7	7.6	11.3	9.6	32.4
Pennsylvania	260.9	174.1	28.8	28.6	19.9	78.7	40.1	11.1	7.3	12.6	9.1	31.8
Rhode Island	264.4	175.9	27.2	26.2	19.7	83.2	44.1	12.0	7.5	13.8	10.2	32.0
South Carolina	281.0	164.8	27.4	26.6	17.4	92.5	38.7	9.3	6.5	13.6	10.0	40.1
South Dakota	242.3	155.6	23.3	26.8	19.7	70.8	31.2	13.1	8.2	12.5	9.4	31.6
Tennessee	287.2	171.5	26.8	26.4	18.3	105.2	43.2	11.1	7.1	13.2	9.2	34.3
Texas	252.1	160.6	25.6	24.4	16.3	80.4	39.3	9.9	6.8	12.0	8.8	31.1
Utah	187.3	126.3	23.3	18.6	14.4	36.2	16.7	10.6	6.6	9.9	6.5	33.1
Vermont	250.3	169.4	27.4	25.5	19.8	77.9	39.4	11.4	7.7	13.5	8.8	29.9
Virginia	265.8	171.3	28.4	25.5	18.4	84.6	41.9	10.1	6.6	12.7	9.0	36.1
Washington	236.5	167.7	25.0	22.3	15.6	71.0	46.2	10.9	7.2	12.3	9.7	28.7
West Virginia	282.9	186.0	27.3	28.0	20.4	102.8	52.5	10.5	7.4	11.4	7.5	30.1
Wisconsin	244.8	162.1	26.2	25.8	17.1	67.8	36.8	11.6	7.1	12.0	9.2	32.6
Wyoming	232.6	163.0	25.1	24.1	19.2	64.1	38.8	7.0	5.4	11.5	8.1	36.3
United States	251.1	166.7	27.0	25.3	17.7	77.9	40.8	10.5	6.9	12.2	9.2	31.5

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

Source: US Mortality Public Use Data Tapes 1960-2001, National Center for Health Statistics, Centers for Disease Control and Prevention, 2004.

American Cancer Society, Surveillance Research, 2005

Selected Cancers

Breast

New cases: An estimated 211,240 new cases of invasive breast cancer are expected to occur among women in the US during 2005. It is the most frequently diagnosed cancer in women. Breast cancer incidence rates increased rapidly in the 1980s due to increased use of mammography and have increased gradually since that time. The increase since 1990 is predominantly in women 50 and older. About 1,690 new cases of breast cancer are expected in men in 2005.

In addition to invasive breast cancer, 58,490 new cases of in situ breast cancer are expected to occur among women during 2005. 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, which can detect breast cancers before they can be felt.

Deaths: An estimated 40,870 breast cancer deaths (40,410 women, 460 men) are anticipated in 2005. Breast cancer ranks second among cancer deaths in women (after lung cancer). According to the most recent data, mortality rates declined by 2.3% per year from 1990 to 2001 in all women, with larger decreases in younger (< 50 years) women. These decreases are due to increased awareness, earlier detection through screening, 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 her health care provider. When breast cancer has grown to the point where physical signs and symptoms exist, these may include a breast lump, thickening, swelling, distortion, or tenderness; skin irritation or dimpling; and nipple pain, scaliness, ulceration, retraction, or spontaneous discharge. Breast pain is commonly due to benign conditions and is not usually the first symptom of breast cancer.

Risk factors: The risk of being diagnosed with breast cancer increases with age. The primary factors that increase risk of breast cancer in women include certain inherited genetic mutations (BRCA1 and BRCA2), a personal or family history of breast cancer, high breast tissue density (which is a mammographic measure of the amount of glandular breast tissue relative to fatty tissue in the breast), and biopsy-confirmed hyperplasia (especially atypical hyperplasia). Other factors that increase breast cancer risk include a long menstrual history (menstrual periods that started early and/or ended late in life), obesity after menopause, recent use of oral contraceptives, postmenopausal hormone therapy (especially combined estrogen and progestin therapy), never having children or having one's first child after age 30, or consumption of one or more alcoholic beverages per day. Studies show that both pre- and postmenopausal women with breast cancer who are overweight are more likely to die from their disease.

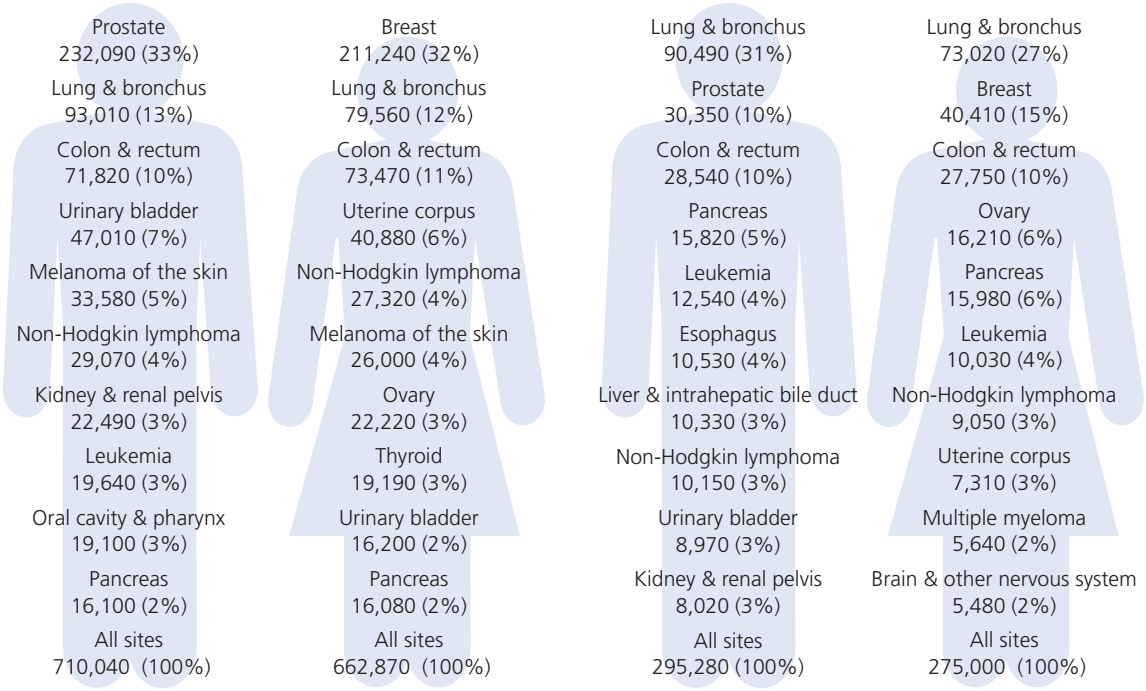
Breastfeeding, moderate or vigorous physical activity, and maintaining a healthy body weight are all associated with lower risk of breast cancer. Current data indicate that tamoxifen decreases breast cancer risk in women at increased risk, and preliminary data suggest that raloxifene may decrease breast cancer risk in these women.

Cancer-causing mutations in the inherited susceptibility genes, BRCA1 and BRCA2, account for approximately 5% of all breast cancer cases. Women who carry these rare mutations have a lifetime risk of developing breast cancer ranging from 35% to 85%. While testing the general population for mutations of BRCA1 and BRCA2 is not recommended, 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 findings 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 have an opportunity to undergo counseling before reaching a decision.

Early detection: Mammography is especially valuable as an early detection tool because it can identify breast cancer at an early stage, usually before physical symptoms develop. Numerous studies have shown that early detection saves lives and increases treatment options. The recent declines in breast cancer mortality have been attributed to the regular use of screening mammography and to improvements in treatments. However, mammography also has limitations: it will miss 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.

See page 60 for the American Cancer Society's screening guidelines for the early detection of breast cancer.

Leading Sites of New Cancer Cases and Deaths – 2005 Estimates*



Estimated New Cases*		Estimated Deaths	
Male	**Female**	**Male**	**Female**
Prostate 232,090 (33%)	Breast 211,240 (32%)	Lung & bronchus 90,490 (31%)	Lung & bronchus 73,020 (27%)
Lung & bronchus 93,010 (13%)	Lung & bronchus 79,560 (12%)	Prostate 30,350 (10%)	Breast 40,410 (15%)
Colon & rectum 71,820 (10%)	Colon & rectum 73,470 (11%)	Colon & rectum 28,540 (10%)	Colon & rectum 27,750 (10%)
Urinary bladder 47,010 (7%)	Uterine corpus 40,880 (6%)	Pancreas 15,820 (5%)	Ovary 16,210 (6%)
Melanoma of the skin 33,580 (5%)	Non-Hodgkin lymphoma 27,320 (4%)	Leukemia 12,540 (4%)	Pancreas 15,980 (6%)
Non-Hodgkin lymphoma 29,070 (4%)	Melanoma of the skin 26,000 (4%)	Esophagus 10,530 (4%)	Leukemia 10,030 (4%)
Kidney & renal pelvis 22,490 (3%)	Ovary 22,220 (3%)	Liver & intrahepatic bile duct 10,330 (3%)	Non-Hodgkin lymphoma 9,050 (3%)
Leukemia 19,640 (3%)	Thyroid 19,190 (3%)	Non-Hodgkin lymphoma 10,150 (3%)	Uterine corpus 7,310 (3%)
Oral cavity & pharynx 19,100 (3%)	Urinary bladder 16,200 (2%)	Urinary bladder 8,970 (3%)	Multiple myeloma 5,640 (2%)
Pancreas 16,100 (2%)	Pancreas 16,080 (2%)	Kidney & renal pelvis 8,020 (3%)	Brain & other nervous system 5,480 (2%)
All sites 710,040 (100%)	All sites 662,870 (100%)	All sites 295,280 (100%)	All sites 275,000 (100%)

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

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

Treatment: Taking into account the tumor size and characteristics and the patient's preferences, treatment may involve lumpectomy (local removal of the tumor) or mastectomy (surgical removal of the breast) and 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. 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) and 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. 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. Women without evidence of cancer in the sentinel lymph nodes sampled will not have to have additional axillary lymph nodes removed, a procedure that at times causes lymphedema, or swelling of the arm, which can be painful and disabling. If a woman is eligible for sentinal 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. Patients should discuss possible options for the best management of their breast cancer with their physicians. Significant advances in reconstruction techniques provide several options for breast reconstruction immediately after mastectomy.

The exact percentage of mammographically-detected ductal carcinoma in situ (DCIS) breast cancers that would progress to invasive 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 distinguish DCIS cancers that will progress from those that won't, 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 rate 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, however, the 5-year survival rate is 80%, and for women with distant metastases, the rate 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 77% compared to 88% at 5 years.

For more information about breast cancer, please inquire about the American Cancer Society's *Breast Cancer Facts & Figures 2003-2004* (8610.03) publication and Web site posting.

Childhood Cancer

New cases: An estimated 9,510 new cases are expected to occur among children aged 0-14 in 2005. Childhood cancers are rare.

Deaths: An estimated 1,585 deaths are expected to occur among children aged 0-14 in 2005, about one-third of them from leukemia. Despite its rarity, cancer is the chief cause of death by disease in children between the ages of 1 and 14. Mortality rates from childhood cancer have declined by about 49% since 1975.

Early detection: Early symptoms are usually nonspecific. 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, which accounts for about 30% of cancer cases in children aged 0-14, and which may be recognized by pain in the bone and joints, weakness, bleeding, and fever
- Brain and other nervous system (21%), which in early stages may cause headaches, nausea, vomiting, blurred or double vision, dizziness, and difficulty in walking or handling objects
- Neuroblastoma (7.4%), a cancer of the sympathetic nervous system which can appear anywhere but usually occurs in the abdomen as a swelling
- Wilms tumor (6.0%), a kidney cancer which may be recognized by a swelling or lump in the abdomen
- Hodgkin lymphoma (4.3%) and non-Hodgkin lymphoma (4.0%), which involve lymph nodes but which also 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 (3.5%), the most common childhood soft tissue sarcoma, which can occur in the head and neck area, genitourinary area, trunk, and extremities, and may be recognized by pain
- Retinoblastoma (2.9%), an eye cancer, which usually occurs in children under the age of 4 and which, when detected early, may be cured with appropriate treatment
- Osteosarcoma (2.5%), a bone cancer that often has no initial pain or symptoms until local swelling begins
- Ewing sarcoma (1.7%), 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 specific 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 rates have improved markedly over the past 30 years, from less than 50% before the 1970s to more than 70% in the late 1990s, largely due to new and improved treatments. Rates vary considerably, however, depending on the specific type. For the most recent time period (1995-2000), the 5-year survival rate for all sites combined is 79%; neuroblastoma, 66%; brain and other nervous system, 73%; bone and joint, 73%; leukemia, 79%; Wilms tumor (kidney), 92%; and Hodgkin lymphoma, 96%. Survivors of childhood cancer may experience treatment-related side effects several months or years after their childhood cancer. Late treatment effects include organ malfunction, secondary cancers, and

cognitive impairments. The Children's Oncology Group 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 organization's Web site at: http://www.survivorshipguidelines.org.

Colon and Rectum

New cases: An estimated 104,950 colon and 40,340 rectal cancer cases are expected to occur in 2005. Colorectal cancer is the third most common cancer both in men and in women. Incidence rates declined by 2.9% per year during 1998-2001. Research suggests that these declines may in part be due to increased screening and polyp removal, thereby preventing progression of polyps to cancers.

Deaths: An estimated 56,290 deaths from colon and rectum cancer are expected to occur in 2005, accounting for about 10% of all cancer deaths. Mortality rates from colorectal cancer continued to decline in both men and women over the past 15 years, at an average of 1.8% per year. This decrease reflects the decreasing incidence rates since the mid-1980s and improvements in survival.

Signs and symptoms: Colorectal cancer usually causes no symptoms in its early stages, making screening important. Rectal bleeding, blood in the stool, a change in bowel habits, and cramping pain in the lower abdomen may signal advanced disease.

Risk factors: The primary risk factor for colorectal cancer is age, with more than 90% of cases diagnosed in individuals older than 50. Risk is increased by a personal or family history of colorectal cancer and/or polyps, or a personal history of inflammatory bowel disease. Other risk factors include smoking, alcohol consumption, physical inactivity, a diet high in saturated fat and/or red meat, as well as 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. Recent studies suggest that estrogen and progestin hormone therapy and nonsteroidal anti-inflammatory drugs, such as aspirin, may reduce colorectal cancer risk. However, women taking estrogen and progestin hormone therapy are more likely to be diagnosed at a more advanced stage of disease.

Early detection: Beginning at age 50, men and women who are at average risk for developing colorectal cancer should begin screening. See page 60 for the American Cancer Society's guidelines for the early detection of 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 or chemotherapy plus radiation (for rectal cancer) is given before or after surgery to most patients whose cancer has deeply penetrated the bowel wall or has spread to the lymph nodes. Oxaliplatin in combination with 5-fluorouracil (5-FU) followed by leucovorin (LV) is a new chemotherapy 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 rates for persons with colorectal cancer are 83% and 63%, respectively. When colorectal cancers are detected at an early, localized stage, the 5-year relative survival rate 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 rate drops to 67%. The 5-year survival rate for persons with distant metastases is 10%. Survival continues to decline beyond five years to 57% at 10 years after diagnosis.

Leukemia

New cases: An estimated 34,810 new cases are expected in 2005, with slightly more acute (15,930) than chronic (14,330) leukemia cases. Although often thought of as primarily a childhood disease, leukemia is diagnosed 10 times more often in adults than in children. Acute lymphocytic leukemia accounts for approximately 78% (2,180/2,790) of the leukemia cases among children. In adults, the most common types are acute myeloid leukemia (approximately 10,980 cases) and chronic lymphocytic leukemia (approximately 8,900 cases). Incidence of leukemia has decreased by 1.1% per year since 1995.

Deaths: An estimated 22,570 deaths are expected to occur in 2005. Death rates in males and females combined have decreased by about 0.5% per year since 1991.

How to Estimate Cancer Statistics Locally, 2005

To obtain the estimated number of...	Multiply community population by: All Sites	Female Breast*	Colon & Rectum	Lung	Prostate*
New cancer cases	0.0046	0.0014	0.0005	0.0006	0.0016
Cancer deaths	0.0019	0.0003	0.0002	0.0006	0.0002
People who will eventually develop cancer	0.4158	0.1339	0.0571	0.0660	0.1781
People who will eventually die of cancer	0.2117	0.0295	0.0225	0.0537	0.0305

*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 Software, Version 5.2, Surveillance, Epidemiology, and End Results Program, Division of Cancer Control and Population Sciences, National Cancer Institute, 2004.

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 (see page 48) 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 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 4,600 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: Survival rates in leukemia vary by type, ranging from 5-year survival rates of 20% for people with acute myeloid leukemia to 73% 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 the mid-1970s to 65% in the late 1990s. Survival rates for children with acute lymphocytic leukemia have increased from 53% to 85% over the same time period.

Lung and Bronchus

New cases: An estimated 172,570 new cases are expected in 2005, accounting for about 13% of cancer diagnoses. The incidence rate is declining significantly in men, from a high of 102.1 per 100,000 in 1984 to 77.7 in 2001. In women, the rate decreased for the first time from 52.8 in 1998 to 49.1 in 2001, after a long period of increase.

Deaths: Lung cancer is the leading cause of cancer-related death in both men and women. An estimated 163,510 deaths, accounting for about 29% of all cancer deaths, are expected to occur in 2005. Since 1987, more women have died each year of lung cancer than from breast cancer. Death rates have continued to decline significantly in men since 1991 by about 1.9% per year. Female lung cancer death rates have recently reached a plateau after continuously increasing for several decades. Decreasing lung cancer incidence and mortality rates reflect decreased smoking rates over the past 30 years.

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

Risk factors: Cigarette smoking is by far the most important risk factor for lung cancer. Other risk factors

Probability of Developing Invasive Cancers Over Selected Age Intervals, by Sex, US, 1999-2001*

		Birth to 39 (%)	40 to 59 (%)	60 to 79 (%)	Birth to Death (%)
All sites†	Male	1.41 (1 in 71)	8.52 (1 in 12)	34.63 (1 in 3)	45.59 (1 in 2)
	Female	1.97 (1 in 51)	9.10 (1 in 11)	22.51 (1 in 4)	38.18 (1 in 3)
Urinary bladder‡	Male	.02 (1 in 4264)	.41 (1 in 243)	2.42 (1 in 41)	3.56 (1 in 28)
	Female	.01 (1 in 8876)	.12 (1 in 804)	.65 (1 in 153)	1.13 (1 in 88)
Breast	Female	.48 (1 in 207)	4.18 (1 in 24)	7.49 (1 in 13)	13.39 (1 in 7)
Colon & rectum	Male	.07 (1 in 1484)	.90 (1 in 111)	3.96 (1 in 25)	5.90 (1 in 17)
	Female	.06 (1 in 1586)	.69 (1 in 145)	3.04 (1 in 33)	5.54 (1 in 18)
Leukemia	Male	.15 (1 in 659)	.22 (1 in 461)	.85 (1 in 118)	1.47 (1 in 68)
	Female	.13 (1 in 799)	.14 (1 in 697)	.48 (1 in 206)	1.04 (1 in 96)
Lung & bronchus	Male	.03 (1 in 3164)	1.06 (1 in 95)	5.75 (1 in 17)	7.63 (1 in 13)
	Female	.03 (1 in 2977)	.81 (1 in 123)	3.91 (1 in 26)	5.71 (1 in 18)
Melanoma of skin	Male	.13 (1 in 795)	.51 (1 in 195)	1.08 (1 in 93)	1.89 (1 in 53)
	Female	.21 (1 in 484)	.40 (1 in 248)	.53 (1 in 190)	1.28 (1 in 78)
Non-Hodgkin lymphoma	Male	.14 (1 in 724)	.46 (1 in 217)	1.32 (1 in 76)	2.18 (1 in 46)
	Female	.09 (1 in 1147)	.31 (1 in 328)	1.00 (1 in 100)	1.80 (1 in 56)
Prostate	Male	.01 (1 in 9879)	2.58 (1 in 39)	14.76 (1 in 7)	17.81 (1 in 6)
Uterine cervix	Female	.16 (1 in 636)	.29 (1 in 340)	.27 (1 in 368)	.77 (1 in 130)
Uterine corpus	Female	.06 (1 in 1632)	.72 (1 in 139)	1.57 (1 in 64)	2.62 (1 in 38)

*For those free of cancer at beginning of age interval. Based on cancer cases diagnosed during 1999-2001. The "1 in" statistic and the inverse of the percentage may not be equivalent due to rounding.

†All sites exclude basal and squamous cell skin cancers and in situ carcinomas except urinary bladder. ‡Includes invasive and in situ cancer cases.

Source: DEVCAN: Probability of Developing or Dying of Cancer Software, Version 5.2. Statistical Research and Applications Branch, National Cancer Institute, 2004. http://srab.cancer.gov/devcan

American Cancer Society, Surveillance Research, 2005

include secondhand smoke and occupational or environmental exposures to substances such as arsenic; some organic chemicals such as benzene; radon and asbestos (particularly among smokers); radiation exposure from occupational, medical, and environmental sources; air pollution; and tuberculosis.

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 which must be considered when evaluating the risks and benefits of screening. The National Lung Screening Trial (NLST), a cancer screening clinical trial funded by the National Cancer Institute, was launched in 2003 and will determine if screening individuals at high risk for lung cancer with spiral CT or with standard chest x-ray can reduce lung cancer deaths.

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 gefitinab (Iressa). 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 in some cases is long lasting. Gefitinib (Iressa), a drug that blocks activity of growth factor receptors, is approved for advanced non-small cell lung cancer, and several similar targeted therapies are currently under study.

Survival: The 1-year relative survival rate for lung cancer has increased from 37% in 1975 to 42% in 2000, largely due to improvements in surgical techniques and combined therapies. However, the 5-year relative survival rate for all stages combined is only 15%. The survival rate

is 49% for cases detected when the disease is still localized. Only 16% of lung cancers are diagnosed at this early stage, however.

Lymphoma

New cases: An estimated 63,740 new cases of lymphoma will occur in 2005, including 7,350 cases of Hodgkin lymphoma and 56,390 cases of non-Hodgkin lymphoma (NHL). Since the early 1970s, incidence rates for NHL have nearly doubled. More recently, incidence rates have stabilized, due primarily to the decline in AIDS-related NHL. Overall, incidence rates for Hodgkin lymphoma have declined significantly since 1990 at a rate of 1.2% per year.

Deaths: An estimated 20,610 deaths will occur in 2005 (Hodgkin lymphoma, 1,410; non-Hodgkin lymphoma, 19,200).

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

Risk factors: Many 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 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 lymphoma and may be related to other lymphomas. *H. pylori* infection increases the risk of gastric lymphoma. Occupational exposures to herbicides, organic solvents, and certain other chemicals appear to increase risk, though the mechanism is unknown. Some studies have suggested a role for diet, exercise, and obesity, but the relationships have not yet been confirmed. 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 rates vary widely by cell type and stage of disease. The 1-year relative survival rates for Hodgkin lymphoma and non-Hodgkin lymphoma are 93% and 77%, respectively; the 5-year rates are 85% and 59%. Ten years after diagnosis, the relative survival rates for Hodgkin lymphoma and non-Hodgkin lymphoma decline to 77% and 42%.

Oral Cavity and Pharynx

New cases: An estimated 29,370 new cases are expected in 2005. 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 7,320 deaths from oral cavity and pharynx cancer are expected in 2005. Death rates have been decreasing since the late 1970s, with rates declining faster since the early 1990s.

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 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 detect 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 85% 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 44%, respectively.

Ovary

New cases: An estimated 22,220 new cases are expected in the US in 2005. Ovarian cancer accounts for about 3% of all cancers among women and ranks second among gynecologic cancers, following cancer of the uterine corpus. During 1985-2001, ovarian cancer incidence

declined at a rate of 0.8% per year. The decline was greater in women 65 and older.

Deaths: An estimated 16,210 deaths are expected in 2005. 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 is rarely a symptom. In women older than 40, digestive disturbances (stomach discomfort, gas, distention) that persist and cannot be explained by any other cause 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, tubal ligation, 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. Increased risk for ovarian cancer may be associated with increased body weight. Women who have had breast cancer or who have a family history of breast or ovarian cancer are at increased risk. Mutations in BRCA1 or BRCA2 genes have been observed in some of these families. 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 industrialized countries other than Japan.

Early detection: Routine screening for women at average risk is not recommended because no sufficiently accurate screening tests are currently available. The pelvic examination, which can detect a variety of gynecologic disorders, can only occasionally detect ovarian cancer, and generally only when the cancer is already in its 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, tranvaginal 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: Surgery, chemotherapy, and occasionally radiation therapy are treatment options. Surgery usually includes the 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 attempt is made to remove all abdominal metastasis to enhance the effect of chemotherapy.

Survival: Survival varies by age; women younger than 65 are about twice as likely to survive 5 years following diagnosis than women 65 and older, 56% and 29%, respectively. Overall, about 77% of new ovarian cancer patients survive 1 year after diagnosis; the 5-year relative survival rate for all stages is 44%. 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 relative survival rates are 69% 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 32,180 new cases are expected to occur in the US in 2005. Over the past 15 to 25 years, incidence rates of pancreatic cancer have declined slowly in both men and women.

Deaths: An estimated 31,800 deaths are expected to occur in 2005. 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.

Five-Year Relative Survival Rates* by Stage at Diagnosis, 1995-2000

Site	All Stages %	Local %	Regional %	Distant %	Site	All Stages %	Local %	Regional %	Distant %
Breast (female)	87.7	97.5	80.4	25.5	Ovary†	44.0	93.5	68.8	28.5
Colon & rectum	63.4	89.9	67.3	9.6	Pancreas	4.4	15.2	6.8	1.8
Esophagus	14.3	29.3	13.3	3.1	Prostate‡	99.3	100.0	–	33.5
Kidney	63.9	91.1	59.1	9.3	Stomach	23.3	58.4	22.5	3.1
Larynx	65.1	83.7	48.7	18.7	Testis	95.9	99.4	95.9	71.8
Liver	8.3	18.4	6.2	2.9	Thyroid	96.5	99.6	96.3	61.0
Lung & bronchus	15.2	49.4	16.1	2.1	Urinary bladder	81.7	94.1	48.8	5.5
Melanoma	90.5	97.6	60.3	16.2	Uterine cervix	72.7	92.2	53.3	16.8
Oral cavity	58.7	81.0	50.7	29.5	Uterine corpus	84.4	95.8	67.0	25.6

*Rates are adjusted for normal life expectancy and are based on cases diagnosed from 1995-2000, followed through 2001. †Recent changes in classification of ovarian cancer, namely excluding borderline tumors, has affected 1995-2000 survival rates. ‡The rate for local stage represents local and regional stages combined.

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, 1975-2001, Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, MD, 2004.

American Cancer Society, Surveillance Research, 2005

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 can 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 23%, and the 5-year rate is about 4%. Even for those people diagnosed with local stage disease, the 5-year relative survival rate is only 15%.

Prostate

New cases: An estimated 232,090 new cases will occur in the US during 2005. Prostate cancer incidence rates are significantly higher in African American men than in white men. Between 1988 and 1992, prostate cancer incidence rates increased dramatically due to earlier diagnosis with prostate-specific antigen (PSA) blood testing. Prostate cancer incidence rates subsequently declined and have increased at a less rapid rate since 1995 due to an increasing rate in men younger than 65, likely due to widespread screening with the PSA test. In those 65 and older, however, rates have leveled off. Rates peaked in 1992 among white men (237.5 per 100,000 men) and in 1993 among African American men (341.4 per 100,000 men).

Deaths: With an estimated 30,350 deaths in 2005, prostate cancer is the second leading cause of cancer death in men. Although death rates have been declining among white and African American men since the early 1990s, 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 70% of all prostate cancer cases are diagnosed in men older than 65. 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.

Trends in Five-Year Relative Survival Rates*(%) by Race and Year of Diagnosis, US, 1974-2000

Site	Relative Five-Year Survival Rate (%)								
	White			African American			All Races		
	1974-76	1983-85	1995-2000	1974-76	1983-85	1995-2000	1974-76	1983-85	1995-2000
All cancers	51	54	66†	39	40	55†	50	53	64†
Brain	22	26	32†	27	32	38†	22	27	33†
Breast (female)	75	79	89†	63	64	75†	75	78	88†
Colon	51	58	64†	46	49	54†	50	58	63†
Esophagus	5	9	16†	4	6	9†	5	8	14†
Hodgkin lymphoma	72	79	86†	69	77	80†	71	79	85†
Kidney	52	56	64†	49	55	64†	52	56	64†
Larynx	66	69	67	60	55	51	66	67	65
Leukemia	35	42	48†	31	34	39	34	41	46†
Liver	4	6	8†	1	4	5†	4	6	8†
Lung & bronchus	13	14	15†	11	11	13†	13	14	15†
Melanoma of the skin	81	85	91†	67‡	75§	74‡	80	85	91†
Multiple myeloma	24	27	32†	28	31	32	24	28	32†
Non-Hodgkin lymphoma	48	55	60†	49	45	51	47	54	59†
Oral cavity	55	55	61†	36	35	39	54	53	59†
Ovary^	37	40	44†	41	42	38	37	41	44†
Pancreas	3	3	4†	3	5	4†	3	3	4†
Prostate	68	76	100†	58	64	96†	67	75	99†
Rectum	49	56	65†	42	44	55†	49	55	64†
Stomach	15	16	22†	16	19	24†	15	17	23†
Testis	79	91	96†	76‡	88‡	87	79	91	96†
Thyroid	92	93	97†	88	92	95	92	94	97†
Urinary bladder	74	78	83†	48	60	62†	73	78	82†
Uterine cervix	70	71	74†	64	61	66	69	69	73†
Uterine corpus	89	85	86†	62	54	63	88	83	84†

*Survival rates are adjusted for normal life expectancy and are based on cases diagnosed from 1974-1976, 1983-1985, and 1995-2000, and followed through 2001. †The difference in rates between 1974-1976 and 1995-2000 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 1995-2000 survival rates.

Source: Surveillance, Epidemiology, and End Results Program, 1975-2001, Division of Cancer Control and Population Sciences, National Cancer Institute, Bethesda, MD, 2004.

American Cancer Society, Surveillance Research, 2005

International studies suggest that a diet high in saturated fat may also be a risk factor. There is some evidence that suggests the risk of dying from prostate cancer increases with increased body weight.

Early detection: At this time, there is insufficient data to recommend for or against early prostate cancer testing. The prostate-specific antigen (PSA) blood test, used to detect a substance made by the prostate called prostate-specific antigen, and the digital rectal examination should be offered. Individuals at average or high risk should be given information about the benefits and limitations of testing so they can make informed decisions about testing. See page 60 for the American Cancer Society's screening guidelines for the early detection of prostate cancer.

Treatment: Treatment options vary depending on age, stage of the cancer, and other medical conditions the individual may have, and should be discussed with the individual's physician. Surgery and external beam or radioactive seed implants, called brachytherapy, may be used for 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 without immediate, active treatment ("watchful waiting") may be appropriate for older individuals with limited life expectancy and/or less aggressive tumors.

Survival: Ninety percent 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 99%. According to the most recent data, relative 10-year survival is 92%, and 15-year survival is 61%. 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 59,580 persons in 2005. During the 1970s, the incidence rate of melanoma increased rapidly at about 6% per year. Since 1981, however, the rate of increase has slowed to a little less than 3% per year. Melanoma is primarily a disease of whites, and rates are more than 10 times higher in whites than in African Americans. In addition to basal cell and squamous cell carcinomas and melanoma, other important forms of skin cancer include Kaposi sarcoma, which commonly occurred among patients with AIDS prior to the introduction of protease inhibitors, and cutaneous T-cell lymphoma.

Deaths: An estimated 10,590 deaths, 7,770 from melanoma and 2,820 from other non-epithelial skin cancers, will occur this year. After increasing for several decades, the melanoma mortality rate has stabilized since 1990 in white men. Among white women, the mortality rate has decreased since 1988.

Signs and symptoms: Symptoms of melanoma may include any change on the skin, such as a new spot or one that changes in size, shape, or color. Other important signs of melanoma include changes in size, shape, or color of a mole. Basal cell carcinomas often appear as flat, firm, pale areas or as small, raised, pink or red, translucent, shiny, waxy 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 symptom 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 (sunburn easily; difficulty tanning; natural blonde or red hair color); a history of excessive sun exposure, including sunburns; exposure to tanning booths and to 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. Because severe sunburns in childhood may greatly increase risk of melanoma in later life, children, in particular, should be protected from the sun.

Early detection: Recognizing changes in skin growths or the appearance of new growths is the best way to detect skin cancer early. Adults should practice skin self-examination 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, including surgical excision, electrodessication 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, and in some cases, it may be necessary to remove one or more nearby lymph nodes for staging. Removal and microscopic examination of all suspicious moles is essential. Advanced cases of melanoma are treated with immunotherapy or chemotherapy.

Survival: For basal cell or squamous cell cancers, a cure is highly likely if the cancer is detected and treated early. Melanoma can spread to other parts of the body quickly. When detected in its earliest stages and treated properly, however, it is highly curable. The 5-year relative survival rate for persons with melanoma is 91%; the 10-year survival rate is 87%. For localized melanoma, the 5-year relative survival rate is 98%; 5-year survival rates for regional and distant stage diseases are 60% and 16%, respectively. About 83% of melanomas are diagnosed at a localized stage.

Urinary Bladder

New cases: An estimated 63,210 new cases are expected to occur in 2005. Bladder cancer incidence rates among men and women combined leveled off from 1986 to 2001, after increasing by 0.7% per year from 1975 to 1986. Overall, bladder cancer incidence is about four times higher in men than in women and two times higher in whites than in African Americans.

Deaths: An estimated 13,180 deaths will occur in 2005. 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 be responsible for about 48% of bladder cancer deaths among men and 28% among women. Workers in the dye, rubber, or leather industries also have a higher 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 recurrence or secondary 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 relative survival rate is 94%; 74% of cancers are detected at this early stage. For regional and distant stages, 5-year relative survival rates are 49% and 6%, respectively. Beyond 5 years, survival continues to decline, with a rate of 75% at 10 years and 70% at 15 years after diagnosis.

Uterine Cervix

New cases: An estimated 10,370 cases of invasive cervical cancer are expected to be diagnosed in 2005. Incidence rates have decreased steadily over the past several decades in both white and African American women. As Pap screening has become more prevalent, pre-invasive lesions of the cervix are detected far more frequently than invasive cancer.

Deaths: An estimated 3,710 cervical cancer deaths are expected in 2005. 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 also may be symptoms.

Risk factors: The primary cause of cervical cancer is infection with certain types of human papillomavirus (HPV). (See Special Section, pages 27-29.) 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.

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 60 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: Survival for women with pre-invasive lesions is nearly 100%. Almost 90% of cervical cancer patients survive 1 year after diagnosis, and 73% survive 5 years. When detected at an early stage, invasive cervical cancer is one of the most successfully treated cancers with a 5-year relative 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 57% of white women and 49% of African American women.

Uterine Corpus (Endometrium)

New cases: An estimated 40,880 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 2005. After increasing from 1988 to 1998, incidence rates of endometrial cancer leveled off through 2001.

Deaths: An estimated 7,310 deaths are expected in 2005. Death rates from cancer of the uterine corpus have stabilized since 1990, after decreasing from 1975-1990.

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 the major 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, 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, which 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 post-menopausal 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 endometrial cancer is 94%. The 5-year relative survival rate is 96%, 67%, and 26%, if the cancer is diagnosed at local, regional, and distant stages, respectively. Relative survival rates for whites exceed those for African Americans by at least 10 percentage points at every stage.

Special Section: Cancers Linked to Infectious Diseases

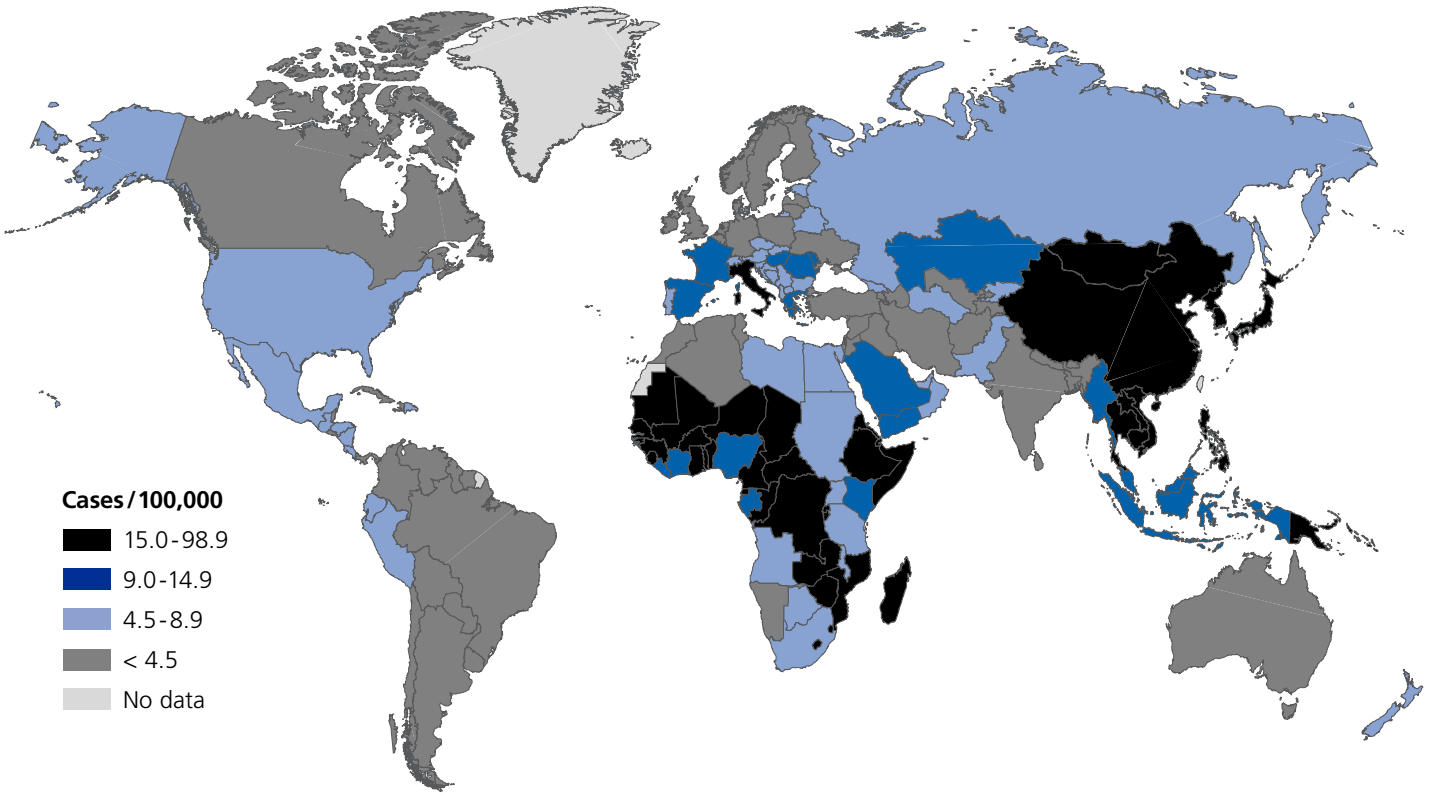
Introduction

In 2005, it is estimated that 17% of new cancers worldwide will be attributable to infection. This includes 1.5 million (26%) of cancers in economically developing countries, where 84% of the world's population resides, and 360,000 (7.2%) of cancers in developed countries, where 16% of the world's population resides.[1,2] Cancers caused by infections are thought to result from one or more of the following: chronic inflammation, immune suppression, and/or chronic stimulation. Some viruses also directly stimulate cell replication by disrupting cell cycle control. While some of these cancers are preventable by available public health and medical interventions, substantial barriers exist to applying these interventions, especially in developing countries. This review will focus on the most common infection-related cancers in the US for which preventive measures exist: hepatitis B virus (HBV)- and hepatitis C virus (HCV)-related liver cancer, human papilloma virus (HPV)-related cervical cancer, *Helicobacter pylori* (*H. Pylori*)-related stomach cancer, and human immunodeficiency virus (HIV)-related Kaposi sarcoma and lymphoma.

Liver Cancer, Hepatitis B Virus, and Hepatitis C Virus

In 2005, it is predicted that there will be more than 667,000 new cases of liver cancer throughout the world and 17,550 in the US. Eighty-three percent of new cases will occur in developing countries (Figure 1).[1,2] Liver cancer ranks as the sixth most common type of cancer worldwide, while in the US it is the 18th. However, the incidence of liver cancer has been steadily increasing in the US over the past two decades (Figure 2). In the US,

Figure 1. International Variation in Liver Cancer Incidence Rates in Men



Rates were age-adjusted to the world standard population.

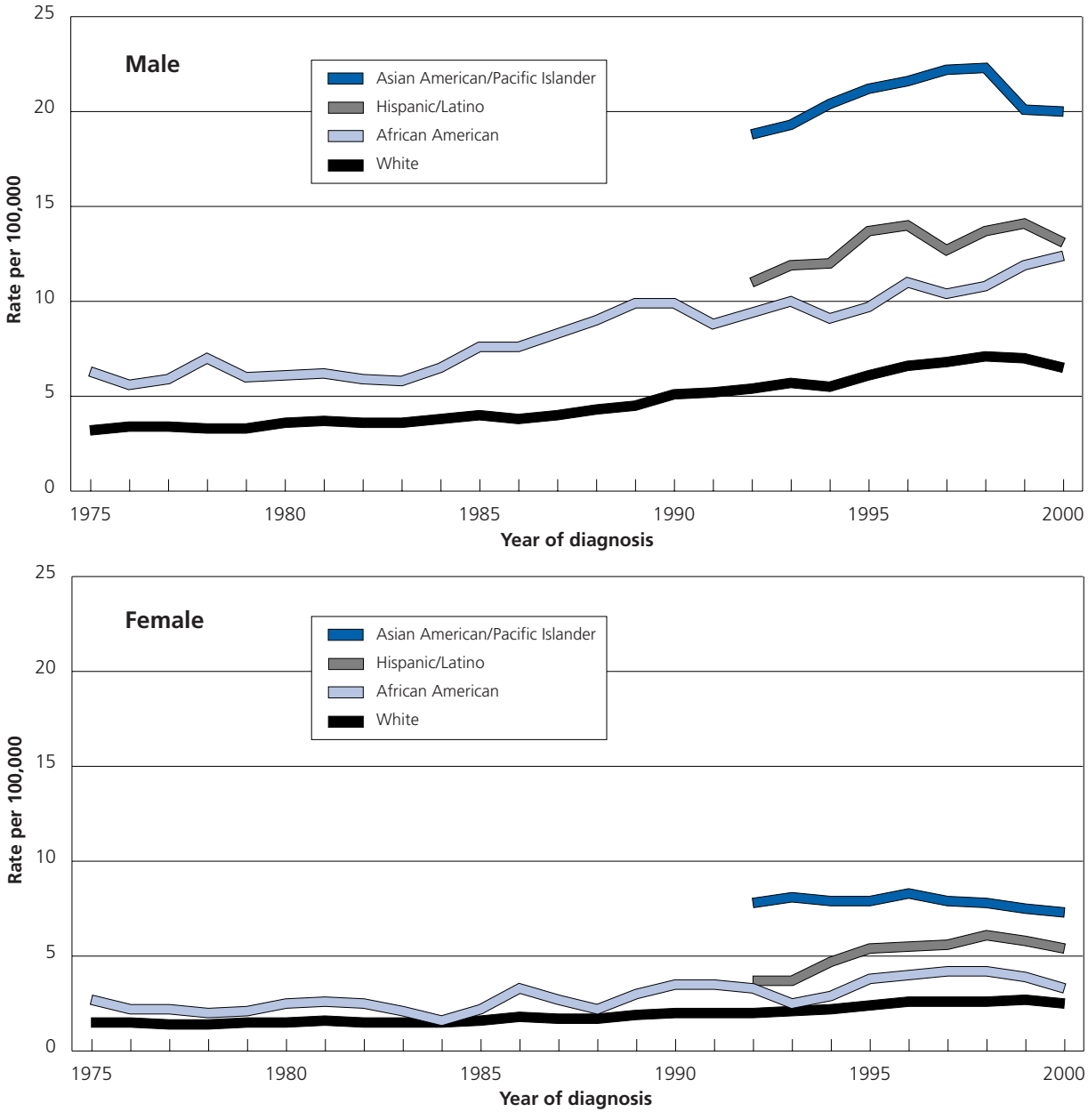
Source: http://www-depdb.iarc.fr/globocan/GLOBOframe.htm.

Reference: 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. http://www-depiarc.fr/.

the incidence of liver cancer is substantially greater among men than women, and varies by race and ethnicity, with Asian Americans experiencing the highest rates.

About 83% of liver cancers are hepatocellular carcinomas (HCC), affecting hepatocytes, the predominant type of cell in the liver. Worldwide, the major causes of liver cancer are chronic infection with HBV and HCV. In developing countries, 37% of liver cancers are attributable to HBV, 25% to HCV, 10% to infection of the intrahepatic bile ducts by liver flukes, and 9% to other causes. In developed countries, 14% of liver cancers are attributable to HBV, 14% to HCV, and 71% to other causes

Figure 2. Trends in Liver Cancer Incidence Rates,* by Race,† 2-Year Moving Averages, 1975-1976 to 2000-2001



*Rates are per 100,000 and age-adjusted to the 2000 US standard population.
†Trends for American Indians/Alaska Natives are not shown because of sparse data.
Source: Surveillance, Epidemiology, and End Results (SEER) program. SEER*Stat database. www.seer.cancer.gov.

(alcohol-related cirrhosis and possibly hepatitis from obesity).[2]

Both HBV and HCV are transmitted by intimate person-to-person contact or direct contact with infectious blood or blood-derived body fluids. Hepatitis A virus (HAV), another common agent of viral hepatitis, is usually transmitted by the fecal-oral route through person-to-person contact or by ingestion of HAV-contaminated food or water. HAV infection does not cause either chronic infection or liver cancer.

Hepatitis B Virus (HBV)

About 6.2% of liver cancers in North America and 35% worldwide are attributed to chronic infection with HBV.[3] Symptoms of initial infection with HBV are variable. Many people have no symptoms. When symptoms occur, they may include nausea, vomiting, diarrhea, loss of appetite, and headache, followed by jaundice.[4] Chronic (long-term) infection with HBV is indicated by persistence of hepatitis B surface antigen (HBsAg), a marker of active HBV infection, in the blood for more than 6 months. The probability of developing chronic infection is much higher for infants and children than for adults (about 90% for neonates and about 10% for adults). People with chronic infection are often referred to as "chronic carriers" because they are able to infect others. Among people who have had HBV infection, only those with chronic infection are at increased risk of developing chronic liver disease, cirrhosis (inflammation and scarring of the liver), and liver cancer.

Although 5.7% of men and 4.1% of women in the US had evidence of previous HBV infection as determined by the National Health and Nutrition Examination Survey conducted in 1988-1994, only 0.42% of people in the US were chronically infected.[5] Much higher infection and carrier rates are observed in Africa, China, and Oceania (excluding Australia and New Zealand). About 350 million people in the world today[6], and 1.25 million people in the US[7], are chronic carriers of HBV.

Chronic infection is critical in the epidemiology of HBV transmission.[8] HBV is transmitted by percutaneous (i.e., puncture through the skin) or permucosal (i.e., direct contact with mucous membranes) exposure to infectious blood or body fluids that contain blood. This can occur through contaminated injections, sexual intercourse with an infected partner, birth to an infected mother, or contact with contaminated surfaces.

HBV is relatively stable in the environment and remains viable for at least 7 days on environmental surfaces at room temperature. Therefore, even minute exposures from sharing toothbrushes, razors, and other personal care items contaminated with blood can result in transmission.[9] An important cause of HBV infection in developing countries is reuse of syringes or needles on multiple patients without complete sterilization. An estimated 20% of new HBV infections worldwide, or 8-16 million infections per year, arise from unsafe injections in medical care settings.[10]

In high prevalence areas of the world, HBV infection is often acquired at birth or in early childhood, when it is most likely to result in a carrier state. In the US and other industrialized countries, infection more often occurs in adolescence and young adulthood and is associated with high-risk behaviors such as injection drug use, and, to a lesser degree, multiple sex partners. As a result, chronic HBV infection more often occurs in the context of HIV coinfection, which presents unique challenges to patient management. Historically, health care workers and patients subject to accidental exposure to pooled blood products, such as hemophiliacs, were also at increased risk. However, due to immunization, universal precautions, and viral inactivation procedures, infections in these groups are now rare. Other US populations at increased risk include Alaska natives, Pacific Islanders, and children who reside in households with first-generation immigrants from countries where HBV infection is common.[9]

The exact mechanism by which HBV infection causes HCC is unknown, but it is thought that inflammation and scarring of the liver (cirrhosis) plays a primary role in malignant transformation. About 60%-90% of patients with HCC due to chronic HBV have cirrhosis.[11] Exposure to aflatoxins (toxic products of mold in grains and other foods products) or other liver-damaging agents (e.g., alcohol) may be significant cofactors in some parts of the world.[12]

Primary prevention: A vaccine that protects against HBV has been available since 1982. Three doses are typically needed to achieve adequate long-term immunity. In the US, hepatitis B vaccination is recommended for:

- All infants, starting at birth
- All children aged 0-18 who were not previously vaccinated
- Adults in high-risk groups, including health care workers

It is also recommended that all pregnant women be tested for HBsAg, i.e., evidence of current infection; if positive, the newborn infant should receive hepatitis B immune globulin (HBIG) as well as hepatitis B vaccine within 12 hours of birth.[13] This treatment is about 85% effective in preventing infection in newborns.[14]

Screening of blood donors for HBsAg was initiated in the US in 1973, virtually eliminating the risk of transmission via blood transfusion.[9] As a result of these effective public health measures, the reported incidence of acute hepatitis B in the US declined from 8.5 cases per 100,000 in 1990 to 2.8 cases per 100,000 persons in 2002.[15] The decline was particularly significant among persons under age 20, reflecting the success of immunization programs for infants and children. In 2002, the hepatitis B vaccine coverage rate was 90% for children aged 19-35 months and 67% for children aged 13-15 years. State laws mandating hepatitis B vaccination for middle school children have contributed to achieving high coverage rates among adolescents.[13] In the US, hepatitis B vaccine is available through the Vaccines for Children (VFC) program, which provides vaccination at no cost to low-income and uninsured children through their health care providers.[16] Universal hepatitis B vaccination has been shown to reduce the incidence of hepatocellular cancer among children in Taiwan.[17]

In contrast to progress in preventing hepatitis B infection among children and adolescents, hepatitis B incidence rates among men over age 19 and women 40 and older have been rising since 1999. Increasing efforts to vaccinate high-risk individuals, including those with multiple sex partners, men who have sex with men, and injection drug users are recommended to counteract this trend.[15] Efforts are also needed to improve vaccination rates among children in high-risk, medically underserved communities, including children of immigrants from high-prevalence areas[18], and to ensure prenatal testing for women in urban areas, where infection rates are high but testing rates are low.[19]

The burden of HBV infection and resulting liver disease is much greater in the developing world, which also faces many more barriers to prevention. Although the World Health Organization (WHO) recommends hepatitis B vaccination for all infants, many poor countries have been unable to implement this recommendation because they cannot afford the cost of obtaining and administering the vaccine (Figure 3). In 1999, a generous commitment by the Bill and Melinda Gates Foundation to contribute $750 million over 5 years led to the development of the Global Alliance for Vaccines and Immunization (GAVI), an international partnership created to improve access to sustainable immunization services.

Screening of blood products and sterilization of injection equipment is essential to reduce HBV transmission in medical settings in developing countries. Another potential way to reduce the incidence of liver cancer in some areas of the world is to reduce consumption of foods contaminated with aflatoxins, which may contribute to the development of HCC among HBV carriers. Preventing aflatoxin contamination of the food supply can be accomplished by implementing changes in pre- and post-harvest agricultural practices and through consumption of a more varied diet.[12]

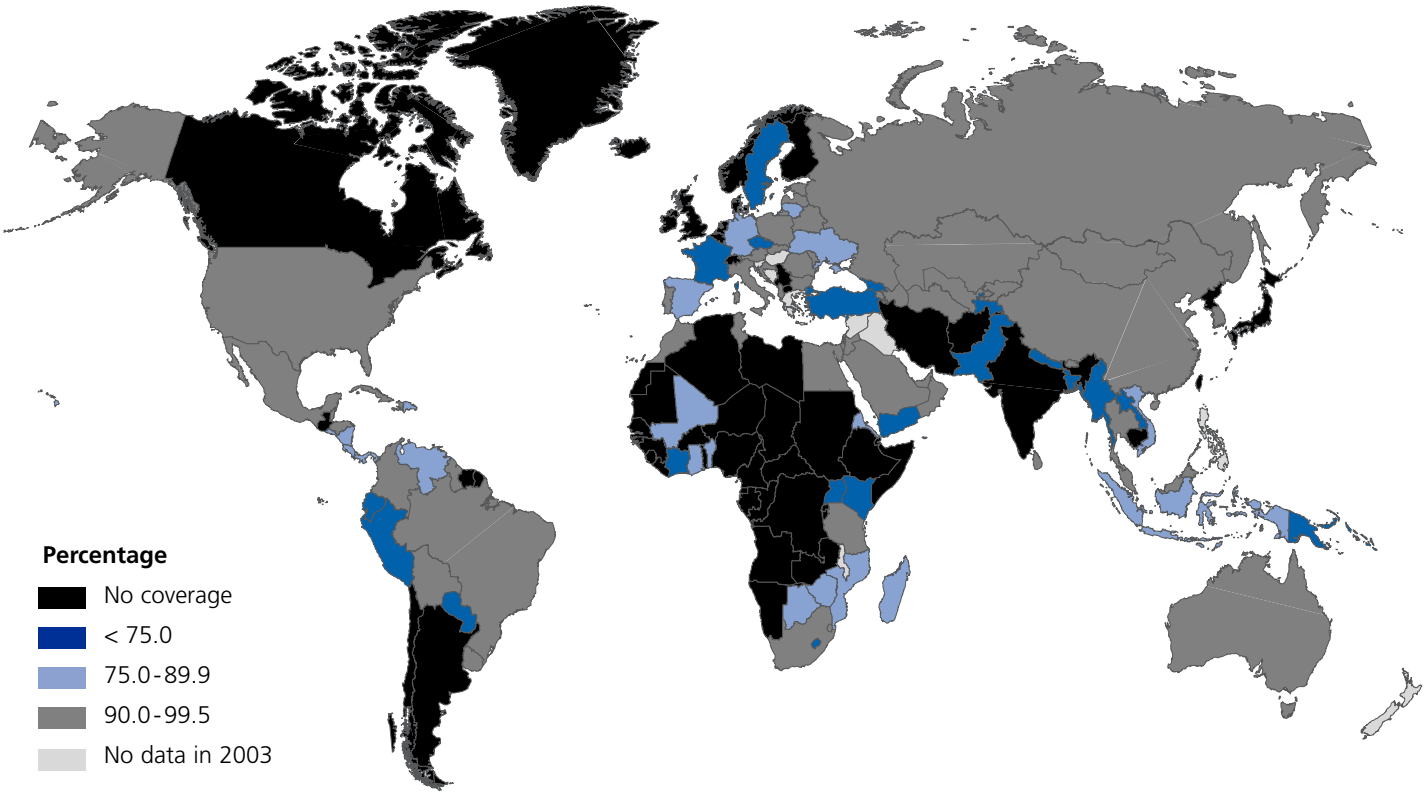
Secondary prevention: Antiviral therapy with drugs such as pegylated alpha interferon, lamivudine, or adefovir dipivoxil has been approved by the Food and Drug Administration for treatment of chronic hepatitis B. None of these therapies, however, is proven to be effective in preventing progression to cirrhosis and HCC among persons with chronic HBV infection. Nevertheless, these therapies have been shown to result in loss of HBeAg (an immunologic marker associated with high levels of HBV in blood), reduction in HBV DNA levels, and improved histology, intermediate outcomes which may suggest long-term benefit.[20]

A randomized trial of screening for liver cancer with serum α-fetoprotein among chronic HBV carriers in China found that screening resulted in earlier diagnosis, but no reduction in death.[21] In the US, many physicians screen carriers with normal liver enzymes yearly or twice yearly for high levels of serum α-fetoprotein. Carriers with additional risk factors, including chronic hepatitis or cirrhosis, may be screened twice yearly with serum α-fetoprotein measurement and ultrasound.[22]

Hepatitis C Virus (HCV)

About 23% of liver cancer in North America and 23% worldwide is attributed to chronic infection with HCV.[3] First identified in 1988, HCV was confirmed as the major cause of bloodborne "non-A, non-B" hepatitis in 1990.[23] Although HCV infection can cause symptoms similar to HBV, the majority of newly infected people have no symptoms. Chronic infection develops in 75%-85% of HCV-infected persons. An estimated 3.9 million people in the US had been infected with HCV, and 2.7 million

Figure 3. Proportion of Infants Covered by National Hepatitis B Immunization Program, 2003



Source: http://www.who.int/vaccines-surveillance/DataDown.htm

were chronically infected as determined by the National Health and Nutrition Examination Survey conducted in 1988-1994.[24] Most of these persons were 30-49 years old at the time of testing. Aging of this population may account for some of the increase in liver cancer incidence in the US. A study of recently diagnosed HCC patients in the US found that about 50% had antibodies to hepatitis C virus.[25] Worldwide, 170 million persons are infected with HCV, and the global prevalence of HCV infection is 3.1%, ranging from 1.0 % in Europe to 5.3% in Africa.[26]

Direct percutaneous exposure to infected blood is the primary mode of HCV transmission. In the US, 60% of chronic HCV infections are attributed to injection drug use, 10% to receiving blood transfusions before donor screening, and 15% to sexual transmission.[27] Among injection drug users, the rate of acquiring HCV infection is very high, with a number of studies showing 20%-40% being infected within the first year of reusing or sharing needles.[28]

HCV infection occurs in an average of 2% of health care workers who experience needle-stick exposures to HCV-infected patients and an average of 6% of infants born to HCV-infected mothers.[29] Approximately 50% of infants are able to eliminate the virus without therapeutic intervention.[30] Post-exposure prophylaxis with immunoglobulin is not effective in preventing HCV infection and is not recommended.

HCV is estimated to have infected as many as 242,000 Americans annually during the 1980s. Since 1989, the annual number of new infections has declined by more than 80%, to approximately 30,000 in 2002. This decline has been attributed primarily to a decrease in cases among injection drug users for reasons that are not clear.

An estimated 5%-20% of people with chronic HCV infection will develop hepatic fibrosis that evolves into cirrhosis. Among those who develop cirrhosis, liver cancer develops at a rate of 1%-4% per year. Cofactors that may influence this progression are alcohol intake, age at infection, and coinfection with HBV or HIV.[30]

In developing countries, use of unscreened blood and blood products and reuse of injection equipment in medical settings remain the major causes of HCV transmission.[28]

Primary prevention: There is no vaccine available for HCV. In most developed countries and in some developing countries, the main cause of HCV transmission is injection drug use. In a limited number of studies, needle and syringe exchange programs have been shown to reduce rates of HCV infection.[28] Universal precautions (a set of precautions designed to prevent transmission of bloodborne pathogens when providing first aid or health care) and safer needle design have reduced risks of accidental infection among health care workers.

Other important elements of primary prevention are screening of blood, organ, tissue, and semen donors for antibodies to HCV, and instituting adequate infection control and injection practices during all medical, surgical, and dental procedures. While these measures are particularly important in parts of the world with high rates of bloodborne infections, including HBV and HCV, they have not been implemented in many developing countries due to training and resource constraints and cultural barriers.[28]

Secondary prevention: The Centers for Disease Control and Prevention (CDC) recommends that routine HCV testing be offered to individuals at high risk for infection. Individuals who test positive should be provided with a medical referral, counseling, and immunizations to reduce their risk of developing severe complications and transmitting HCV to others.[27] Treatment with pegylated interferon and ribavirin produces sustained response rates of 40%-50%, with a low probability of subsequent relapse.[31] (Sustained response rates means that HCV RNA is undetectable at 24 weeks after therapy.) Although one Japanese study reported a reduced incidence of liver cancer among sustained responders, there have been no long-term follow-up studies in the US demonstrating that antiviral therapy reduces HCV-related morbidity or mortality. As with HBV, however, intermediate benefits of virus eradication may result in long-term benefits.[31] There also are numerous adverse effects and contraindications to this treatment, and the high cost makes it unaffordable for most chronically infected persons in developing countries. Screening measures for liver cancer patients with chronic viral hepatitis due to HCV are similar to those for patients with chronic hepatitis or cirrhosis from HBV.

HPV and Cervical Cancer

Cancer of the cervix is the second most common cancer among women worldwide; about 490,000 new cases will be diagnosed in 2005. About 80% of cervical cancer cases occur in developing countries where, in many regions, it is the most common cancer among women.[33]

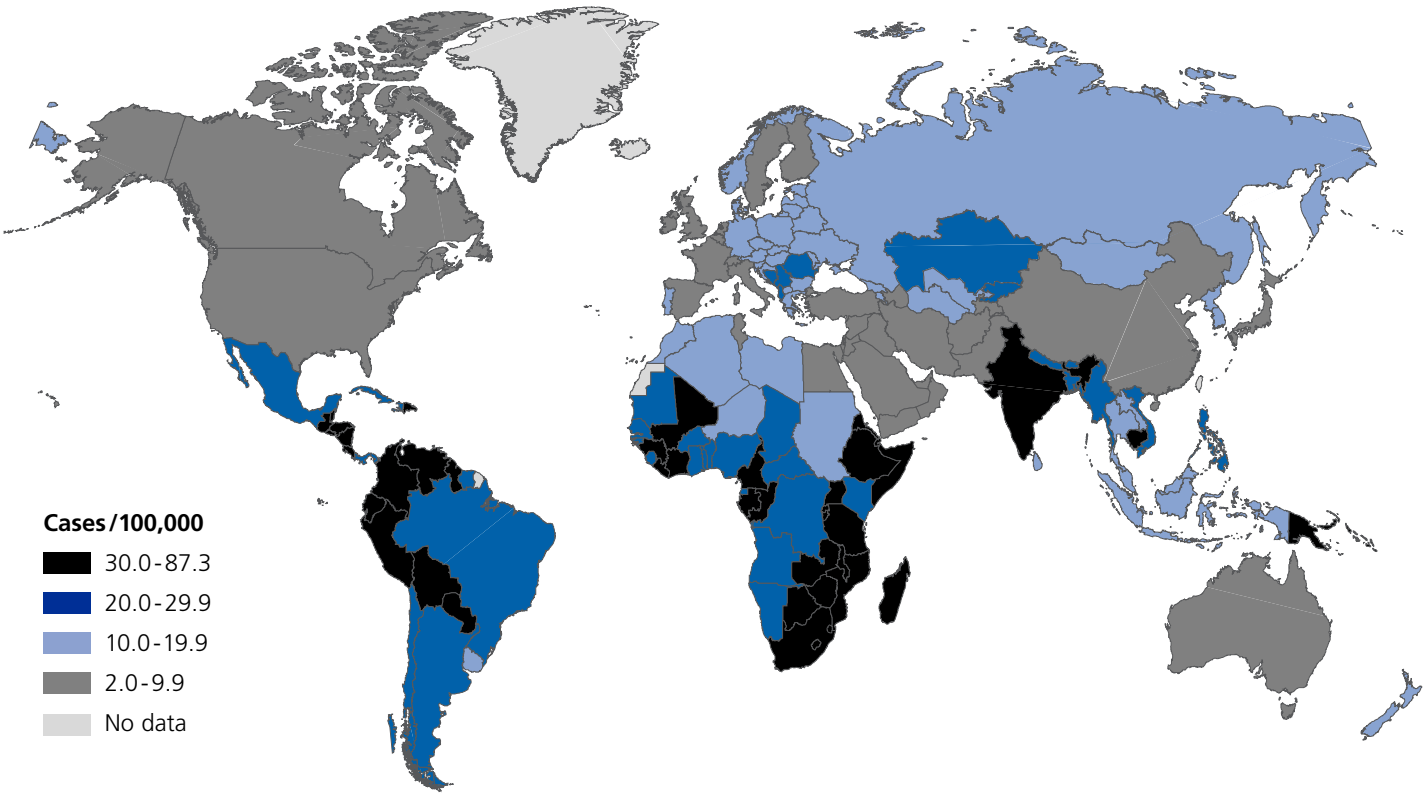
In the US, cervical cancer is the 14th most common type of cancer in women, with 10,370 new cases projected for 2005. Incidence and mortality rates for cervical cancer have decreased dramatically in the US, due largely to screening using Pap tests. Pap tests reduce cancer incidence by detecting precancerous lesions that can be treated before they progress to cancer, and they also detect invasive cervical cancer at an early and treatable stage.

The incidence of cervical cancer varies by race, ethnicity, and geographic region, with the highest incidence rates observed among Hispanic/Latina women and the highest mortality rates among African American women (see page 36). Worldwide, the highest incidence rates are in South America and the Caribbean, sub-Saharan Africa, and South and Southeastern Asia (Figure 4, page 28). The disproportionate burden of cervical cancer in developing countries and elsewhere in medically underserved populations is mainly due to lack of screening.

Nearly 100% of women with cervical cancer have evidence of cervical infection with human papillomavirus (HPV), which has been recognized as the main cause of cervical cancer.[32,34] About 40 HPV viral types have been found to infect the anogenital tract,[34] out of almost 200 HPV types known to date. A recent pooled analysis of case-control studies from 9 countries identified 15 HPV types that are associated with an increased risk of cervical cancer. Among these, HPV 16 and 18 are the most common types among cervical cancer patients (50.5% and 13.1%, respectively) and are associated with a more than 200-fold increased risk of cervical cancer.[35]

Although infection with high-risk HPV appears necessary for cervical cancer to develop, such infection is common and most infected women do not develop the disease. In a recent international study, the prevalence of HPV infection among controls (women without cervical cancer) was 15.5%, with 5% of controls being positive for HPV types 16 or 18. The cumulative lifetime probability of acquiring a cervical infection with at least one type of HPV is extremely high for sexually active women. However, most HPV infections disappear spontaneously within 2 to 4 years, and only a small percentage progress

Figure 4. International Variation in Cervical Cancer Incidence Rates



Rates are age-adjusted to the world standard population.

Source: http://www-depdb.iarc.fr/globocan/GLOBOframe.htm.

Reference: 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. http://www-depiarc.fr/.

to cervical precancer, histologically confirmed cervical intraepithelial neoplasia grade 3 (CIN3), or carcinoma in situ.

Precancerous changes may progress to invasive cervical cancer if not detected and treated. Since progression is associated with persistent infection over many years, and since the peak incidence of cancer is one or more decades removed from the peak incidence of infection, it is strongly suspected that additional genetic, cellular, or systemic cofactors are required. Factors that may influence progression include immunosuppression, HIV infection, smoking, increasing parity (number of children born to a woman), long-time use of oral contraceptives, and co-infection with herpes simplex virus or *chlamydia trachomatis*.[36,37] High-risk HPVs result in stimulation of cell proliferation and induction of chromosomal damage.[38]

In addition to cervical cancer, HPV infection is associated with some vulvar, vaginal, oropharyngeal, penile, and anal carcinomas. The risk of anal carcinoma is increased among men who have sex with men.[39]

Primary prevention: Although some HPV subtypes cause genital warts, most HPV infections cause no symptoms. Since HPV can be present in skin and mucous membranes throughout the anogenital area as well as in genital secretions, use of condoms may only be partially protective.

Vaccine development holds promise for primary prevention of cervical cancer.[40] A recent controlled trial of a human HPV type 16 vaccine found that it was effective at preventing persistent HPV-16 infection and HPV-16-related premalignant cellular changes during a median follow-up period of 17 months.[41] A second trial has shown that a combined vaccine against HPV-16 and HPV-18 are highly effective against incident and persistent infections over a 27-month follow-up period.[42] Currently, such vaccines are being tested in large phase III clinical trials and, if successful, are expected to reach the market in about five years.

Detection of advanced premalignant lesions by Pap testing, followed by effective treatment, prevents invasive cervical cancer.

The American Cancer Society Guidelines for the Early Detection of Cervical Cancer are given on page 60.[43] The Food and Drug Administration has recently approved HPV testing as an adjunct to cytology for cervical cancer screening, and interim guidelines for its use have recently been published.[44]

Conventional Pap testing may not be effective in early detection of adenocarcinoma of the cervix, which now comprises 20%-25% of cervical cancers in the US and worldwide.[45,46,47] It has been suggested that testing for high-risk HPV types in conjunction with Pap testing,[47] as well as use of new sampling devices, such as the endocervical brush and broom to improve collection of cells from the upper portion of the endocervical canal, may increase detection of adenocarcinoma in situ.

Pap testing is not available to most women in developing countries because of inadequate public health and medical infrastructure necessary to organize population screening and follow up, and a lack of expertise and quality control needed to ensure accuracy of testing and diagnosis. In some countries, cultural taboos may also prevent women from seeking or receiving appropriate screening from male health care providers.

Development and evaluation of alternative screening strategies for use in developing countries are a high priority for international health agencies. Training and use of midwives and other female health workers offers some potential for overcoming cultural barriers. Using visual inspection of the cervix to identify areas that appear white after application of acetic acid is under investigation as a screening technique in low-resource countries; however, evidence for the efficacy of this method is currently limited.[46,48]

Secondary prevention: In addition to preventing invasive cervical cancer, Pap testing can detect cervical cancer at an early stage, when it is most treatable. To date, no effective antiviral drugs have been developed to slow the progression of HPV. When detected, localized HPV-infected precancerous lesions can be removed through various techniques ranging from application of liquid nitrogen or podophyllotoxin to laser excision, cryosurgery (freezing), or electrocautery (or LEEP: Loop Electrosurgical Excisional Procedure).

H. Pylori and Stomach Cancer

Stomach cancer is expected to remain the fourth most common malignancy in the world in 2005, accounting for an estimated 930,000 new cases and 700,000 deaths per year. Sixty percent of new cases occur in developing countries.[49]

In 2005, it is predicted that stomach cancer will be the 15th most common cancer in the US, with 21,860 new cases. The incidence of stomach cancer is declining worldwide, with striking decreases in incidence continuing from 1975 in the US. Men in the US have higher stomach cancer incidence than women, and in both men and women, incidence rates are substantially higher among Asian Americans, African Americans, and Hispanic/Latinos, compared to whites.

Helicobacter pylori (*H. pylori*) is a bacterium that colonizes the stomach. It is not known with absolute certainty how *H. pylori* is transmitted, but the most likely route of spread from person to person is through fecal-oral or oral-oral routes. Possible environmental sources include water contaminated with human waste. Symptoms of initial infection include gastric discomfort and vomiting, but not all infected persons experience symptoms.

There is substantial evidence that *H. pylori* infection is the main cause of chronic gastritis and peptic ulcers, and it appears to increase risk for developing cancer of the distal stomach and gastric lymphoma, but not cancer of the gastric cardia (the portion of the stomach nearest the esophagus).[50] Testing of blood samples collected in 1988-1991 found that 32.5% of adults in the US had evidence of *H. pylori* infection.[51] Prevalence increased steadily with increasing age, peaking at more than 50% among persons aged 50 and older. In developing countries, the age at onset of infection is generally lower and peaks in young adulthood.[50]

A recent meta-analysis of 14 case-control and 5 cohort studies estimated that *H. pylori* infection was associated with about twice the risk of developing stomach cancer.[52] An analysis of 12 cohort studies showed about a 3-fold increase in risk, which rose to 5-fold when the blood sample had been collected more than 10 years before diagnosis.[53] Recent studies, however, prove that serologic tests based on the ELISA assay are less sensitive in gastric cancer cases, often affected by gastric atrophy, than in non-cases. The real association is therefore likely to be stronger than it appears in epidemiologic studies.[2]

The number of stomach cancers attributable to *H. pylori* has been estimated by assuming that the relative risk for stomach cancer is 6.0. Taking into account regional variation of *H. pylori* infection, 59% of gastric cancer cases in developing countries and 63% of cases in developed countries can be attributed to *H. pylori* infection.[3]

Possible reasons for the 15- to 20-fold variation in gastric cancer incidence throughout the world include variations in age and risk of infection with *H. pylori*, dietary factors, and, possibly, concurrent parasitic infection.[50] Geographic variations in gastric cancer incidence may also be influenced by geographic variations in *H. pylori* strains. Strains that produce a particular protein (CagA) are more likely to cause disease than strains that do not.[54] The exact causes of the worldwide decline in gastric cancer incidence in the past decades are not known, but probably include improvements in diet and food storage, and a decline in *H. pylori* infection due to a general improvement in sanitary conditions and increasing use of antibiotics.[3,54]

Primary prevention: Since the source of *H. pylori* is not known, specific recommendations for avoiding infection have not been made. In general, however, it is always wise to wash hands thoroughly, to eat food that has been properly prepared and stored, and to drink water from a safe, clean source.

Trials of *H. pylori* eradication in high-risk populations have been attempted. Treatment with bismuth salts, amoxicillin, and clarithromycin is currently the regimen of choice; however, suboptimal results (clearance of infection in less than 50% of persons treated) have been observed in some studies. Eradication will be ineffective in preventing stomach cancer if people are rapidly reinfected.[50] There is concern that extensive use of antibiotics may lead to antibiotic-resistant strains of *H. pylori* or other pathogens.[55]

An economic analysis found that screening for and treatment of *H. pylori* is potentially cost-effective in preventing gastric cancer in the US, and the authors recommended that cancer prevention trials be conducted.[56]

Chemoprevention trials using vitamin supplements have shown some promise, and additional trials are underway.[50]

Efforts are also underway to develop an *H. pylori* vaccine, but to date trials have been disappointing.[55] Furthermore, it is thought that the reduction in gastric acid secretion due to *H. pylori* infection may protect against the adverse effects of gastro-esophageal reflux disease such as Barrett esophagus and adenocarcinoma of the gastric cardia and esophagus. Efforts to eradicate *H. pylori* with antibiotic treatment or vaccination should consider the potential risks as well as benefits.[54]

Secondary prevention: Since 1963, screening for stomach cancer has been widespread in Japan, where the incidence of stomach cancer is about six times higher than the incidence in the US. The main screening techniques used in Japan are indirect x-ray examination by the double-contrast method and upper gastroendoscopy. As a result of population screening and perhaps a greater awareness of early symptoms, 50% of stomach cancers in Japan are diagnosed at a localized stage, and the overall 5-year survival increased from 20% in 1962 to 40% in 1992. Over the same period, the 5-year survival rate in the US remained stable at 20%.[57] General population screening is not recommended in low-incidence countries such as the US.

Kaposi Sarcoma (KS), HHV-8, and HIV

It is estimated that 77,600 new cases of Kaposi sarcoma (KS) will occur worldwide in 2005, and that fewer than 2,500 new cases will occur in the US. The disease has been common in central Africa since the early 20th century, and was also found in some Mediterranean countries and the Middle East, but was rare elsewhere. It occurs in developed countries among immigrants from areas where KS was common, in recipients of organ transplants, and in patients with immune suppression from chemotherapeutic drugs. In 1981, an aggressive form of KS began to appear in the US among homosexual men, one of the first signals of the AIDS epidemic.[58]

KS is now divided into four types: sporadic (classic), endemic (African), epidemic (AIDS-related), and immunosuppression-associated (usually in transplant recipients). Although microscopic examination shows these types to be identical, AIDS-related KS is more likely to involve multiple lesions and a worse prognosis. In areas of Africa where KS was relatively common before the AIDS epidemic, the incidence of KS has increased about 20-fold. In the African countries of Malawi, Swaziland, Uganda, and Zimbawe, KS has become the most common cancer in men and the second most common cancer in women.[58]

It is now thought that infection with Human Herpes Virus 8 (HHV-8) must be present for KS to develop (also known as Kaposi sarcoma-associated herpes virus [KSHV]), but immune suppression induced by HIV profoundly increases risk. Although sexual contact is thought to be a major mode of transmission of HHV-8, the fact that HHV-8 prevalence increases steadily with age among children in Africa indicates that alternate modes of transmission exist.[58]

In the US, the risk of KS among men having sex with men is much greater than among other persons infected

with HIV.[59] The incidence of KS peaked among men aged 20-54 in 1989, and then declined markedly (Figure 5). Since highly active antiretroviral therapy (HAART) did not become widely available in the US until 1996, some of this decline is likely due to changes in sexual practices that reduced transmission of both HIV and HHV-8.[59,60] KS rates peaked somewhat later (1991-1996) among African American men, and when first reported in 1992, rates among Hispanics/Latinos were higher than among white and African American men (Figure 5). Incidence rates among all 5 racial and ethnic groups declined from 1992-2001, but have shown some evidence of stabilizing in the past 3 to 4 years.

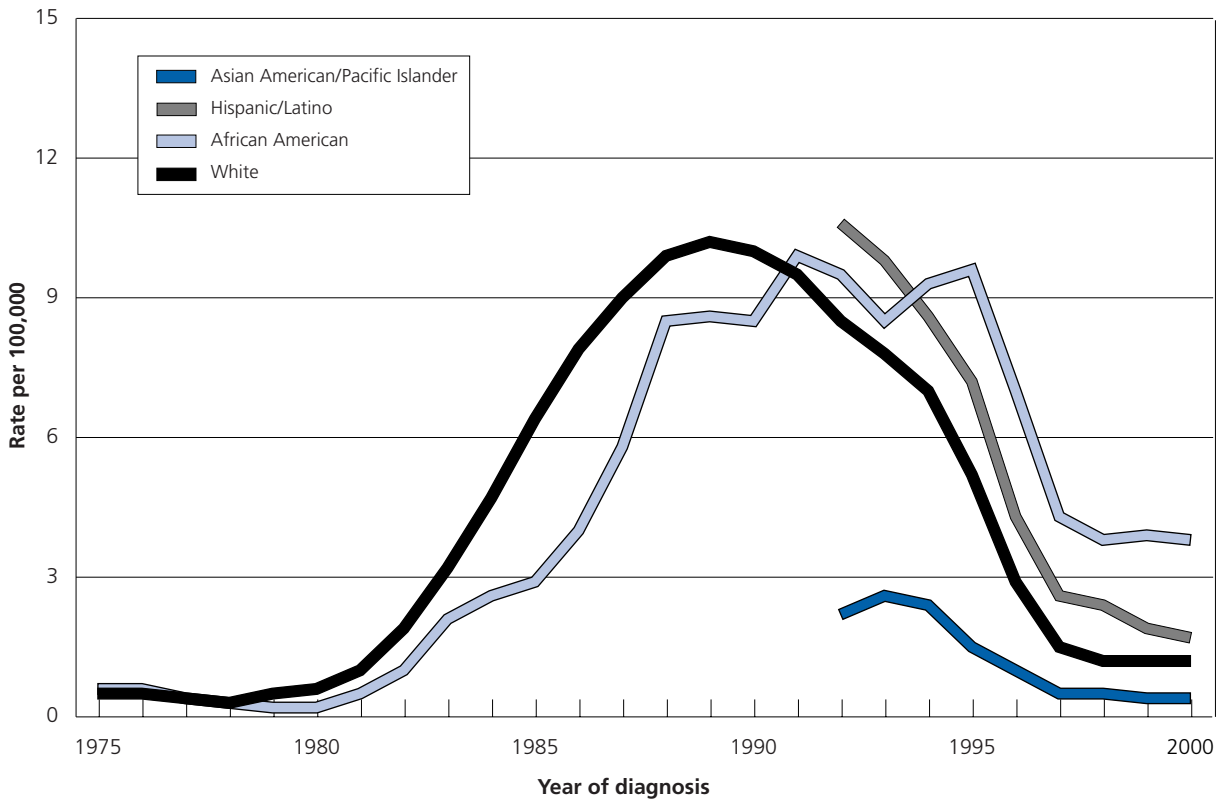
Primary prevention: Protecting against exposure to HIV and HHV-8 is the most effective way to prevent KS. Preventive behaviors include sexual abstinence, a monogamous relationship with an uninfected partner, consistent and correct condom use, abstinence from injection drug use, and consistent use of sterile equipment by those unable to cease injection drug use.[61] Similar precautions are recommended for those who are already HIV-positive, both to prevent infecting others and to avoid infection with other sexually transmitted and blood-borne diseases.

Secondary prevention: HAART treatment reduces the risk of KS among patients infected with HIV and may also be effective in treating the tumors.[59] In 2003, the WHO estimated that 6 million people in developing countries needed immediate HAART, but less than 8% would be likely to get it. On World AIDS Day in 2003, the WHO launched "The 3 by 5 Initiative," the goal of which is to provide antiretroviral treatment to 3 million people in developing countries by 2005.[62]

Human Immunodeficiency Virus (HIV), Epstein Barr Virus (EBV), and Non-Hodgkin Lymphoma (NHL)

It is estimated that there will be 320,000 new cases of non-Hodgkin lymphoma (NHL) worldwide, and 56,390 in the US in 2005. NHL is an extremely varied group of

Figure 5. Trends in Kaposi Sarcoma Incidence Rates Among Males*, 2-Year Moving Averages, 1975-1976 to 2000-2001



*Rates are per 100,000 and age-adjusted to the 2000 US standard population.
Source: Surveillance, Epidemiology, and End Results (SEER) program. SEER*Stat database. www.seer.gov.

neoplasms. Some forms of NHL, including Burkitt lymphoma, are associated with Epstein-Barr Virus (EBV). Most people are infected with EBV at some time in their lives. When infection occurs during adolescence or young adulthood, it causes infectious mononucleosis 35%-50% of the time. EBV infection is also associated with some AIDS-related NHL and Hodgkin lymphoma, although the pathogenic or causal role of the virus is not entirely clear.

AIDS-related NHL generally involves aggressive, high-grade lymphoma of B-cell origin. Subtypes include primary central nervous system (CNS) lymphomas, high-grade immunoblastic and Burkitt lymphoma, and, to a lesser extent, intermediate-grade large-cell diffuse lymphomas. The diagnosis of AIDS precedes the onset of NHL in 57% of patients, but in 30% of cases, the diagnosis of AIDS (or HIV positivity) is made at the same time as NHL. In general, the clinical course of AIDS-related lymphomas is more aggressive, and the disease is more extensive and less responsive to therapy than that of non-HIV patients with non-Hodgkin lymphoma.[63]

There is also evidence of an increased risk of Hodgkin lymphoma among HIV-infected individuals.[63]

Primary prevention: Primary prevention of AIDS-related lymphomas rests on primary prevention of HIV infection, as described under Kaposi sarcoma (page 31). Since EBV is transmitted through contact with saliva and may be present in the saliva of healthy people, there are no practical methods for primary prevention of EBV infection.

Secondary prevention: Some AIDS-related lymphomas are associated with high levels of immunosuppression, as reflected by very low counts of CD4-positive T-lymphocytes in the blood. Time trends in HIV-related subtypes of NHL in US men aged 20-54 reflect this pattern (Figure 6). The incidence of primary CNS lymphoma, which is associated with very low CD4 counts, fell rapidly after introduction of HAART therapy, while the incidence of intermediate-type lymphoma has remained stable since 1995. Overall, epidemiologic data show that the risk of AIDS-related lymphoma has decreased approximately 50% with HAART therapy. As the proportion of patients receiving HAART therapy has increased, there has also been a shift in the distribution of lymphoma types to those that are more responsive to treatment, which may account for recent trends of improved survival for AIDS-related NHL.[64]

Other Cancers Related to Infection

There are a number of other cancers linked with infection that are not discussed in the special section, largely because they are rare in the US. For example, HHV-8 infection, discussed under Kaposi sarcoma (page 30), is also related to a rare form of lymphoma (primary effusion lymphoma).[65] Infection with human T-cell lymphotrophic virus (HTLV-I) has been established as a cause of adult T-cell leukemia, a disease mainly observed in tropical countries and Japan, but rarely in the US or Europe.[66] For further information on other infections related to cancer, refer to references #3 and #66.

American Cancer Society Efforts to Address the Burden of Cancer Related to Infectious Diseases

Research

Since 2000, the Extramural Grants program of the American Cancer Society has invested more than $18 million in research to better understand the links between chronic infections and the development of skin (Kaposi sarcoma), liver, cervical, and stomach cancers. These include molecular studies at the University of Wisconsin of viral transforming proteins from human papillomaviruses and their role in cervical cancer. In addition, the Society supports research at the University of Alabama at Birmingham examining gastritis caused by *Helicobacter pylori* and its role in stomach cancer, and at the University of California, San Francisco, on understanding how the herpes virus, KSHV, induces uncontrolled angiogenesis in the skin of AIDS patients.

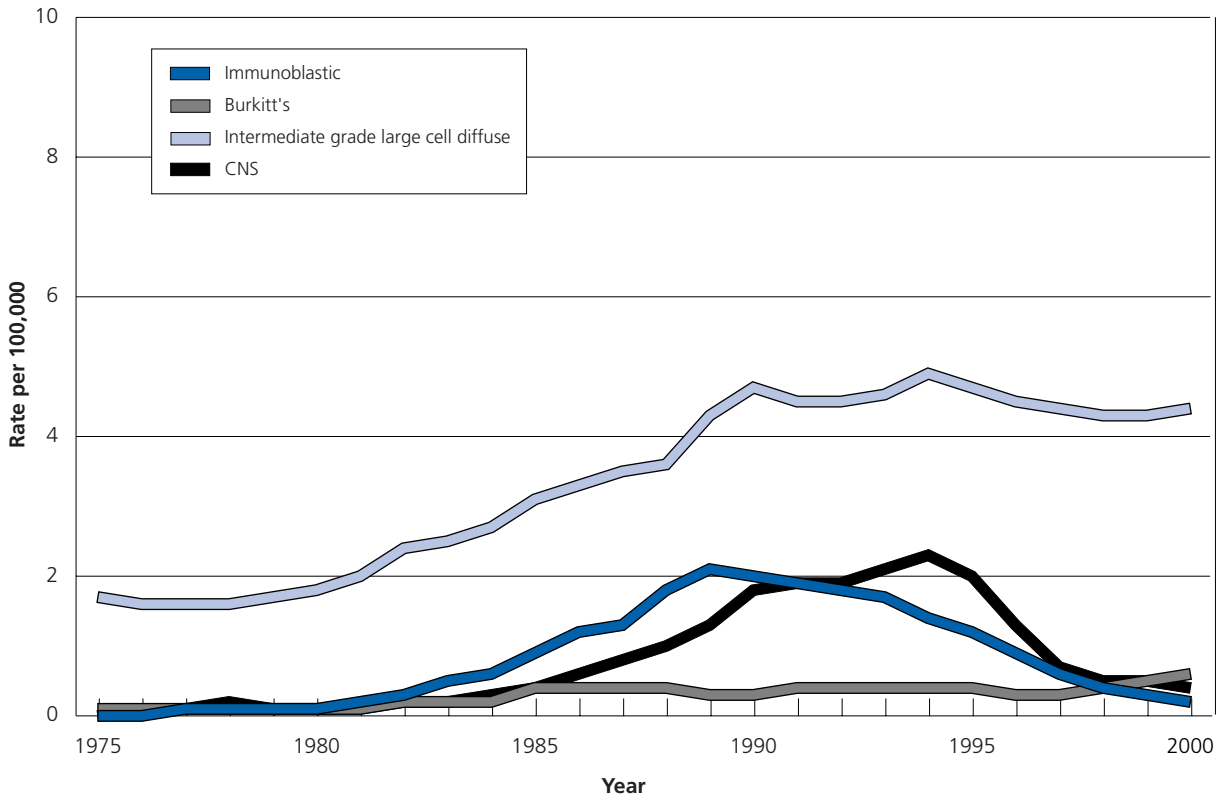
International Collaboration

The American Cancer Society's South Atlantic Division is partnering with the Bolivian Foundation Against Cancer to build capacity among local health care providers to combat high incidence and mortality rates from breast and cervical cancer. The California Division is working with the Philippine Cancer Society on programs to promote hepatitis B vaccination and prevent liver cancer. The Society has funded seed grants to improve medical follow up of abnormal Pap smears in southern Thailand, and to increase screening for cervical cancer among impoverished women in Calcutta, India.

Other Activities

The Society's international activities, described on page 37, aim to strengthen the capacity of developing countries for cancer control, including immunization pro-

Figure 6. AIDS-Associated Non-Hodgkin Lymphoma Incidence Rates* by Histology and Anatomic Subsite, Males of All Races Aged 20-54 Years, 2-Year Moving Averages, 1975-1976 to 2000-2001



*Rates are per 100,000 and age-adjusted to the 2000 US standard population.
Source: Surveillance, Epidemiology, and End Results (SEER) program. SEER*Stat database. www.seer.gov.

grams, sanitation, and early detection and screening programs, which can reduce the burden of cancers related to infection. The Society's advocacy and public policy programs have played a major role in increasing access to cervical cancer screening for uninsured and medically underserved women in the US.

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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 1.4 times higher than that among white males; for African American females, it is 1.2 times 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 1997-2001 was twice as high in Asian American and Pacific Islanders as in African Americans, the population with the second highest rate, 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 the special section on Cancers Linked to Infectious Diseases, page 22.

Incidence and Mortality Rates* by Site, Race, and Ethnicity, US, 1997-2001

Incidence	White	African American	Asian American and Pacific Islander	American Indian and Alaska Native	Hispanic/ Latino†
All sites					
Males	556.5	689.2	385.9	263.2	419.8
Females	429.8	400.1	302.8	222.5	309.9
Breast (female)	141.7	119.9	96.8	54.2	89.6
Colon & rectum					
Males	63.1	72.9	56.3	38.3	49.6
Females	45.9	56.5	38.6	32.7	32.5
Lung & bronchus					
Males	77.9	117.2	60.5	46.0	45.2
Females	51.3	54.5	28.5	23.4	23.9
Prostate	167.4	271.3	100.7	51.2	140.0
Stomach					
Males	10.8	18.8	21.9	15.7	17.8
Females	5.0	9.9	12.4	8.9	10.0
Liver & intrahepatic bile duct					
Males	7.2	11.8	21.1	8.3	13.5
Females	2.9	3.9	7.7	4.8	5.8
Uterine cervix	8.9	11.8	9.5	6.0	16.2

Mortality	White	African American	Asian American and Pacific Islander	American Indian and Alaska Native	Hispanic/ Latino†
All sites					
Males	245.5	347.3	151.2	167.0	174.0
Females	165.5	196.5	100.5	113.4	111.6
Breast (female)	26.4	35.4	12.6	13.6	17.3
Colon & rectum					
Males	24.8	34.3	15.8	17.1	18.0
Females	17.1	24.5	10.8	11.7	11.6
Lung & bronchus					
Males	76.6	104.1	40.2	49.8	39.6
Females	41.6	39.9	19.2	26.6	14.9
Prostate	28.8	70.4	13.0	20.2	23.5
Stomach					
Males	5.8	13.3	11.9	7.3	9.7
Females	2.8	6.3	7.0	4.1	5.3
Liver & intrahepatic bile duct					
Males	6.1	9.3	15.6	8.3	10.6
Females	2.7	3.8	6.6	4.3	5.1
Uterine cervix	2.6	5.6	2.8	2.8	3.6

*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, Fay MP, Feuer EJ, Edwards BK (eds). *SEER Cancer Statistics Review, 1975-2001*, National Cancer Institute, Bethesda, Maryland. http://seer.cancer.gov/csr/1975_2001, 2004.

American Cancer Society, Surveillance Research, 2005

Some of the differences between population groups in cancer rates and risks result from social and economic inequities. Poverty is the most important factor because it influences the prevalence of underlying risk factors for cancer (such as tobacco use and obesity) as well as access to early detection and high-quality treatment. In general, compared to non-Hispanic whites, members of racial and ethnic minority populations are more likely to be poor and lack health insurance coverage. In fact, 24% of African Americans and 22% of Hispanics/Latinos live below the poverty line, compared with 8% of whites. Moreover, 20% of African Americans and 32% of Hispanics/Latinos but only 11% of whites are medically uninsured. Importantly, poor and uninsured people are more likely to be treated for cancer at late stages of disease and are more likely to die from cancer. Social inequalities, such as racial discrimination, can affect the interactions between patients and physicians. Opportunities to reduce cancer disparities exist across the entire cancer spectrum, from primary prevention to palliative care (For more comprehensive information on Cancer Disparities, please see the Special Section, *Cancer Facts & Figures 2004*).

Not all differences in cancer risks and rates between population groups result from disparities or inequities. 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 are likely to have children at an earlier age, which lowers breast cancer risk. Individuals who don't smoke or who maintain a vegetarian diet due to cultural or religious beliefs will experience a lower risk of many cancers. Genetic factors may also 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 heart of the American Cancer Society's mission is to eliminate cancer. Because cancer knows no boundaries, this mission extends around the world. Better prevention, early detection, and effective treatment options have helped some nations lower incidence and mortality rates for certain cancers. But in most parts of the world, cancer is a growing problem. In fact, during the next 20 years deaths from cancer could nearly double worldwide. Tragically, the vast majority of these deaths could be avoided.

Today, most cancers are linked to a few controllable factors – tobacco use, poor diet and 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, 500 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 and lack of physical activity are associated with nearly as many cases of cancer as tobacco, and as these unhealthy lifestyle behaviors have spread to other parts of the world, cancers of the colon, breast and prostate have begun to rise dramatically. At the same time, cancers linked to infectious agents – including cervical, stomach, and liver cancers – remain a serious threat throughout the developing world (see Special Section, page 22).

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 (32)	2.0 (38)	48.7 (16)	26.8 (2)
Australia	147.1 (33)	99.0 (31)	18.7 (16)	13.3 (15)	3.4 (43)	1.5 (46)	34.7 (29)	13.8 (12)
Austria	156.0 (28)	106.7 (22)	20.1 (9)	13.9 (11)	7.1 (18)	2.5 (27)	37.7 (27)	12.1 (17)
Azerbaijan	132.7 (41)	80.2 (48)	3.8 (48)	2.8 (49)	3.3 (46)	2.0 (38)	28.1 (37)	5.1 (44)
Bulgaria	139.5 (39)	86.3 (41)	17.1 (25)	11.4 (25)	7.3 (16)	3.2 (19)	39.1 (24)	6.9 (35)
Canada	156.6 (27)	114.3 (15)	16.1 (27)	11.7 (23)	3.8 (39)	1.7 (43)	48.5 (17)	25.6 (3)
Chile	148.9 (31)	114.4 (14)	7.7 (39)	7.8 (37)	6.6 (20)	4.1 (12)	21.0 (42)	7.6 (31)
China	159.8 (23)	86.7 (40)	7.9 (37)	5.3 (43)	35.3 (1)	13.3 (1)	36.7 (28)	16.3 (9)
Colombia	141.1 (36)	122.5 (8)	7.3 (40)	7.6 (38)	7.6 (14)	7.1 (4)	19.9 (43)	10.0 (21)
Croatia	212.6 (5)	104.6 (25)	23.4 (6)	13.0 (17)	7.3 (16)	3.2 (19)	65.3 (4)	9.7 (23)
Cuba	139.8 (38)	100.2 (29)	10.7 (35)	13.5 (14)	4.2 (36)	3.8 (15)	38.0 (25)	16.2 (10)
Czech Republic	216.4 (4)	126.6 (5)	34.0 (2)	18.0 (4)	7.7 (13)	3.6 (17)	61.8 (7)	12.8 (15)
Denmark	179.2 (15)	148.1 (2)	23.3 (7)	19.2 (2)	3.4 (43)	2.3 (33)	45.2 (20)	27.8 (1)
Estonia	201.7 (8)	106.3 (23)	17.9 (22)	12.6 (18)	3.6 (42)	1.6 (45)	62.2 (6)	7.3 (34)
Finland	130.2 (43)	93.0 (37)	11.5 (34)	9.8 (33)	4.2 (36)	3.0 (23)	34.4 (31)	8.2 (27)
France	191.7 (12)	96.3 (33)	18.2 (18)	11.8 (22)	11.4 (7)	2.5 (27)	47.5 (18)	8.0 (30)
Germany	161.8 (21)	110.4 (18)	19.9 (12)	15.7 (7)	4.9 (29)	2.1 (37)	42.4 (22)	10.8 (19)
Greece	148.2 (32)	81.9 (45)	9.7 (36)	8.0 (36)	11.3 (8)	5.1 (7)	49.8 (14)	7.6 (31)
Hungary	271.4 (1)	145.1 (3)	35.6 (1)	21.2 (1)	7.8 (12)	3.8 (15)	83.9 (1)	22.3 (5)
Iceland	145.8 (34)	118.6 (11)	12.8 (32)	13.2 (16)	4.3 (34)	2.2 (34)	33.1 (33)	25.2 (4)
Ireland	168.4 (18)	123.7 (6)	23.6 (5)	13.7 (12)	3.4 (43)	1.7 (43)	37.9 (26)	18.1 (8)
Israel	132.6 (42)	105.0 (24)	18.8 (15)	14.6 (8)	3.0 (47)	2.2 (34)	26.9 (38)	8.6 (25)
Italy	170.9 (17)	95.2 (34)	16.5 (26)	10.9 (31)	12.6 (5)	4.8 (9)	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 (35)	9.6 (24)
Kazakhstan	221.2 (3)	120.1 (9)	6.2 (44)	5.1 (44)	12.5 (6)	4.8 (9)	66.8 (3)	10.0 (21)
Kyrgyzstan	122.3 (45)	81.4 (47)	3.8 (48)	3.6 (48)	6.4 (23)	3.0 (23)	26.8 (39)	4.7 (45)
Latvia	196.6 (10)	101.4 (28)	18.0 (20)	12.3 (20)	4.4 (32)	2.0 (38)	58.9 (9)	6.3 (38)
Lithuania	194.4 (11)	100.1 (30)	18.0 (20)	11.3 (27)	3.8 (39)	1.8 (42)	55.9 (11)	5.3 (42)
Macedonia	145.6 (35)	89.6 (38)	12.3 (33)	8.4 (35)	7.4 (15)	3.9 (13)	41.5 (23)	7.5 (33)
Mali	86.0 (49)	98.8 (32)	4.7 (46)	4.3 (45)	29.3 (2)	13.2 (2)	2.8 (50)	0.1 (50)
Mauritius	83.3 (50)	60.6 (50)	6.0 (45)	4.0 (47)	4.6 (31)	2.4 (30)	16.1 (47)	4.3 (47)
Mexico	92.3 (48)	86.0 (42)	4.5 (47)	4.1 (46)	7.1 (18)	7.0 (5)	16.6 (46)	6.6 (37)
Moldova	141.1 (36)	84.0 (43)	16.1 (27)	10.5 (32)	8.4 (10)	3.1 (22)	33.3 (32)	6.0 (40)
New Zealand	159.7 (24)	127.0 (4)	23.2 (8)	18.5 (3)	3.8 (39)	1.3 (48)	34.7 (29)	19.0 (7)
Norway	156.7 (26)	109.1 (20)	20.1 (9)	16.8 (5)	2.0 (50)	1.3 (48)	32.7 (34)	13.5 (13)
Poland	203.5 (7)	110.6 (17)	18.2 (18)	11.4 (25)	4.3 (34)	3.2 (19)	68.4 (2)	12.3 (16)
Portugal	160.2 (22)	87.3 (39)	20.0 (11)	11.9 (21)	5.5 (28)	1.9 (41)	29.9 (36)	5.3 (42)
Romania	159.4 (25)	93.7 (36)	13.6 (31)	9.0 (34)	8.8 (9)	3.9 (13)	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)
Slovakia	224.5 (2)	110.3 (19)	33.2 (3)	16.0 (6)	6.6 (20)	2.9 (25)	59.9 (8)	8.2 (27)
Slovenia	200.6 (9)	117.1 (13)	24.1 (4)	14.0 (10)	6.6 (20)	2.4 (30)	54.0 (12)	11.9 (18)
South African Rep.	163.6 (6)	107.6 (21)	7.9 (37)	6.4 (40)	5.8 (25)	2.2 (34)	23.0 (40)	6.9 (35)
Spain	173.6 (16)	81.9 (45)	18.5 (17)	11.3 (27)	8.4 (10)	3.3 (18)	49.2 (15)	4.7 (45)
Sweden	135.1 (40)	102.8 (26)	14.9 (30)	11.1 (29)	4.2 (36)	2.4 (30)	22.6 (41)	12.9 (14)
The Netherlands	181.6 (14)	119.8 (10)	18.9 (13)	14.4 (9)	2.5 (49)	1.3 (48)	57.6 (10)	15.6 (11)
Turkmenistan	110.6 (46)	76.6 (49)	1.3 (50)	1.1 (50)	5.6 (27)	2.5 (27)	18.3 (44)	4.1 (48)
Uganda	123.6 (44)	118.5 (12)	7.0 (41)	6.2 (41)	6.1 (24)	5.0 (8)	3.3 (49)	2.1 (49)
United Kingdom	162.3 (20)	122.7 (7)	17.5 (23)	12.4 (19)	2.8 (48)	1.5 (46)	42.9 (21)	21.1 (6)
Venezuela	101.5 (47)	95.1 (35)	6.4 (43)	6.7 (39)	4.8 (30)	4.3 (11)	18.1 (45)	10.2 (20)
Zimbabwe	183.6 (13)	165.4 (1)	6.5 (42)	6.2 (41)	25.4 (3)	10.5 (3)	12.0 (48)	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	Prostate	Uterus		Esophagus		Stomach	
	Female	Male	Cervix	Corpus	Male	Female	Male	Female
United States	19.0 (18)	15.8 (28)	2.3 (44)	2.6 (20)	5.1 (23)	1.2 (23)	4.0 (50)	2.2 (50)
Australia	18.4 (22)	17.7 (22)	1.7 (50)	1.6 (40)	4.9 (26)	1.8 (15)	5.7 (48)	2.8 (48)
Austria	20.6 (12)	18.4 (17)	4.1 (31)	2.5 (21)	3.8 (36)	0.7 (37)	10.3 (29)	6.5 (25)
Azerbaijan	13.7 (39)	4.5 (48)	2.8 (40)	6.0 (2)	10.1 (7)	6.1 (7)	30.0 (5)	13.1 (8)
Bulgaria	16.0 (33)	8.9 (39)	8.0 (13)	2.8 (16)	2.4 (45)	0.5 (44)	15.0 (23)	7.6 (21)
Canada	21.1 (11)	16.6 (25)	2.5 (42)	1.9 (33)	4.7 (28)	1.3 (21)	5.9 (47)	2.8 (48)
Chile	13.1 (42)	20.8 (10)	10.9 (9)	1.3 (44)	7.4 (15)	3.4 (10)	32.5 (3)	13.2 (7)
China	5.5 (50)	1.0 (50)	3.8 (32)	0.4 (49)	21.6 (1)	9.6 (4)	32.7 (2)	15.1 (4)
Colombia	12.5 (44)	21.6 (9)	18.2 (5)	1.5 (42)	4.7 (28)	2.1 (13)	27.8 (8)	15.7 (2)
Croatia	20.0 (14)	13.5 (32)	5.0 (26)	2.5 (21)	5.8 (20)	0.8 (33)	19.4 (14)	8.0 (20)
Cuba	14.6 (37)	26.4 (4)	8.3 (12)	5.8 (3)	4.4 (34)	1.4 (19)	6.9 (44)	3.6 (43)
Czech Republic	20.0 (14)	17.2 (24)	5.5 (24)	4.6 (6)	4.7 (28)	0.7 (37)	12.1 (26)	6.4 (27)
Denmark	27.8 (1)	22.6 (7)	5.0 (26)	2.9 (14)	7.0 (16)	1.9 (14)	5.4 (49)	3.3 (46)
Estonia	20.4 (13)	17.6 (23)	6.6 (21)	3.6 (9)	4.6 (33)	0.4 (48)	24.1 (9)	11.4 (10)
Finland	17.4 (28)	18.0 (20)	1.8 (49)	2.7 (19)	2.5 (44)	1.2 (23)	7.9 (41)	4.5 (37)
France	21.5 (10)	18.2 (19)	3.1 (37)	2.2 (28)	8.6 (11)	1.2 (23)	7.0 (43)	3.1 (47)
Germany	21.6 (9)	15.8 (28)	3.8 (32)	1.9 (33)	5.0 (25)	1.0 (28)	10.3 (29)	6.4 (27)
Greece	15.4 (36)	11.2 (37)	2.5 (42)	1.3 (44)	1.3 (50)	0.4 (48)	8.9 (36)	4.3 (38)
Hungary	24.6 (4)	18.4 (17)	6.7 (20)	4.1 (7)	9.1 (8)	1.3 (21)	18.2 (16)	8.5 (18)
Iceland	19.6 (16)	23.0 (6)	4.7 (28)	1.9 (33)	4.7 (28)	1.6 (17)	9.0 (35)	3.5 (44)
Ireland	25.5 (3)	19.7 (14)	3.5 (34)	1.6 (40)	7.9 (13)	4.0 (9)	8.5 (39)	4.8 (35)
Israel	24.0 (7)	13.4 (33)	2.3 (44)	2.2 (28)	1.6 (48)	0.8 (33)	8.9 (36)	4.7 (36)
Italy	18.9 (19)	12.2 (36)	2.2 (47)	2.2 (28)	3.4 (37)	0.7 (37)	12.6 (25)	6.5 (25)
Japan	8.3 (49)	5.7 (45)	2.8 (40)	1.3 (44)	7.5 (14)	1.1 (27)	28.7 (7)	12.7 (9)
Kazakhstan	18.7 (20)	6.0 (43)	7.9 (14)	7.4 (1)	19.1 (4)	10.0 (3)	34.7 (1)	15.4 (3)
Kyrgyzstan	11.5 (45)	4.6 (47)	7.9 (14)	4.7 (5)	8.9 (10)	3.2 (11)	29.7 (6)	14.6 (5)
Latvia	18.5 (21)	13.4 (33)	7.4 (19)	3.2 (12)	5.6 (21)	0.6 (41)	22.2 (11)	10.4 (12)
Lithuania	17.6 (27)	16.6 (25)	9.0 (11)	3.6 (9)	6.0 (19)	0.6 (41)	22.4 (10)	9.7 (14)
Macedonia	17.7 (25)	8.7 (40)	7.6 (18)	2.1 (31)	1.4 (49)	0.4 (48)	20.3 (12)	8.7 (17)
Mali	13.1 (42)	6.0 (43)	28.4 (3)	0.6 (48)	2.8 (41)	1.4 (19)	16.1 (22)	18.3 (1)
Mauritius	9.3 (47)	7.5 (42)	10.2 (10)	0.1 (50)	3.4 (37)	1.5 (18)	10.1 (31)	5.1 (33)
Mexico	10.5 (46)	14.8 (31)	14.1 (7)	1.9 (33)	1.9 (47)	0.7 (37)	9.9 (32)	7.2 (22)
Moldova	17.7 (25)	4.7 (46)	7.8 (16)	2.9 (14)	2.7 (43)	0.6 (41)	17.8 (17)	7.1 (23)
New Zealand	24.5 (5)	20.3 (11)	3.2 (36)	2.5 (21)	4.4 (34)	1.8 (15)	8.0 (40)	4.1 (39)
Norway	17.9 (24)	28.4 (2)	3.5 (34)	2.3 (26)	3.3 (39)	0.9 (29)	9.4 (33)	5.0 (34)
Poland	15.5 (35)	12.4 (35)	7.8 (16)	2.8 (16)	4.7 (28)	0.8 (33)	16.6 (20)	6.2 (30)
Portugal	17.0 (30)	19.9 (12)	4.5 (30)	1.9 (33)	5.6 (21)	0.9 (29)	20.3 (12)	10.1 (13)
Romania	16.7 (31)	9.0 (38)	13.0 (8)	2.0 (32)	2.8 (41)	0.5 (44)	17.0 (18)	6.6 (24)
Russian Federation	18.0 (23)	8.2 (41)	6.5 (22)	3.6 (9)	6.9 (17)	1.2 (23)	31.8 (4)	13.5 (6)
Slovakia	19.3 (17)	16.5 (27)	6.1 (23)	5.1 (4)	8.2 (12)	0.5 (44)	16.6 (20)	6.4 (27)
Slovenia	22.1 (8)	18.8 (16)	4.7 (28)	3.0 (13)	4.8 (27)	0.9 (29)	17.0 (18)	8.2 (19)
South African Rep.	16.4 (32)	22.6 (7)	21.0 (4)	1.5 (42)	19.2 (3)	6.9 (6)	7.6 (42)	3.4 (45)
Spain	15.9 (34)	14.9 (30)	2.2 (47)	2.4 (24)	5.1 (23)	0.5 (44)	11.4 (27)	5.4 (31)
Sweden	17.3 (29)	27.7 (3)	3.1 (37)	2.3 (26)	3.3 (39)	0.9 (29)	6.8 (45)	3.8 (42)
The Netherlands	27.5 (2)	19.7 (14)	2.3 (44)	2.4 (24)	6.8 (18)	2.2 (12)	9.1 (34)	4.1 (39)
Turkmenistan	8.5 (48)	1.5 (49)	5.2 (25)	4.0 (8)	20.4 (2)	13.2 (1)	19.2 (15)	11.1 (11)
Uganda	13.4 (40)	32.5 (1)	29.2 (2)	1.2 (47)	12.5 (6)	11.3 (2)	6.6 (46)	5.2 (32)
United Kingdom	24.3 (6)	17.9 (21)	3.1 (37)	1.8 (39)	9.0 (9)	4.1 (8)	8.7 (38)	4.0 (41)
Venezuela	13.4 (40)	19.8 (13)	16.8 (6)	1.9 (33)	2.4 (45)	0.8 (33)	14.5 (24)	9.3 (15)
Zimbabwe	14.1 (38)	23.5 (5)	43.1 (1)	2.8 (16)	17.6 (5)	8.4 (5)	10.4 (28)	9.1 (16)

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, 2005

Tobacco Use

Smoking remains the most preventable cause of death in our society. Since the first published Surgeon General's report on smoking and health in 1964, there have been more than 12 million premature deaths attributable to smoking in the US.[1] Worldwide in 2000 alone, about 4.8 million smoking-related premature deaths occurred. The number of deaths were almost evenly divided among industrialized and developing nations and were greater in men (84% of smoking-attributable deaths) than in women.[2]

Health Consequences of Smoking

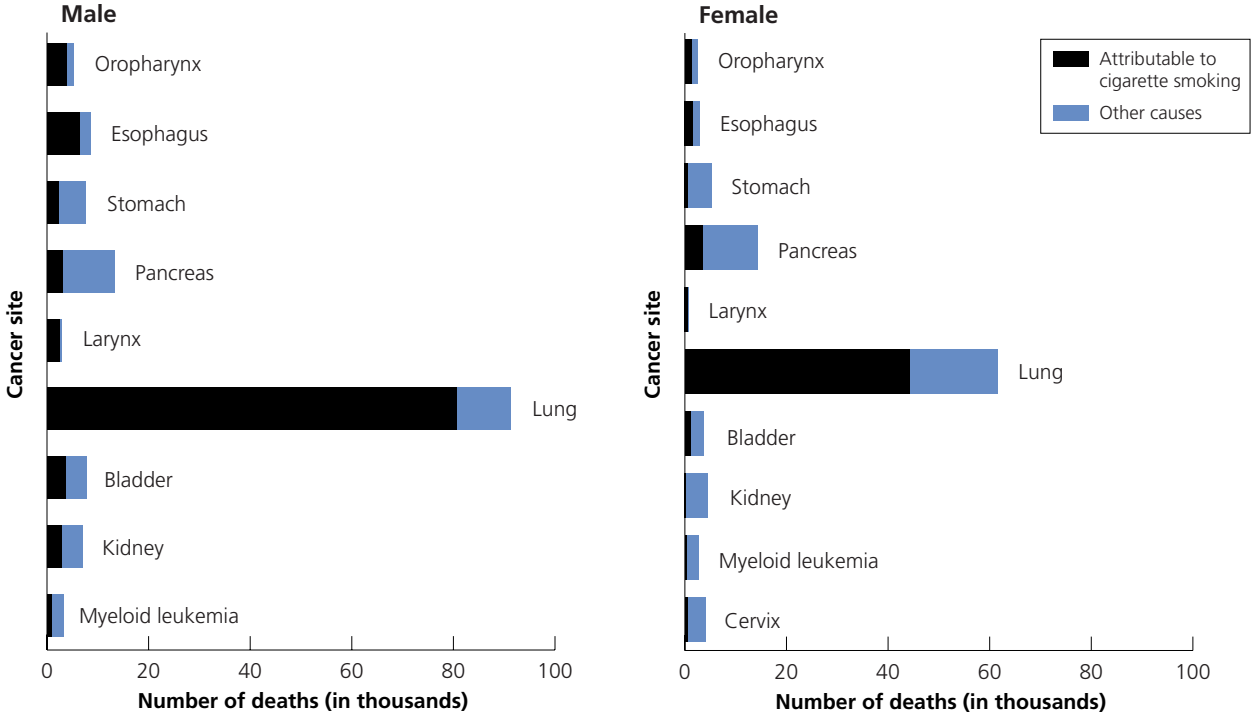
Half of all Americans who continue to smoke will die from their cigarette smoking addiction.[3] In the US, tobacco use is responsible for nearly 1 in 5 deaths; this amounted to 435,000 deaths in 2000.[4,5] In addition, an estimated 8.6 million persons suffer from smoking-related chronic conditions (chronic bronchitis, chronic obstructive lung disease, emphysema, and several cardiovascular diseases).[6]

- Smoking accounts for at least 30% of all cancer deaths and 87% of lung cancer deaths.[7,8]
- Lung cancer mortality rates are about 22 times higher for current male smokers and 12 times higher for current female smokers compared with lifelong nonsmokers.[8]
- Smoking is associated with increased risk for at least 15 types of cancers such as cancer of the nasopharynx, nasal cavity and paranasal sinuses, lip, oral cavity, pharynx, larynx, lung, esophagus, pancreas, uterine cervix, kidney, bladder, and stomach, as well as acute leukemia.[1]
- Smoking is a major cause of heart disease, cerebrovascular disease, chronic bronchitis, and emphysema, and is associated with gastric ulcers.[1,8]
- The risk of lung cancer is no different in smokers of "light" or "low-tar" yield cigarettes.[9]

Reducing Tobacco Use and Exposure

A recent US Surgeon General's report on reducing tobacco use outlines the components of comprehensive tobacco control.[10] 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 among youth, promoting quitting among young people and adults, eliminating nonsmokers'

Annual Number of Cancer Deaths* Attributable to Smoking, Males and Females, by Site, US, 1995-1999



*Among men and women 35 and older.

Source: US Department of Health and Human Services. *The Health Consequences of Smoking: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health, 2004.

American Cancer Society, Surveillance Research, 2005

exposure to secondhand smoke, and identifying and eliminating the disparities related to tobacco use and its effects among different population groups.[11] The Centers for Disease Control and Prevention has recommended funding guidelines for comprehensive tobacco use and prevention and cessation programs for all 50 states and the District of Columbia. With adequate funding levels, comprehensive tobacco control programs in some states (e.g., California, Massachusetts, Florida, and Maine) have effectively reduced smoking rates, saved lives, and saved states millions of dollars in tobacco-related health care costs.[10,12] (Additional information can be found in *Cancer Prevention and Early Detection Facts & Figures 2004*, accessible at http://www.cancer.org/downloads/STT/CPED2004PWSecured.pdf.)

Trends in Smoking

- The prevalence of cigarette smoking among adults aged 18 and older declined by nearly half between 1965 and 2002 – from 42% to 23%.[13,14]
- Although cigarette smoking peaked higher and earlier in men, the gender gap narrowed in the mid-1980s and has since remained constant.[15] As of 2002, the prevalence of smoking in women is 20% and in men, 25.2%.[16]
- While the percentage of smokers decreased for all levels of educational attainment between 1983 and 2002, college graduates achieved the greatest decline: 41%, from 21% to 12%. Among adults without a high school education, the percentage decreased 24%, from 41% to 31%.[13,14]
- Per capita consumption of cigarettes continues to decline. After peaking at 4,345 cigarettes per capita in 1963, consumption among Americans 18 and older decreased 56% to an estimated 1,903 cigarettes per capita in 2003.[17] Per capita cigarette consumption is currently lower than at any point since the start of World War II.
- Current cigarette smoking among US high school students increased significantly from 28% in 1991 to 36% in 1997, then declined to 22% in 2003.[18]
- By age 13, 18% of students had smoked a whole cigarette, and 58% of high school students have tried smoking.[19] This suggests that continued efforts to prevent youth initiation and experimentation are needed.

Smokeless Tobacco

In 1986, the US Surgeon General concluded that the use of smokeless tobacco is not a safe substitute for smoking cigarettes or cigars, as these products cause various cancers and noncancerous oral conditions, and can lead to nicotine addiction.[20]

- Oral cancer occurs several times more frequently among snuff dippers compared with non-tobacco users.[20]
- The risk of cancer of the cheek and gums may increase nearly 50-fold among long-term snuff users.[20]
- According to the US Department of Agriculture, US output of moist snuff has risen more than 50% in the past decade from 48 million pounds in 1991 to an estimated 73 million pounds in 2002.[17]
- Among adults aged 18 and older, national data showed 6% of men and 1% of women were current users of chewing tobacco or snuff.[21]
- Nationwide, 11% of US male high school students were currently using chewing tobacco, snuff, or dip in 2003.[19]

Cigars

The consumption of large cigars and cigarillos increased from 1993 to 2001. An estimated 4.1 billion large cigars and cigarillos were consumed in 2002. Small-cigar production increased from 1.5 billion pounds in 1997 to an estimated 2.6 billion pounds in 2003.[17]

- In 1998, the median percentage of adults 18 and older who had smoked cigars in the past month was 5%. More men than women smoked cigars in the past month in all 50 states.[22]
- Nationwide, 15% of US high school students had smoked cigars, cigarillos, or little cigars on at least 1 of the past 30 days.[19]

In 2001, 7 major cigar manufacturers began to provide 5 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:[23]

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

Smoking Cessation

In 1990, the US Surgeon General outlined the benefits of smoking cessation:[24]

- 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 developing 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 2002, national data showed:[14]

- An estimated 46 million adults were former smokers, representing 50% of persons who ever smoked.
- Among those who smoke, an estimated 15.4 million (or 41.2%) had stopped smoking for at least one day during the preceding 12 months because they were trying to quit.
- Nearly 5 percent (4.7%) of smokers who had smoked every day or some days during the preceding year quit and maintained abstinence for 3-12 months.[16]

In 2003, among US high school students who were current cigarette smokers, national data showed that more than half (54%) had tried to quit smoking cigarettes during the 12 months preceding the survey, with female (56%) students more likely than male students (52%) to have made a quit attempt.[25]

Secondhand Smoke

Secondhand smoke, or environmental tobacco smoke (ETS), contains numerous human carcinogens for which there are no safe levels of exposure. Scientific consensus groups have repeatedly reviewed the data on ETS. These include the US Environmental Protection Agency,[26] the International Agency for Research on Cancer,[27] and the National Institute of Environmental Sciences' National Toxicology Program.[28] Public policies to protect people from secondhand smoke are based on documented adverse health effects of ETS exposure, including lung cancer, heart disease, and respiratory diseases.

- Each year, about 3,000 nonsmoking adults die of lung cancer as a result of breathing secondhand smoke.[26]
- ETS causes an estimated 35,000 to 40,000 deaths from heart disease in people who are not current smokers.[29]
- ETS causes coughing, phlegm, chest discomfort, and reduced lung function in nonsmokers.[26]
- 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.[26]
- Secondhand smoke increases the number of asthma attacks and the severity of asthma in about 200,000 to 1 million asthmatic children.[26]
- Secondhand smoke contains more than 4,000 substances, more than 40 of which are known or suspected to cause cancer in humans and animals and many of which are strong irritants.[26]

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.[30] Forty-five states have approved some form of clean indoor air law affecting public places. Forty-six states have laws that regulate smoking in government worksites, and 29 states have laws restricting smoking in private worksites.[31]

- 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.[32]
- About 69% of US indoor workers are currently covered by a smoke-free workplace policy.[33]

Worldwide Tobacco Use

While the prevalence of smoking has been slowly declining in the US and most other high-income countries over the past 20 years, smoking prevalence rates have been rising in many developing nations.

- Tobacco consumption in developing nations increased at a rate of about 2.8% per year between 1971 and 1998 and is projected to continue increasing by 1.7% per year between 1998 and 2010.[34]
- 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.[35]

- Female smoking prevalence rates have peaked in a handful of economically developed countries, such as Australia, Canada, the United Kingdom, and the US, but in most countries, female smoking rates are still increasing or show no evidence of decline.[36] Female smoking rates in both developing and developed nations are expected to converge at 20%-25% by 2030.[36,37]
- Based on current patterns, smoking-attributable diseases will kill about 500 million of the world's smokers alive today.[38]
- In 2000, there were about 4.8 million smoking-related premature deaths worldwide, nearly evenly divided among developed (2.43 million deaths) and developing (2.41 million deaths) nations.[2] It is expected that global tobacco-related mortality will increase to about 10 million deaths per year by 2030, with 70% of these deaths occurring in developing nations. By 2030, tobacco's annual death toll will be higher than the combined mortality due to malaria, pneumonia, tuberculosis, and diarrheal diseases.[39]
- In a series of surveys among youth aged 13-15 years 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.[40] In every region of the world, the ratio of male to female smokers among youth was lower than the ratio reported among adults, reflecting a global trend of increased smoking among female youth.[40]

To curtail the tobacco pandemic, the 192 member states of the World Health Organization unanimously adopted the first global public health treaty, the Framework Convention on Tobacco Control (FCTC) on May 21, 2003. The treaty 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.[41,42] Following the November 30, 2004, ratification by Peru (the 40th country to ratify the treaty), the FCTC entered into force as a legally binding international accord. Treaty signatories are expected to strengthen national legislation, enact effective tobacco control policies, and cooperate internationally to reduce global tobacco consumption.[43]

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, on average, adult male and female smokers lost 13.2 and 14.5 years of life, respectively, due to smoking.[5] Additional data showed:[5]

- Smoking caused approximately $157.7 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 $81.9 billion annually during 1995-1999, or $1,760 in lost productivity per adult smoker in 1999.
- Smoking-related medical costs totaled $75.5 billion in 1998, and accounted for 8% of the personal health care medical expenditures. This translated to $1,623 in excess medical expenditures per adult smoker in 1998.
- Smoking-attributable costs for newborns were $366 million in 1996, or $704 per maternal smoker.
- In 2001, states spent an estimated $12 billion in Medicaid costs alone, related to treating smoking-attributable diseases.[44]
- For each of the approximately 2.2 billion packs of cigarettes sold in 1999, $3.45 was spent on medical care due to smoking and $3.73 in productivity losses, for a total of $7.18 per pack.[5]
- A recent review of the cost of treating smoking-attributable diseases in the US showed that it ranges from 6%-8% of personal health expenditures.[45]

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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 next review will take place in 2006. 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 of cancer, heart disease, and diabetes.

Recommendations for Individual Choices

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

- Eat 5 or more servings 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 healthful 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 at least 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, falls, osteoporosis, 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 cancers at several 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 which are associated with increased cancer risk. Therefore, people who are overweight should be encouraged to achieve and maintain a healthy weight [a body mass index (BMI) of less than 25 kg/m^2].

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 preadolescents 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 a 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.

Environmental Cancer Risks

Environmental factors, defined broadly to include smoking, diet, and infectious diseases as well as chemicals and radiation, cause an estimated three-quarters of all cancer deaths in the US. Among these factors, tobacco use, obesity, and physical inactivity have a greater effect on individual cancer risk than do trace levels of pollutants in food, drinking water, and air. However, the degree of risk from pollutants depends on the concentration, intensity, and duration of exposure. Substantial increases in risk have been shown in patients treated with certain drugs or therapies and in workers who have been exposed to high concentrations of ionizing radiation, certain chemicals, metals, and other substances, as well as nonoccupational exposure from radiation accidents and nuclear bombs. Some medical treatments used in the past were later found to be carcinogenic. Even today, certain drugs and treatments that are known to increase cancer risk continue to be used because the benefits of the treatment outweigh the risks.

Even low-dose exposures that pose only a small risk to individuals can still cause substantial ill health across an entire population if the exposures are widespread. For example, secondhand tobacco smoke increases risk in large numbers of people who do not smoke but who are exposed to others' smoke.

Strong regulatory control and attention to safe occupational practices, drug testing, and consumer product safety play an important role in reducing risk of cancer from environmental exposures. Additional information on environmental factors associated with cancer risks can be found on several Web sites, including www.atsdr.cdc.gov, www.epa.gov, www.niehs.nih.gov, www.osha.gov, and www.who.int.

Risk Assessment

Risk assessment evaluates the cancer-causing potential of a substance, the levels of the substance in the environment, and the extent to which people are actually exposed. However, the process is not perfect. For most potential carcinogens, data are only available from high-dose experiments in animals or highly exposed occupational groups. To use such information to set human safety standards, regulators must extrapolate from animals to humans and from high-dose to low-dose conditions. Because both extrapolations involve much uncertainty, as does the effect of mixtures of chemicals and of especially susceptible subgroups of the population, risk assessment generally makes conservative assumptions to err on the side of safety. For cancer safety standards, regulatory agencies seek to limit exposures in the general population to levels that do not increase risk by more than one case per million persons over a lifetime.

Safety standards developed in this way for chemical or radiation exposures are the basis for federal regulatory activities at the Food and Drug Administration, the Environmental Protection Agency, the Nuclear Regulatory Commission, and the Occupational Safety and Health Administration. The application of laws and procedures by which standards are implemented and risks are controlled is called risk management.

Chemicals

Various chemicals (for example, benzene, asbestos, vinyl chloride, arsenic, and aflatoxin) show definite evidence of causing cancer in humans. Others are considered probable human carcinogens based on evidence from animal experiments (for example, chloroform, dichlorodiphenyl-trichloroethane [DDT], formaldehyde, polychlorinated biphenyls [PCBs], and polycyclic aromatic hydrocarbons). Often in the past, direct evidence of human carcinogenicity has come from studies of workplace conditions involving sustained, high-dose exposures. For some exposures (asbestos and arsenic), the risks are increased when combined with cigarette smoking.

Radiation

The only types of radiation proven to cause human cancer are high-frequency ionizing radiation (IR) and ultraviolet (UV) radiation. Exposure to sunlight (UV radiation) causes almost all cases of basal and squamous cell skin cancer and is a major cause of skin melanoma. Disruption of the earth's ozone layer by pollution (the "ozone hole") may cause increased levels of UV radiation. Evidence that high-dose IR (x-rays, radon, etc.) causes cancer comes from studies of atomic bomb survivors, patients receiving radiotherapy, and certain occupational groups, such as uranium miners. Virtually any part of the body can be affected by IR, but bone marrow and the thyroid gland are particularly vulnerable. Exposure to high levels of radon, the result of working in uranium mines, increases lung cancer risk, producing an especially high rate of lung cancer among miners who smoke. Radon exposures in homes can also increase lung cancer risk. Fortunately, there are tests that can be used to detect high levels of radon. Corrective actions may be needed if those levels are too high.

Diagnostic medical and dental x-rays should deliver the lowest possible does of ionizing radiation to minimize risk while preserving image quality. In recent years, some medical facilities have begun offering full-body computer tomographic (CT) screening for healthy adults, intended to detect a variety of diseases including lung cancer, coronary artery disease, and colon cancer at an early stage. There have been no studies to demonstrate that such screening offers medical benefits or prolongs life; thus there is no evidence that the added risk from exposure to ionizing radiation is offset by any medical benefit. Moreover, full-body CT scans involve much higher radiation doses than routine medical x-rays. For example, the estimated effective dose (a weighted average of the dose to all of the relevant organs) of a full-body CT scan (about 12 mSV) is almost 100 times greater than the effective dose of a mammogram (0.13 mSv). Multiple exposures to radiation from full-body CT scans have been predicted to increase a person's lifetime risk of cancer by a small amount. Anyone considering this procedure should discuss the potential risks and benefits with their primary care physician.

Unproven Risks

Public concern about cancer risks in the environment often focuses on unproven risks or on situations in which known carcinogen exposures are at such low levels that risks are negligible, for example:

Pesticides. Many kinds of pesticides (insecticides, herbicides, etc.) are widely used in agriculture in the production of the food supply. High doses of some of these chemicals have been shown to cause cancer in animals, but the very low concentrations found in some foods have not been associated with increased cancer risk. In fact, people who eat more vegetables and fruits, which may be contaminated with trace amounts of pesticides, generally have lower cancer risks than people who eat

few fruits and vegetables. Workers exposed to higher levels of pesticides, in industry or farming, may be at higher risk of certain cancers.

Environmental pollution by pesticides such as DDT, which is now banned but formerly was used in agriculture, degrade slowly and can lead to accumulation in body fat. These residues have been suggested as a possible risk factor for breast cancer, although study results have largely been negative.

Continued research regarding pesticide use is essential for maximum food safety, improved food production through alternative pest control methods, and reduced pollution of the environment. In the meantime, pesticides play a major role in sustaining our food supply. When properly controlled, the minimal risks they pose are greatly overshadowed by the health benefits of a diverse diet rich in foods from plant sources.

Non-ionizing radiation. Electromagnetic radiation at frequencies below ionizing and ultraviolet levels has not been proven to cause cancer. Some studies suggest an association with cancer, but most of the now-extensive research in this area does not. Low-frequency radiation includes radiowaves, such as are used in radios, television sets, and cellular phones; microwaves; radar; and power frequency radiation arising from the electric and magnetic fields associated with electric currents and household appliances.

Toxic wastes. Toxic wastes in dump sites can threaten human health through air, water, and soil pollution. Many toxic chemicals contained in such wastes can be carcinogenic at high doses, but most community exposures appear to involve very low or negligible dose levels. Cleanup of existing dumpsites and close control of toxic materials in the future are essential to ensure healthy living conditions.

Nuclear power plants. Ionizing radiation emissions from nuclear facilities are closely controlled and involve negligible levels of exposure for communities near the plants. Reports about cancer case clusters in such communities have raised public concern, but studies show that clusters do not occur more often near nuclear plants than they do by chance elsewhere.

The American Cancer Society

In 1913, 10 physicians and 5 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 2 million friends and volunteers working to conquer cancer.

For nearly a century, the American Cancer Society has continued to make significant progress toward victory over cancer. The Society has helped lead the way in cancer research, education, advocacy, and service. As a result, we have seen remarkable strides in cancer science, prevention, early detection, treatment, and cancer patients' quality of life. Today, more than ever, our goals of saving lives and improving the quality of lives are within reach.

Organization: The American Cancer Society consists of a National Home Office with 14 chartered Divisions throughout the country and a local presence in most communities.

The National Society: A National Assembly provides basic representation from the Divisions. The Assembly approves the charters for the 14 Divisions and elects a 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 for cancer information delivery, cancer control and prevention, advocacy, resource development, and patient services. The National Home Office also provides technical support and materials to Divisions and local offices and administers the intramural and extramural research programs.

The Divisions: These are governed by Division Boards of Directors composed of both medical and lay volunteers throughout the US and Puerto Rico. The Society's 14 Divisions are responsible for program delivery in their regions.

Local offices: More than 3,400 local offices nationwide are organized to deliver cancer prevention, early detection, and patient services programs at the community level. Descriptions of some of the Society's major programs follow.

Advocacy and Public Policy

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. Laws and policies can fund cancer research, ensure access to care, offer prevention, early detection, and quality cancer care to the medically underserved, and reduce suffering from tobacco-related illnesses. The Society's advocacy efforts help ensure that lawmakers at every level of government adopt policies, laws, and regulations that will help us win the fight against cancer.

Advocacy Priorities

The Society's advocacy efforts work in concert with its research, education, and patient services initiatives to strengthen our nation's laws, regulations, and programs in a way that will:

- Support cancer research and programs to prevent, detect, and treat cancer
- Expand access to quality cancer care, prevention, and awareness
- Reduce cancer disparities in minority and other medically underserved populations
- Reduce and prevent suffering from tobacco-related illnesses

The federal government is the largest source of funding for cancer research and programs to prevent, detect, and treat cancer, providing billions of dollars each year to fuel the fight. That investment has yielded remarkable returns. Since the passage of the National Cancer Act in 1971, cancer patients' 5-year survival rates have nearly doubled. But to reach the next level of medical breakthroughs, our nation needs to expand its investment in research. Scientists, doctors, nurses, and other caregivers are pushing every day to find better ways to prevent and treat cancer. The federal government must support their momentum by increasing research funding and funding for proven cancer programs that put effective research to work. By urging legislators to fund research and its application, the American Cancer Society helps move the nation that much closer to the Society's ultimate goal – defeating cancer.

Many patients face a variety of financial and bureaucratic barriers that keep cancer prevention and early detection tools and lifesaving treatments, such as clinical trials, out of their reach. Legislation and policy changes can effectively lower these barriers by ensuring that all people, regardless of their insurance status, have access to quality cancer prevention, screening, and treatment – including effective pain management, appropriate follow-up care for cancer survivors, and comfortable, dignified end-of-life care.

People who are poor, who lack adequate health insurance, who have lower education levels, who live in rural areas, or who belong to certain racial or ethnic minority groups are more likely to develop and die of cancer. Expanding prevention education and increasing access to and participation in cancer screening and treatment programs can dramatically reduce this unfair burden. In addition to requesting funding for research that will determine how to best reach, protect, and treat underserved groups, the Society also urges policymakers to enact and fund "patient navigator" programs that facilitate direct delivery of services, providing outreach and coordination for cancer awareness, screening, and treatment.

Tobacco is responsible for nearly one-third of all cancer deaths. Federal, state, and local governments all have a role to play in helping the Society reduce the nation's enormous tobacco-related cancer burden. Steps must be taken to help tobacco users quit and to keep children from starting. For example, the Society advocates for increased tobacco taxes, which have been proven to reduce consumption, especially among young people. Policies that ensure all employees work in a smoke-free environment reduce illnesses from secondhand smoke and encourage smokers to quit. In addition, effective local, state, and federal tobacco control programs must be sufficiently funded, and to further protect children, the Food and Drug Administration (FDA) must have meaningful regulatory authority over tobacco products. The American Cancer Society encourages lawmakers to embrace these and other tobacco control policies.

Advocacy Successes

American Cancer Society 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. The American Cancer Society, through its local, state, and federal efforts, has successfully influenced or supported policies, laws, and regulations by:

- Leading the charge to secure additional funding for cancer research at the National Institutes of Health (NIH) – including completion of the 5-year effort to double the NIH budget – and the National Cancer Institute (NCI), as well as resources for the NIH Center on Minority Health and Health Disparities
- Improving our ability to apply research findings in cancer-related screening and early detection programs provided by the Centers for Disease Control and Prevention (CDC) and the Health Resources and Services Administration (HRSA)
- Convincing the US Senate to pass legislation granting the FDA meaningful regulatory authority over tobacco products
- Passing "patient navigator" legislation to reduce barriers and expand access to care for minorities and other medically underserved communities unanimously in the US House of Representatives
- Securing coverage for an initial physical exam for new Medicare beneficiaries beginning January 2005 and raising public awareness of the new benefit
- Working to provide transitional Medicare coverage for oral anticancer drugs such as Gleevec and tamoxifen until the full prescription drug benefit goes into effect in January 2006, when most oral anticancer drugs will be covered
- Monitoring implementation of the new Medicare law to protect cancer patients
- Enacting 10 statewide smoke-free workplace laws and helping more than 1,800 communities become smoke-free (Smoke-free campaigns are underway in all 50 states and the District of Columbia.)
- Expanding health care coverage for the full range of colorectal cancer screening tests to people aged 50 and older or those at high risk for the disease in 15 states and the District of Columbia, for Medicare beneficiaries, and for many federal employees
- Expanding access to clinical trials in 18 states and the District of Columbia and for Medicare beneficiaries in all states
- Securing passage of tobacco excise tax increases in 36 states and the District of Columbia, including the tobacco-growing state of Virginia, over the past three years

In addition, the Society's sister issue advocacy organization, the American Cancer Society Cancer Action Network℠, conducted voter education activities in 14 federal election races, including at the presidential level, as part of its Campaign Against Cancer® electoral program.

Cancer Information

Providing the public with up-to-date, reliable cancer information anytime, day or night, is a priority for the American Cancer Society. Through the toll-free cancer information service at 1-800-ACS-2345, trained specialists answer calls 24 hours a day, 7 days a week. At www.cancer.org, visitors can find the latest cancer news, links to community resources and events, and informative books. They can also email cancer questions and receive prompt answers. An online community of fellow patients, survivors, and caregivers who understand and inspire is also available through the Cancer Survivors Network℠.

National Cancer Information Center – 1-800-ACS-2345

People facing cancer need clear, reliable information in order to understand their disease and make informed decisions about their health. Trained cancer information specialists are available 24 hours a day, 7 days a week, to answer questions about cancer, link callers with resources in their communities, and provide information on local events. Cancer information specialists answer calls in both English and Spanish, and translation services are available for callers who speak other languages. The National Cancer Information Center (NCIC) includes an email response center staffed by cancer information specialists who reply to questions and comments submitted through the Society's Web site. Last year, NCIC received more than 1.3 million calls and responded to nearly 37,000 emails.

American Cancer Society Web Site – www.cancer.org

The American Cancer Society's Web site is an important extension of the Society's mission to provide lifesaving information to the public. The user-friendly site includes an interactive cancer resource center containing in-depth information on every major cancer type. Information is also available in Spanish. Through the Web site, visitors

can order American Cancer Society publications, gain access to daily cancer-related articles and personal stories, and find additional online and offline resources. Other useful sections of the Web site include a directory of medical resources; links to other sites organized by cancer type or topic; resources for media representatives; and information on the Society's research grants program, advocacy efforts, and special events. In the last year, the Society's Web site has averaged more than 1 million visits each month.

Publications

The Society publishes patient education brochures and pamphlets; books for patients, loved ones, and caregivers; and books and journals for health care professionals. The Society's book-publishing portfolio includes many types of books for consumers (including general reference books, children's books, and cookbooks) and covers a wide array of topics, from prevention and healthy living to books on specific cancer types and books on psychosocial, quality-of-life, and caregiving issues. The Society also publishes specialized cancer-related and clinical oncology titles for health care professionals. A complete list of book publications is available online at http://www.cancer.org/bookstore.

The Society publishes three clinical journals, *Cancer*, *Cancer Cytopathology*, and *CA: A Cancer Journal for Clinicians*. In the US, a free 3-year print subscription to *CA* is available to health care professionals by completing the online subscription form at http://CAonline.AmCancerSoc.org/ or by contacting journals@cancer.org. Free online access to all *CA* content is available on the journal's Web site. Free access to all *Cancer* and *Cancer Cytopathology* abstracts of published papers may also be obtained on the journal Web sites and at http://interscience.wiley.com/cancer.

Cancer Control

The Cancer Control Science Department contributes to the Society's mission by identifying emerging science and trends, translating research into effective cancer control strategies, communicating the Society's position on a wide range of cancer issues to the public, and formulating science-based public health strategies.

The department develops and regularly updates the Society's widely recognized cancer prevention and early detection guidelines; provides scientific support for service programs that aim to improve the quality of life for cancer patients, survivors, and caregivers; offers guidance on the role of nutrition and physical activity in preventing cancer and meeting the health needs of cancer survivors; develops effective, data-based tobacco control programs; and addresses the impact of new scientific findings on public health and the fight against cancer.

The department collaborates extensively with Divisions and with other organizations to reduce cancer suffering. Building upon long-established relationships with organizations such as the Centers for Disease Control and Prevention, the National Cancer Institute, and the National Colorectal Cancer Roundtable, and developing new, strategic relationships with other organizations, the Cancer Control Science Department provides the basis for well-regarded and effective partnerships, which further the goals and mission of the American Cancer Society.

The Cancer Control Science Department leads the Society's efforts to ensure a high quality of life for cancer survivors and caregivers. With an ever-increasing number of cancer patients surviving long-term, it is imperative to understand and meet their physical, emotional, financial, and spiritual needs. Several science-based strategies have the potential to increase quality of life by minimizing the impact of symptoms and side effects and by decreasing the loss of economic resources. The Society continues to investigate opportunities to design effective interventions to alleviate the cancer burden.

Community Cancer Control

Community cancer control encompasses activities at the local, state, regional, and national levels that have a positive impact on the entire spectrum of cancer prevention, early detection, treatment, survival, and quality of life. Across the country, the Society seeks to fulfill its mission to save lives and diminish suffering from cancer through community-based programs aimed at reducing cancer risk, detecting it early, ensuring proper treatment, and empowering people facing cancer to cope with the disease and maintain the highest possible quality of life.

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; the relationship between diet, physical activity, and cancer; promoting coordinated school health; and reducing the risk of skin cancer. Other Society programs are designed to help both adults and children make health-enhancing decisions.

The American Cancer Society collaborates with several national groups to implement comprehensive tobacco

control programs. The Society advocates for social and environmental change at the national, state, and community levels to prevent young people from starting to use tobacco and to support people who wish to stop using it.

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 tobacco smoke exposure
- Supporting effective, coordinated school-based education programs
- Providing access to cessation programs for people who wish to quit
- Increasing tobacco taxes to offset the health care costs associated with tobacco use
- Supporting global partnerships to reduce tobacco-related death and diseases

Eating well, being physically active, and maintaining a healthy weight are also important ways to reduce cancer risk. The Society publishes Guidelines on Nutrition and Physical Activity for Cancer Prevention that offer the best evidence available to help people reduce their risk of cancer through a healthy diet and physical activity. We work to increase public awareness of these lifestyle factors' impact on cancer risk through media, education, and programming activities. For example, because of the impact that diet, activity, and weight control have on reducing the risk not only of cancer, but also of heart disease and diabetes, the Society has recently launched a campaign with the American Heart Association and the American Diabetes Association to encourage every American to eat better, adopt a more physically active lifestyle, and maintain a healthy weight. In collaboration with national, state, and local groups, we help schools, worksites, and communities increase the availability of healthy foods and opportunities for safe, enjoyable physical activity. We also collaborate to increase funding for these comprehensive strategies.

Because up to 60 percent of cancers could be prevented if individuals adopted healthy lifestyle behaviors that often begin in childhood, children and young people are an important audience for cancer prevention. The Society, together with the Centers for Disease Control and Prevention (CDC) and a host of other education, health, and social service agencies, has identified schools as a key system for effective cancer prevention. By helping 15,000 school districts in the US deliver strong, coordinated school health programs and quality school health education, the American Cancer Society is positively influencing more than 45 million school children's health.

The Society has joined other health, education, and social service agencies to promote comprehensive school health education and the National School Health Education Standards. Comprehensive school health education is a planned health education curriculum for preschool through grade 12. The standards help schools, parents, and communities create an instructional program that will enable students to become healthy and achieve academic success. The Society's school health education programs emphasize the importance of developing good health habits and can be an integral part of a comprehensive school health education curriculum.

Specific efforts the Society has developed to strengthen schools' ability to teach cancer prevention include conducting a National School Health Coordinator Leadership Institute, creating a series of social marketing campaigns on the benefits of school health, and coordinating the development of a Healthy Kids Network of parents and community members.

The Society promotes its skin cancer prevention message through a variety of media, awareness, and education activities, as well as through the National Council on Skin Cancer Prevention. Founded in 1998 by the Centers for Disease Control and Prevention, the Council has been co-sponsored by the American Cancer Society, the American Academy of Dermatology, and the Skin Cancer Foundation since 2002. The Council is composed of 30 organizations, and its purpose is to ensure consistent messages to the public about skin cancer prevention and early detection.

Early Cancer Detection/Treatment

The Society also seeks, through its early detection guidelines and its cancer education and advocacy programs, to ensure that cancer is diagnosed at the earliest possible stage – when there is the greatest likelihood of successful treatment. The Society assesses its guidelines annually to ensure that recommendations to the public and health care providers are based on the most current scientific evidence. The Society currently offers prevention and early detection recommendations for cancers of the breast, cervix, colon and rectum, prostate, and endometrium, as well as guidance about testing for lung cancer and general recommendations for a cancer-related

checkup. (For more information, see Screening Guidelines, page 60.)

The Society also works in partnership with many public and private organizations in diverse settings to increase awareness about breast cancer and the importance of early detection and to overcome the barriers to regular mammography. The American Cancer Society collaborates with the CDC to advocate for, support, and sustain the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). Since 1990 NBCCEDP has helped low-income, uninsured, and medically underserved women gain access to lifesaving screening programs for the early detection of breast and cervical cancers.

Similarly, the Society works with the CDC to lead a national initiative to increase colorectal cancer screening, which is currently inadequately used by adults. In addition to public outreach campaigns and initiatives targeting health care providers, the American Cancer Society and the CDC have established the National Colorectal Cancer Roundtable, bringing leading government agencies, professional and medical organizations, and advocacy and patient groups together to identify collective strategies and opportunities to increase screening for colorectal cancer. Working with The Advertising Council, the premier nonprofit communications organization dedicated to stimulating action on public issues, the Society has reached millions of people with the lifesaving colorectal cancer screening message: "Get the test. Get the polyp. Get the cure." Using a larger-than-life polyp character to grab attention, this campaign is designed to educate the public that screening tests can prevent this disease by removing polyps before they become cancerous.

The availability of genetic testing for inherited cancer risk has raised a complex set of questions about the medical, psychosocial, ethical, legal, policy, and quality-of-life implications of using genetic information. The Society is working with other national organizations to address these issues through advocacy and educational initiatives.

As the delivery of health care continues to change, the Society is working with groups in all sectors of the health care system to ensure that all people are offered a full range of services that enable them to reduce their risk of getting cancer or to find their cancer at an early stage when the opportunity for a cure is greatest. The Society also collaborates with other organizations such as the National Comprehensive Cancer Network (NCCN), an alliance of 19 of the world's leading cancer centers, to ensure that people with cancer receive the highest quality care.

In addition to producing treatment guidelines for cancer patients and physicians, NCCN partners with the Society to translate the NCCN Clinical Practice Guidelines in Oncology into easy-to-understand pamphlets 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.

Patient/Survivor Services

The Society offers a range of services for patients, their families, their caregivers, and their communities from the time of diagnosis throughout life.

Cancer Survivors Network℠: Created by and for cancer survivors and their families, this "virtual" community offers unique opportunities and accessibility to survivors, caregivers, and all people touched by cancer. It is a welcoming, safe place for people to find hope and inspiration from others who have "been there." Services include radio talk show conversations and interviews, individual stories, personal Web pages, discussion forums, an Expression Gallery, and more – available online at www.cancer.org.

I Can Cope®: Adult cancer patients and their loved ones learn to navigate the cancer experience while building their knowledge, coping skills, and positive attitudes. In this series of educational classes, doctors and other health care professionals provide information, encouragement, and practical tips in a supportive environment.

Hope Lodge®: This home-like environment provides free, temporary lodging for cancer patients undergoing treatment and their family members. It makes the cancer treatment process a little easier by providing a supportive environment and lifting the financial burden of an extended stay.

"tlc"™ or **Tender Loving Care**®: A magazine and catalog in one, "tlc" supports women dealing with hair loss and other physical effects of cancer treatment. The magalog offers a wide variety of affordable products, such as wigs, hats, and prostheses, through the privacy and convenience of mail order.

Look Good…Feel Better®: Through this free service, women in active cancer treatment learn 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. This program is a partnership among the

American Cancer Society; the Cosmetic, Toiletry, and Fragrance Association Foundation; and the National Cosmetology Association.

Road to Recovery[SM]: This service assists cancer patients and their families with transportation to and from treatment facilities. 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 and information to help individuals cope with breast cancer. Specially trained survivors serve as volunteers, responding in person or by phone to the concerns of people facing breast cancer diagnosis, treatment, recurrence, or recovery.

Man to Man®: This comfortable, community-based setting for discussion and education provides men facing prostate cancer with support individually or in groups. 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 children who have, or have survived, cancer. These camps are equipped to handle the special needs of children undergoing treatment.

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.

Pain Control

Cancer pain management continues to be a serious public health concern and an important focus area for the American Cancer Society. While pain related to cancer treatment is often adequately managed, pain that emerges later in the course of the disease may not be. Pain needs to be addressed at every interval in the cancer experience as it can negatively affect the patient's quality of life.

The Society is working to eliminate barriers to cancer-related pain relief across the survivorship continuum. Efforts include addressing quality pain management through reimbursement; insurance; modification of patients' beliefs about the effectiveness of treatments for pain; and tools that educate the public, patients, families, and health care providers about access to treatments that effectively manage most cancer pain.

Research

The American Cancer Society's comprehensive research program has 3 components: extramural grants that fund researchers at universities, research institutes, and cancer centers throughout the US; intramural epidemiology and surveillance research; and the intramural behavioral research center. The intramural programs are dedicated to research conducted by the Society's own in-house scientists.

As the largest source of private, nonprofit cancer research funds in the US, the Society spent an estimated $127 million on research and health professional training in 2003. Since 1946, when the Society awarded its first research grants, it has invested nearly $2.7 billion in research. The investment has paid rich dividends: the 5-year survival rate has almost tripled since 1946, and incidence and mortality rates have declined each year since 1990. Society-supported researchers have contributed to many of the advances that make the conquest of cancer a feasible goal.

Extramural Grants

The American Cancer Society's extramural grants program supports the best research in a wide range of disciplines at more than 160 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 at the beginning of 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 more than 50 years, the Society's intramural epidemiologic research program has evaluated trends in cancer incidence, mortality, and survival. Current information is available in several formats, including *Cancer Facts & Figures*, *Breast Cancer Facts & Figures*, and separate versions of *Cancer Facts & Figures for African Americans* and *Hispanics/Latinos*. *Cancer Prevention & Early Detection Facts & Figures* presents trends in cancer risk factors such as tobacco use, obesity, physical inactivity, and nutritional factors for adults and children. These documents, as well as cancer statistics slides, are available on 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 study factors that cause or prevent cancer in large prospective studies. Three such studies have been conducted over the past 50 years:

- Hammond-Horn Study (188,000 men studied from 1952-1955)
- 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 by 77,000 volunteers in 50 states)

More than 300 scientific publications resulting from these studies have examined the contribution of lifestyle (smoking, nutrition, obesity, etc.), family history, illnesses, medications, and environmental exposures to various cancers. Mortality follow up of all CPS-II cohort members, as well as cancer incidence follow up and periodic updating of exposure information in the CPS-II Nutrition Cohort (a subgroup of 184,000 men and women), continues.

Beginning in 1998, the CPS-II LifeLink Study obtained blood samples from approximately 40,000 surviving members of the CPS-II Nutritional Cohort residing in urban and suburban areas. An additional 70,000 buccal (cheek) cell samples were obtained, providing DNA specimens on more than 100,000 cohort members. These samples are being stored in liquid nitrogen for epidemiologic studies of nutritional, hormonal, and genetic factors related to cancer and other diseases. Additional information about the Cancer Prevention Studies is available at www.cancer.org, including copies of questionnaires and publication citations.

Behavioral Research Center

The Behavioral Research Center (BRC) was established in 1995 to conduct original behavioral and psychosocial cancer research, provide consultation to other parts of the Society, and facilitate the transfer of behavioral and psychosocial research and theory to improve cancer control policies.

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 cross-sectional national study of cancer survivors who are 2, 5, and 10 years from their initial diagnosis and treatment. This study will evaluate their psychological needs, adjustment, and quality of life and provide information on longer-term cancer survivors.
- 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 2 and 5 years after diagnosis, and examines the impact of the caregiving 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.
- An analysis of data from the health-related quality-of-life surveys is conducted by the Department of Health and Human Services' Centers for Medicare and Medicaid (formerly the Health Care Financing Administration, or HCFA) and provided to the BRC. These data are being analyzed to examine changes in the quality of life of cancer survivors who receive Medicare-managed care.
- 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 pilot study of cancer knowledge, attitudes, beliefs, and risk perceptions among college students. Through partnerships with selected historically black colleges and 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.

- A survey of primary care providers (family physicians, nurse practitioners, and physician assistants) that seeks to identify their level of awareness, evaluation, and use of guidelines, recommendations, and educational/support programs of the American Cancer Society and other national organizations.
- Research to explore sedentary behavior patterns in an obese population. The objective is to identify key determinants of this population's behavior in order to increase their physical activity and reduce their cancer risk.
- A study of the use of complementary therapies by breast and prostate cancer survivors, as well as a corresponding survey of physicians who treat cancer patients. The physicians' survey will explore physician-patient communications about complementary therapies.
- A study of the effect of acupuncture on quality of life in ambulatory cancer patients at the end of life. This study is being conducted in collaboration with the Zakin Center for Integrated Therapies at the Dana Farber Cancer Center.
- A collaboration with the Georgia Cancer Center for Excellence located at the Grady Hospital in Atlanta, GA, to research factors affecting adherence to cancer treatment of women diagnosed with breast cancer.
- A study to determine the incidence and natural history of cognitive dysfunction in women receiving adjuvant chemotherapy for breast cancer compared to breast cancer patients receiving treatment not including chemotherapy.

In June 2004, the BRC, in collaboration with the National Cancer Institute, sponsored the second Biennial Cancer Survivorship Conference in Washington, DC. The conference focused on "Pathways to Health After Treatment."

The BRC maintains as a priority contributing to the scientific literature on behavioral and psychosocial aspects of cancer. In 2003-2004, BRC staff members published nearly 30 articles in peer-reviewed journals.

Sources of Statistics

Cancer Deaths. The estimated numbers of US cancer deaths are calculated by fitting the numbers of cancer deaths for 1969 through 2002 to a statistical model which forecasts the numbers of deaths that are expected to occur in 2005. 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 2001 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 2001 and fitting these estimates to a statistical model which forecasts the numbers of cases that are expected to occur in 2005. Estimates of the numbers of cancer cases for 1979 through 2005 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 2001 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 2005 by state, based on the state distribution of estimated cancer deaths for 2005.

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, 1997-2001.* Incidence rates for the US by race/ethnicity were originally published in *SEER Cancer Statistics Review, 1975-2001 (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 non-hospital settings. Delay-adjusted trends for selected cancer sites are reported in CSR, 1975-2001.

Survival. Five-year relative survival rates are presented in this report for cancer patients diagnosed between 1995 and 2000, followed through 2001. 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. All survival statistics presented in this publication were originally published in *SEER Cancer Statistics Review, 1975-2001.*

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 July 19, 2004.

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, 1975-2001.* National Cancer Institute. Bethesda, MD, 2004. Available at: http://seer.cancer.gov/csr/1975_2001/. Accessed July 15, 2004.

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 5.2. Probability of developing or dying of cancer. Statistical Research and Applications Branch, NCI. www.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 which 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	• 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	Beginning at age 50, men and women should begin screening with 1 of the examination schedules below: • 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 **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.*
Prostate	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.
Uterus	**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. **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).
Cancer-related checkup	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.

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 (AHCRQ) 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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