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 with surgery, radiation, chemotherapy, hormone therapy, biological therapy, and targeted therapy.

Can Cancer Be Prevented?

All cancers caused by cigarette smoking and heavy use of alcohol could be prevented completely. The American Cancer Society estimates that in 2007 about 168,000 cancer deaths are expected to be caused by tobacco use.

Scientific evidence suggests that about one-third of the 559,650 cancer deaths expected to occur in 2007 will be related to overweight or obesity, physical inactivity, and nutrition and thus could also be prevented. Certain cancers are related to infectious agents, such as hepatitis B virus (HBV), human papillomavirus (HPV), human immunodeficiency virus (HIV), Helicobacter pylori (H.

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

This year about 559,650 Americans are expected to die of cancer, more than 1,500 people a day. Cancer is the second most common cause of death in the US, exceeded only by heart disease. In the US, cancer accounts for 1 of every 4 deaths.

What Percentage of People Survive Cancer?

The 5-year relative survival rate for all cancers diagnosed between 1996 and 2002 is 66%, up from 51% in 1975-1977 (see page 18). The improvement in survival reflects progress in diagnosing certain cancers at an earlier stage and improvements in treatment. Rates vary greatly by cancer type and stage at diagnosis. Relative survival compares survival among cancer patients to that of people not diagnosed with cancer who are of the same

How Is Cancer Staged?

Staging describes 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 and whether it has spread to other areas of the body. A number of different staging systems are used to classify tumors. The TNM staging system assesses tumors in three ways: extent of the primary tumor (T), absence or presence of regional lymph node involvement (N), and absence or presence of distant metastases (M). Once the T, N, and M are determined, a stage of I, II, III, or IV is assigned, with stage I being early stage and IV being advanced. A different system of summary staging (in situ, local, regional, and distant) is used for descriptive and statistical analysis of tumor registry data. If cancer cells are present only in the layer of cells where they developed and have not spread, the stage is in situ. If cancer ce

Estimated New Cancer Cases and Deaths by Sex for All Sites, US, 2007*

	Estimated New Cases			Estimated Deaths		
	Both Sexes	**Male**	**Female**	**Both Sexes**	**Male**	**Female**
All sites	1,444,920	766,860	678,060	559,650	289,550	270,100
Oral cavity & pharynx	34,360	24,180	10,180	7,550	5,180	2,370
Tongue	9,800	6,930	2,870	1,830	1,180	650
Mouth	10,660	6,480	4,180	1,860	1,110	750
Pharynx	11,800	9,310	2,490	2,180	1,620	560
Other oral cavity	2,100	1,460	640	1,680	1,270	410
Digestive system	271,250	147,390	123,860	134,710	74,500	60,210
Esophagus	15,560	12,130	3,430	13,940	10,900	3,040
Stomach	21,260	13,000	8,260	11,210	6,610	4,600
Small intestine	5,640	2,940	2,700	1,090	570	520
Colon†	112,340	55,290	57,050	52,180	26,000	26,180
Rectum	41,420	23,840	17,580			
Anus, anal canal, & anorectum	4,650	1,900	2,750	690	260	430
Liver & intrahepatic bile duct	19,160	13,650	5,510	16,780	11,280	5,500
Gallbladder & other biliary	9,250	4,380	4,870	3,250	1,260	1,990
Pancreas	37,170	18,830	18,340	33,370	16,840	16,530
Other digestive organs	4,800	1,430	3,370	2,200	780	1,420
Respiratory system	229,400	127,090	102,310	164,840	92,910	71,930
Larynx	11,300	8,960	2,340	3,660	2,900	760
Lung & bronchus	213,380	114,760	98,620	160,390	89,510	70,880
Other respiratory organs	4,720	3,370	1,350	790	500	290
Bones & joints	2,370	1,330	1,040	1,330	740	590
Soft tissue (including heart)	9,220	5,050	4,170	3,560	1,840	1,720
Skin (excluding basal & squamous)	65,050	37,070	27,980	10,850	7,140	3,710
Melanoma-skin	59,940	33,910	26,030	8,110	5,220	2,890
Other non-epithelial skin	5,110	3,160	1,950	2,740	1,920	820
Breast	180,510	2,030	178,480	40,910	450	40,460

Estimated New Cancer Cases for Selected Cancer Sites by State, US, 2007*

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	20,590	2,750	170	2,350	460	550	3,850	740	860	3,010	850
Alaska	2,500	340	†	270	60	70	330	80	110	420	110
Arizona	26,270	3,220	190	2,750	550	740	3,740	1,300	1,080	3,400	1,360
Arkansas	14,130	1,830	130	1,640	320	510	2,420	550	600	1,960	560
California	151,250	19,790	1,350	15,000	3,870	4,610	17,920	6,860	7,190	24,590	6,590
Colorado	19,190	2,660	150	1,790	490	670	2,100	1,210	880	3,160	880
Connecticut	19,780	2,510	100	2,190	650	610	2,720	1,120	870	2,890	1,090
Delaware	4,530	560	†	480	130	110	770	190	170	800	220
Dist. of Columbia	2,540	320	†	270	70	60	380	60	100	540	90
Florida	106,560	11,710	850	11,420	2,490	3,360	17,490	4,380	4,530	15,710	5,460
Georgia	35,440	4,520	330	3,690	810	960	5,780	1,460	1,370	5,850	1,360
Hawaii	6,020	820	50	790	170	170	690	270	250	780	200
Idaho	6,140	780	†	600	150	220	760	350	280	1,080	310
Illinois	62,010	7,030	530	6,890	1,730	2,030	9,550	2,050	2,670	8,060	2,880
Indiana	30,040	3,560	240	3,390	880	910	5,210	1,220	1,310	3,710	1,390
Iowa	16,540	2,000	100	1,930	500	620	2,290	690	800	2,140	820
Kansas	12,760	1,750	100	1,360	360	420	1,870	430	600	1,490	570
Kentucky	22,850	2,590	200	2,570	560	680	4,450	1,050	900	2,880	970
Louisiana	22,540	2,820	200	2,520	420	680	3,510	670	920	3,640	850
Maine	8,340	980	†	880	270	250	1,360	410	330	1,210	470
Maryland	26,390	3,560	190	2,870	810	630	4,130	1,150	1,160	4,690	1,150
Massachusetts	34,920	4,260	180	3,850	1,110	1,010	5,060	1,820	1,550	5,180	1,950
Michigan	54,410	5,900	370	5,570	1,610	1,680	8,210	2,080	2,250	8,200	2,700
Minnesota	25,420	3,240	150	2,650	750	920	3,160	1,130	1,170	4,800	1,250
Mississippi	12,470	1,620	120	1,440	230	340	2,190	320	480	2,010	480
Missouri	29,930	3,730	240	3,380	830	890	5,350	870	1,260	3,910	1,350
Montana	4,920	630	†	520	120	170	690	190	220	940	260
Nebraska	8,720	1,160									

Estimated Cancer Deaths for Selected Cancer Sites by State, US, 2007*

State	All Sites	Brain/ Nervous System	Female Breast	Colon & Rectum	Leukemia	Liver	Lung & Bronchus	Non-Hodgkin Lymphoma	Ovary	Pancreas	Prostate
Alabama	9,740	210	680	880	350	300	3,240	330	290	530	480
Alaska	810	†	50	70	†	†	230	†	†	50	†
Arizona	10,120	250	710	970	400	330	2,850	320	300	590	520
Arkansas	6,240	140	410	610	240	200	2,220	200	140	310	300
California	54,890	1,460	4130	5,230	2150	2,270	13,220	1,830	1,680	3,480	3,040
Colorado	6,660	190	520	630	290	200	1,650	240	220	410	330
Connecticut	6,990	150	490	590	270	190	1,860	230	190	480	390
Delaware	1,810	†	120	160	70	†	580	60	50	100	90
Dist. of Columbia	1,020	†	80	100	†	†	260	†	†	60	60
Florida	40,430	790	2700	3,530	1630	1,190	12,360	1,300	1,040	2,350	2,180
Georgia	14,950	280	1120	1,340	540	360	4,500	470	420	820	630
Hawaii	2,260	†	130	210	80	110	530	90	50	170	130
Idaho	2,370	80	180	200	120	50	570	100	50	140	150
Illinois	23,870	490	1740	2,380	990	650	6,690	750	620	1,480	990
Indiana	12,730	280	860	1,180	510	290	3,800	430	350	740	600
Iowa	6,510	160	410	600	310	140	1,750	300	190	390	350
Kansas	5,290	140	380	520	230	120	1,530	220	150	310	220
Kentucky	9,390	150	600	860	320	220	3,450	290	220	460	310
Louisiana	9,550	200	730	960	330	330	3,020	310	220	530	400
Maine	3,190	80	190	280	100	70	970	110	80	190	180

Cancer Incidence Rates by Site and State, US, 1999-2003*

	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†	526.5	365.2	115.3	60.6	41.8	108.9	49.9	18.8	13.3	140.4	30.0	7.1
Alaska†	556.8	421.2	134.2	65.5	50.3	87.6	60.9	23.7	15.7	167.7	39.5	8.4
Arizona	462.4	364.1	116.7	53.1	38.2	71.8	48.7	18.7	13.4	118.2	36.0	8.8
Arkansas	544.1	377.1	121.0	60.1	43.4	114.9	56.1	20.8	15.1	154.2	34.3	8.2
California†	520.9	398.5	129.8	56.6	41.5	70.8	48.4	22.4	15.3	158.3	34.4	8.3
Colorado†	516.2	400.3	134.2	53.7	40.7	66.6	44.7	21.7	16.7	164.8	35.4	9.3
Connecticut†	597.3	448.3	140.4	68.8	50.3	84.2	57.1	24.4	17.0	179.8	45.0	12.3
Delaware†	586.8	433.4	128.8	66.6	48.8	97.4	63.0	21.6	15.9	176.1	38.5	10.2
Dist. of Columbia†	635.6	422.6	135.3	65.6	52.0	96.4	50.1	21.0	11.9	227.1	25.3	9.8
Florida†	562.2	415.6	123.0	62.8	46.6	94.4	60.5	22.3	15.5	152.7	40.4	10.4
Georgia†	565.8	391.5	124.0	61.5	43.7	108.6	52.8	19.6	13.8	166.2	32.7	8.0
Hawaii†	481.8	375.2	127.3	65.4	42.3	68.0	37.2	18.7	13.1	132.3	23.4	5.2
Idaho†	530.0	396.0	128.2	52.4	39.5	71.1	44.8	20.8	17.6	171.9	38.2	7.6
Illinois†	580.9	425.5	129.7	71.1	49.8	96.1	56.6	23.2	16.2	165.6	40.2	10.5
Indiana†	545.7	414.4	124.8	67.6	48.5	107.1	60.3	22.0	15.7	138.6	36.1	9.2
Iowa†	557.1	424.2	128.7	71.6	53.0	90.2	50.4	22.6	16.7	154.2	39.1	9.8
Kansas‡	–	–	–	–	–	–	–	–	–	–	–	–
Kentucky†	616.9	440.5	124.8	72.0	53.1	137.9	73.5	21.6	16.5	155.1	37.8	9.5
Louisiana†	613.8	402.3	122.8	72.7	49.6	114.0	56.8	22.4	15.7	179.5	34.2	8.2
Maine†	609.9	447.6	131.4	69.1	51.4	101.0	62.8	22.5	16.9	171.3	48.9	13.2
Maryland†	581.6	428.3	131.9	63.2	47.2	87.2	57.1	20.9	14.4	185.2	34.0	9.4
Massachusetts†	591.6	451.8	138.8	68.7	50.3	84.0	61.4	23.1	16.8	178.2	45.8	12.5
Michigan†	608.6	429.9	129.4	62.4	46.5	94.8	58.6	23.6	17.3	199.1	42.0	10.7
Minnesota†	559.4	412.3	135.9	60.3	44.6	72.1	47.8	25.4	18.0	188.6	38.4	10.2
Mississippi‡	–	–	–	–	–	–	–	–	–	–	–	–
Missouri†	537.4	408.8	125.4	67.9	48.5	104.7	59.5	21.9	15.9	136.8	35.9	9.0
Montana†	558.8	412.0	128.4	59.0	43.9	81.2	56.0	22.6	15.1	183.6	40.8	10.1
Nebraska†	551.0	413.4	131.4	70.8	49.7	81.6	47.4	22.6	17.3	165.7	38.3	9.2
Nevada†	541.3	414.2	120.8	60.7	44.1	91.5	71.2	20.7	14.3	150.6	44.0	11.0
New Hampshire†	571.7	436.6	135.2	62.4	48.5	81.9	59.3	24.2	16.4	165.3	46.2	12.7
New Jersey†	623.9	448.7	133.9	73.1	52.3	85.0	55.7	25.7	18.0	200.3	45.3	12.0
New Mexico	485.0	357.3	115.0	52.0	35.2	60.1	36.8	17.9	13.6	152.2	28.7	7.1
New York†	565.4	424.8	126.7	68.0	50.2	82.8	53.5	23.4	16.6	168.1	41.0	11.1
North Carolina	519.2	372.6	121.5	57.0	41.8	96.2	49.9	19.0	13.4	152.4	32.7	8.4
North Dakota	518.0	366.9	123.1	64.8	43.4	70.8	41.0	21.6	14.6	181.8	37.2	9.1
Ohio	551.9	412.6	126.6	65.7	47.7	99.5	57.8	22.9	16.1	154.1	39.5	10.1
Oklahoma†	547.0	399.6	128.3	64.6	44.6	111.2	62.1	21.9	15.1	148.8	32.6	8.0
Oregon†	545.4	436.5	142.6	56.9	44.3	82.6	61.0	23.4	17.3	164.1	41.1	10.2
Pennsylvania†	594.4	436.5	129.4	72.2	51.1	92.9	53.9	24.5	17.0	172.3	44.2	11.6
Rhode Island												

Cancer Death Rates by Site and State, US, 1999-2003*

	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	282.2	165.3	26.3	23.9	15.7	97.6	40.0	9.1	6.4	13.0	9.4	36.9
Alaska	237.5	165.8	23.0	23.9	17.7	70.6	43.4	9.4	5.9	12.2	10.0	27.4
Arizona	211.3	148.3	24.1	20.9	14.5	60.6	38.0	9.0	6.4	10.5	8.1	25.5
Arkansas	275.4	167.0	24.4	26.1	18.0	101.0	45.2	10.4	6.3	12.1	8.9	31.9
California	213.9	155.3	24.6	20.7	15.0	58.3	37.5	9.3	5.8	11.3	9.0	26.4
Colorado	208.1	148.2	23.4	21.0	15.2	53.3	33.3	9.3	6.4	11.3	8.7	28.4
Connecticut	228.5	160.2	25.3	23.7	16.6	62.7	40.2	9.7	6.3	12.8	9.4	27.1
Delaware	255.8	175.6	26.8	26.0	17.5	81.3	47.3	10.2	5.9	13.2	9.0	28.3
Dist. of Columbia	299.1	187.8	33.7	30.4	21.5	79.3	39.4	9.0	5.1	15.2	11.4	49.2
Florida	229.4	154.2	23.7	21.9	15.1	73.0	42.0	9.4	5.8	11.5	8.7	24.5
Georgia	264.5	163.8	25.7	23.6	16.5	90.6	40.5	8.6	5.9	12.6	9.4	34.8
Hawaii	192.5	122.7	18.3	20.5	12.6	49.4	24.1	8.2	4.6	11.5	9.5	20.3
Idaho	216.0	151.6	24.7	20.4	13.5	57.5	34.7	9.4	6.9	10.6	9.2	31.1
Illinois	256.1	172.6	27.8	27.7	18.6	77.7	41.8	10.3	6.5	13.0	9.8	30.6
Indiana	268.0	176.2	26.6	27.1	18.2	90.9	47.6	11.0	7.2	12.7	9.2	30.5
Iowa	237.2	157.1	24.3	25.5	17.5	73.1	36.4	10.7	7.1	11.7	9.0	29.7
Kansas	235.2	159.3	25.7	23.3	16.6	74.4	39.3	10.7	7.2	12.2	8.5	27.2
Kentucky	296.6	182.0	26.6	28.9	19.5	114.0	54.1	10.4	6.6	12.2	8.7	29.9
Louisiana	296.1	181.1	30.1	30.2	18.9	97.8	45.2	9.8	6.9	14.5	10.5	34.9
Maine	259.4	178.8	24.8	25.6	18.8	79.6	47.7	10.2	6.5	13.1	9.7	28.8
Maryland	252.5	172.2	27.9	25.8	18.5	76.8	44.7	9.7	5.8	12.8	9.7	31.3
Massachusetts	249.1	171.0	26.2	26.0	17.7	70.4	44.2	9.6	6.8	13.0	10.0	29.4
Michigan	247.4	168.7	26.6	23.9	16.6	75.4	43.6	11.0	6.9	12.3	9.5	29.4
Minnesota	229.1	157.0	24.4	21.7	16.2	61.0	36.8	10.9	7.1	11.6	9.2	30.9
Mississippi	298.4	169.7	27.9	27.0	18.8	106.5	42.7	9.2	5.4	13.7	10.3	41.9
Missouri	256.1	171.8	26.7	25.4	18.1	86.5	45.6	10.5	7.1	12.5	9.0	27.1
Montana	232.7	163.2	23.8	22.6	15.1	67.9	43.1	9.5	6.3	11.1	8.2	29.6
Nebraska	226.9	156.8	23.8	25.3	18.1	68.3	36.1	10.0	6.9	11.1	8.6	26.2

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

Treatment:

- Brain and other nervous system (22.3%), which in early stages may cause headaches, nausea, vomiting, blurred o

Oncology Group (COG) has developed long-term follow-up guidelines for screening and management of late effects in survivors of childhood cancer. For more on childhood cancer management, see the COG Web site at: www.survivorshipguidelines.org.

Colon and Rectum

New cases: An estimated 112,340 cases of colon and 41,420 cases of rectal cancer are expected to occur in 2007. Colorectal cancer is the third most common cancer in both men and women. Colorectal cancer incidence rates have been decreasing for most of the last 2 decades, from 66.3 cases per 100,000 population in 1985 to 49.5 in 2003. The more rapid decrease in the most recent time period (2.1% per year from 1998-2003) partly reflects an increase in screening, which can detect and remove colorectal polyps before they progress to cancer.

Deaths: An estimated 52,180 deaths from colon and rectum cancer are expected to occur in 2007, accounting for almost 10% of all cancer deaths. Mortality rates from colorectal cancer have declined in both men and women over the past two decades. This decrease reflects declining incidence rates and improvements in early detection and treatment.

Signs and symptoms: Screening is necessary to detect colorectal cancer in its early stages. Advanced disease may cause rectal bleeding, blood in the stool, a change in bowel habits, and cramping pain in the lower abdomen.

Risk factors: The risk of colorectal cancer increases with age; more than 90% of cases are diagnosed in individuals aged 50 years and older. Risk is also increased by certain inherited genetic mutations [familial adenomatous polyposis (FAP) and hereditary non-polyposis colorectal cancer (HNPCC)], a personal or family history of colorectal cancer and/or polyps, or a personal history of chronic inflammatory bowel disease. Several modifiable factors are associated with increased risk of colorectal cancer. Among these are obesity, physical inactivity, smoking, heavy alcohol consumption, a diet high in red or processed meat, and inadequate intake of fruits and vegetables. Studies indicate that men and women who are overweight are more likely to develop and die from colorectal cancer. Some studies suggest that regular use of nonsteroidal anti-inflammatory drugs such as aspirin or hormones such as estrogen and progestin may possibly reduce colorectal cancer risk. However, these drugs are not currently recommended for the prevention of cancer.

Early detection: Beginning at age 50, men and women who are at average risk for developing colorectal cancer should begin screening. Screening can result in the detection and removal of colorectal polyps before they become cancerous as well as the detection of cancer that is at an early stage. Thus, screening reduces mortality both by decreasing incidence and by detecting a higher proportion of cancers at early, more treatable stages. (See page 52 for the American Cancer Society's screening guidelines for colorectal cancer.)

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

Survival: The 1- and 5-year relative survival for persons with colorectal cancer is 84% and 64%, respectively. Survival continues to decline beyond 5 years to 57% at 10 years after diagnosis. When colorectal cancers are detected at an early, localized stage, the 5-year survival is 90%; however, only 39% of colorectal cancers are diagnosed at this stage, mostly due to low rates of screening. After the cancer has spread regionally to involve adjacent organs or lymph nodes, the 5-year survival drops to 68%. For persons with distant metastases, 5-year survival is 10%.

Leukemia

New cases: An estimated 44,240 new cases are expected in 2007, with slightly more cases of chronic (19,910) than acute (18,610) disease. Leukemia is diagnosed 10 times

the bronchial passages have shown limited effectiveness in improving survival. Newer tests, such as low-dose spiral computed tomography (CT) scans and molecular markers in sputum, have produced promising results in detecting lung cancers at earlier, more operable stages when survival is better. However, there are considerable risks associated with lung biopsy and surgery that must be considered when evaluating the risks and benefits of screening. The National Lung Screening Trial is a clinical trial to assess whether screening individuals at high risk for lung cancer with spiral CT or standard chest x-ray can reduce lung cancer deaths. The study, launched in 2002, represents a collaboration of the National Cancer Institute (NCI), the American College of Radiology Imaging Network, and the American Cancer Society. Results from the study are expected by 2010.

Treatment: Treatment options are determined by the type (small cell or non-small cell) and stage of cancer and include surgery, radiation therapy, chemotherapy, and

unexplained. Since 1991, increasing NHL incidence has been confined to women. Over the past 30 years, incidence rates for Hodgkin lymphoma have decreased in men (0.7% per year) while they slightly increased in women (0.3 % per year).

Deaths: An estimated 19,730 deaths will occur in 2007

disturbances (stomach discomfort, gas, distention) may

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

melanoma are treated with palliative surgery, immunotherapy, and/or chemotherapy.

Survival: Most basal and squamous cell cancers can be cured if the cancer is detected and treated early. If detected in its earliest stages and treated properly, melanoma is also highly curable. However, melanoma is more likely than other skin tumors to spread to other parts of the body. The 5- and 10-year relative survival rates for persons with melanoma are 92% and 89%, respectively. For localized melanoma, the 5-year survival rate is 99%; 5-year survival rates for regional and distant stage diseases are 65% and 15%, respectively. About 80% of melanomas are diagnosed at a localized stage.

Urinary Bladder

New cases: An estimated 67,160 new cases are expected to occur in 2007. Bladder cancer incidence rates among men and women combined leveled off from 1987-2003, after increasing by 0.8% per year from 1975-1987. Bladder cancer incidence is nearly four times higher in men than in women and almost two times higher in whites than in African Americans.

Deaths: An estimated 13,750 deaths will occur in 2007. Mortality rates have continued to decrease since the late 1970s, although the rate of decrease slowed in the most recent time period (by 0.2% per year from 1987-2003 compared to 2.1% per year from 1977-1987).

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

Risk factors: Smoking is the most important risk factor for bladder cancer. Smokers have twice the risk of bladder cancer than that of nonsmokers. Smoking is estimated to cause about 48% of bladder cancer deaths among men and 28% among women. Workers in the dye, rubber, or leather industries and communities with high levels of arsenic in drinking water also have increased risk. Drinking more fluids and eating more vegetables may lower the risk of bladder cancer.

Early detection: Bladder cancer is diagnosed by examination of cells in the urine under a microscope and examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that can be inserted through the urethra. These tests are not recommended for screening people at average risk but are used for people at increased risk due to occupational exposure, or for follow-up after bladder cancer treatment to detect recurrent or new tumors.

Treatment: Surgery, alone or in combination with other treatments, is used in more than 90% of cases. Superficial, localized cancers may also be treated by administering immunotherapy or chemotherapy directly into the bladder. Chemotherapy alone or with radiation before cystectomy (bladder removal) has improved treatment results.

Survival: For all stages combined, the 5-year relative survival rate is 82%. Survival declines to 78% at 10 years and 73% at 15 years after diagnosis. When diagnosed at a localized stage, the 5-year survival is 94%; 74% of cancers are detected at this early stage. For regional and distant stages, 5-year survival is 46% and 6%, respectively.

Uterine Cervix

New cases: An estimated 11,150 cases of invasive cervical cancer are expected to be diagnosed in 2007. Incidence rates have decreased steadily over the past seve

use of oral contraceptives is also associated with increased risk of cervical cancer.

Prevention: The US Food and Drug Administration (FDA) has approved Gardasil®, the first vaccine developed to prevent the most common HPV infections that cause cervical cancer, for use in females aged 9-26 years. Another vaccine (Cervarix) is currently awaiting approval by the European Agency for the Evaluation of Medicinal Products.

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. DNA tests to detect HPV strains associated with cervical cancer may be used in conjunction with the Pap test, particularly

Special Section: Cancer-Related Pain

Introduction

Pain is an important concern among people with cancer and their caregivers. Cancer patients may experience pain at diagnosis, during treatment, and after treatment has ended, even if their cancer does not recur. Pain is common and often more severe among people with advanced disease. It is one of the most important negative factors affecting the quality of life of people with cancer. Pain can interfere with normal daily activities; diminish enjoyment of everyday pleasures; prevent relaxation and sleep; and increase anxiety, depression, stress, and fatigue. It can also make people withdraw from others, decrease their social activities, and have less contact with friends or family.

Regardless of the stage of disease or recovery, pain associated with cancer can almost always be relieved by proper treatment.[1-4] Pain control is an important component of quality cancer care. All patients with cancer should be assessed for pain each time they are seen throughout the course of cancer treatment and continuing care. Cancer patients play an important role in describing the severity and nature of their pain so that the most effective treatment(s) can be given. Understanding the reasons for pain at different stages of cancer, the importance of reporting it, how to describe it, and the many ways it can be

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that respond specifically to hurtful stimuli, such as extreme temperature or mechanical pressure, or to chemicals generated in response to injury or inflammation (Figure 1). When the nociceptor encounters a noxious stimulus, it sends a message into the spinal cord. This message activates nerves that carry the pain signal to the brain. When pain signals reach the brain, they may or may not reach the level of conscious thought; if they do, the person experiences pain.[5,6]

Not only does pain affect people differently, but it can also affect the same person differently at different times. Factors that may influence pain perception include complex processing of sensory information within the central nervous system, the strength of the stimulus that generates the pain sensation, the presence of other stimuli in the environment, and the person's emotional and psychological state.[6,7] Cultural factors may modify the response to pain, resulting in a range of responses to the same stimulus from stoicism to intolerance. Cultural factors may also influence communication about pain among patients, caregivers, and health care providers.[8,9]

There are many possible causes of pain associated with cancer, the most common being pain caused by the cancer itself. Pain can also be caused by the cancer treatment or may have nothing to do with the cancer.[4,3]

Experts divide pain into two basic types: **nociceptive** and **neuropathic**. It is important to distinguish between the two types of pain because the causes and treatments are different.

Nociceptive describes pain that accompanies damage to tissues of the body. It results from activation of nociceptors and can be further classified as **somatic** or **visceral**.

- **Somatic** pain arises from activation of nociceptive neurons in either the body surface (skin) or musculoskeletal tissues (bone, joint, muscle, and connective tissue). Common causes of somatic pain in cancer patients include metastases in the bone and pain related to surgery. Somatic pain is localized to a specific area and is often described as stabbing, throbbing, dull, or aching.
- **Visceral** pain arises from the soft internal organs and tissues of the body that are enclosed within a cavity, the so-called "viscera." It occurs because of compression or stretching of pain receptors in the thoracic (chest), abdominal, or pelvic organs. Visceral pain is common in pancreatic cancer patients, as well as patients who have cancer metastases to the abdomen. Visceral pain is difficult to pinpoint and is usually described as pressure-like cramping, gnawing, or squeezing. Sometimes visceral pain is experienced at the surface of the body (referred pain); for example, pain resulting from irritation of the diaphragm (the muscle partition separating the chest and abdominal cavities) may be experienced as shoulder pain.[4]

Neuropathic pain is caused by injury to the nervous system rather than stimulation of nerve endings. It may result from a tumor compressing or infiltrating -5926-0.0051e9262438110(h)3(as w)m

diagnosed with cancer, 30%-50% of patients undergoing treatment, and 70%-90% of patients with advanced disease experience pain.[11,12,13]

Pain is generally not the first sign of cancer. Early-stage cancers of the lung, breast, uterus, and ovary rarely produce pain. However, prostate and colon cancers may produce pain even in the early stages by obstructing the urinary or digestive tract. Solid tumors generally are a more common source of pain than leukemia and lymphoma.

Pain among patients undergoing active treatment may be associated with the treatment itself. Pain is a potential side effect of surgery, radiation therapy, and chemotherapy. For example, patients receiving certain

types of chemo- and radiation therapy may develop mucositis (painful mouth sores).[14]

For about half of the people diagnosed with cancer, the initial course of therapy is successful and the cancer never recurs.[15] Although they remain cancer-free, some of these patients continue to experience pain. Such pain may result from long-term side effects of treatment. For example, 2%-20% of women experience pain after breast surgery, which is caused by injury to the intercostal-brachial nerve.[10,16] Damage to the nervous system is also a serious side effect of treatment with some commonly used chemotherapy drugs, including the taxanes (such as paclitaxel and docetaxel), vinca alkaloids (such as vincristine and vinblastine), and platinum-based compounds (such as cisplatin and oxaliplatin).[6] When chemotherapy damages the nervous system, it results in a condition called peripheral neuropathy. The symptoms include tingling, burning, weakness, or numbness in the hands or feet or both.[15] Although painful peripheral neuropathy from chemotherapy usually subsides over time, some patients develop persistent or chronic pain. The neuropathy associated with cisplatin, for example, may progress for a long period of time even after therapy has concluded.[17]

For some patients, either the initial course of therapy does not eliminate the cancer entirely, or the therapy produces a cancer-free period but eventually the cancer recurs. Patients are said to have advanced cancer when treatment no longer controls disease progression.

Clinicians using a visual analog scale (VAS) ask the patient to locate the position on the scale (usually a straight line) that is equivalent to the intensity of pain. One end of the line represents no pain and the other end represents the worst possible pain (Figure 3). In addition, some clinicians use a numerical rating scale (NRS). The most commonly used NRS uses an 11-point scale of 0 to 10. As with a VAS, the numbers are typically arranged along a horizontal line ranging from no pain (0) to the worst pain imaginable (10). Another alternative, the simple descriptive pain intensity scale is especially useful for a quick estimate of pain intensity (Figure 3). Pain assessment instruments may alert clinicians to moderate pain (i.e., 5-6 on the NRS) that requires immediate intervention, which should then be continuously monitored to determine the effectiveness of the treatment. Severe pain, defined as 7 to 10 on the NRS, requires emergency evaluation and treatment. Cancer patients reporting severe pain usually require rapid treatment with a very effective opioid, such as morphine.[23]

The description of pain can provide valuable clues to its origin and help in identifying the best treatment. Information on the location, quality (e.g., sharp, aching, tingling), temporal pattern, and exacerbating factors (such as position or movement) of the pain is helpful in understanding the potential causes and best approach to treatment. When a patient reports a new or intensifying pain, a physical examination and other tests such as x-rays, magnetic resonance imaging (MRI), and blood tests may also be needed.[23] Once the necessary information has been collected, a treatment plan can be

reduces pain is not fully understood. Although acetaminophen does not slow blood clotting, high doses can damage the liver.[2,26] Patients must be cautioned about combining prescription and non-prescription pain medications that contain acetaminophen.

Some non-opioid medications are available without prescription. A maximum daily dose is recommended for each of these medicines because of the potential for serious side effects.

Opioids: Opioids are the most effective pain-relieving medicines and are available only by prescription. Opioids are sometimes classified as short-acting or long-acting. It is common for opioids to have a non-opioid pain-relieving medicine, such as acetaminophen, mixed with them.[27]

In contrast to non-opioid pain medicines, opioids relieve pain by inhibiting transmission of the pain message from the spinal cord to the brain. Opioids also cause the neurons within the spinal cord to be less responsive to pain signals.[5,27]

Although the role of opioids in blocking pain is primarily in the spinal cord, other neurons in the body have opioid receptors, including neurons in the brain and the digestive system. This explains why opioids can cause a range of undesirable side effects including drowsiness, constipation, and respiratory depression. Though most of these side effects can be treated, a patient's level of tolerance may limit the dosage that can be comfortably administered. Patients taking opioids must be monitored closely in order to maintain maximum pain relief while minimizing side effects.[28]

Opioids commonly used in the treatment of cancer pain are morphine, hydromorphone, oxycodone, fentanyl, and methadone. Morphine is u-21(,)]T(i)-8(e(o)2(11(p))1(d)-21(e)-2i3 T0w0e92(el)1P(h)Tj0.53698 c0 0 13)4(i)22(m)-1-21(e)-2i3 T0w0e9

grow and divide. By shrinking the size of the tumor, radiation may decrease the discomfort of cancer cell invasion of critical tissues. Fatigue is a common side effect of radiation treatment.[33]

Non-pharmacological and complementary methods: Although medication is the mainstay of cancer pain management, a number of other methods can be helpful and can generally be used in conjunction with pain medications. Cognitive and behavioral techniques can help to divert attention from pain, improve pain tolerance, and increase a person's sense of control. Education about pain origin and treatment can also be helpful to patients and caregivers. Many different approaches are used, including videos, books, special tutorials, and educational sessions with an expert. Some individuals with cancer pain can be assisted through telephone counseling and Internet-based educational approaches.[34,35]

Non-traditional approaches to pain management include acupuncture, mind-body imaging techniques, and therapeutic massage. Acupuncture involves application of small needles (or in the case of acupressure, pressure with fingers) along points of the body "meridians." Mind-body techniques include hypnosis and progressive muscle relaxation. Pain reduction using these methods may occur by distracting and refocusing on more positive perceptions. Therapeutic massage is thought to alter pain impulses through the relaxation induced by surface sensory input. The relaxation and sleep associated with massage may reduce perceived pain levels.[34]

Interventional treatments: Some patients experience inadequate pain control despite medications or cannot tolerate the side effects of these drugs. Approaches that may be used to relieve pain in these individuals include regional infusion of medications (similar to epidural anesthesia) and neurosurgical approaches (interrupting the pain pathways by injecting blocking substances or cutting the nerves responsible for the pain).[4] The choice of a neurosurgical procedure is based on the location and type of pain, the general condition of the patient, the patient's life expectancy, and the nature of the expertise available. Another approach is transcutaneous electrical nerve stimulation (TENS), which uses a small battery-powered device with superficial electrodes to stimulate painful areas.[4]

Inequities in Treatment of Cancer Pain

Although control of pain can improve a person's quality of life, cancer pain often goes untreated, under treated, or improperly treated. Some population groups – including the elderly, women, and members of racial and ethnic minorities – are more likely to be under treated for cancer pain than others. For example, a study of under treatment of pain among cancer patients in nursing homes found that while half of all patients in pain were receiving opioids, only 13% of patients aged 85 or older were receiving these medications. The study also found that African American patients in daily pain were 1.6 times as likely to receive no medication for pain relief.[36] A study of pain management in adult outpatients of all ages with advanced cancer found that the likelihood of receiving inadequate pain relief varied by race/ethnicity, age, and sex.[37] Predictors of inadequate pain management included minority status, age of 70 years or older, and female sex. The same study also found that patients seen at centers that mostly treated minorities were 3 times as likely as those treated elsewhere to have inadequate pain management.[37] A study of opioid availability in New York area pharmacies in 1998 found that pharmacies located in predominantly Hispanic and African American neighborhoods were significantly less likely to stock opioid analgesics than those in predominantly non-Hispanic white neighborhoods.[38]

Cancer Pain in Children

Treatment of cancer pain in children is a special concern. Although children with cancer experience pain from the same general causes as adults, they have a different spectrum of cancers than adults. Specifically, children tend to have fewer solid tumors, so they are less likely to experience tumor-related pain and more likely to have pain as a result of diagnostic or therapeutic procedures and treatment toxicities.[39] The prevalence of pain in children who are hospitalized for cancer reaches 50% in some surveys, while the prevalence of pain in outpatients is about 25%.

Barriers to Effective Treatment of Cancer-related Pain

Studies have identified a number of barriers to effective treatment for cancer pain.[42]

Barriers among patients and families

Many patients and caregivers have misconceptions about cancer pain. They may believe that pain is inevitable with cancer or that reporting pain will distract

provisions limiting the amount of opioids that can be prescribed for the treatment of cancer pain.[48]

Overcoming Barriers to Cancer Pain Management

Professional education and training

Steps have been taken to improve opportunities for professional education about cancer pain and its treatment. Excellent, evidence-based pain management clinical practice guidelines for practitioners are available through the American Pain Society and the National Comprehensive Cancer Network (NCCN).[21,22]

medical infrastructure, and financial resources. In some countries, stringent regulations and negative perceptions associated with heroin trafficking further limit appropriate medical use of opioids.[52] The WHO has played an important role in encouraging effective pain management and monitoring the availability of opioids internationally.[53]

Looking Ahead: Advocating for Better Pain Control

The American Cancer Society seeks to limit the negative impact that cancer and its treatment can have on a person's quality of life. This includes efforts to ensure that the lives of patients, survivors, and their families are not overpowered by pain and that pain related to cancer and its treatment is addressed during all phases of the cancer experience. We are dedicated to working with state pain initiatives and other partners to advocate for needed policy change and to raise awareness about the importance of treating cancer pain and suffering for all patients and survivors from the time of diagnosis throughout the balance of life.

Helpful Online Resources:

American Cancer Society: http://www.cancer.org

American Pain Foundation:
http://www.painfoundation.org

Alliance of State Pain Initiatives (ASPI):
http://www.aspi.wisc.edu

Pain and Policy Studies Group (PPSG):

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Incidence and Mortality Rates* by Site, Race, and Ethnicity, US, 1999-2003

Incidence	White	African American	Asian American and Pacific Islander	American Indian and Alaska Native	Hispanic/ Latino†
All sites					
Males	555.0	639.8	385.5	359.9	444.1
Females	421.1	383.8	303.3	305.0	327.2
Breast (female)	130.8	111.5	91.2	74.4	92.6
Colon & rectum					

ian diet or don't use tobacco because of cultural or religious beliefs have a lower risk of many cancers. Genetic factors may also explain some differences in cancer incidence. For example, women from population groups with an increased frequency of mutations in the BRCA1 and BRCA2 genes, such as women of Ashkenazi Jewish descent, have an increased risk of breast and ovarian cancer. Genetic factors may also play a role in the elevated risk of prostate cancer among African American men and the incidence of more aggressive forms of breast cancer in African American women.

Tobacco Use

Smoking-related diseases remain the most preventable cause of death in our society. Since the first US Surgeon General's report on smoking and health was published in 1964, there have been more than 12 million premature deaths attributable to smoking in the US.[1] In 2000 alone, about 4.8 million smoking-related premature deaths occurred worldwide. The number of deaths was almost evenly divided between industrialized and developing nations, and was greater in men (80% of smoking-attributable deaths) than in women. More men die from smoking in developing nations (2 million) than in industrialized nations (1.8 million).[2,3]

Health Consequences of Smoking

Half of all Americans who continue to smoke will die from smoking-related diseases.[4] In the US, tobacco use is responsible for nearly one in five deaths; this amounted to an estimated 438,000 premature deaths each year between 1997-2001.[5-7] In addition, an estimated 8.6 million people suffer from smoking-related chronic conditions (i.e., chronic bronchitis, emphysema, and other cardiovascular diseases).[8]

young people and adults, eliminating nonsmokers' exposure to secondhand smoke, and identifying and eliminating the disparities related to tobacco use and its effects among different population groups.[13] The Centers for Disease Control and Prevention have recommended funding guidelines for comprehensive tobacco use prevention and cessation programs for all 50 states and the District of Columbia. In 2006, only four states (Colorado, Delaware, Maine, and Mississippi) invested at least the minimum per capita amount recommended for tobacco control programs.[14] With adequate funding levels, comprehensive tobacco control programs in some states (e.g., California, Massachusetts, Florida, and Maine) have reduced smoking rates and saved states millions of dollars in tobacco-related health care costs.[12,15] (For more information about tobacco control, please see the American Cancer Society's Cancer Prevention and Early Detection Facts & Figures 2006 (8600.06) available online at www.cancer.org)

Trends in Smoking

- Cigarette smoking among adults aged 18 and older declined 50% from 1965-2005 – from 42% to 21%; nevertheless, an estimated 45 million Americans are current smokers.[16,17]
- Although cigarette smoking became prevalent among men before women, the gender gap narrowed in the mid-1980s and has since remained constant.[18] As of 2005, there was a 4% difference in smoking prevalence between white men and women, and a 9% difference between African American men and women.[17]
- Smoking prevalence generally decreases with increasing years of education. While the percentage of smokers decreased for all levels of educational attainment during 1983-2005, college graduates achieved the greatest percentage decrease of 43% (21% to 12%).[16,17]
- Annual cigarette consumption among US adults continues to decline, peaking in 1963 at 4,345 cigarettes per capita and decreasing to an estimated 1,716 in 2005 – a net reduction of 61%.[19,20]
- Although cigarette smoking among US high school students increased significantly from 1991-1997 (28% to 36%), it declined to 23% by 2005.[21,22,23]
- In 1997, nearly one-half (48%) of male high school students and more than one-third (36%) of female students reported using some form of tobacco – cigarettes, cigars, or smokeless tobacco – in the past month. The percentages declined to 32% for male students and to 25% for female students in 2005.[23,24]

Spit Tobacco

In 1986, the US Surgeon General concluded that chewing tobacco and snuff are not safe substitutes for smoking cigarettes or cigars, as these products cause various cancers and non-cancerous oral conditions and can lead to nicotine addiction.[25]

- There is no evidence that switching to snuff or chewing tobacco is more effective or as safe as conventional cessation therapies in helping smokers quit.[26]
- The risk of cancer of the cheek and gums may increase nearly 50-fold among long-term snuff users.[25]
- According to the US Department of Agriculture, US output of moist snuff has increased more than 76% in the past decade, from 48 million pounds in 1991 to an estimated 85 million pounds in 2005.[19,20]
- In 2004, about 3% of US adults used smokeless tobacco in the past month, 6% of men and 1% of women. Whites (4%) and American Indian/Alaska Natives (4%) were more likely to use smokeless tobacco than African Americans (2%), Asians (1%), or Hispanic/Latinos (1%).[27]
- Nationwide, 14% of male high school students and 2% of female high school students were currently using chewing tobacco, snuff, or dip in 2005. White students (10%) were more likely to use smokeless tobacco than

warn consumers of the dangers of cigar smoking. Cigar smoking has health consequences similar to those of cigarettes and smokeless tobacco, such as:[30]

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

Smoking Cessation

In 1990, the US Surgeon General outlined the benefits of smoking cessation:[31]

- People who quit, regardless of age, live longer than people who continue to smoke.
- Smokers who quit before age 50 cut their risk of dying in the next 15 years in half, compared with those who continue to smoke.
- Quitting smoking substantially decreases the risk of lung, laryngeal, esophageal, oral, pancreatic, bladder, and cervical cancers.
- Quitting lowers the risk for other major diseases, including heart disease and stroke.

Among adults aged 18 years and older in 2004, national

prohibit smoking in workplaces and/or restaurants and/or bars.[40]

- Currently, approximately 44% of the US population is covered by a smoke-free policy or provision in the workplace and/or restaurants and/or bars.[40]
- Nationally, coverage of all indoor workers by smoke-free policies increased substantially from 1993-2002; 71% of workers were covered in 2002, compared to 47% in 1993.[33]
- Workplace smoking restrictions vary by occupation: in 2002, more than 77% of employees in an office environment reported working under a smoke-free policy compared to 60% of service occupation workers.[33]

Worldwide Tobacco Use

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

- Developing countries consume an increasing proportion of the world's tobacco. In 1998, developing countries consumed 67% of the world's tobacco. If recent trends continue, the developing world will consume 71% of the world's tobacco by 2010. About 80% of the projected increase will occur in East Asia, particularly China.[41]
- In 2003, the number of smokers in the world was estimated at about 1.3 billion (more than 1 billion men and 250 million women). This figure is expected to rise to at least 1.7 billion (1.2 billion men and 500 million women) by 2025, with the doubling in the number of female smokers making the greatest contribution to the increase.[42]
- Female smoking prevalence rates have peaked and are decreasing in a handful of economically developed countries, such as Australia, Canada, the United Kingdom, and the United States; but in most countries female smoking rates are still increasing or show no evidence of decline.[43] Female smoking rates in both developing and developed nations are expected to converge at 20%-25% by 2030.[43,44]
- Based on current patterns, smoking-attributable diseases will kill about 650 million of the world's 1.3 billion smokers alive today.[45,46]
- In 2000, there were about 4.8 million smoking-related premature deaths worldwide, almost evenly divided between developed (2.4 million deaths) and developing (2.4 million deaths) nations.[2,3]
- In a series of surveys among youth aged 13-15 years conducted in 93 countries and territories between 1999-2005, 11% of boys and 7% of girls reported smoking cigarettes, and 14% of boys and 8% of girls reported using other tobacco products.[47]

- In 2001, states spent an estimated $12 billion treating smoking-attributable diseases.[52]
- For each pack of cigarettes sold in 1999, $3.45 was spent on medical care due to smoking and $3.73 was lost in productivity, for a total cost to society of $7.18 per pack.[7]
- Recent reviews of the cost of treating smoking-attributable diseases in the US have shown that they range from 6%-14% of personal health expenditures.[53,54]

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Nutrition and Physical Activity

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

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 at all phases of development.

The American Cancer Society reviews and updates its nutrition and physical activity guidelines every 5 years. The Society's most recent guidelines, published in 2006, emphasize the importance of weight control, physical activity, and dietary patterns 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 guidelines include an explicit Recommendation for Community Action to promote the availability of healthy food choices and opportunities for physical activity in schools, worksites, and communities.

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

Recommendations for Individual Choices

1. Maintain a healthy weight throughout life.

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

In the US, overweight and obesity contribute to 14%-20% of all cancer-related mortality. Overweight and obesity are clearly associated with increased risk for developing many cancers, including cancers of the breast (in postmenopausal women), colon, endometrium, adenocarcinoma of the esophagus, and kidney. Evidence is highly suggestive that obesity also increases risk for cancers of the pancreas, gallbladder, thyroid, ovary, and cervix, as well as for multiple myeloma, Hodgkin lymphoma, and aggressive prostate cancer. 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.

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

2. Adopt a physically active lifestyle.

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

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,

Environmental Cancer Risks

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

Environmental (as opposed to hereditary) factors account for an estimated 75%-80% of cancer cases and deaths in the US. Exposure to carcinogenic agents in occupational, community, and other settings is thought to account for a relatively small percentage of cancer deaths, about 4% from occupational exposures and 2% from environmental pollutants (man-made and naturally occurring). Although the estimated percentage of cancers related to occupational and environmental carcinogens is small compared to the cancer burden from tobacco smoking (30%) and the combination of nutrition, physical activity, and obesity (35%), the relationship between such agents and cancer is important for several reasons.

First, even a small percentage of cancers can represent many deaths: 6% of cancer deaths in the United States each year corresponds to approximately 33,600 deaths. Second, the burden of exposure to occupational and environmental carcinogens is borne disproportionately by lower-income workers and communities, contributing to disparities in the cancer burden across the population. Third, although much is known about the relationship between occupational and environmental exposure and cancer, some important research questions remain. These include the role of exposures to certain classes of chemicals (such as hormonally active agents) during critical periods of human development and the potential for pollutants to interact with each other as well as with genetic and acquired factors.

How Carcinogens Are Identified

The term carcinogen refers to exposures that can increase the incidence of malignant tumors (cancer). The term can apply to a single chemical such as benzene; fibrous minerals such as asbestos; metals and physical agents such as x-rays or ultraviolet light; or exposures linked to specific occupations or industries (e.g., nickel refining). Carcinogens are usually identified on the basis of epidemiological studies or by testing in animals. Studies of occupational groups (cohorts) have played an important role in understanding many chemical carcinogens – as well as radiation – because exposures are often higher among workers and they can be followed for long periods of time. Some information has also come from studies of persons exposed to carcinogens during medical treatments (such as radiation and estrogen), as well as from studies conducted among individuals who experienced large, short-term exposure to a chemical or physical agent due to an accidental or intentional release (such as survivors of the atomic bomb explosions of Hiroshima and Nagasaki).

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Today, most cancers are linked to a few controllable factors – tobacco use, poor diet, lack of exercise, and infectious diseases. Tobacco use is the number one cause of cancer and the number one cause of preventable death throughout the world. If current trends continue, 650 million people alive today will eventually die of tobacco-related diseases, including cancers of the lung, esophagus, and bladder. In the developed world, poor diets, inadequate physical activity, and obesity are second only to tobacco as causes of cancer. As these unhealthy lifestyle behaviors spread to other parts of the world, cancers of the colon, breast, and prostate are rising to levels now seen in industrialized countries. At the same time, cancers linked to infectious agents – including cervix, stomach, and liver cancers – remain a

serious threat throughout the developing world. Although the vast majority of these deaths could be avoided with the implementation of widespread programs in prevention, early detection, and access to effective treatment, the resources necessary to achieve this are not available in developing countries.

The American Cancer Society addresses the global cancer burden through three key initiatives aimed at building effective, sustainable programs in cancer control in low- and middle-income countries: American Cancer Society University, International Relay For Life®, and the International Partners Program.

The American Cancer Society also 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), the World Health Organization (WHO), and the International Network for Cancer Treatment and Research (INCTR), the American Cancer Society is expanding its efforts to address the rising cancer burden throughout the world.

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 3 million American volunteers working together to conquer cancer.

Since its inception nearly a century ago, the American Cancer Society has made significant contributions to progress against cancer in the US. The Society's work in cancer research, education, advocacy, and service has yielded remarkable strides in cancer prevention, early detection, treatment, and patient quality of life. As a result, overall cancer mortality has steadily declined since the early 1990s, and the 5-year survival rate is now 66%, up from 50% in the 1970s. Today, more than ever, our goal of eliminating cancer as a major public health threat is within reach.

How the American Cancer Society Is Organized

The American Cancer Society consists of a National Home Office with 13 chartered Divisions and a local presence in nearly every community nationwide.

The National Society. A National Assembly of volunteer representatives from each Division approves Division charters and elects a national volunteer Board of Directors. The Board of Directors sets and approves strategic goals for the Society, ensures management accountability, and provides stewardship of donated funds. The National Home Office is responsible for overall planning and coordination of the Society's programs, provides technical support and materials to Divisions and local offices, and administers the Society's research program.

American Cancer Society Divisions. The Society's 13 Divisions are responsible for program delivery and fundraising in their regions. They are governed by Division Boards of Directors composed of both medical and lay volunteers in their regions.

Local offices. More than 3,400 local offices nationwide raise funds at the community level and deliver cancer prevention, early detection, and patient services programs.

Volunteers. More than 3 million volunteers carry out the Society's work in communities across the country. These dedicated people donate their time and talents to further cancer research; educate the public about early detection and prevention; advocate for responsible cancer legislation at the local, state, and federal levels; serve cancer patients and their families; and raise funds for the fight against cancer.

How the American Cancer Society Fights Cancer

The Society has set challenge goals for 2015 to dramatically decrease cancer incidence and mortality rates while increasing the quality of life for all cancer survivors. The Society is uniquely qualified to make a difference in the fight against cancer by continuing its leadership position in supporting high-impact research; improving the quality of life for those affected by cancer; pre

Behavioral Research Center

The American Cancer Society was one of the first organizations to recognize the importance of behavioral and psychosocial factors in the prevention and control of cancer, and to fund extramural research in this area. In 1995, the Society established the Behavioral Research Center as an intramural department.

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

- An extensive, nationwide longitudinal study of adult cancer survivors to determine the unmet psychosocial needs of survivors and their loved ones, to identify factors that affect their quality of life, to evaluate programs intended to meet their needs, and to examine late effects, including second cancers.
- A large-scale, nationwide, cross-sectional study of cancer survivors who are 2, 5, and 10 years from their initial diagnosis and treatment. This study will evaluate cancer survivors' quality of life and provide data on survivors at several different time points since diagnosis.
- Two studies of family caregivers that explore the impact of the family's involvement in cancer care on the quality of life of the cancer survivor and the caregiver. 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; it also examines the impact on the caregiver's quality of life and health behaviors. The second longitudinal study follows cancer patients and their caregivers from the time of diagnosis and examines the behavioral, physical, psychological, and spiritual adjustment of the patients and their family caregivers across various ethnic groups.
- A study to test the Patient/Provider/System Theoretical Model (PPSTM) for cancer screening in federally funded primary care centers that provide care for many underserved populations. Through partnerships with researchers from the National Center for Primary Care, this project seeks to identify factors that influence screening behaviors (patients) and screening recommendations (providers and health care systems).
- A study of cancer knowledge, attitudes, beliefs, and risk perceptions among college students. Through P

- Providing access to cessation programs for people who wish to quit, including a science-based, telephone counseling service
- Increasing tobacco taxes to offset the health care costs associated with tobacco use
- Supporting global partnerships to reduce tobacco-related deaths and diseases

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

Early Detection

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

and government officials make decisions every day about health issues that affect people's lives. The American Cancer Society works with all levels of government to advocate for stronger policies, laws, and regulations that will reduce the burden of cancer in all populations.

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

In coordination with its sister advocacy organziation, the American Cancer Society Cancer Action Network℠ (ACS CAN), the Society is promoting the "Congressional Cancer Promise." The Congressional Cancer Promise is a statement of support for concrete steps Congress should take in the short term to put the fight against cancer back on track. Thanks to the nation's historical commitment to cancer research and prevention programs, the conquest of cancer is within our grasp if we adopt bold new policies and make the necessary investments. The Congressional Cancer Promise identifies policy changes and investments in four broad areas that should be made now as we look toward a time when cancer patients live fuller lives.

- **Make health care system reform a priority.** The Society recognizes that many of the challenges that cancer patients confront are the result of systemic problems not specific to cancer. The Society is urging m

Patient/Survivor Services

For more than 1.4 million cancer patients diagnosed this year and more than 10 million American cancer survivors, the American Cancer Society offers a range of services to help patients and their families through cancer treatment, recovery, and beyond. From comprehensive cancer information that helps patients understand their disease and their treatment options to community programs that ease the physical, psychological, and financial burdens of cancer, the American

Cancer deaths.

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 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 in 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 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

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

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