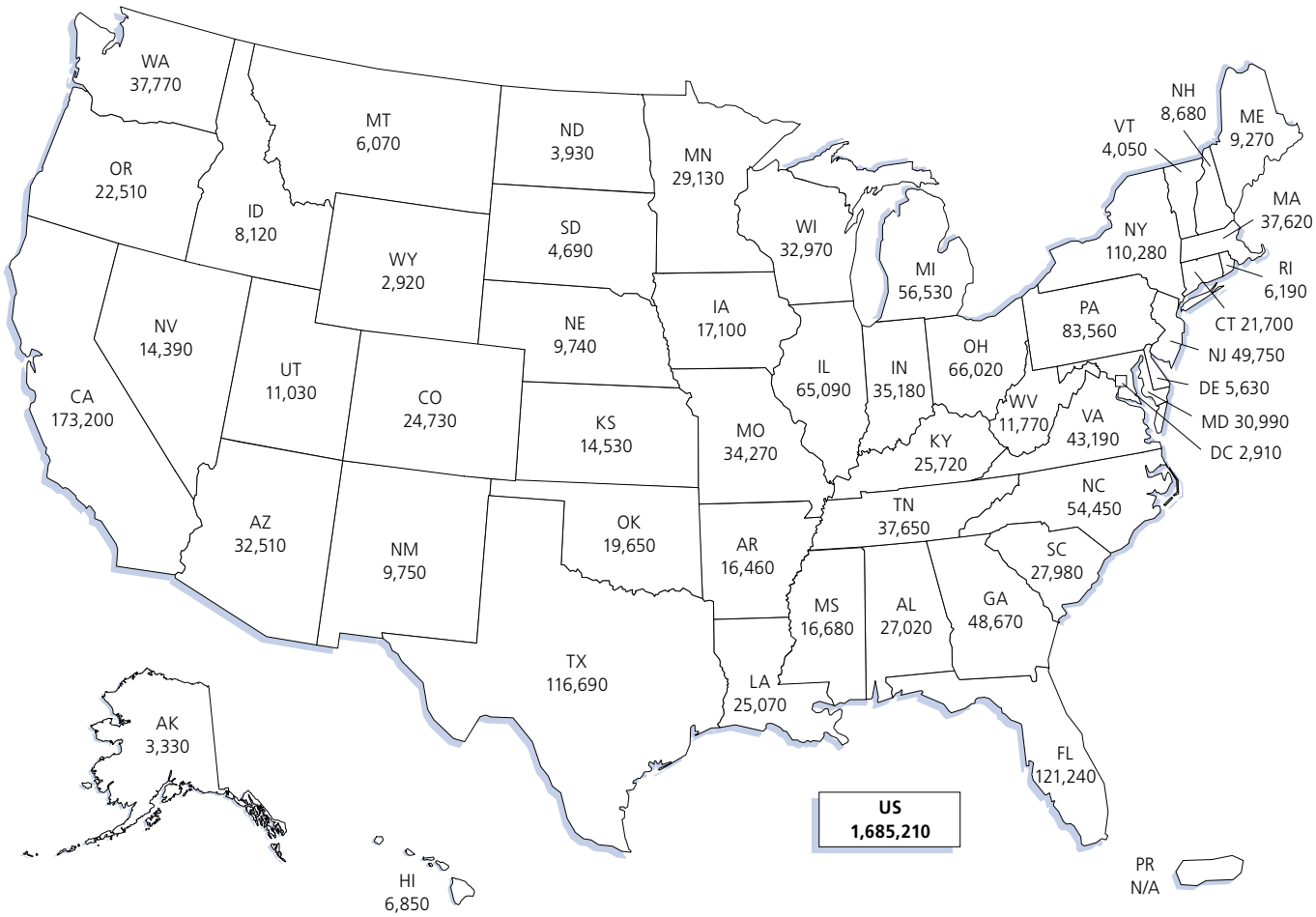
Cancer Facts & Figures 2016



Estimated numbers of new cancer cases for 2016, excluding basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder. Estimates are not available for Puerto Rico.

Note: State estimates are offered as a rough guide and should be interpreted with caution. State estimates may not add to US total due to rounding.

Special Section: **Cancer in Asian Americans, Native Hawaiians, and Pacific Islanders**
see page 25

American Cancer Society®

Contents

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This publication attempts to summarize current scientific information about cancer.
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Basic Cancer Facts

What Is Cancer?

Cancer is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death. Cancer is caused by external factors, such as tobacco, infectious organisms, and an unhealthy diet, and internal factors, such as inherited genetic mutations, hormones, and immune conditions. These factors may act together or in sequence to cause cancer. Ten or more years often pass between exposure to external factors and detectable cancer. Treatments include surgery, radiation, chemotherapy, hormone therapy, immune therapy, and targeted therapy (drugs that interfere specifically with cancer cell growth).

Can Cancer Be Prevented?

A substantial proportion of cancers could be prevented. All cancers caused by tobacco use and heavy alcohol consumption could be prevented completely. In 2016, about 188,800 of the estimated 595,690 cancer deaths in the US will be caused by cigarette smoking, according to a recent study by American Cancer Society epidemiologists. In addition, the World Cancer Research Fund estimates that about 20% of all cancers diagnosed in the US are related to body fatness, physical inactivity, excess alcohol consumption, and/or poor nutrition, and thus could also be prevented. Certain cancers are related to infectious agents, such as human papillomavirus (HPV), hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and *Helicobacter pylori (H. pylori)*. Many of these cancers could be avoided by preventing these infections through behavioral changes or vaccination, or by treating the infection. Many of the more than 5 million skin cancer cases that are diagnosed annually could be prevented by protecting skin from excessive sun exposure and not using indoor tanning devices.

Screening can prevent colorectal and cervical cancers by allowing for the detection and removal of precancerous lesions. Screening also offers the opportunity to detect some cancers early, when treatment is less extensive and more likely to be successful. Screening is known to help reduce mortality for cancers of the breast, colon, rectum, cervix, and lung (among long-term and/or heavy smokers). In addition, a heightened awareness of changes in certain parts of the body, such as the breast, skin, mouth, eyes, or genitalia, may also result in the early detection of cancer. For complete cancer screening guidelines, see page 66.

How Many People Alive Today Have Ever Had Cancer?

Nearly 14.5 million Americans with a history of cancer were alive on January 1, 2014. Some of these individuals were diagnosed recently and undergoing treatment, while most were diagnosed many years ago with no current evidence of cancer.

How Many New Cases and Deaths Are Expected to Occur This Year?

About 1,685,210 new cancer cases are expected to be diagnosed in 2016 (Table 1, page 4). This estimate does not include carcinoma in situ (noninvasive cancer) of any site except urinary bladder, nor does it include basal cell or squamous cell skin cancers because these are not required to be reported to cancer registries. Table 2 (page 5) provides estimated new cancer cases in 2016 by state.

About 595,690 Americans are expected to die of cancer in 2016, which translates to about 1,630 people per day (Table 1, page 4). Cancer is the second most common cause of death in the US, exceeded only by heart disease, and accounts for nearly 1 of every 4 deaths. Table 3 (page 6) provides estimated cancer deaths by state in 2016.

How Much Progress Has Been Made in the Fight against Cancer?

Trends in cancer death rates are the best measure of progress against cancer. The total cancer death rate rose for most of the 20th century because of the tobacco epidemic, peaking in 1991 at 215 cancer deaths per 100,000 persons. However, from 1991 to 2012, the rate dropped 23% because of reductions in smoking, as well as improvements in early detection and treatment. This decline translates into the avoidance of more than 1.7 million cancer deaths. Death rates are declining for all four of the most common cancer types – lung, colorectal, breast, and prostate (Figure 1, page 2 and Figure 2, page 3).

Do Cancer Incidence and Death Rates Vary By State?

Tables 4 (page 7) and 5 (page 8) provide average annual incidence and death rates during 2008 to 2012 for selected cancer types by state. For some cancers (e.g., lung), there is substantial variation by state, whereas for others (e.g., breast), there is less variation. For more information about geographic disparities in cancer occurrence, see page 53.

Who Is at Risk of Developing Cancer?

Cancer usually develops in older people; 86% of all cancers in the United States are diagnosed in people 50 years of age or older.

Certain behaviors also increase risk, such as smoking, eating an unhealthy diet, or not being physically active. Cancer researchers use the word "risk" in different ways, most commonly expressing risk as lifetime risk or relative risk. Lifetime risk refers to the probability that an individual will develop or die from cancer over the course of a lifetime. In the US, the lifetime risk of developing cancer is 42% (1 in 2) in men and 38% (1 in 3) in women (Table 6, page 14). These probabilities are estimated based on the overall experience of the general population and may overestimate or underestimate individual risk because of differences in exposures (e.g., smoking), family history, and/or genetic susceptibility.

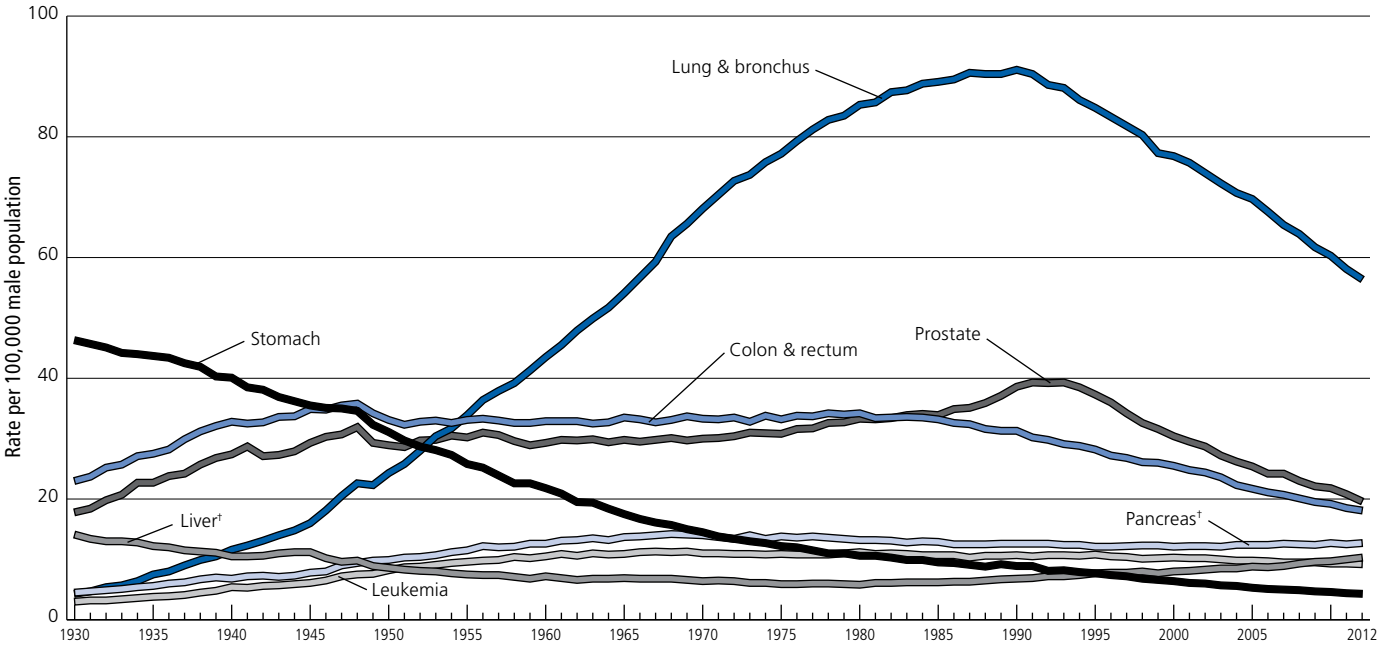
Relative risk is a measure of the strength of the relationship between a risk factor and cancer. It compares the risk of developing cancer in people with a certain exposure or trait to the risk in people who do not have this characteristic. For example, men and women who smoke are about 25 times more likely to develop lung cancer than nonsmokers, so their relative risk of lung cancer is 25. Most relative risks are not this large. For example, women who have a mother, sister, or daughter with a history of breast cancer are about twice as likely to develop breast cancer as women who do not have this family history; in other words, their relative risk is about 2. For most types of cancer, risk is higher with a family history of the disease. It is now thought that many familial cancers arise from the interplay between common gene variations and lifestyle/environmental risk factors. Only a small proportion of cancers are strongly hereditary, that is, caused by an inherited genetic alteration that confers a very high risk.

What Percentage of People Survive Cancer?

The 5-year relative survival rate for all cancers diagnosed during 2005-2011 was 69%, up from 49% during 1975-1977 (Table 7, page 18). Improvement in survival reflects both the earlier diagnosis of certain cancers and improvements in treatment. Survival statistics vary greatly by cancer type and stage at diagnosis (Table 8, page 21).

Relative survival is the percentage of people who are alive a designated time period (usually 5 years) after a cancer diagnosis divided by the percentage expected to be alive in the absence of cancer based on normal life expectancy. It does not distinguish between patients who have no evidence of cancer and those who have relapsed or are still in treatment. The 5-year relative survival rate does not represent the proportion of people who are cured because cancer deaths occur beyond 5 years after diagnosis. For information about how survival rates were calculated for this report, see "Sources of Statistics" on page 64.

Figure 1. Trends in Age-adjusted Cancer Death Rates* by Site, Males, US, 1930-2012



*Per 100,000, age adjusted to the 2000 US standard population. †Mortality rates for pancreatic and liver cancers are increasing.

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

Source: US Mortality Volumes 1930 to 1959 and US Mortality Data 1960 to 2012, National Center for Health Statistics, Centers for Disease Control and Prevention.

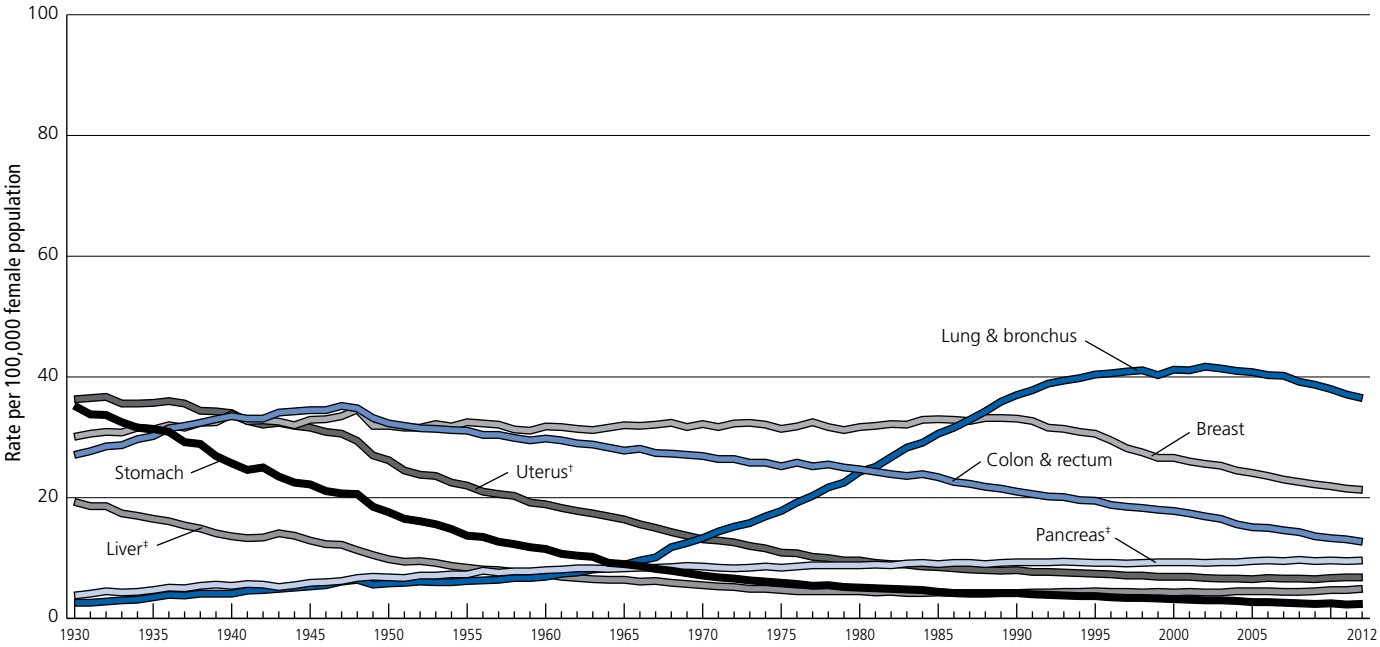
Although relative survival rates provide some indication about the average survival experience of cancer patients in a given population, they should be interpreted with caution. First, 5-year survival rates do not reflect the most recent advances in detection and treatment because they are based on patients who were diagnosed as far back as 10 years. Second, they are not equally applicable to all patients because of factors that affect individual survival, such as treatment, other illnesses, and biological or behavioral differences. Third, improvements in survival rates over time do not always indicate progress against cancer. For example, increases in average survival time can occur if screening results in the detection of some indolent cancers that would have gone undetected in the absence of screening (overdiagnosis). Screening also artificially increases survival rates when early diagnosis does not extend lifespan.

How Is Cancer Staged?

Staging describes the extent or spread of cancer at the time of diagnosis. Proper staging is essential for optimizing therapy and assessing prognosis. A cancer's stage is based on the size or extent of the primary tumor and whether it has spread to nearby lymph nodes or other areas of the body. A number of different staging systems are used to classify cancer. A system of summary staging is used for descriptive and statistical analysis of tumor registry data and is particularly useful for looking at trends over time. According to this system, if cancer cells are present only in the layer of cells where they developed and have not spread, the stage is in situ. If cancer cells have penetrated beyond the original layer of tissue, the cancer has become invasive and is categorized as local, regional, or distant based on the extent of spread. (For a more detailed description of these categories, see the footnotes in Table 8 on page 21.)

Clinicians use a different staging system, called TNM, for most cancers. The TNM system assesses cancer growth and spread in 3 ways: extent of the primary tumor (T), absence or presence of regional lymph node involvement (N), and absence or presence of distant metastases (M). Once the T, N, and M categories are determined, a stage of 0, I, II, III, or IV is assigned, with stage 0 being in situ, stage I being early, and stage IV being the most advanced disease. Some cancers (e.g., lymphoma) have alternative staging systems. As the biology of cancer has become better understood, additional tumor-specific features have been incorporated into treatment plans and/or stage for some cancers.

Figure 2. Trends in Age-adjusted Cancer Death Rates* by Site, Females, US, 1930-2012



*Per 100,000, age adjusted to the 2000 US standard population. †Uterus refers to uterine cervix and uterine corpus combined. ‡Mortality rates for pancreatic and liver cancers are increasing.

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

Source: US Mortality Volumes 1930 to 1959, US Mortality Data 1960 to 2012, National Center for Health Statistics, Centers for Disease Control and Prevention.

Table 1. Estimated Number* of New Cancer Cases and Deaths by Sex, US, 2016

	Estimated New Cases			Estimated Deaths		
	Both sexes	**Male**	**Female**	**Both sexes**	**Male**	**Female**
All Sites	1,685,210	841,390	843,820	595,690	314,290	281,400
Oral cavity & pharynx	48,330	34,780	13,550	9,570	6,910	2,660
Tongue	16,100	11,700	4,400	2,290	1,570	720
Mouth	12,910	7,600	5,310	2,520	1,630	890
Pharynx	16,420	13,350	3,070	3,080	2,400	680
Other oral cavity	2,900	2,130	770	1,680	1,310	370
Digestive system	304,930	172,530	132,400	153,030	88,700	64,330
Esophagus	16,910	13,460	3,450	15,690	12,720	2,970
Stomach	26,370	16,480	9,890	10,730	6,540	4,190
Small intestine	10,090	5,390	4,700	1,330	710	620
Colon†	95,270	47,710	47,560	49,190	26,020	23,170
Rectum	39,220	23,110	16,110			
Anus, anal canal, & anorectum	8,080	2,920	5,160	1,080	440	640
Liver & intrahepatic bile duct	39,230	28,410	10,820	27,170	18,280	8,890
Gallbladder & other biliary	11,420	5,270	6,150	3,710	1,630	2,080
Pancreas	53,070	27,670	25,400	41,780	21,450	20,330
Other digestive organs	5,270	2,110	3,160	2,350	910	1,440
Respiratory system	243,820	132,620	111,200	162,510	89,320	73,190
Larynx	13,430	10,550	2,880	3,620	2,890	730
Lung & bronchus	224,390	117,920	106,470	158,080	85,920	72,160
Other respiratory organs	6,000	4,150	1,850	810	510	300
Bones & joints	3,300	1,850	1,450	1,490	860	630
Soft tissue (including heart)	12,310	6,980	5,330	4,990	2,680	2,310
Skin (excluding basal & squamous)	83,510	51,650	31,860	13,650	9,330	4,320
Melanoma of the skin	76,380	46,870	29,510	10,130	6,750	3,380
Other nonepithelial skin	7,130	4,780	2,350	3,520	2,580	940
Breast	249,260	2,600	246,660	40,890	440	40,450
Genital system	297,530	191,640	105,890	57,730	26,840	30,890
Uterine cervix	12,990		12,990	4,120		4,120
Uterine corpus	60,050		60,050	10,470		10,470
Ovary	22,280		22,280	14,240		14,240
Vulva	5,950		5,950	1,110		1,110
Vagina & other genital, female	4,620		4,620	950		950
Prostate	180,890	180,890		26,120	26,120	
Testis	8,720	8,720		380	380	
Penis & other genital, male	2,030	2,030		340	340	
Urinary system	143,190	100,920	42,270	31,540	21,600	9,940
Urinary bladder	76,960	58,950	18,010	16,390	11,820	4,570
Kidney & renal pelvis	62,700	39,650	23,050	14,240	9,240	5,000
Ureter & other urinary organs	3,530	2,320	1,210	910	540	370
Eye & orbit	2,810	1,510	1,300	280	150	130
Brain & other nervous system	23,770	13,350	10,420	16,050	9,440	6,610
Endocrine system	66,730	16,200	50,530	2,940	1,400	1,540
Thyroid	64,300	14,950	49,350	1,980	910	1,070
Other endocrine	2,430	1,250	1,180	960	490	470
Lymphoma	81,080	44,960	36,120	21,270	12,160	9,110
Hodgkin lymphoma	8,500	4,790	3,710	1,120	640	480
Non-Hodgkin lymphoma	72,580	40,170	32,410	20,150	11,520	8,630
Myeloma	30,330	17,900	12,430	12,650	6,430	6,220
Leukemia	60,140	34,090	26,050	24,400	14,130	10,270
Acute lymphocytic leukemia	6,590	3,590	3,000	1,430	800	630
Chronic lymphocytic leukemia	18,960	10,830	8,130	4,660	2,880	1,780
Acute myeloid leukemia	19,950	11,130	8,820	10,430	5,950	4,480
Chronic myeloid leukemia	8,220	4,610	3,610	1,070	570	500
Other leukemia‡	6,420	3,930	2,490	6,810	3,930	2,880
Other & unspecified primary sites‡	34,170	17,810	16,360	42,700	23,900	18,800

*Rounded to the nearest 10; cases exclude basal cell and squamous cell skin cancer and in situ carcinoma except urinary bladder. About 61,000 cases of carcinoma in situ of the female breast and 68,480 cases of melanoma in situ will be diagnosed in 2016. †Deaths for colon and rectal cancers are combined because a large number of deaths from rectal cancer are misclassified as colon. ‡More deaths than cases may reflect lack of specificity in recording underlying cause of death on death certificates and/or an undercount in the case estimate.

Source: Estimated new cases are based on 1998-2012 incidence data reported by the North American Association of Central Cancer Registries (NAACCR). Estimated deaths are based on 1998-2012 US mortality data, National Center for Health Statistics, Centers for Disease Control and Prevention.

Table 2. Estimated Number* of New Cases for Selected Cancers by State, US, 2016

State	All sites	Female breast	Uterine cervix	Colon & rectum	Uterine corpus	Leukemia	Lung & bronchus	Melanoma of the skin	Non-Hodgkin lymphoma	Prostate	Urinary bladder
Alabama	27,020	3,960	220	2,190	710	900	4,220	1,390	1,030	2,950	1,110
Alaska	3,330	500	†	270	110	120	440	100	140	330	150
Arizona	32,510	4,900	230	2,550	1,060	1,160	3,980	1,510	1,300	3,150	1,630
Arkansas	16,460	2,090	150	1,410	470	510	2,610	340	670	1,670	700
California	173,200	26,730	1,460	13,770	6,120	6,370	18,140	8,560	7,760	17,240	7,580
Colorado	24,730	4,110	180	1,790	860	1,020	2,520	1,460	1,110	3,060	1,080
Connecticut	21,700	3,290	120	1,610	880	790	2,770	680	920	2,460	1,130
Delaware	5,630	800	†	430	190	180	850	320	220	690	260
Dist. of Columbia	2,910	470	†	200	100	80	300	110	110	460	90
Florida	121,240	16,770	1,050	9,710	3,940	3,930	17,360	6,200	5,370	13,310	5,940
Georgia	48,670	7,160	430	3,980	1,450	1,490	6,670	2,540	1,830	5,570	1,830
Hawaii	6,850	1,130	60	650	280	220	740	410	300	610	250
Idaho	8,120	1,110	50	610	280	360	990	490	370	1,010	430
Illinois	65,090	10,160	550	5,580	2,690	2,370	8,820	2,500	2,860	7,250	3,040
Indiana	35,180	4,980	290	2,980	1,310	1,190	5,520	1,460	1,500	3,510	1,620
Iowa	17,100	2,310	110	1,500	700	730	2,420	1,000	790	1,670	840
Kansas	14,530	2,210	110	1,150	560	540	1,970	820	640	1,510	650
Kentucky	25,720	3,470	200	2,200	810	980	4,960	1,450	1,080	2,460	1,120
Louisiana	25,070	3,400	220	2,170	620	710	3,730	620	1,090	2,950	940
Maine	9,270	1,310	50	720	380	380	1,410	340	400	960	570
Maryland	30,990	4,880	230	2,390	1,170	1,000	4,100	1,590	1,230	3,840	1,330
Massachusetts	37,620	6,010	210	2,750	1,560	1,340	4,910	1,380	1,720	4,350	2,030
Michigan	56,530	8,150	380	4,570	2,290	1,890	8,440	2,560	2,520	6,000	3,000
Minnesota	29,130	4,300	140	2,180	1,070	1,280	3,660	1,220	1,370	2,930	1,300
Mississippi	16,680	2,330	150	1,530	430	520	2,550	490	570	1,770	600
Missouri	34,270	5,030	250	2,850	1,250	1,220	5,450	1,610	1,440	3,260	1,550
Montana	6,070	890	†	460	210	270	750	350	270	770	330
Nebraska	9,740	1,480	60	850	380	390	1,220	470	440	960	460
Nevada	14,390	2,010	110	1,140	390	520	1,700	440	550	1,320	670
New Hampshire	8,680	1,280	†	620	350	290	1,140	290	350	910	490
New Jersey	49,750	7,420	370	4,020	2,050	1,870	5,580	2,470	2,430	5,970	2,460
New Mexico	9,750	1,480	80	760	330	380	1,020	450	410	1,020	390
New York	110,280	16,360	790	8,730	4,360	4,490	13,200	4,250	4,860	12,010	5,220
North Carolina	54,450	7,830	400	4,280	1,780	1,870	7,870	2,850	2,210	5,990	2,280
North Dakota	3,930	530	†	310	130	150	480	190	160	400	180
Ohio	66,020	9,390	470	5,340	2,640	2,140	10,550	2,880	2,820	6,760	3,180
Oklahoma	19,650	2,760	180	1,630	590	720	3,150	570	860	2,080	840
Oregon	22,510	3,430	150	1,610	850	750	2,970	1,530	980	2,490	1,130
Pennsylvania	83,560	11,310	540	6,390	3,290	3,020	10,500	3,750	3,540	8,350	4,260
Rhode Island	6,190	940	†	490	250	210	890	210	260	640	350
South Carolina	27,980	4,010	210	2,220	860	920	4,280	1,540	1,080	3,190	1,210
South Dakota	4,690	680	†	390	170	180	590	210	210	470	230
Tennessee	37,650	5,420	300	3,130	1,100	1,350	6,010	1,850	1,510	3,370	1,590
Texas	116,690	16,800	1,330	9,680	3,700	4,210	14,620	2,920	5,120	13,210	4,150
Utah	11,030	1,420	70	720	400	470	890	840	510	1,310	430
Vermont	4,050	580	†	280	160	140	510	180	170	450	220
Virginia	43,190	6,620	300	3,240	1,490	1,310	5,690	2,340	1,660	4,820	1,910
Washington	37,770	5,820	230	2,700	1,390	1,490	4,670	2,440	1,750	4,430	1,830
West Virginia	11,770	1,490	90	1,010	450	410	2,020	640	490	1,030	600
Wisconsin	32,970	4,730	200	2,520	1,310	1,260	4,230	1,350	1,490	3,570	1,630
Wyoming	2,920	420	†	220	100	110	310	180	120	380	160
United States	1,685,210	246,660	12,990	134,490	60,050	60,140	224,390	76,380	72,580	180,890	76,960

*Rounded to nearest 10. Excludes basal cell and squamous cell skin cancers and in situ carcinomas except urinary bladder. †Estimate is fewer than 50 cases. These estimates are offered as a rough guide and should be interpreted with caution. State estimates may not sum to US total due to rounding and exclusion of state estimates fewer than 50 cases.

Please note: Estimated cases for additional cancer sites by state can be found in Supplemental Data at **cancer.org/statistics**.

Table 3. Estimated Number* of Deaths for Selected Cancers by State, US, 2016

State	All sites	Brain/ nervous system	Female breast	Colon & rectum	Leukemia	Liver‡	Lung & bronchus	Non-Hodgkin lymphoma	Ovary	Pancreas	Prostate
Alabama	10,650	300	670	920	430	420	3,260	340	260	690	470
Alaska	1,070	†	70	90	†	50	290	†	†	70	†
Arizona	11,800	360	780	980	510	590	2,830	410	310	900	590
Arkansas	6,830	170	430	600	260	260	2,190	210	150	420	270
California	59,060	1,760	4,400	5,180	2,560	3,600	12,230	2,140	1,530	4,390	3,050
Colorado	7,760	270	560	650	330	370	1,690	260	240	560	430
Connecticut	6,780	190	450	450	310	300	1,690	220	170	540	320
Delaware	2,050	50	130	150	80	100	600	60	50	140	90
Dist. of Columbia	980	†	90	90	†	80	210	†	†	90	70
Florida	43,600	1,080	2,880	3,500	1,770	1,870	11,960	1,480	940	3,080	1,970
Georgia	16,840	460	1,260	1,500	620	730	4,700	490	420	1,090	730
Hawaii	2,480	†	130	230	90	150	570	100	50	230	100
Idaho	2,810	90	180	220	120	110	670	100	70	210	160
Illinois	24,080	600	1,660	2,030	1,010	930	6,540	800	570	1,640	1,020
Indiana	13,510	350	860	1,070	570	460	4,020	440	300	860	520
Iowa	6,470	190	380	570	260	230	1,770	250	160	430	280
Kansas	5,540	180	360	460	260	210	1,540	200	130	390	220
Kentucky	10,350	250	600	830	390	360	3,570	330	200	610	340
Louisiana	9,110	220	630	790	330	470	2,620	280	180	650	360
Maine	3,320	90	170	230	140	120	970	120	60	230	130
Maryland	10,560	270	820	850	390	510	2,670	310	260	800	480
Massachusetts	12,630	330	770	890	520	630	3,380	390	330	930	530
Michigan	21,100	610	1,410	1,640	850	800	6,030	780	480	1,520	790
Minnesota	9,850	280	610	750	480	410	2,430	500	240	660	470
Mississippi	6,480	150	420	630	240	280	1,930	170	110	440	280
Missouri	12,970	320	880	1,050	520	550	3,950	370	250	860	470
Montana	2,020	60	130	170	80	70	520	70	60	130	120
Nebraska	3,500	110	210	330	150	130	890	130	70	240	180
Nevada	4,970	150	380	480	180	210	1,390	160	110	360	240
New Hampshire	2,770	80	170	190	110	90	770	80	60	210	130
New Jersey	16,150	400	1,280	1,450	640	670	3,830	510	440	1,260	680
New Mexico	3,690	100	260	350	150	210	790	130	110	240	200
New York	34,910	880	2,410	2,830	1,460	1,650	8,770	1,200	920	2,660	1,550
North Carolina	19,620	600	1,360	1,480	750	830	5,820	610	450	1,240	820
North Dakota	1,270	†	80	120	50	†	330	†	†	90	60
Ohio	25,510	630	1,700	2,060	1,000	1,020	7,420	850	570	1,800	1,060
Oklahoma	8,260	220	530	690	340	330	2,470	280	190	500	340
Oregon	8,150	240	500	660	340	430	2,100	280	220	570	410
Pennsylvania	28,700	680	1,940	2,340	1,240	1,140	7,530	1,030	700	2,090	1,190
Rhode Island	2,090	50	120	160	90	100	580	60	†	120	90
South Carolina	10,330	250	690	830	360	420	3,010	310	240	730	450
South Dakota	1,640	50	110	130	70	60	460	50	†	110	80
Tennessee	14,560	360	900	1,230	550	630	4,610	450	300	870	540
Texas	39,450	1,050	2,780	3,520	1,660	2,470	9,620	1,320	950	2,650	1,520
Utah	2,970	120	270	240	140	130	460	120	90	250	200
Vermont	1,390	50	70	100	50	60	390	†	†	100	70
Virginia	14,910	390	1,080	1,160	580	640	4,080	490	390	1,050	630
Washington	12,770	410	820	970	510	660	3,170	440	350	920	630
West Virginia	4,750	120	270	400	180	140	1,460	170	90	270	160
Wisconsin	11,630	350	710	840	540	420	3,060	460	300	840	550
Wyoming	1,000	†	70	90	50	†	230	†	†	70	†
United States	595,690	16,050	40,450	49,190	24,400	27,170	158,080	20,150	14,240	41,780	26,120

*Rounded to nearest 10. †Estimate is fewer than 50 deaths. ‡Liver includes intrahepatic bile duct.
These estimates are offered as a rough guide and should be interpreted with caution. State estimates may not sum to US total due to rounding and exclusion of state estimates fewer than 50 deaths.

Please note: Estimated deaths for additional cancer sites by state can be found in Supplemental Data at **cancer.org/statistics**.

Table 4. Incidence Rates* for Selected Cancers by State, US, 2008-2012

	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	560.8	398.0	119.5	54.2	38.2	99.2	54.2	19.6	13.7	146.1	33.6	7.5
Alaska	479.3	419.2	125.5	50.5	40.6	74.4	59.9	20.5	14.7	111.8	36.5	10.8
Arizona	420.4	373.9	111.0	40.5	30.9	59.2	47.0	18.3	13.3	89.8	31.9	8.3
Arkansas†‡	550.2	383.7	107.7	54.3	39.4	103.6	59.9	21.5	15.5	148.1	32.9	7.7
California	485.6	394.8	122.1	46.0	35.1	55.8	42.1	22.8	15.5	126.9	32.6	7.8
Colorado	473.7	396.5	125.2	40.0	31.6	52.8	43.3	22.1	15.5	133.2	32.5	8.3
Connecticut	554.4	456.9	137.1	48.2	36.5	72.6	57.6	25.4	17.7	139.9	47.3	12.6
Delaware	578.7	446.3	126.5	45.6	34.9	83.7	63.3	23.4	17.0	156.3	42.3	11.2
Dist. of Columbia	564.1	436.0	141.7	48.6	40.9	74.5	48.7	21.5	12.8	184.1	25.6	8.9
Florida	502.1	400.2	115.2	45.0	34.2	75.8	55.5	21.7	14.9	118.9	34.9	8.4
Georgia	554.5	409.0	123.5	49.6	36.7	89.0	54.1	22.3	14.6	150.1	34.0	8.0
Hawaii	466.5	403.9	130.2	55.1	37.2	59.5	38.4	21.8	14.7	105.0	24.1	6.1
Idaho	510.4	410.9	118.9	42.8	33.8	59.1	47.4	22.1	16.7	142.7	39.2	8.9
Illinois	546.2	439.8	127.7	55.2	40.3	82.8	59.9	23.5	16.5	138.9	38.6	9.7
Indiana	513.0	425.1	119.0	51.0	40.2	93.2	61.9	23.5	16.5	108.9	36.4	8.9
Iowa	545.6	439.4	123.0	54.2	41.1	81.7	53.6	27.4	18.6	126.2	40.4	8.8
Kansas	541.9	427.3	123.2	50.5	37.8	75.5	53.4	23.4	16.7	143.1	39.1	9.1
Kentucky	598.2	466.6	121.3	60.5	44.1	120.4	80.7	25.4	17.3	122.6	40.8	9.8
Louisiana	595.5	417.9	121.9	59.6	42.7	95.2	56.0	24.6	16.7	161.1	33.7	8.1
Maine	546.3	452.8	124.4	46.5	36.7	85.8	66.9	24.6	17.7	120.2	47.8	12.5
Maryland	512.0	419.5	129.9	44.3	34.6	70.0	53.9	21.0	14.9	141.1	34.5	9.1
Massachusetts	539.2	458.6	136.5	45.7	36.0	75.4	62.9	24.0	16.4	135.6	42.2	11.8
Michigan	544.8	428.6	121.4	46.8	35.9	81.4	59.9	24.5	17.1	147.3	40.3	10.4
Minnesota†§	–	–	–	–	–	–	–	–	–	–	–	–
Mississippi	577.5	406.0	116.8	59.4	43.4	106.4	56.9	21.4	14.6	149.7	30.9	7.5
Missouri	511.4	427.0	124.7	51.7	38.7	92.1	64.4	22.2	15.6	113.6	33.5	8.6
Montana	508.4	424.5	124.2	46.6	36.3	66.0	52.8	22.3	15.9	133.5	37.8	10.4
Nebraska	501.8	417.2	122.7	52.0	41.1	70.7	50.0	23.4	17.7	125.7	34.8	8.2
Nevada†¶	502.2	401.8	114.0	50.5	36.3	71.4	60.3	20.3	14.8	136.0	38.8	10.7
New Hampshire	558.1	458.4	135.1	43.1	36.3	75.7	63.8	25.8	17.8	140.7	50.2	12.9
New Jersey	564.7	450.5	130.2	51.0	39.4	69.3	53.7	25.4	17.9	157.3	42.1	11.3
New Mexico	431.2	367.2	112.1	41.2	31.3	49.7	37.4	18.0	13.8	110.4	26.1	6.0
New York	568.6	451.2	128.6	49.6	38.1	73.9	55.3	26.4	18.1	153.7	41.8	10.6
North Carolina	546.6	417.9	127.1	46.3	34.3	92.3	56.1	22.2	15.2	138.7	36.7	8.9
North Dakota	517.1	411.5	122.2	54.7	40.5	68.3	45.4	22.8	18.5	141.4	37.3	8.5
Ohio	522.1	421.7	120.5	50.3	37.3	87.5	59.8	22.8	15.6	127.1	38.5	9.4
Oklahoma	520.1	411.8	119.2	50.3	38.8	90.1	60.2	21.9	15.4	128.8	33.6	8.1
Oregon	489.5	427.9	128.4	43.3	34.0	66.9	56.6	22.5	15.6	122.8	37.4	9.5
Pennsylvania	559.2	458.3	128.1	52.6	39.7	81.3	56.8	26.1	17.9	133.6	44.2	10.9
Rhode Island	544.3	456.4	129.9	44.8	36.2	79.9	64.0	24.1	17.7	130.6	46.8	13.7
South Carolina	538.7	408.6	125.3	46.8	35.9	90.6	54.0	20.0	13.5	138.1	33.1	8.6
South Dakota	495.0	416.7	125.9	53.2	40.0	68.6	49.2	23.7	16.7	129.3	34.4	9.3
Tennessee	552.7	420.1	120.6	50.3	37.7	98.9	61.7	22.2	15.8	135.5	35.5	8.1
Texas	488.5	384.4	113.1	48.4	33.5	73.0	46.7	21.8	15.4	115.7	28.2	6.6
Utah	480.6	368.0	113.8	36.7	29.4	34.7	23.7	23.9	15.4	156.8	30.7	5.8
Vermont	514.7	439.8	128.0	43.4	34.7	75.4	62.5	24.7	17.2	121.6	39.9	11.0
Virginia	485.4	397.6	124.6	43.0	34.3	77.9	53.0	20.9	14.3	126.3	32.0	8.3
Washington	524.1	444.3	135.0	43.0	35.0	69.2	55.9	25.6	17.3	133.9	37.9	9.5
West Virginia	541.2	436.7	111.2	55.3	41.3	102.8	67.4	22.3	16.2	114.1	39.5	10.9
Wisconsin	524.4	430.7	125.6	46.1	35.7	71.8	54.4	24.9	17.5	129.6	40.1	9.8
Wyoming	472.4	387.6	111.2	44.8	33.3	55.7	45.8	18.8	13.8	127.1	37.1	11.8
United States	522.6	419.0	123.1	48.3	36.6	76.7	54.1	23.1	16.0	131.5	36.4	9.0

*Per 100,000, age adjusted to the 2000 US standard population. †This state's data are not included in US combined rates because they were unavailable or did not meet high-quality standards for one or more years during 2008-2012 according to the North American Association of Central Cancer Registries (NAACCR). ‡Rates are based on incidence data for 2008-2009. §Incidence data not submitted to NAACCR. ¶Rates are based on incidence data for 2008-2010.

Source: NAACCR, 2015. Data are collected by cancer registries participating in the National Cancer Institute's SEER program and the Centers for Disease Control and Prevention's National Program of Cancer Registries.

American Cancer Society, Inc., Surveillance Research, 2016

Table 5. Death Rates* for Selected Cancers by State, US, 2008-2012

	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	246.8	152.4	22.6	21.2	14.1	82.6	40.1	7.9	5.1	13.3	9.9	26.4
Alaska	211.4	151.5	21.0	18.0	13.7	61.2	44.8	7.8	5.0	13.7	9.2	21.9
Arizona	180.0	128.1	19.7	15.9	11.3	46.6	31.9	7.2	4.6	11.5	8.9	19.4
Arkansas	246.5	156.6	22.3	22.7	15.3	88.0	44.2	8.2	5.5	13.2	9.4	22.7
California	183.4	135.3	21.2	16.8	12.2	43.7	30.5	7.4	4.6	11.8	9.3	21.1
Colorado	173.8	129.4	19.7	15.3	11.8	40.8	29.7	7.0	4.3	10.8	9.0	22.6
Connecticut	192.2	138.4	20.3	14.8	11.0	49.7	35.8	7.1	4.5	13.2	10.2	20.2
Delaware	218.1	156.3	22.1	17.5	12.2	66.4	45.2	6.9	4.8	13.6	9.5	22.6
Dist. of Columbia	227.1	161.6	29.0	18.7	16.6	54.6	33.9	7.1	3.7	15.7	12.2	34.9
Florida	197.1	136.9	21.0	17.2	12.1	58.1	37.3	7.5	4.5	12.1	9.0	18.7
Georgia	218.2	143.5	22.9	19.5	13.1	68.0	37.2	7.3	4.2	12.2	9.0	24.6
Hawaii	171.7	114.8	15.1	16.8	10.7	44.4	25.0	7.4	4.5	12.9	10.2	14.8
Idaho	189.3	134.9	20.7	16.0	11.8	45.9	33.6	8.0	4.9	12.3	8.9	24.7
Illinois	215.9	154.4	23.0	20.3	14.0	62.4	40.7	8.2	5.0	13.0	10.0	22.4
Indiana	232.4	157.8	22.7	20.3	14.0	75.3	44.7	8.6	5.3	12.8	9.5	22.0
Iowa	209.1	145.3	20.7	19.8	14.3	61.4	37.5	8.8	5.2	12.4	9.2	20.7
Kansas	206.1	144.7	21.3	18.7	12.8	61.7	39.1	8.7	4.8	12.7	9.7	19.2
Kentucky	253.6	170.0	22.6	21.8	15.2	92.2	55.2	8.8	5.7	12.8	9.4	21.5
Louisiana	247.4	161.0	25.0	22.7	15.1	77.4	42.8	8.6	5.0	14.9	11.4	24.2
Maine	223.8	154.6	19.4	18.4	12.8	66.5	44.1	8.8	5.3	12.0	10.6	21.1
Maryland	207.4	148.0	23.7	18.9	12.8	57.1	38.6	7.3	4.3	13.4	10.2	22.5
Massachusetts	205.5	147.1	20.3	17.1	12.2	56.2	40.3	7.4	4.5	12.6	10.2	20.5
Michigan	215.9	155.0	23.1	18.6	13.2	64.7	42.8	9.2	5.4	13.4	10.1	20.3
Minnesota	197.0	141.1	20.0	16.5	11.8	49.7	35.6	9.4	5.4	12.0	9.0	22.5
Mississippi	260.4	158.5	24.5	23.9	16.5	88.5	41.4	7.8	4.4	14.4	10.6	28.4
Missouri	222.7	156.8	23.4	20.5	13.9	72.8	45.2	7.8	5.0	12.7	9.8	19.9
Montana	188.5	138.6	20.3	16.1	12.5	49.7	37.2	8.0	4.3	11.2	8.2	23.4
Nebraska	200.9	140.8	19.8	19.8	14.6	55.5	35.5	7.9	5.0	12.0	9.4	22.0
Nevada	201.9	149.0	23.3	21.0	13.8	55.9	44.1	6.8	4.3	12.5	9.2	21.5
New Hampshire	208.3	147.6	20.4	16.2	13.0	57.7	42.1	7.2	4.3	13.6	9.4	20.8
New Jersey	199.0	147.4	23.9	19.6	13.8	52.0	35.3	7.4	4.7	13.3	10.3	20.3
New Mexico	181.0	128.1	20.4	18.0	12.2	40.9	27.2	6.0	4.3	11.1	8.0	21.9
New York	193.8	141.7	21.5	17.9	13.0	51.9	35.1	7.6	4.7	13.0	10.0	20.6
North Carolina	222.2	145.0	22.2	18.0	12.3	72.0	39.1	7.5	4.7	11.9	9.2	23.5
North Dakota	198.1	130.2	19.8	19.6	13.1	53.3	31.8	6.3	4.6	13.3	7.8	22.6
Ohio	228.2	158.5	23.8	20.9	14.1	70.9	43.8	9.0	5.3	13.4	10.1	22.0
Oklahoma	233.6	159.6	23.2	21.7	14.4	75.7	45.3	8.9	5.3	12.4	9.6	22.4
Oregon	203.6	149.8	20.9	17.3	12.8	55.2	41.2	8.3	5.0	12.3	9.7	23.2
Pennsylvania	218.5	153.3	23.2	20.2	14.1	62.4	38.7	8.7	5.2	13.3	10.1	21.1
Rhode Island	216.1	143.3	19.8	17.6	13.1	62.5	41.6	7.7	4.2	12.7	8.4	20.8
South Carolina	232.7	148.8	23.2	19.6	13.4	72.7	38.9	7.6	4.5	13.0	10.1	25.5
South Dakota	196.9	142.8	20.7	18.5	13.2	58.2	35.0	7.5	5.0	10.8	9.6	20.8
Tennessee	245.9	156.7	22.6	21.3	14.8	83.6	45.1	8.7	5.0	12.9	9.6	22.6
Texas	201.8	137.7	21.0	18.9	12.5	56.4	33.7	7.7	4.6	11.8	8.9	19.6
Utah	153.0	108.6	20.8	13.2	10.2	26.4	15.6	7.2	4.6	10.9	8.1	23.3
Vermont	206.2	149.9	18.7	16.2	13.3	57.2	43.8	8.2	4.6	13.4	10.2	22.4
Virginia	211.5	145.8	22.8	17.9	12.9	62.5	38.2	7.9	4.6	12.5	9.5	22.7
Washington	201.8	146.4	20.3	16.4	12.2	53.9	39.7	8.3	5.1	12.7	10.2	22.2
West Virginia	242.5	165.2	22.5	22.9	15.0	80.5	49.3	8.4	5.8	12.0	8.6	20.1
Wisconsin	208.9	146.8	21.0	17.4	12.3	56.3	38.1	8.6	5.2	13.1	10.1	23.1
Wyoming	187.0	140.3	19.5	18.3	12.2	46.5	33.7	6.3	4.8	10.9	8.3	20.3
United States	207.9	145.4	21.9	18.6	13.1	59.8	37.8	7.9	4.8	12.6	9.6	21.4

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

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

American Cancer Society, Inc., Surveillance Research, 2016

What Are the Costs of Cancer?

The Agency for Healthcare Research and Quality estimates that the direct medical costs (total of all health care expenditures) for cancer in the US in 2013 were $74.8 billion. Forty-four percent of those costs were for hospital outpatient or office-based provider visits, and 40% were for inpatient hospital stays. These estimates are based on a set of large-scale surveys of individuals and their medical providers called the Medical Expenditure Panel Survey (MEPS), the most complete, nationally representative data on health care use and expenditures. Visit meps.ahrq.gov/mepsweb/ for more information.

Lack of health insurance and other barriers prevent many Americans from receiving optimal health care. According to the US Census Bureau, 33 million Americans (10%) were uninsured during the entire 2014 calendar year. This is almost 9 million fewer than during 2013 because of the implementation in January 2014 of several new provisions of the Affordable Care Act. The largest increase in health insurance coverage was among those with the lowest education and income. Hispanics and blacks continue to be the most likely to be uninsured, 20% and 12%, respectively, compared to 8% of non-Hispanic whites. The percentage of uninsured ranged from 3% in Massachusetts to 19% in Texas. Uninsured patients and those from many ethnic minority groups are substantially more likely to be diagnosed with cancer at a later stage, when treatment is often more extensive, more costly, and less successful. To learn more about how the Affordable Care Act supports the fight against cancer, see "Advocacy" on page 62.

Selected Cancers

This section provides basic information on risk factors, symptoms, early detection, and treatment, as well as statistics on incidence, mortality, and survival, for the most commonly diagnosed cancers. The information primarily applies to the more common subtypes for each site and may have limited relevance to rare subtypes.

Breast

New cases: In 2016, invasive breast cancer will be diagnosed in about 246,660 women and 2,600 men. An additional 61,000 new cases of in situ breast cancer will be diagnosed in women. Breast cancer is the most frequently diagnosed cancer in women (Figure 3, page 10).

Incidence trends: From 2003 to 2012, the most recent 10 years for which data are available, breast cancer incidence rates were stable in white women and increased slightly (by 0.3% per year) in black women, resulting in the convergence of rates in blacks with those in whites.

Deaths: An estimated 40,890 breast cancer deaths (40,450 women, 440 men) are expected in 2016. Breast cancer ranks second as a cause of cancer death in women.

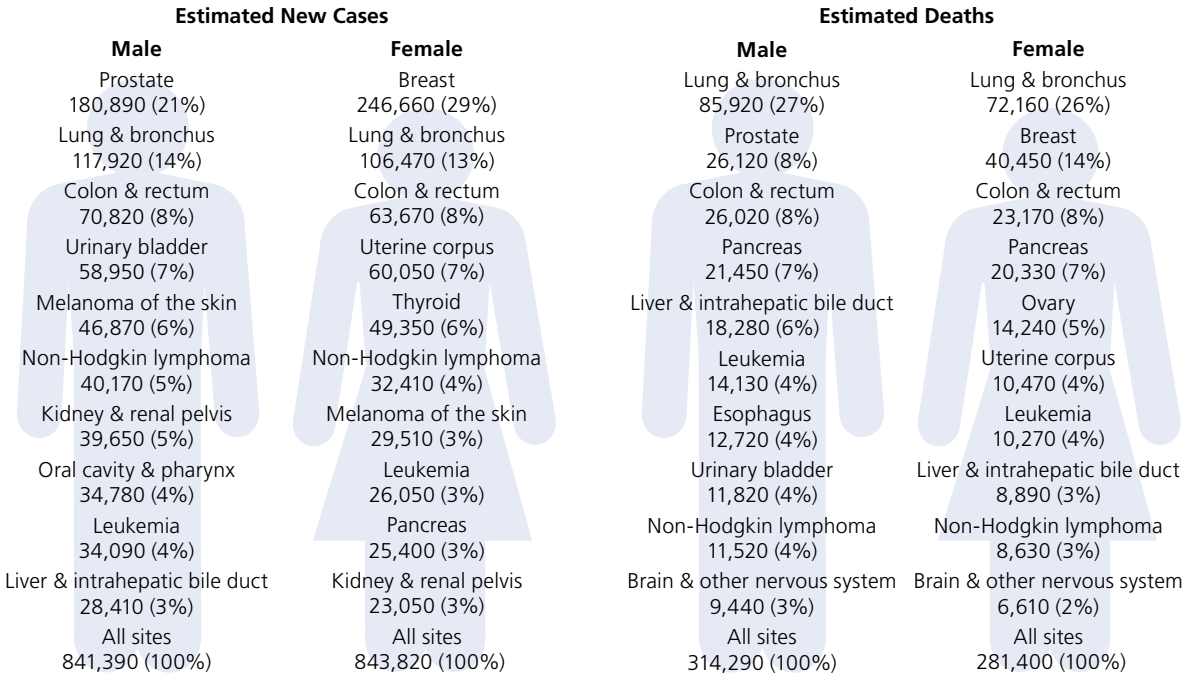
Mortality trends: From 2003 to 2012, breast cancer death rates decreased by 1.9% per year in white women and by 1.4% per year in black women. Overall, breast cancer death rates declined by 36% from 1989 to 2012 due to improvements in early detection and treatment, translating to the avoidance of approximately 249,000 breast cancer deaths.

Signs and symptoms: The most common symptom of breast cancer is a lump or mass in the breast, which is often painless. Less common symptoms include other persistent changes to the breast, such as thickening, swelling, distortion, tenderness, skin irritation, redness, scaliness, nipple abnormalities, or spontaneous discharge. Breast pain is more likely to be caused by benign conditions and is not a common symptom of breast cancer.

Risk factors: Potentially modifiable factors associated with increased breast cancer risk include weight gain after the age of 18 and/or being overweight or obese (for postmenopausal breast cancer), use of menopausal hormone therapy (combined estrogen and progestin), physical inactivity, and alcohol consumption. In addition, recent research indicates that long-term, heavy smoking may also increase breast cancer risk, particularly among women who start smoking before their first pregnancy. The International Agency for Research on Cancer has concluded that shift work, particularly at night (i.e., that disrupts sleep patterns), may be associated with an increased risk of breast cancer.

Non-modifiable factors associated with increased breast cancer risk include older age; a personal or family history of breast or ovarian cancer; inherited mutations (genetic alterations) in *BRCA1*, *BRCA2*, or other breast cancer susceptibility genes; certain benign breast conditions (such as atypical hyperplasia); a history of ductal or lobular carcinoma in situ; high-dose radiation to the chest at a young age (e.g., for cancer treatment); high breast tissue density (the amount of glandular tissue relative to fatty tissue measured on a mammogram); high bone mineral density (evaluated during screening for osteoporosis); and type 2 diabetes (independent of obesity). Reproductive factors that increase risk include a long menstrual history (menstrual periods that start early and/or end later in life), recent use of oral contraceptives, never having children, having one's first child after age 30, and high natural levels of sex hormones.

Figure 3. Leading Sites of New Cancer Cases and Deaths – 2016 Estimates



Estimates are rounded to the nearest 10, and cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

Factors associated with a decreased risk include breastfeeding for at least one year, regular moderate or vigorous physical activity, and maintaining a healthy body weight. Two medications – tamoxifen and raloxifene – have been approved to reduce breast cancer risk in women at high risk. Raloxifene appears to have a lower risk of certain side effects, but is only approved for use in postmenopausal women.

Early detection: Mammography is a low-dose x-ray procedure used to detect breast cancer at an early stage. Numerous studies have shown that early detection with mammography helps save lives and increases treatment options. However, like any screening tool, mammography is not perfect. For example, it can miss cancers, particularly those in women with very dense breasts, and also detects cancers that would never have caused harm, resulting in some overdiagnoses. Most (95%) of the 10% of women who have an abnormal mammogram do not have cancer. For women at average risk of breast cancer, recently updated American Cancer Society screening guidelines recommend that those 40 to 44 years of age have the choice for annual mammography; those 45 to 54 have annual mammography; and those 55 years of age and older have biennial or annual mammography, continuing as long as their overall health is good and life expectancy is 10 or more years. For some women at high risk of breast cancer, annual screening using magnetic resonance imaging (MRI) in addition to mammography is recommended, typically starting at age 30. For more information on breast cancer screening, see the American Cancer Society's screening guidelines on page 66.

Treatment: Taking into account tumor characteristics, including size and extent of spread, as well as patient preference, treatment usually involves either breast-conserving surgery (surgical removal of the tumor and surrounding tissue) or mastectomy (surgical removal of the breast). For early breast cancer (without spread to the skin, chest wall, or distant organs), long-term survival is similar for women treated with breast-conserving surgery plus radiation therapy and those treated with mastectomy. Underarm lymph nodes are usually removed and evaluated during surgery to determine whether the tumor has spread beyond the breast. Women undergoing mastectomy who elect breast reconstruction have several options, including the tissue or materials used to restore breast shape and the timing of the procedure.

Treatment may also involve radiation therapy, chemotherapy (before or after surgery), hormonal therapy, and/or targeted therapy. Women with early stage breast cancer that tests positive for hormone receptors benefit from treatment with hormonal therapy for at least 5 years. For women whose cancer overexpresses the growth-promoting protein HER2, several targeted therapies are available.

Survival: The 5-, 10-, and 15-year relative survival rates for breast cancer are 89%, 83%, and 78%, respectively. (Caution should be used when interpreting long-term survival rates because they represent patients who were diagnosed many years ago and do not reflect recent advances in detection and treatment.) Most cases (61%) are diagnosed at a localized stage (no spread to lymph nodes, nearby structures, or other locations outside the breast), for which the 5-year survival is 99% (Table 8, page 21). Survival rates have increased over time for both white and black women, although they remain 11 percentage points lower, in absolute terms, for blacks (Table 7, page 18).

See *Breast Cancer Facts & Figures 2015-2016* at cancer.org/statistics for more detailed information.

Childhood Cancer (Ages 0-14 years)

New cases: An estimated 10,380 new cases are expected to occur among children 0 to 14 years of age in 2016.

Incidence trends: Childhood cancer incidence rates have slowly increased by 0.6% per year since 1975, when population-based cancer registration began in the US.

Deaths: An estimated 1,250 cancer deaths are expected to occur among children in 2016. Cancer is the second leading cause of death in children ages 1-14 years, exceeded only by accidents.

Mortality trends: Childhood cancer death rates declined by a total of 66% from 1969 (6.5 per 100,000) to 2012 (2.2 per 100,000), largely due to improvements in treatment and high rates of participation in clinical trials. From 2003 to 2012, the death rate declined by 1.3% per year.

Signs and symptoms: The early diagnosis of childhood cancer is often hampered by nonspecific symptoms that are similar to those of more common childhood diseases. Parents should ensure that children have regular medical checkups and be alert to unusual, persistent symptoms. These include an unusual mass or swelling; unexplained paleness or loss of energy; a sudden increase in the tendency to bruise or bleed; a persistent, localized pain or limping; a prolonged, unexplained fever or illness; frequent headaches, often with vomiting; sudden eye or vision changes; and excessive, rapid weight loss. Major categories of pediatric cancer, based on the International Classification of Childhood Cancer, their distribution (including benign brain tumors), and more specific symptoms include:

- Leukemia (30% of all childhood cancers), which may be recognized by bone and joint pain, weakness, pale skin, bleeding or bruising easily, and fever or infection
- Brain and other central nervous system tumors (26%), which may cause headaches, nausea, vomiting, blurred or double vision, seizures, dizziness, and difficulty walking or handling objects
- Neuroblastoma (6%), a cancer of the nervous system that is most common in children younger than 5 years of age and usually appears as a swelling in the abdomen
- Wilms tumor (5%), a kidney cancer (also called nephroblastoma) that may be recognized by a swelling or lump in the abdomen
- Non-Hodgkin lymphoma including Burkitt lymphoma (5%), and Hodgkin lymphoma (3%), which are most common during adolescence, affect lymph nodes, but may also involve the bone marrow and other organs; may cause swelling of lymph nodes in the neck, armpit, or groin, as well as general weakness and fever
- Rhabdomyosarcoma (3%), a soft tissue sarcoma that can occur in the head and neck, genitourinary area, trunk, and extremities, and may cause pain and/or a mass or swelling
- Osteosarcoma (2%), a bone cancer that most often occurs in adolescents and commonly appears as sporadic pain in the affected bone that may worsen at night or with activity and eventually progresses to local swelling
- Retinoblastoma (2%), an eye cancer that usually occurs in children younger than 5 years of age and is typically recognized because the pupil appears white or pink instead of the normal red color in flash photographs or during an eye examination
- Ewing sarcoma (1%), another type of cancer that usually arises in the bone, is most common in adolescents, and typically appears as pain at the tumor site

Risk factors: There are few known risk factors for childhood cancer. Exposure to ionizing radiation increases the risk of childhood leukemia and possibly other cancers. A small percentage of childhood cancers are caused by a genetic mutation that is inherited or arises during fetal development. Children with certain genetic syndromes, such as Down syndrome, are at increased risk for leukemia.

Treatment: Childhood cancers are treated with surgery, radiation, and/or chemotherapy/targeted therapy based on the type and stage of cancer. Treatment is coordinated by a team of experts, including pediatric oncologists and nurses, social workers, psychologists, and others trained to assist children and their families. Outcomes are most successful when treatment is managed by specialists at a children's cancer center. If the child is eligible, placement in a clinical trial, which compares a new treatment to the best current treatment, should be considered.

Survival: Survival for all invasive childhood cancers combined has improved markedly over the past 30 years due to new and improved treatments. The 5-year relative survival rate increased from 58% in the mid-1970s to 83% in the most recent time period (2005-2011). However, rates vary considerably depending on cancer type, patient age, and other characteristics. The 5-year survival for retinoblastoma is 97%; Hodgkin lymphoma, 98%; Wilms tumor, 92%; non-Hodgkin lymphoma, 89%; leukemia,

85% (89% for acute lymphoid leukemia and 65% for acute myeloid leukemia); neuroblastoma, 78%; Ewing sarcoma, 78%; brain and other central nervous system tumors (excluding benign brain tumors), 72%; osteosarcoma, 69%; and rhabdomyosarcoma, 69%. Pediatric cancer patients may experience treatment-related side effects long after active treatment, including impairment in the function of specific organs (e.g., cognitive defects) and secondary cancers. The Children's Oncology Group (COG) has developed guidelines for screening and management of late effects in survivors of childhood cancer. See the COG website at survivorshipguidelines.org for more information. The Childhood Cancer Survivor Study, which has followed more than 14,000 long-term childhood cancer survivors, has also provided valuable information about the late effects of cancer treatment; visit ccss.stjude.org for more information.

See the *Cancer Facts & Figures 2014* Special Section: Childhood & Adolescent Cancers at cancer.org/statistics for more detailed information.

Colon and Rectum

New cases: An estimated 95,270 cases of colon cancer and 39,220 cases of rectal cancer are expected to be diagnosed in 2016. Colorectal cancer is the third most common cancer in both men and women.

Incidence trends: Incidence rates have generally been decreasing since the mid-1980s due to both changes in risk factors (e.g., decreased smoking, increased use of nonsteroidal anti-inflammatory drugs) and the uptake of screening among adults 50 years of age and older. The pace of the decline has increased over the past 5 data years. However, trends differ by age. From 2008 to 2012, incidence rates declined by 4.5% per year among adults 50 years of age and older, but increased by 1.8% per year among those younger than age 50. Reasons for the increase in young adults, which has been consistent since at least 1992, are unknown.

Deaths: An estimated 49,190 deaths from colorectal cancer are expected to occur in 2016. Colorectal cancer is the third leading cause of cancer death in both men and women and the second leading cause of cancer death when men and women are combined. Deaths for cancers of the colon and rectum are combined because of the large number of rectal cancer deaths that are misclassified as colon on death certificates. This is thought to be largely due to the widespread use of the term "colon cancer" to refer to both colon and rectal cancers in educational messaging.

Mortality trends: Colorectal cancer death rates have been declining since 1980 in men and since 1947 in women, with an overall drop of 49% from 1976 to 2012. This trend reflects improvements in early detection and treatment, as well as declines in incidence. From 2003 to 2012, death rates declined by 2.8% per year.

Signs and symptoms: Early stage colorectal cancer typically does not have symptoms, which is why screening is usually necessary to detect this cancer early. Symptoms may include rectal bleeding, blood in the stool, a change in bowel habits or stool shape (e.g., narrower than usual), the feeling that the bowel is not completely empty, cramping pain in the lower abdomen, decreased appetite, or weight loss. In some cases, blood loss from the cancer leads to anemia (low number of red blood cells), causing symptoms such as weakness and fatigue. Timely evaluation of symptoms consistent with colorectal cancer is essential, even for adults younger than age 50.

Risk factors: The risk of colorectal cancer increases with age. Modifiable factors that increase risk include obesity, physical inactivity, long-term smoking, high consumption of red or processed meat, low calcium intake, moderate to heavy alcohol consumption, and very low intake of fruit and vegetables. Consumption of whole-grain fiber reduces risk. Hereditary and medical factors that increase risk include a personal or family history of colorectal cancer and/or polyps, certain inherited genetic conditions (e.g., Lynch syndrome, also known as hereditary nonpolyposis colorectal cancer [HNPCC], and familial adenomatous polyposis [FAP]), a personal history of chronic inflammatory bowel disease (e.g., ulcerative colitis or Crohn disease), and type 2 diabetes.

Regular long-term use of nonsteroidal anti-inflammatory drugs, such as aspirin, reduces risk. However, these drugs can have serious adverse health effects, such as stomach bleeding. While the American Cancer Society has not made recommendations about their use, the US Preventive Services Task Force issued a draft statement in September 2015 recommending daily, low-dose aspirin for some individuals at high risk for cardiovascular disease based on a review of aspirin's harms and benefits, including the benefit of colorectal cancer prevention.

Early detection: Beginning at the age of 50, men and women who are at average risk for developing colorectal cancer should begin screening. Some screening tests can detect colorectal polyps, which can be removed before becoming cancerous, whereas all tests can detect cancer at an early stage, when treatment is usually less extensive and more successful. There are a number of recommended screening options, which differ in terms of how often they should be performed and whether bowel preparation is required, as well as benefits, limitations, potential harms, and cost. For the Society's recommendations for colorectal cancer screening, see page 66.

Treatment: Surgery is the most common treatment for colorectal cancers that have not spread. A permanent colostomy (creation of an abdominal opening for elimination of body waste) is not usually required for rectal cancer and is rarely necessary for colon cancer. Chemotherapy alone, or in combination with radiation, is given before (neoadjuvant) or after (adjuvant)

surgery to most patients whose cancer has penetrated the bowel wall deeply or spread to lymph nodes. For colorectal cancer that has spread to other parts of the body (metastatic colorectal cancer), treatments typically include chemotherapy and/or targeted therapy.

Survival: The 5- and 10-year relative survival rates for colorectal cancer are 65% and 58%, respectively. Although 5-year survival for localized disease is 90% (Table 8, page 21), only 39% of patients are diagnosed at this stage, in part due to the underuse of screening.

For more detailed information, see *Colorectal Cancer Facts & Figures 2014-2016* at cancer.org/statistics.

Kidney & Renal Pelvis

New cases: An estimated 62,700 new cases of kidney (renal) cancer are expected to be diagnosed in 2016. These are primarily renal cell carcinomas, which occur in the body of the kidney, but also include cancers of the renal pelvis (6%), which behave more like bladder cancer, and Wilms tumor (1%), a childhood cancer that usually develops before the age of 5 (see "Childhood Cancer (Ages 0-14 years)" on page 11). Men are twice as likely as women to be diagnosed with kidney cancer.

Incidence trends: Kidney cancer incidence rates increased over the past several decades, in part due to incidental diagnoses during abdominal imaging. However, rates stabilized from 2008 to 2012.

Deaths: An estimated 14,240 deaths from kidney cancer are expected to occur in 2016.

Mortality trends: Kidney cancer death rates have been decreasing by 0.7% per year since 1995.

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

Risk factors: Obesity and tobacco smoking increase risk for kidney cancer. Additional risk factors include high blood pressure; chronic renal failure; and occupational exposure to certain chemicals, such as trichloroethylene. Radiation exposure (e.g., for cancer treatment) slightly increases risk. A small proportion of renal cell cancers are the result of rare hereditary conditions (e.g., von Hippel-Lindau disease and hereditary papillary renal cell carcinoma).

Early detection: There are no recommended screening tests for the early detection of kidney cancer among people at average risk.

Treatment: Surgery (traditional or laparoscopic, i.e., minimally invasive, performed through very small incisions) is the primary treatment for most kidney cancers, although active surveillance (observation) may be an option for some patients with small tumors. Patients who are not surgical candidates may be offered ablation therapy, a procedure that uses heat or cold to destroy the tumor. So far, adjuvant treatment has not been shown to be helpful after surgery, although several targeted therapies are being studied. For metastatic disease, targeted therapies are typically the main treatment, sometimes along with removal of the kidney.

Survival: The 5- and 10-year relative survival rates for kidney and renal pelvis cancer are 73% and 63%, respectively. Almost two-thirds of cases (65%) are diagnosed at a local stage, for which the 5-year relative survival rate is 92% (Table 8, page 21). Five-year survival for cancer in the renal pelvis (50%) is lower than for cancer in the kidney (74%).

Leukemia

New cases: An estimated 60,140 new cases of leukemia are expected in 2016. Leukemia is a cancer of the bone marrow and blood and is classified into four main groups according to cell type and rate of growth: acute lymphocytic (ALL), chronic lymphocytic (CLL), acute myeloid (AML), and chronic myeloid (CML). Although leukemia is often thought of as a childhood cancer, the majority (91%) of cases are diagnosed in adults 20 years of age and older. Among adults, the most common types are CLL (37%) and AML (31%), while ALL is most common in those 0 to 19 years, accounting for 75% of cases.

Incidence trends: Overall leukemia incidence has increased slowly for many decades; from 2003 to 2012, rates increased by 1.3% per year.

Deaths: An estimated 24,400 deaths are expected to occur in 2016.

Mortality trends: In contrast to incidence, death rates for leukemia have dropped 18% since 1980, with a steady decline of 1.0% per year from 2001 to 2012.

Signs and symptoms: Symptoms may include fatigue, paleness, weight loss, repeated infections, fever, bleeding or bruising easily, bone or joint pain, and swelling in the lymph nodes or abdomen. In acute leukemia, these signs can appear suddenly. Chronic leukemia typically progresses slowly with few symptoms and is often diagnosed during routine blood tests.

Risk factors: Exposure to ionizing radiation increases the risk of most types of leukemia (excluding CLL). Medical radiation, such as that used in cancer treatment, is one of the most common sources of radiation exposure. The risk of leukemia is also increased in patients treated with chemotherapy, children with Down syndrome and certain other genetic abnormalities, and workers in the rubber-manufacturing industry. Studies suggest that obesity also increases risk.

Table 6. Probability (%) of Developing Invasive Cancer during Selected Age Intervals by Sex, US, 2010-2012*

		Birth to 49	50 to 59	60 to 69	70 and older	Birth to death
All sites†	Male	3.4 (1 in 29)	6.5 (1 in 15)	14.5 (1 in 7)	34.6 (1 in 3)	42.1 (1 in 2)
	Female	5.4 (1 in 19)	6.0 (1 in 17)	10.0 (1 in 10)	26.1 (1 in 4)	37.6 (1 in 3)
Breast	Female	1.9 (1 in 53)	2.3 (1 in 44)	3.5 (1 in 29)	6.7 (1 in 15)	12.3 (1 in 8)
Colon & rectum	Male	0.3 (1 in 300)	0.7 (1 in 149)	1.2 (1 in 82)	3.7 (1 in 27)	4.7 (1 in 21)
	Female	0.3 (1 in 318)	0.5 (1 in 195)	0.9 (1 in 117)	3.4 (1 in 30)	4.4 (1 in 23)
Kidney & renal pelvis	Male	0.2 (1 in 467)	0.3 (1 in 295)	0.6 (1 in 158)	1.3 (1 in 76)	2.0 (1 in 49)
	Female	0.1 (1 in 748)	0.2 (1 in 576)	0.3 (1 in 317)	0.7 (1 in 136)	1.2 (1 in 83)
Leukemia	Male	0.2 (1 in 415)	0.2 (1 in 591)	0.4 (1 in 261)	1.4 (1 in 72)	1.8 (1 in 57)
	Female	0.2 (1 in 508)	0.1 (1 in 939)	0.2 (1 in 458)	0.9 (1 in 115)	1.2 (1 in 82)
Lung & bronchus	Male	0.2 (1 in 608)	0.7 (1 in 145)	2.0 (1 in 51)	6.4 (1 in 16)	7.2 (1 in 14)
	Female	0.2 (1 in 572)	0.6 (1 in 177)	1.5 (1 in 67)	4.8 (1 in 21)	6.0 (1 in 17)
Melanoma of the skin‡	Male	0.3 (1 in 297)	0.4 (1 in 238)	0.8 (1 in 127)	2.2 (1 in 45)	3.0 (1 in 33)
	Female	0.5 (1 in 206)	0.3 (1 in 321)	0.4 (1 in 242)	0.9 (1 in 107)	1.9 (1 in 52)
Non-Hodgkin lymphoma	Male	0.3 (1 in 376)	0.3 (1 in 347)	0.6 (1 in 174)	1.8 (1 in 55)	2.4 (1 in 42)
	Female	0.2 (1 in 546)	0.2 (1 in 477)	0.4 (1 in 237)	1.4 (1 in 73)	1.9 (1 in 53)
Thyroid	Male	0.2 (1 in 560)	0.1 (1 in 821)	0.2 (1 in 635)	0.2 (1 in 451)	0.6 (1 in 169)
	Female	0.8 (1 in 131)	0.4 (1 in 281)	0.3 (1 in 306)	0.4 (1 in 258)	1.7 (1 in 58)
Prostate	Male	0.3 (1 in 325)	2.1 (1 in 48)	5.8 (1 in 17)	10.0 (1 in 10)	14.0 (1 in 7)
Uterine cervix	Female	0.3 (1 in 364)	0.1 (1 in 850)	0.1 (1 in 871)	0.2 (1 in 576)	0.6 (1 in 157)
Uterine corpus	Female	0.3 (1 in 355)	0.6 (1 in 170)	0.9 (1 in 107)	1.3 (1 in 76)	2.8 (1 in 36)

*For those who are free of cancer at the beginning of each age interval. †All sites excludes basal cell and squamous cell skin cancers and in situ cancers except urinary bladder. ‡Statistic is for whites.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.3. Statistical Research and Applications Branch, National Cancer Institute, 2015. srab.cancer.gov/devcan.

Please note: The probability of developing cancer for additional sites, as well as the probability of cancer death, can be found in Supplemental Data at cancer.org/statistics.

American Cancer Society, Inc., Surveillance Research, 2016

Some risk factors are most closely associated with specific types of leukemia. For example, family history is a strong risk factor for CLL. Cigarette smoking is a risk factor for AML in adults, and there is accumulating evidence that parental smoking before and after childbirth may increase the risk of childhood leukemia. There is limited evidence that maternal exposure to paint fumes also increases the risk of childhood leukemia. Exposure to certain chemicals, such as formaldehyde and benzene, increases the risk of myeloid leukemia. Infection with human T-cell leukemia virus type I (HTLV-I) can cause a rare type of leukemia called adult T-cell leukemia/lymphoma. The prevalence of HTLV-I infection is most common in southern Japan and the Caribbean, and infected individuals in the US tend to be immigrants (or their descendants) from these regions.

Early detection: There are no recommended screening tests for the early detection of leukemia. However, it is sometimes diagnosed early because of abnormal results on blood tests performed for other indications.

Treatment: Chemotherapy is used to treat most types of leukemia. Various anticancer drugs are used, either in combination or as single agents. Several targeted drugs are effective for treating CML because they attack cells with the Philadelphia chromosome, the genetic abnormality that is the hallmark of CML. Some of these drugs are also used to treat a type of ALL involving a similar genetic defect. People diagnosed with CLL that is not progressing or causing symptoms may not require treatment. For those who do require treatment, CLL-targeted drugs are effective for some patients, even when other treatments are no longer working. Certain types of leukemia may be treated with high-dose chemotherapy followed by stem cell transplantation under appropriate conditions.

Survival: Survival rates vary substantially by leukemia subtype, ranging from a current (2005-2011) 5-year relative survival of 26% for patients diagnosed with AML to 82% for those with CLL. Advances in treatment have resulted in a dramatic improvement in survival over the past three decades for most types of leukemia (Table 7, page 18). For example, from 1975-1977 to 2005-2011, the overall 5-year relative survival for ALL increased from 41% to 70%. In large part due to the discovery of targeted drugs, the 5-year survival rate for CML has doubled over the past two decades, from 31% in the early 1990s to 63% for patients diagnosed from 2005 to 2011. Survival rates beyond 5 years are more relevant for chronic than for acute leukemia because of the slow-growing nature of chronic disease. For example, the absolute drop in the survival rate from 5 to 10 years following diagnosis is 15 percentage points for chronic leukemia versus 3 points for acute leukemia.

Liver

New cases: An estimated 39,230 new cases of liver cancer (including intrahepatic bile duct cancers) are expected to occur in the US during 2016, approximately three-fourths of which will be hepatocellular carcinoma (HCC). Liver cancer is about 3 times more common in men than in women.

Incidence trends: Liver cancer incidence has more than tripled since 1980. However, rates in young adults have recently begun to decline. From 2008 to 2012, the rate increased by 3.5% per year among those 50 and older, but decreased by 3.9% per year among adults younger than 50 years of age.

Deaths: An estimated 27,170 liver cancer deaths are expected in 2016.

Mortality trends: Liver cancer death rates have generally been increasing since 1980; from 2003 to 2012, rates increased by 2.7% per year.

Signs and symptoms: Common symptoms, which do not usually appear until the cancer is advanced, include abdominal pain and/or swelling, weight loss, weakness, loss of appetite, jaundice (a yellowish discoloration of the skin and eyes), and fever. Enlargement of the liver is the most common physical sign.

Risk factors: The most important risk factors for liver cancer in the US are chronic infection with hepatitis B virus (HBV) and/or hepatitis C virus (HCV), heavy alcohol consumption, obesity, diabetes, tobacco smoking, and certain rare genetic disorders, such as hemochromatosis. A vaccine that protects against HBV has been available since 1982, and is recommended for all infants at birth; for all children under 18 years of age who were not vaccinated at birth; and for adults in high-risk groups (e.g., health care workers, injection drug users, and those younger than 60 years of age who have been diagnosed with diabetes). There is no vaccine available to prevent HCV infection, although new combination antiviral therapies can often clear the infection and reduce the risk of cancer development among those already infected. The Centers for Disease Control and Prevention (CDC) recommends one-time HCV testing for everyone born from 1945 to 1965 because people in this birth cohort account for about three-fourths of HCV-infected individuals and HCV-related deaths in the US. Preventive measures for HCV infection include screening of donated blood, organs, and tissues; adherence to infection control practices during medical and dental procedures; and needle-exchange programs for injection drug users. Visit the CDC website at cdc.gov/hepatitis/ for more information on viral hepatitis, including who is at risk.

Early detection: Although screening for liver cancer has not been shown to reduce mortality, many health care providers in the US test individuals at high risk for the disease (e.g., those with cirrhosis) with ultrasound or blood tests.

Treatment: Early stage liver cancer can sometimes be treated successfully with surgery to remove part of the liver (partial hepatectomy); however, only a limited number of patients have sufficient healthy liver tissue for this option. Liver transplantation may be possible for individuals with small tumors who are not candidates for partial hepatectomy. Other treatment options include ablation (tumor destruction) or embolization (blocking blood flow to the tumor).

Fewer treatment options exist for patients diagnosed at an advanced stage. Sorafenib (Nexavar®) is a targeted drug approved for the treatment of HCC in patients who are not candidates for surgery and do not have severe cirrhosis.

Survival: The 1- and 5-year relative survival rates for patients with liver cancer are 44% and 17%, respectively. Forty-three percent of patients are diagnosed with a localized stage of disease, for which 5-year survival is 31% (Table 8, page 21).

Lung and Bronchus

New cases: Lung cancer is the second most commonly diagnosed cancer in both men and women. An estimated 224,390 new cases of lung cancer are expected in 2016, accounting for about 14% of all cancer diagnoses.

Incidence trends: The incidence rate has been declining since the mid-1980s in men, but only since the mid-2000s in women. Gender differences reflect historical patterns of smoking uptake and cessation over the past several decades. From 2008 to 2012, lung cancer incidence rates decreased by 3.0% per year in men and by 1.9% per year in women.

Deaths: Lung cancer accounts for more deaths than any other cancer in both men and women. An estimated 158,080 deaths are expected to occur in 2016, accounting for about 1 in 4 cancer deaths.

Mortality trends: Death rates have declined by 38% since 1990 in men and by 12% since 2002 in women due to the drop in smoking prevalence. From 2008 to 2012, rates decreased by 2.9% per year in men and by 1.9% per year in women.

Signs and symptoms: Symptoms do not usually occur until the cancer is advanced, and may include persistent cough, sputum streaked with blood, chest pain, voice change, worsening shortness of breath, and recurrent pneumonia or bronchitis.

Risk factors: Cigarette smoking is by far the most important risk factor for lung cancer; 80% of lung cancer deaths in the US are caused by smoking. Risk increases with both quantity and duration of smoking. Cigar and pipe smoking also increase risk. Exposure to radon gas released from soil and building materials is estimated to be the second-leading cause of lung cancer in the US. Other risk factors include occupational or environmental exposure to secondhand smoke, asbestos (particularly among

smokers), certain metals (chromium, cadmium, arsenic), some organic chemicals, radiation, air pollution, and diesel exhaust. Additional occupational exposures that increase risk include rubber manufacturing, paving, roofing, painting, and chimney sweeping. Risk is also probably increased among people with a history of tuberculosis. Genetic susceptibility plays a role in the development of lung cancer, especially in those who develop the disease at a young age.

Early detection: Screening with low-dose spiral computed tomography (LDCT) has been shown to reduce lung cancer mortality by 20% compared to standard chest x-ray among adults with at least a 30 pack-year smoking history who were current smokers or had quit within 15 years. The American Cancer Society guidelines for the early detection of lung cancer endorse a process of shared decision making between clinicians who have access to high-volume, high-quality lung cancer screening programs and current or former smokers (quit within 15 years) who are 55 to 74 years of age, in good health, and with at least a 30 pack-year history of smoking. Shared decision making should include a discussion of the benefits, uncertainties, and harms associated with lung cancer screening. The US Preventive Services Task Force has issued similar guidelines. For more information on lung cancer screening, see the American Cancer Society's screening guidelines on page 66.

Treatment: Appropriate treatment for lung cancer is based on whether the tumor is small cell (13%) or non-small cell (83%), as well as other tumor characteristics. Based on type and stage of cancer, as well as specific molecular characteristics of cancer cells, treatments can include surgery, radiation therapy, chemotherapy, and/or targeted therapies. For early stage non-small cell lung cancers, surgery is usually the treatment of choice; chemotherapy (sometimes in combination with radiation therapy) may be given as well. Advanced-stage non-small cell lung cancer patients are usually treated with chemotherapy, targeted drugs (or a combination of the two), or immunotherapy. Chemotherapy, alone or combined with radiation, is the usual treatment for small cell lung cancer; on this regimen, a large percentage of patients experience remission, though the cancer often returns.

Survival: The 1- and 5-year relative survival rates for lung cancer are 44% and 17%, respectively. Only 16% of lung cancers are diagnosed at a localized stage, for which the 5-year survival is 55% (Table 8, page 21). The 5-year survival rate for small cell lung cancer (7%) is lower than that for non-small cell (21%).

Lymphoma

New cases: An estimated 81,080 new cases of lymphoma will be diagnosed in 2016. This cancer begins in certain immune system cells, and is classified as either Hodgkin lymphoma (8,500 cases) or non-Hodgkin lymphoma (NHL, 72,580 cases).

Incidence trends: Incidence rates for Hodgkin lymphoma increased slightly from 2001 to 2007, then declined from 2008 to 2012 by 2.4% per year. Incidence rates for NHL leveled off from 2003 to 2012 after increasing for several decades. (Patterns vary for subtypes.)

Deaths: An estimated 21,270 deaths from lymphoma will occur in 2016, most of which will be due to NHL (20,150).

Mortality trends: Death rates for Hodgkin lymphoma have been decreasing for the past four decades; from 2003 to 2012, rates decreased by 2.5% per year. Death rates for NHL began decreasing in the late 1990s, with a decline of 2.5% per year from 2003 to 2012. Reductions in lymphoma death rates reflect improvements in treatment.

Signs and symptoms: The most common symptoms of lymphoma are caused by swollen lymph nodes, and include lumps under the skin; chest pain; shortness of breath; and abdominal fullness and loss of appetite. Other symptoms can include itching, night sweats, fatigue, unexplained weight loss, and intermittent fever.

Risk factors: Like most cancers, the risk of developing NHL increases with age. In contrast, the risk of Hodgkin lymphoma increases during adolescence and early adulthood, decreases during middle age, and then increases again later in life. Most of the few known risk factors for lymphoma are associated with severely altered immune function. For example, risk is elevated in people who receive immune suppressants to prevent organ transplant rejection. Certain infectious agents increase the risk of some lymphoma subtypes. Epstein-Barr virus causes Burkitt lymphoma (an aggressive type of NHL), as well as a number of autoimmune-related NHLs, post-transplant lymphoproliferative disorders (the most common cancer after organ transplant), and a subset of Hodgkin lymphoma. In addition, chronic infection with infectious agents that cause immunosuppression (e.g., human immunodeficiency virus [HIV]) or that cause the immune system to be continuously active (e.g., *Helicobacter pylori*, hepatitis C virus) are associated with certain NHL subtypes. A family history of lymphoma confers increased risk of all Hodgkin lymphoma and NHL subtypes, and a growing number of confirmed common genetic variations are associated with modestly increased risk. Studies also suggest a role for some behavioral risk factors (e.g., body weight) and environmental exposures for some subtypes.

Treatment: NHL patients are usually treated with chemotherapy; radiation, alone or in combination with chemotherapy, is used less often. Targeted drugs directed at lymphoma cells are used for some NHL subtypes, as are antibodies linked to a chemotherapy drug or a radioactive atom. If NHL persists or recurs after standard treatment, stem cell transplantation may be an option.

Hodgkin lymphoma is usually treated with chemotherapy, radiation therapy, or a combination of the two, depending on disease stage and cell type. Stem cell transplantation may be an option if other treatments are not effective. Patients whose Hodgkin lymphoma has failed to respond to treatment may be given a monoclonal antibody linked to a chemotherapy drug.

Survival: Survival varies widely by subtype and stage of disease. For NHL, the overall 5- and 10-year relative survival rates are 70% and 60%, respectively. For Hodgkin lymphoma, the 5- and 10-year relative survival rates are 86% and 80%, respectively.

Oral Cavity and Pharynx

New cases: An estimated 48,330 new cases of cancer of the oral cavity and pharynx (throat) are expected in 2016. Incidence rates are more than twice as high in men as in women.

Incidence trends: From 2003 to 2012, incidence rates among whites increased by 1.3% per year in men and were stable in women, while among blacks rates declined by 2.8% per year in men and by 1.6% per year in women. The increase among white men is driven by a subset of cancers in the oropharynx, including the base of tongue and tonsils, that is associated with human papillomavirus (HPV) infection. HPV-associated oral cancers recently began increasing in white women as well.

Deaths: An estimated 9,570 deaths from cancers of the oral cavity and pharynx are expected in 2016.

Mortality trends: Overall death rates for cancers of the oral cavity and pharynx have been decreasing over most of the past three decades, partly due to the downturn in the smoking epidemic. However, from 2003 to 2012, while rates continued to decrease in women (by 1.1% per year in whites and 3.5% per year in blacks), they stabilized in men, likely due to the increased incidence of HPV-related cancers.

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

Risk factors: Known risk factors include tobacco use in any form (smoked and smokeless) and excessive alcohol consumption. Many studies have reported a synergistic relationship between smoking and alcohol, resulting in a 30-fold increased risk for individuals who both smoke and drink heavily. HPV infection of the mouth and throat, believed to be transmitted through sexual contact, also increases risk.

Early detection: Cancer can affect any part of the oral cavity, including the lip, tongue, mouth, and throat. Visual inspection by dentists and physicians can often detect premalignant abnormalities and cancer at an early stage, when treatment may be less extensive and more successful.

Treatment: Radiation therapy and surgery, separately or in combination, are standard treatments; chemotherapy is added for advanced disease. Targeted therapy may be combined with radiation in initial treatment or used to treat recurrent cancer.

Survival: The 5- and 10-year relative survival rates for people with cancer of the oral cavity and pharynx are 63% and 52%, respectively. Less than one-third (31%) of cases are diagnosed at a local stage, for which 5-year survival is 83% (Table 8, page 21). Five-year survival varies substantially by subsite, and is highest for lip (90%) and salivary gland (73%) and lowest for hypopharynx (32%) and floor of mouth (51%).

Ovary

New cases: An estimated 22,280 new cases of ovarian cancer are expected in the US in 2016.

Incidence trends: From 2003 to 2012, ovarian cancer incidence rates decreased by 0.9% per year, a trend that has held steady since the mid-1980s.

Deaths: An estimated 14,240 deaths are expected in 2016. Ovarian cancer accounts for 5% of cancer deaths among women, causing more deaths than any other gynecologic cancer.

Mortality trends: The decline in ovarian cancer death rates was slow from 1975 until 2002, but gained momentum in the past decade. From 2003 to 2012, the rate decreased by 2.0% per year.

Signs and symptoms: Early ovarian cancer usually has no obvious symptoms. However, studies indicate that some women experience persistent, nonspecific symptoms, such as bloating, pelvic or abdominal pain, difficulty eating or feeling full quickly, or urinary urgency or frequency. Women who experience such symptoms daily for more than a few weeks should seek prompt medical evaluation. The most common sign of ovarian cancer is swelling of the abdomen, which is caused by the accumulation of fluid. Abnormal vaginal bleeding is rarely a symptom of ovarian cancer, though it is a symptom of cervical and uterine cancers.

Risk factors: The most important risk factor is a strong family history of breast or ovarian cancer. Women who have had breast cancer or who have tested positive for inherited mutations in ovarian cancer susceptibility genes, such as *BRCA1* or *BRCA2*, are at increased risk. Preventive surgery to remove the ovaries and fallopian tubes in these women decreases the risk of ovarian cancer. Other medical conditions associated with increased risk include pelvic inflammatory disease and Lynch syndrome. The

Table 7. Trends in 5-year Relative Survival Rates* (%) by Race, US, 1975-2011

	All races			White			Black		
	1975-77	1987-89	2005-11	1975-77	1987-89	2005-11	1975-77	1987-89	2005-11
All sites	49	55	69†	50	57	70†	39	43	62†
Brain & other nervous system	22	29	35†	22	28	33†	25	32	40†
Breast (female)	75	84	91†	76	85	92†	62	71	81†
Colon & rectum	50	60	66†	50	60	67†	45	52	59†
Esophagus	5	10	20†	6	11	21†	4	7	14†
Hodgkin lymphoma	72	79	88†	72	80	89†	70	72	86†
Kidney & renal pelvis	50	57	74†	50	57	74†	49	55	74†
Larynx	66	66	63†	67	67	65	58	56	51
Leukemia	34	43	62†	35	44	63†	33	35	55†
Liver & intrahepatic bile duct	3	5	18†	3	6	18†	2	3	13†
Lung & bronchus	12	13	18†	12	13	19†	11	11	16†
Melanoma of the skin	82	88	93†	82	88	93†	57‡	79‡	70
Myeloma	25	27	49†	24	27	48†	30	30	50†
Non-Hodgkin lymphoma	47	51	72†	47	51	73†	49	46	64†
Oral cavity & pharynx	53	54	66†	54	56	68†	36	34	45†
Ovary	36	38	46†	35	38	46†	42	34	38
Pancreas	3	4	8†	3	3	8†	2	6	7†
Prostate	68	83	99†	69	84	>99†	61	71	98†
Stomach	15	20	30†	14	18	29†	16	19	28†
Testis	83	95	97†	83	95	97†	73‡§	88‡	91
Thyroid	92	94	98†	92	94	99†	90	92	97†
Urinary bladder	72	79	79†	73	80	79†	50	63	67†
Uterine cervix	69	70	69	70	73	71	65	57	60†
Uterine corpus	87	82	83†	88	84	85†	60	57	66†

*Rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 9 areas from 1975 to 1977, 1987 to 1989, and 2005 to 2011, all followed through 2012. †The difference between the 1975-1977 and 2005-2011 rates is statistically significant ($p<0.05$). ‡The standard error is between 5 and 10 percentage points. §Survival rate is for cases diagnosed from 1978 to 1980.

Source: Howlader N, Noone AM, Krapcho M, et al. (eds). *SEER Cancer Statistics Review*, 1975-2012, National Cancer Institute, Bethesda, MD, **http://seer.cancer.gov/csr/1975_2012/,** based on November 2014 SEER data submission, posted to the SEER website April 2015.

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use of menopausal hormone therapy (estrogen alone and estrogen combined with progesterone) also increases risk. Tobacco smoking increases the risk of a rare type of ovarian cancer (mucinous). Pregnancy, long-term use of oral contraceptives, and tubal ligation reduce risk.

Early detection: There is currently no sufficiently accurate screening test for the early detection of ovarian cancer in average-risk women. A pelvic exam, sometimes in combination with a transvaginal ultrasound, may be used to evaluate women with symptoms, but only occasionally detects ovarian cancer, generally when the disease is advanced. For women who are at high risk, a thorough pelvic exam in combination with transvaginal ultrasound and a blood test for the tumor marker CA125 may be offered, although this strategy has not proven effective in reducing ovarian cancer mortality when used as a screening tool in average-risk women.

Treatment: Treatment includes surgery and often chemotherapy. Surgery usually involves removal of both ovaries and fallopian tubes (salpingo-oophorectomy), the uterus (hysterectomy), and the omentum (fatty tissue attached to some of the organs in the belly), along with biopsies of the peritoneum (lining of the abdominal cavity). In younger women with very early stage tumors who want to preserve fertility, only the involved ovary and fallopian tube may be removed. Among patients with early ovarian cancer, more accurate surgical staging (microscopic examination of tissue from different parts of the pelvis and abdomen) has been associated with better outcomes. For some women with advanced disease, chemotherapy administered

directly into the abdomen improves survival; however, in 2012, less than half of eligible women received this treatment. Targeted drugs can sometimes be used after other treatments to shrink tumors or slow growth of advanced cancers.

Survival: Overall, the 5- and 10-year relative survival rates for ovarian cancer patients are 46% and 35%, respectively. However, survival varies substantially by age; women younger than 65 are twice as likely to survive 5 years as women 65 and older (58% versus 28%). Overall, only 15% of cases are diagnosed at a local stage, for which 5-year survival is 92%.

Pancreas

New cases: An estimated 53,070 new cases of pancreatic cancer are expected to occur in the US in 2016. Most (95%) will be cancers of the exocrine pancreas, which produces enzymes to digest food. Much rarer are neuroendocrine tumors (5%), which have a younger median age at diagnosis and better prognosis.

Incidence trends: Pancreatic cancer incidence rates increased by 1.2% per year from 2000 through 2012.

Deaths: An estimated 41,780 deaths from pancreatic cancer will occur in 2016, with similar numbers in men (21,450) and women (20,330).

Mortality trends: Death rates for pancreatic cancer have increased by 0.4% per year since 2000.

Signs and symptoms: Symptoms for pancreatic cancer, which usually do not appear until the disease has progressed, include weight loss, abdominal discomfort that may radiate to the back, and occasionally the development of diabetes. Tumors that develop near the common bile duct can cause jaundice (yellowing of the skin and eyes), which sometimes allows the tumor to be diagnosed at an early stage. Signs of advanced stage disease may include severe abdominal pain, nausea, and vomiting.

Risk factors: The risk of pancreatic cancer in cigarette smokers is about twice that for never smokers. Use of smokeless tobacco also increases risk. Other risk factors include a family history of pancreatic cancer, a personal history of chronic pancreatitis or diabetes, and obesity. Individuals with Lynch syndrome and certain other genetic syndromes, and *BRCA1* and *BRCA2* mutation carriers, are also at increased risk.

Early detection: There is currently no reliable method for the early detection of pancreatic cancer.

Treatment: Surgery, radiation therapy, and chemotherapy are treatment options that may extend survival and/or relieve symptoms, but seldom produce a cure. Less than 20% of patients are candidates for surgery because pancreatic cancer is usually detected after it has spread beyond the pancreas. Even among patients who are thought to be surgical candidates, the cancer is often found to have spread too extensively to be removed. For those who undergo surgery, adjuvant treatment with chemotherapy (and sometimes radiation) may lower the risk of recurrence. For advanced disease, chemotherapy (sometimes along with a targeted therapy drug) may lengthen survival. Clinical trials are testing whether several new agents offer improved survival.

Survival: For all stages combined, the 1- and 5-year relative survival rates are 29% and 7%, respectively. Even for the small percentage of people diagnosed with local disease (9%), the 5-year survival is only 27%. More than half (53%) of patients are diagnosed at a distant stage, for which 1- and 5-year survival is 15% and 2%, respectively. Five-year relative survival is substantially higher for neuroendocrine (53%) than exocrine (5%) tumors.

Prostate

New cases: An estimated 180,890 new cases of prostate cancer will occur in the US during 2016. Prostate cancer is the most frequently diagnosed cancer in men aside from skin cancer. For reasons that remain unclear, the risk of prostate cancer is 70% higher in blacks than in non-Hispanic whites.

Incidence trends: In the late 1980s and early 1990s, incidence rates for prostate cancer spiked dramatically, in large part because of widespread screening with the prostate-specific antigen (PSA) blood test. From 2003 to 2012, rates decreased by 4.0% per year.

Deaths: With an estimated 26,120 deaths in 2016, prostate cancer is the second-leading cause of cancer death in men.

Mortality trends: Prostate cancer death rates have been decreasing since the early 1990s in men of all races/ethnicities, although they remain more than twice as high in blacks as in any other group (see Table 9, page 51). Overall, prostate cancer death rates decreased by 3.5% per year from 2003 to 2012. These declines are due to improvements in early detection and treatment.

Signs and symptoms: Early prostate cancer usually has no symptoms. With more advanced disease, men may experience weak or interrupted urine flow; difficulty starting or stopping the urine flow; the need to urinate frequently, especially at night; blood in the urine; or pain or burning with urination. Advanced prostate cancer commonly spreads to the bones, which can cause pain in the hips, spine, ribs, or other areas.

Risk factors: The only well-established risk factors for prostate cancer are increasing age, African ancestry, a family history of the disease, and certain inherited genetic conditions. Black men in the US and Caribbean men of African descent have the highest documented prostate cancer incidence rates in the world. Genetic studies suggest that strong familial predisposition may be responsible for 5%-10% of prostate cancers. Inherited conditions associated with increased risk include Lynch syndrome and *BRCA1* and *BRCA2* mutations. Studies suggest that obesity

and smoking do not increase the overall risk of developing prostate cancer, but may increase risk of developing aggressive/fatal disease.

Prevention: The chemoprevention of prostate cancer is an active area of research. Two drugs of interest, finasteride and dutasteride, reduce the amount of certain male hormones in the body and are approved to treat the symptoms of benign prostatic hyperplasia. Although these drugs also seem to reduce prostate cancer risk, neither is approved for the prevention of prostate cancer because they have not been shown to improve overall or prostate cancer-specific survival and also have important side effects (e.g., erectile dysfunction).

Early detection: No organizations presently endorse routine prostate cancer screening for men at average risk because of concerns about the high rate of overdiagnosis, along with the significant potential for serious side effects associated with prostate cancer treatment. The American Cancer Society recommends that beginning at age 50, men who are at average risk of prostate cancer and have a life expectancy of at least 10 years have a conversation with their health care provider about the benefits and limitations of PSA testing. Men should have an opportunity to make an informed decision about whether to be tested based on their personal values and preferences. Men at high risk of developing prostate cancer (black men or those with a close relative diagnosed with prostate cancer before the age of 65) should have this discussion beginning at age 45, and men at even higher risk (those with several close relatives diagnosed at an early age) should have this discussion at age 40.

Treatment: Treatment options vary depending on age, stage, and grade of cancer, as well as other medical conditions. Careful observation (called active surveillance) instead of immediate treatment is appropriate for many patients, particularly those diagnosed at an early stage or with less aggressive tumors and for older men. Treatment options include surgery (open, laparoscopic, or robotic-assisted), external beam radiation, or radioactive seed implants (brachytherapy). Hormonal therapy may be used along with surgery or radiation therapy in more advanced cases. Treatment often impacts a man's quality of life due to side effects or complications, such as urinary and erectile difficulties, which may be short or long term. Current research is exploring new biologic markers for prostate cancer in order to improve the distinction between indolent and aggressive disease to minimize unnecessary treatment.

Distant stage disease is treated with hormonal therapy, chemotherapy, radiation therapy, and/or other treatments. Hormone treatment may control advanced prostate cancer for long periods of time by shrinking the size or limiting the growth of the cancer, thus helping to relieve pain and other symptoms. Chemotherapy is often used if hormone treatments are no longer effective, although recent studies have shown that adding chemotherapy to initial hormone therapy may lengthen survival. An option for some men with advanced prostate cancer that is no longer responding to hormones is a cancer vaccine designed to stimulate the patient's immune system to specifically attack prostate cancer cells. Newer forms of hormone therapy have been shown to be beneficial for the treatment of metastatic disease that is resistant to initial hormone therapy and/or chemotherapy. Other types of drugs can be used to treat prostate cancer that has spread to the bones.

Survival: The majority (92%) of prostate cancers are discovered at a local or regional stage, for which the 5-year relative survival rate approaches 100%. Over the past 25 years, the 5-year relative survival rate for all stages combined has increased from 68% to 99% (Table 8, page 21), some of which is due to the detection of indolent disease. According to the most recent data, 10- and 15-year relative survival rates are 98% and 95%, respectively.

Skin

New cases: Skin cancer is the most commonly diagnosed cancer in the US. However, the actual number of the most common types – basal cell and squamous cell skin cancer (i.e., keratinocyte carcinoma or KC), also referred to as nonmelanoma skin cancer – is very difficult to estimate because these cases are not required to be reported to cancer registries. The most recent study of KC occurrence estimated that in 2012, 5.4 million cases were diagnosed among 3.3 million people (many people are diagnosed with more than one KC).

An estimated 76,380 new cases of melanoma will be diagnosed in 2016. Melanoma accounts for only 1% of all skin cancer cases, but the vast majority of skin cancer deaths. It is most commonly diagnosed in non-Hispanic whites; the annual incidence rate is 1 (per 100,000) in blacks, 4 in Hispanics, and 25 in non-Hispanic whites. Incidence rates are higher in women than in men before age 50, but by age 65, rates in men are double those in women, and by age 80 they are triple. This pattern reflects differences in occupational and recreational exposure to ultraviolet radiation by sex and age, which have changed over time.

Incidence trends: Overall, the incidence of cutaneous melanoma has risen rapidly over the past 30 years. However, the past 5 years of data indicate that rates are declining or plateauing among those younger than 50. For example, from 2008 to 2012, incidence rates declined by about 3% per year in both men and women ages 20-29. In contrast, among adults 50 and older, the incidence rate has increased by 2.6% per year since 1996.

Deaths: In 2016, an estimated 10,130 deaths from melanoma and 3,520 deaths from other types of skin cancer (not including KC) will occur.

Table 8. Five-year Relative Survival Rates* (%) by Stage at Diagnosis, US, 2005-2011

	All stages	Local	Regional	Distant		All stages	Local	Regional	Distant
Breast (female)	89	99	85	26	Ovary	46	92	73	28
Colon & rectum	65	90	71	13	Pancreas	7	27	11	2
Esophagus	18	40	22	4	Prostate	99	>99	>99	28
Kidney†	73	92	65	12	Stomach	29	65	30	5
Larynx	61	76	45	35	Testis	95	99	96	74
Liver‡	17	31	11	3	Thyroid	98	>99	98	54
Lung & bronchus	17	55	27	4	Urinary bladder§	77	70	34	5
Melanoma of the skin	92	98	63	17	Uterine cervix	68	92	57	17
Oral cavity & pharynx	63	83	62	38	Uterine corpus	82	95	68	17

*Rates are adjusted for normal life expectancy and are based on cases diagnosed in the SEER 18 areas from 2005-2011, all followed through 2012. †Includes renal pelvis. ‡Includes intrahepatic bile duct. §Rate for in situ cases is 96%.

Local: an invasive malignant cancer confined entirely to the organ of origin. **Regional:** a malignant cancer that 1) has extended beyond the limits of the organ of origin directly into surrounding organs or tissues; 2) involves regional lymph nodes; or 3) has both regional extension and involvement of regional lymph nodes. **Distant:** a malignant cancer that has spread to parts of the body remote from the primary tumor either by direct extension or by discontinuous metastasis to distant organs, tissues, or via the lymphatic system to distant lymph nodes.

Source: Howlader N, Noone AM, Krapcho M, et al. (eds). SEER Cancer Statistics Review, 1975-2012, National Cancer Institute, Bethesda, MD, http://seer.cancer.gov/csr/1975_2012/, based on November 2014 SEER data submission, posted to the SEER website April 2015.

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Mortality trends: Although overall mortality rates have been stable since the late 1980s, these trends also vary by age. While rates in individuals younger than 50 have been declining by 2.6% per year since 1986, they have been increasing by 0.6% per year since 1990 among those 50 and older.

Signs and symptoms: Warning signs of skin cancer include changes in the size, shape, or color of a mole or other skin lesion, the appearance of a new growth on the skin, or a sore that doesn't heal. Changes that progress over a month or more should be evaluated by a health care provider. Basal cell carcinoma may appear as a growth that is flat, or as a small, raised pink or red translucent, shiny area that may bleed following minor injury. Squamous cell carcinoma may appear as a growing lump, often with a rough surface, or as a flat, reddish patch that grows slowly.

Risk factors: For melanoma, major risk factors include a personal or family history of melanoma and the presence of atypical, large, or numerous (more than 50) moles. High exposure to ultraviolet (UV) radiation, from sunlight or use of indoor tanning, is a major risk factor for all types of skin cancer. (The International Agency for Research on Cancer has classified indoor tanning devices as "carcinogenic to humans" based on an extensive review of scientific evidence.) People at highest risk include those with sun sensitivity (e.g., sunburning easily, difficulty tanning, or natural blond or red hair color); a history of excessive sun exposure, including sunburns; diseases or treatments that suppress the immune system; and a past history of skin cancer.

Prevention: Minimize skin exposure to intense UV radiation by seeking shade; wearing protective clothing (long sleeves, long pants or skirts, tightly woven fabric, and a wide-brimmed hat); wearing sunglasses that block ultraviolet rays; applying broad-spectrum sunscreen that has a sun protection factor (SPF) of 30 or higher to unprotected skin; and not sunbathing or indoor tanning. Children should be especially protected from the sun because severe sunburns in childhood may greatly increase the risk of melanoma. In July 2014, the US Surgeon General released a Call to Action to Prevent Skin Cancer, citing the elevated and growing burden of this disease. The purpose of this initiative is to increase awareness and encourage all Americans to engage in behaviors that reduce the risk of skin cancer. See surgeongeneral.gov/library/calls/prevent-skin-cancer/call-to-action-prevent-skin-cancer.pdf for more information.

Early detection: The best way to detect skin cancer early is to recognize new or changing skin growths, particularly those that look different from other moles. All major areas of the skin should be examined regularly, and any new or unusual lesions, or a progressive change in a lesion's appearance (size, shape, or color, etc.), should be evaluated promptly by a physician. The ABCDE rule outlines warning signs 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); and E is for evolution. Not all melanomas have these signs, so be alert for any new or changing skin growths or spots.

Treatment: Most early skin cancers are diagnosed and treated by removal and microscopic examination of the cells. Early stage KC can be treated in most cases by one of several methods: 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 and certain topical medications may be used. For melanoma, the primary growth and surrounding normal tissue are removed and sometimes a sentinel lymph node is biopsied to determine stage. More extensive lymph node surgery may be needed if the sentinel lymph nodes contain cancer. Melanomas with deep invasion or that have spread to lymph nodes may be treated with surgery, immunotherapy, chemotherapy, and/or radiation therapy. The treatment of advanced melanoma has changed greatly in recent years with the FDA approval of several new immunotherapy and targeted drugs, which shrink a large portion of melanomas. Chemotherapy might be used, although it is usually less effective than newer treatments.

Survival: Almost all cases of KC can be cured, especially if the cancer is detected and treated early. Although melanoma is also highly curable when detected in its earliest stages, it is more likely than KC to spread to other parts of the body. The 5- and 10-year relative survival rates for people with melanoma are 92% and 89%, respectively. The 5-year survival rate is 98% for localized melanoma (84% of cases), but declines to 63% and 17% for regional and distant stage disease, respectively (Table 8, page 21).

Thyroid

New cases: An estimated 64,300 new cases of thyroid cancer are expected to be diagnosed in 2016 in the US, with 3 out of 4 cases occurring in women.

Incidence trends: Thyroid cancer has been increasing worldwide over the past few decades and is the most rapidly increasing cancer in the US. The rise is thought to be partly due to increased detection because of more sensitive diagnostic procedures, likely resulting in some overdiagnoses. In the US, rates increased by 5.1% per year from 2003 to 2012.

Deaths: An estimated 1,980 deaths from thyroid cancer are expected in 2016.

Mortality trends: Death rates for thyroid cancer were stable from 2003 to 2012.

Signs and symptoms: The most common symptom of thyroid cancer is a lump in the neck that is noticed by a patient or felt by a clinician during an exam. Other symptoms include a tight or full feeling in the neck, difficulty breathing or swallowing, hoarseness, swollen lymph nodes, and pain in the throat or neck that does not go away. Many thyroid cancers are diagnosed in people without symptoms because an abnormality is seen on an imaging test performed for another purpose.

Risk factors: Risk factors for thyroid cancer include being female, having a history of goiter (enlarged thyroid) or thyroid nodules, a family history of thyroid cancer, and radiation exposure early in life (e.g., as a result of medical treatment). People who test positive for a mutation in a gene called *RET*, which causes a hereditary form of thyroid cancer (familial medullary thyroid carcinoma), can lower their risk of developing the disease by having the thyroid gland surgically removed. Certain rare genetic syndromes, such as familial adenomatous polyposis (FAP), also increase risk. Unlike most other adult cancers, for which older age increases risk, 70% of cases are diagnosed in patients younger than age 60.

Early detection: At present, there is no screening test recommended for the early detection of thyroid cancer. However, because symptoms usually develop early and many cancers are found incidentally, two-thirds of thyroid cancers are diagnosed at an early stage.

Treatment: Most thyroid cancers are highly curable, though about 5% (medullary and anaplastic thyroid cancers) are more aggressive and more likely to spread to other organs. Treatment depends on the cell type, tumor size, and extent of disease. The first choice of treatment is usually surgery to partially or totally remove the thyroid gland (thyroidectomy) and sometimes nearby lymph nodes. Treatment with radioactive iodine (I-131) after complete thyroidectomy to destroy any remaining thyroid tissue may be recommended for large tumors or when cancer has spread outside the thyroid. Thyroid hormone replacement therapy is given after thyroidectomy to replace hormones normally made by the thyroid gland and to prevent the body from making thyroid-stimulating hormone, decreasing the likelihood of recurrence. For some types of advanced thyroid cancer, targeted drugs can be used to help shrink or slow tumor growth.

Survival: The 5-, 10-, and 15-year relative survival rates are 98%, 97%, and 95% respectively. However, survival varies by stage (Table 8, page 21), age at diagnosis, and disease subtype.

Urinary Bladder

New cases: An estimated 76,960 new cases of bladder cancer are expected to occur in 2016. Bladder cancer incidence is about 4 times higher in men than in women and almost 2 times higher in white men than in black men.

Incidence trends: After decades of slowly increasing, bladder cancer incidence has begun to decline. From 2003 to 2012, rates decreased by 0.5% per year.

Deaths: An estimated 16,390 deaths will occur in 2016.

Mortality trends: Death rates for urinary bladder cancer have been stable since 1987 in men and decreasing by 0.4% per year since 1986 in women.

Signs and symptoms: Bladder cancer is usually detected early because of blood in the urine or other symptoms, including increased frequency or urgency of urination or pain or irritation during urination.

Risk factors: Smoking is the most well-established risk factor for bladder cancer, accounting for about half of all cases. Risk is also increased among workers in the dye, rubber, leather, and aluminum industries; painters; people who live in communities with high levels of arsenic in the drinking water; and people with certain bladder birth defects.

Early detection: There is currently no screening method recommended for people at average risk. Bladder cancer is diagnosed by microscopic examination of cells from urine or bladder tissue and examination of the bladder wall with a cystoscope, a slender tube fitted with a lens and light that is inserted through the urethra. These and other tests may be used to screen people at increased risk, as well as during follow-up after bladder cancer treatment to detect recurrent or new tumors.

Treatment: Surgery, alone or in combination with other treatments, is used in more than 90% of cases. Early stage cancers may be treated by removing the tumor and then administering immunotherapy or chemotherapy drugs directly into the bladder. More advanced cancers may require removal of the entire bladder (cystectomy). Patient outcomes are improved with the use of chemotherapy, alone or with radiation, before cystectomy. Timely follow-up care is extremely important because of the high rate of bladder cancer recurrence.

Survival: For all stages combined, the 5-year relative survival rate is 77%. Survival declines to 70% at 10 years and 65% at 15 years after diagnosis. Half of all bladder cancer patients are diagnosed while the tumor is in situ (noninvasive, present only in the layer of cells in which the cancer developed), for which the 5-year survival is 96%.

Uterine Cervix

New cases: An estimated 12,990 cases of invasive cervical cancer are expected to be diagnosed in 2016.

Incidence trends: The cervical cancer incidence rate declined by half between 1975 (14.8 per 100,000) and 2012 (6.7 per 100,000) due to the widespread uptake of screening with the Pap test and removal of precancerous lesions. However, declines in younger women have begun to slow in recent years. From 2008 to 2012, incidence rates stabilized in women younger than 50 years of age and decreased by 3.0% per year among in women 50 or older.

Deaths: An estimated 4,120 deaths from cervical cancer will occur in 2016.

Mortality trends: Like incidence, the cervical cancer death rate in 2012 (2.3 per 100,000) was less than half that in 1975 (5.6 per 100,000) due to declines in incidence and the early detection of cancer with the Pap test. However, the magnitude of the decline has begun to slow in recent years in women of all ages, indicating that rates may be approaching a lower limit; from 2003 to 2012, the death rate decreased by 0.9% per year.

Signs and symptoms: Preinvasive cervical lesions often have no symptoms. Once abnormal cervical cells become cancerous and invade nearby tissue, the most common symptom is abnormal vaginal bleeding, which may start and stop between regular menstrual periods or occur after sexual intercourse, douching, or a pelvic exam. Menstrual bleeding may last longer and be heavier than usual. Bleeding after menopause and increased vaginal discharge may also be symptoms.

Risk factors: Most cervical cancers are caused by persistent infection with certain types of human papillomavirus (HPV). While women who begin having sex at an early age or who have had many sexual partners are at increased risk for HPV infection and cervical cancer, a woman may be infected with HPV even if she has had only one sexual partner. In fact, HPV infections are common in healthy women and only rarely cause cervical cancer. Both persistence of HPV infection and progression to cancer may be influenced by many factors, including a suppressed immune system, a high number of childbirths, and cigarette smoking. Long-term use of oral contraceptives (birth control pills) is also associated with increased risk of cervical cancer.

Prevention: Vaccines are available to protect against the most common types of HPV that cause cervical cancer. Vaccination is recommended for use in girls 11 to 12 years of age, but may be given as young as age 9 and up to age 26. HPV vaccines cannot protect against established infections, nor do they protect against all types of HPV, which is why vaccinated women should still be screened for cervical cancer.

Screening can prevent cervical cancer by detecting precancerous lesions that can be treated so they do not progress to cancer. As screening has become more common, precancerous lesions of the cervix are detected far more frequently than invasive cancer. The Pap test is a simple procedure in which a small sample of cells is collected from the cervix and examined under a microscope. HPV tests, which detect HPV infections associated with cervical cancer, can forecast cervical cancer risk many years in the future and are currently recommended to be used in conjunction with the Pap test in some women, either as an additional screening test or when Pap test results are uncertain. HPV tests can also identify women at risk for an uncommon type of cervical cancer (adenocarcinoma) that is often missed by Pap tests.

Most cervical precancers develop slowly, so cancer can usually be prevented if a woman is screened regularly. It is important for all women, even those who have received the HPV vaccine, to follow cervical cancer screening guidelines.

Early detection: In addition to preventing cervical cancer, screening can detect invasive cancer early, when treatment is most likely to be successful. Most women diagnosed with cervical cancer have never or not recently been screened. The American Cancer Society, in collaboration with the American Society for Colposcopy and Cervical Pathology and the American Society for Clinical Pathology, issued new screening guidelines for the prevention and early detection of cervical cancer in 2012. The most important changes to the guidelines were the age range for which screening is appropriate (ages 21 to 65) and the emphasis on the incorporation of HPV testing in addition to the Pap test (for ages 30 to 65). For more detailed information on the American Cancer Society's screening guidelines for the early detection of cervical cancer, see page 66.

Treatment: Precancerous cervical lesions may be treated with a loop electrosurgical excision procedure (LEEP), which removes abnormal tissue with a wire loop heated by electric current; cryotherapy (the destruction of cells by extreme cold); laser ablation (removal of tissue); or conization (the removal of a cone-shaped piece of tissue containing the abnormal tissue). Invasive cervical cancers are generally treated with surgery or radiation combined with chemotherapy. Chemotherapy alone is often used to treat advanced disease. However, for women with metastatic, recurrent, or persistent cervical cancer, the addition of targeted therapy to standard chemotherapy has been shown to improve overall survival.

Survival: Five- and 10-year relative survival rates for cervical cancer patients are 68% and 64%, respectively. Almost half of patients (46%) are diagnosed when the cancer is localized, for which the 5-year survival is 92% (Table 8, page 21).

Uterine Corpus (Endometrium)

New cases: An estimated 60,050 cases of cancer of the uterine corpus (body of the uterus) are expected to be diagnosed in 2016. Cancer of the uterine corpus is often referred to as endometrial cancer because most cases (92%) occur in the endometrium (lining of the uterus).

Incidence trends: Incidence rates have been increasing among women younger than 50 years of age by 1.3% per year since 1988 and among women 50 and older by 1.9% per year since 2005.

Deaths: An estimated 10,470 deaths are expected in 2016.

Mortality trends: From 2003 to 2012, death rates for cancer of the uterine corpus increased by 1.1% per year.

Signs and symptoms: Abnormal uterine bleeding or spotting (especially in postmenopausal women) is a frequent early sign. Pain during urination, intercourse, or in the pelvic area can also be a symptom.

Risk factors: Obesity and abdominal fatness increase the risk of uterine cancer, most likely by increasing the amount of circulating estrogen, which is a strong risk factor. Other factors that increase estrogen exposure include menopausal estrogen therapy, late menopause, never having children, and a history of polycystic ovary syndrome. (Estrogen plus progestin menopausal hormone therapy does not appear to increase risk.) Tamoxifen, a drug used to treat breast cancer, increases risk slightly because it has estrogen-like effects on the uterus. Medical conditions that increase risk include Lynch syndrome and diabetes. Pregnancy, use of oral contraceptives or intrauterine devices, and physical activity are associated with reduced risk.

Early detection: There is no standard or routine screening test for women at average risk. Most cases (67%) are diagnosed at an early stage because of postmenopausal bleeding. Women are encouraged to report any unexpected bleeding or spotting to their physicians. The American Cancer Society recommends that women with known or suspected Lynch syndrome be offered annual screening with endometrial biopsy and/or transvaginal ultrasound beginning at age 35.

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

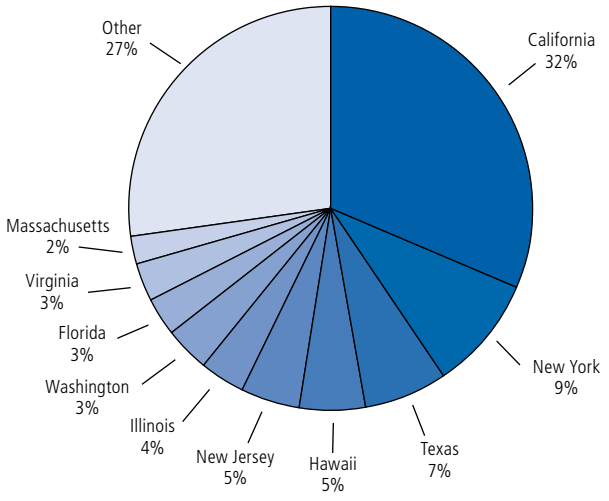
Survival: The 5- and 10-year relative survival rates for uterine cancer are 82% and 79%, respectively. The 5-year survival is substantially higher for whites (84%) than for blacks (62%). This is partly because white women are more likely than black women to be diagnosed with local stage disease (69% versus 53%).

Special Section: Cancer in Asian Americans, Native Hawaiians, and Pacific Islanders

Introduction

Asian Americans are the fastest-growing racial/ethnic group in the US, representing 6.3% of the population (20.0 million/318.7 million) in 2014.[1] In contrast to Hispanics, the rapid growth of the Asian American population is driven by immigration as opposed to native births.[2] The Native Hawaiian and Pacific Islander (NHPI) population (1.5 million) is also among the fastest-growing groups.[1, 3] The term Asian refers to people with origins in the Far East, Southeast Asia, or the Indian subcontinent and includes, but is not limited to, Asian Indian, Cambodian, Chinese, Filipino, Hmong, Japanese, Korean, Pakistani, and Vietnamese.[4] The term NHPI refers to people with origins in Hawaii, Guam, Samoa, or other Pacific Islands.[3] According to the US Census, a person may be Asian American or NHPI alone or in combination with other races.[3, 4] While Asian Americans and NHPIs are distinct racial groups with very different cancer profiles, unfortunately demographic and health data are usually available only in aggregate. These two groups are collectively referred to as Asian American, Native Hawaiian, and Pacific Islander (AANHPI), Asian American and Pacific Islander (AAPI), or Asian and Pacific Islander (API).

Figure S1. AANHPI Population by State, 2013



AANHPI = Asian American, Native Hawaiian, and Pacific Islander.

Source: US Census Bureau Population Estimates Program, modified in collaboration with the National Center for Health Statistics with support from the National Cancer Institute, accessed through Surveillance, Epidemiology, and End Results (SEER) Program, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

The largest Asian subpopulation in the US is Chinese (23%), followed by Filipino (20%), Asian Indian (18%), Vietnamese (10%), Korean (10%), Japanese (8%), and 2% or less for Pakistani, Cambodian, Hmong, and other groups.[4] The largest NHPI subpopulation is Native Hawaiian (43%), followed by Samoan (15%), Guamanian or Chamorro (12%), and Tongan (5%).[3] Ten US states are home to 73% of the overall AANHPI population (Figure S1); California has the largest population with 32%, followed by New York (9%), Texas (7%), Hawaii (5%), and New Jersey (5%). Notably, AANHPIs comprise 71% and 15% of the total population in Hawaii and California, respectively. AANHPI populations are generally concentrated in urban areas.

Sociodemographic Characteristics

AANHPI subgroups have highly heterogeneous demographic characteristics. For example, the median age among the largest subgroups ranges from 22 in Hmong to 37 in Japanese (Table S1, page 26). Some groups are largely composed of native-born US citizens, such as Native Hawaiians (98%), Samoans (91%), and Japanese (75%), while others are more likely to be foreign-born, such as Asian Indians (68%). Longer duration in the US is generally associated with the adoption of an American lifestyle, which can influence the prevalence of cancer risk factors, such as smoking and excess body weight.[5, 6] In addition, the ability to access preventive and health care services can be hampered by language barriers.[7] About 50% of Vietnamese and 40% of Chinese, Koreans, Cambodians, and Hmong report speaking a language other than English at home and speaking English less than "very well" (Table S1, page 26).

The variation in socioeconomic status between AANHPI subgroups is striking.[8] For example, more than one-third of Japanese, Filipinos, and Asian Indians have a bachelor's degree or higher and only about 5% live in poverty, compared to 12% and 20%, respectively, of Cambodians and Hmong (Table S1, page 26).

Overall cancer statistics

Cancer patterns in AANHPIs are more similar to Hispanics than NHWs, with lower rates for the most common cancers and higher rates for cancers associated with infectious agents. However, cancer rates within the AANHPI population vary by immigration history, origin, acculturation, and socioeconomic status. For example, lung cancer incidence rates range from 21.1 (per 100,000) in Asian Indian/Pakistani men to 98.9 in Samoan men; these distinctions are masked in aggregated statistics.

Table S1. Sociodemographic Characteristics of AANHPIs by Subgroup, 2011-2013

	Total Asian	Chinese	Filipino	Asian Indian	Vietnamese	Korean	Japanese	Pakistani	Cambodian	Hmong	Laotian	Native Hawaiian	Samoan
Median age	34	35	34	32	35	34	37	29	29	22	29	27	23
Nativity and citizenship (%)													
Native	41	39	49	32	37	39	75	37	47	61	51	98	91
Foreign-born, naturalized citizen	34	36	34	34	47	35	8	38	36	27	34	1	5
Foreign-born, not a citizen	25	25	17	34	16	26	17	25	17	12	15	1	4
Average household size (n of persons)	3.1	2.9	3.4	3.1	3.5	2.7	2.4	4.0	3.9	5.1	3.8	3.2	4.1
Language spoken at home and English-speaking ability (%)													
Only English spoken at home	31	26	46	24	17	32	68	16	25	12	26	89	58
Non-English at home	69	74	55	76	83	68	32	84	75	88	75	11	43
Non-English at home, English spoken less than "very well"	31	41	18	21	49	38	15	27	39	38	35	2	11
Poverty (%)	10	11	6	6	14	12	5	16	20	25	15	13	17
Per capita income ($)	29,630	31,382	26,514	40,221	22,234	27,088	32,923	25,135	16,472	11,938	17,183	20,740	15,021
Educational attainment (%)													
Less than high school graduate	14	18	7	9	29	7	5	13	35	33	31	9	12
High school graduate	16	15	16	9	22	18	19	15	25	23	30	36	37
Some college or associate's degree	21	16	31	11	23	22	29	18	25	28	26	35	37
Bachelor's degree or higher	29	26	37	32	19	34	31	30	12	13	10	14	10

AANHPI = Asian American, Native Hawaiian, and Pacific Islander.

Source: US Census Bureau, 2011-2013 3-Year American Community Survey.

American Cancer Society, Inc., Surveillance Research, 2016

Cancer is the leading cause of death among AANHPIs, accounting for 27% of all deaths (Table S2, page 28). Among non-Hispanic whites, heart disease remains the leading cause of death, followed by cancer. However, the cancer death rate in AANHPIs (104.2 per 100,000) is about 40% lower than that in NHWs (170.2).

The lifetime probability of developing cancer among AANHPIs is 36% in males and 33% in females (Table S3, page 29), compared to 42% and 38% in NHW males and females, respectively. In 2016, an estimated 57,740 new cancer cases and 16,910 cancer deaths will occur among AANHPIs. According to these estimates, the most commonly diagnosed cancers among males are prostate (18%), lung (14%), and colorectum (12%) (Figure S2, page 29). Among females, the most common cancers are breast (34%), thyroid (10%), and lung (9%). The three leading causes of cancer death are lung (27%), liver (14%), and colorectum (11%) among males, and lung (21%), breast (14%), and colorectum (11%) among females.

As mentioned previously, there is substantial variation in cancer occurrence among AANHPI subgroups. For both males and females, Samoans and Native Hawaiians have the highest overall cancer incidence rates, while Asian Indians and Pakistanis (grouped together) and Cambodians have the lowest rates (Figure S4, page 31).

Overall cancer incidence rates declined from 2003 to 2012 (the most recent 10 years for which data are currently available) among AANHPI males by 1.9% annually, compared with declines of 1.5% annually among NHW males.[9] During the same period, incidence rates remained stable among both AANHPI and NHW females (Figure S5, page 32). However, mortality rates during this period declined among both AANHPI males and females by 1.5% and 0.8% annually, respectively, similar to the declines in NHWs.[10] Trends in cancer occurrence among Asian Americans are influenced not only by the risk factor profiles of those living in the US, but also by the influx of immigrants.

Overall five-year cancer survival among AANHPIs compared with NHWs is lower for males (62% versus 68%) and similar for females (70% versus 68%; Figure S6, page 33). Survival is notably higher among AANHPIs for stomach, liver, and nasopharyngeal cancers, while it is similar for other major cancer sites (Figure S6, page 33). Survival statistics for minority groups in the US are particularly influenced by incomplete follow-up of cancer patients due to lost contact or inability to link to death registries, artificially inflating rates by as much as 6 percentage points among Asian Americans.[11] Lost contact of cancer patients is sometimes the result of terminally ill people returning to their country of origin. As a result, comparisons of survival between racial/ethnic groups should be interpreted with caution.

Data limitations

The data presented in this report have several limitations and should be interpreted with caution. First, data are limited for racial and ethnic subpopulations, so many statistics are presented for Asian Americans, Native Hawaiians, and Pacific Islanders in aggregate, masking important differences within this heterogeneous group. For example, cancer risk factor data are only available for the three largest AANHPI subgroups (Chinese, Filipino, and Asian Indian) because estimates for other groups are unreliable due to insufficient representation in national population-based surveys; questionnaires only in English or limited Asian languages may also exclude some Asian Americans. NHPIs in particular have very distinct cancer risk profiles that are obscured when combined with Asian Americans. Increasing recognition of the need to improve health information for AANHPIs led the US Department of Health & Human Services to develop new standards for collecting data on race and ethnicity that will allow for more data reporting for the largest AANHPI subgroups in the future. In addition, data from the first NHPI National Health Interview Survey are forthcoming.

Second, much of the demographic information in health records, such as place of birth and racial/ethnic identity, is often incorrect or incomplete for minority patients. This can occur when information is assigned by a health care worker instead of obtained directly from the patient or their family. The resulting misclassification leads to inaccurate, often underestimated cancer rates. Similarly, it has been shown that a small percentage of decedents who had self-reported as AANHPIs were not recorded as such on death certificates. The standard US death certificate was revised in 2003 to include several AANHPI subgroups and had been adopted by 44 states in 2012. This change will improve the availability of disaggregated death data for AANHPIs, although issues of misclassification will likely persist.

Third, there are challenges when calculating statistics for racial/ethnic subgroups, especially those that are rapidly growing and changing. For example, population size, which is necessary for computing rates, is often difficult to estimate. Also, rates for subpopulations that are based on small numbers may be unreliable.

For information on data sources and methodology, please see Sources of Statistics on page 64.

Major cancer sites

Female breast

Breast cancer is the most commonly diagnosed cancer and the second leading cause of cancer death among AANHPI women, with a total of 11,090 new invasive cases and 1,180 deaths expected to occur in 2016 (Figure S2, page 29). About one in 10 AANHPI women will be diagnosed with breast cancer in her lifetime (Table S3, page 29). Age-standardized breast cancer incidence and mortality rates are 30% and 50% lower, respectively, than those in NHWs (Figure S3, page 30). There is substantial variation in breast cancer occurrence within the AANHPI population, with lower rates among groups that have immigrated more recently. Incidence rates range from 35.0 (per 100,000) in Cambodian women to 135.9 in Native Hawaiian women (Figure S4, page 31). These differences are thought to be related to extent of adoption of western behaviors that increase breast cancer risk, such as a later age at childbirth, fewer births, and higher body weight.[12] A California study found breast cancer rates to be generally higher among US-born compared to foreign-born Asian American women.[13] Breast cancer incidence rates in AANHPI countries of origin are generally substantially lower than in the US;[14] however, in many Asian countries, risk among recent generations is approaching that in the US.[15]

Breast cancer incidence rates among AANHPI women have been increasing gradually since 2005 (Figure S7, page 33). From 2003 to 2012, in contrast to stable rates in NHWs, rates in AANHPIs increased by 1.1% annually.[9] Reasons for this increase are thought to include changes in factors such as body weight and reproductive patterns following immigration and acculturation.[12, 16] Recent uptake of mammography screening among Asian Americans may also have contributed.[12, 17, 18] Increases in incidence of in situ breast cancers among AANHPIs since 1992 are consistent with increased screening.[19] Breast cancer mortality rates decreased by 1.4% annually from 2003 to 2012 among AANHPI women and by 1.9% annually among NHWs.[10] These reductions have been attributed to improvements in both treatment and early detection.[20]

The stage at breast cancer diagnosis is similar in AANHPIs and NHWs (Figure S8, page 34), although the overall 5-year cause-specific survival is slightly higher among AANHPI women (Figure S6, page 33). However, there are some notable differences in survival by nativity and between AANHPI subgroups. A study in California showed that compared with foreign-born women, those who are US-born are more likely to be diagnosed with breast cancer at a localized stage and have higher survival after adjusting for stage and other prognostic factors.[21] Compared to NHWs, survival rates are higher in Japanese but lower in NHPIs.[22] Factors thought to contribute to the Japanese survival advantage include lower body weight and healthy diet.[22, 23] Differences in survival between Asian American subgroups may also reflect biological differences in tumor characteristics;[24] a study in California showed differing prevalence of breast cancer subtypes, each with distinct treatment needs and prognosis, among Asian American subgroups.[25]

Table S2. Leading Causes of Death among AANHPIs and NHWs, US, 2012

	Asian American, Native Hawaiian, and Pacific Islander				Non-Hispanic white			
	Rank	Number of deaths	Percent of total deaths	Death rate	Rank	Number of deaths	Percent of total deaths	Death rate
Cancer	1	15,340	27.2	104.2	2	462,499	22.9	170.2
Heart diseases	2	12,266	21.8	92.0	1	481,991	23.9	171.2
Cerebrovascular diseases	3	4,108	7.3	30.8	4	100,154	5.0	35.5
Accidents (unintentional injuries)	4	2,372	4.2	15.0	5	99,288	4.9	43.7
Diabetes	5	2,158	3.8	15.7	7	50,443	2.5	18.5
Influenza and pneumonia	6	1,745	3.1	13.9	8	40,460	2.0	14.3
Chronic lower respiratory diseases	7	1,624	2.9	12.8	3	127,116	6.3	46.2
Alzheimer's disease	8	1,379	2.4	11.6	6	72,772	3.6	24.9
Suicide	9	1,152	2.0	6.2	9	33,727	1.7	15.7
Nephritis, nephrotic syndrome & nephrosis	10	1,054	1.9	8.0	10	33,105	1.6	11.8
All causes		56,352	100.0	406.1		2,016,896	100.0	742.3

AANHPI = Asian American, Native Hawaiian, and Pacific Islander. NHW = Non-Hispanic white. Rates are per 100,000 and age-adjusted to the 2000 US standard population.
Source: US Mortality Data, National Center for Health Statistics, Centers for Disease Control and Prevention, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

Lung and bronchus

Among AANHPIs, an estimated 3,460 men and 3,030 women will be diagnosed with lung cancer in 2016 (Figure S2). Lung cancer is the leading cause of cancer death among both men and women. Although incidence and mortality are roughly half that among NHWs, risk varies substantially by subgroup (Figure S3, page 30). The highest lung cancer incidence rate in men is in Samoans (98.9 per 100,000), followed by Native Hawaiians (72.1) and Vietnamese (62.7), while Asians Indians/Pakistanis have the lowest rate (21.1) (Figure S4, page 31). The highest rate in AANHPI women is in Native Hawaiians (44.0), followed closely by Samoans (41.8), with the lowest rate also in Asian Indians/Pakistanis (10.2).

In the US, smoking causes 83% and 76% of all lung cancer deaths among men and women, respectively.[26] Data on historical trends in smoking prevalence for AANHPIs are scarce. A survey of smoking status in 2002–2005 found that 42% and 27% of NHPI men and women, respectively, were current smokers compared to 21% and 4% of Indian/Pakistani men women.[27] Notably, lung cancer rates among Chinese women in both Asia and the US are relatively high given the low prevalence of smoking in this group. This may be attributable to exposure to cooking oils at high heat, secondhand smoke, genetic susceptibility, or other unknown risk factors.[28-31]

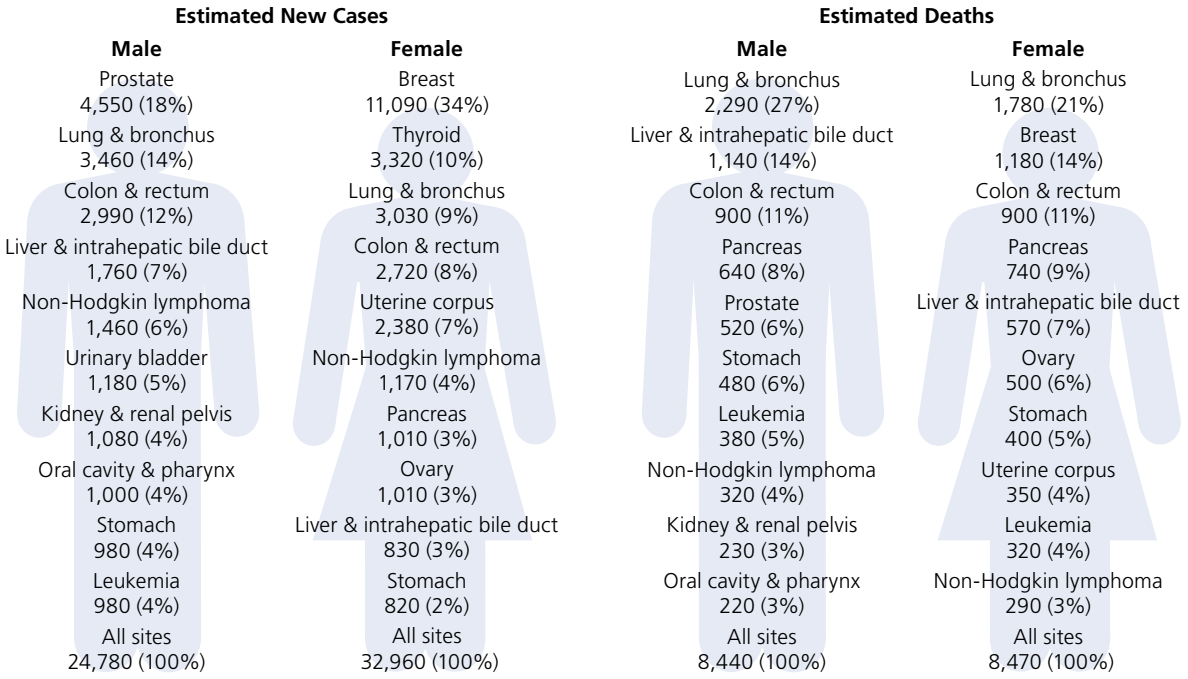
Since the early 1990s, when data became available, lung cancer occurrence has been decreasing among AANHPI men and relatively stable among women (Figure S7, page 33, and Figure S9, page 35).[19] From 2003 to 2012, incidence and death rates decreased in men by about 2% annually among AANHPIs and by about 2.5% annually among NHWs.[9, 10] Among AANHPI women, incidence rates were stable while death rates declined by 0.5% per year; in contrast, among NHW women, incidence and death rates decreased by about 1% annually.[9, 10]

AANHPIs are more likely than NHWs to be diagnosed with lung cancer at a distant stage of disease (58% versus 52%; Figure S8, page 34); however, five-year cause-specific survival is similar (Figure S6, page 33). AANHPIs and NHWs are equally likely to receive appropriate treatment for lung cancer.[32] The reasons for the roughly equivalent survival in AANHPIs given later stage at diagnosis are unknown, but may include genetic and/or cultural factors[32] or loss of patient contact.

Colon and rectum

Among AANHPIs, an estimated 2,990 men and 2,720 women will be diagnosed with colorectal cancer in 2016 (Figure S2). It is the third leading cause of cancer death among both AANHPI men and women. Incidence and death rates are 20% lower and 30% lower, respectively, compared to NHWs (Figure S3, page 30). However, within AANHPI subgroups, colorectal cancer incidence rates are about three times higher in Japanese than in Asian Indians/Pakistanis (Figure S4, page 31). Higher incidence rates among US-born compared to foreign-born Chinese and Filipinos in a California study are likely due to a higher prevalence of behaviors associated with colorectal cancer risk, such as unhealthy diet, physical inactivity, and smoking.[33]

Figure S2. Leading Sites of New Cancer Cases and Deaths among AANHPIs – 2016 Estimates



AANHPI = Asian American, Native Hawaiian, and Pacific Islander. Estimates are rounded to the nearest 10, and cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

Table S3. Probability (%) of Developing Invasive Cancer among AANHPIs during Selected Age Intervals by Sex, US, 2010-2012*

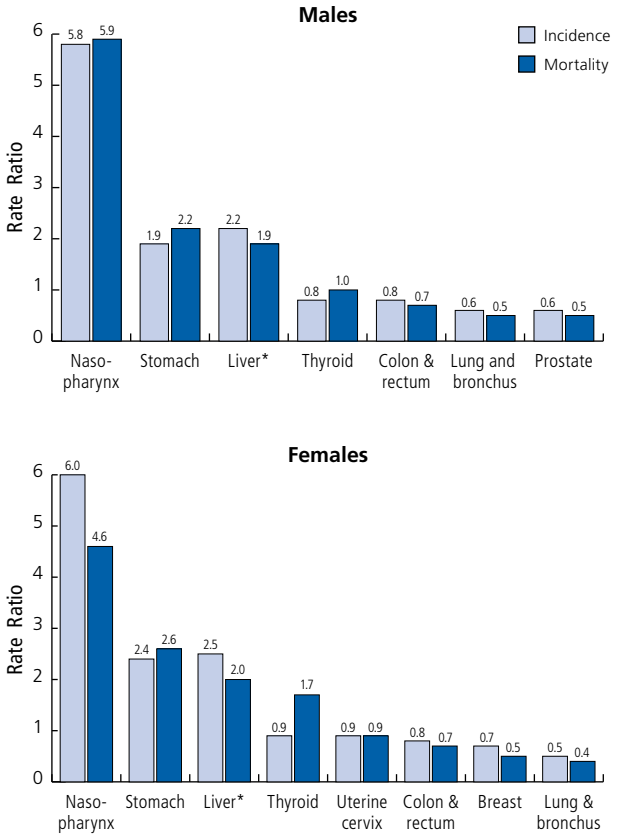
		Birth to 49	50 to 59	60 to 69	70 and older	Birth to death
All sites†	Male	2.2 (1 in 46)	3.8 (1 in 26)	9.0 (1 in 11)	29.2 (1 in 3)	36.2 (1 in 3)
	Female	4.5 (1 in 22)	4.7 (1 in 21)	7.1 (1 in 14)	22.6 (1 in 4)	33.3 (1 in 3)
Breast	Female	1.8 (1 in 56)	2.0 (1 in 50)	2.7 (1 in 37)	4.7 (1 in 21)	10.3 (1 in 10)
Colon & rectum	Male	0.3 (1 in 347)	0.6 (1 in 159)	1.2 (1 in 86)	3.9 (1 in 25)	5.3 (1 in 19)
	Female	0.3 (1 in 377)	0.5 (1 in 214)	0.8 (1 in 130)	3.5 (1 in 29)	4.6 (1 in 22)
Liver & intrahepatic bile duct	Male	0.2 (1 in 644)	0.4 (1 in 249)	0.6 (1 in 157)	1.7 (1 in 59)	2.6 (1 in 39)
	Female	<0.1 (1 in 2,828)	0.1 (1 in 1,152)	0.2 (1 in 431)	1.0 (1 in 96)	1.3 (1 in 78)
Lung & bronchus	Male	0.1 (1 in 789)	0.4 (1 in 229)	1.3 (1 in 78)	6.0 (1 in 17)	6.8 (1 in 15)
	Female	0.1 (1 in 823)	0.3 (1 in 318)	0.8 (1 in 128)	3.6 (1 in 28)	4.4 (1 in 23)
Prostate	Male	0.1 (1 in 1,086)	0.8 (1 in 122)	3.0 (1 in 33)	7.0 (1 in 14)	9.4 (1 in 11)
Stomach	Male	0.1 (1 in 1,411)	0.2 (1 in 640)	0.4 (1 in 273)	1.8 (1 in 57)	2.1 (1 in 49)
	Female	0.1 (1 in 1,500)	0.1 (1 in 1,155)	0.2 (1 in 491)	1.2 (1 in 84)	1.4 (1 in 70)
Thyroid	Male	0.2 (1 in 605)	0.1 (1 in 878)	0.2 (1 in 683)	0.2 (1 in 420)	0.6 (1 in 163)
	Female	0.7 (1 in 136)	0.3 (1 in 291)	0.3 (1 in 302)	0.5 (1 in 209)	1.8 (1 in 55)
Uterine cervix	Female	0.2 (1 in 537)	0.1 (1 in 917)	0.1 (1 in 901)	0.3 (1 in 372)	0.6 (1 in 156)

AANHPI = Asian American, Native Hawaiian, and Pacific Islander. *For those free of cancer at beginning of each age interval. †All sites excludes basal and squamous cell skin cancers and in situ cancers except urinary bladder.

Source: DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.3. Statistical Research and Applications Branch, National Cancer Institute, 2015. http://surveillance.cancer.gov/devcan.

American Cancer Society, Inc., Surveillance Research, 2016

Figure S3. Rate Ratios Comparing AANHPIs (numerator) with NHWs (denominator), 2008-2012



AANHPI = Asian American, Native Hawaiian, and Pacific Islander.
NHW = Non-Hispanic white. *Includes intrahepatic bile duct.

Sources: Incidence– NAACCR, 2015. Mortality– National Center for Health Statistics, Centers for Disease Control and Prevention, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

From 2003 to 2012, colorectal cancer incidence rates decreased by 2.6% annually among AANHPI males and females, slightly lower than declines of 3.8% and 3.2% among NHW males and females, respectively (Figure S7, page 33).[9] Mortality rates declined during this time period in AANHPIs by 1.1% and 1.3% annually in men and women, respectively.[10] Long-term declines in incidence and death rates are attributed to changing patterns in risk factors, the uptake of screening, and improved treatments.[34, 35] However, the aggregation of AANHPIs likely masks differences in trends by subgroup. For example, a California study documented increasing colorectal cancer incidence rates in Koreans, Filipinos, and South Asians between 1988 and 2007.[36]

AANHPIs have slightly higher 5-year colorectal cancer-specific survival rates than NHWs (Figure S6, page 33). However, one study found differences in outcomes between subgroups, with the highest survival among Japanese and Asian Indians/Pakistanis, while rates in other groups were similar to those in NHWs.[32] Another study found that the survival advantage among Japanese was primarily due to sociodemographic factors, but also reflected specific disease characteristics.[37]

Prostate

Prostate cancer is the most commonly diagnosed cancer and the fifth-leading cause of cancer death among AANHPI men, with 4,550 new cases and 520 deaths estimated in 2016 (Figure S2, page 29). Incidence and mortality rates are 50% lower in AANHPIs than in NHWs (Figure S3). However, incidence rates vary by three-fold among subgroups, with rates of about 30 per 100,000 among Cambodians and Laotians compared to 100 or more among Japanese, Filipinos, Native Hawaiians, and Samoans (Figure S4).

Prostate cancer incidence rates peaked among AANHPIs in the early 1990s, followed by a steady decline (Figure S7, page 33). This peak is largely due to the rapid uptake of prostate-specific antigen (PSA) testing.[38] Prostate cancer death rates have been generally declining among AANHPIs since 1993 (Figure S9, page 35), similar to NHWs. These declines are attributed to early detection and improvements in treatment, although the relative contribution of each is debated.[39, 40]

NHW men are more likely to be diagnosed with prostate cancer at the localized stage than AANHPI men (79% versus 74%; Figure S8, page 34), but 5-year cause-specific survival is roughly the same in both groups (Figure S6 page 33).

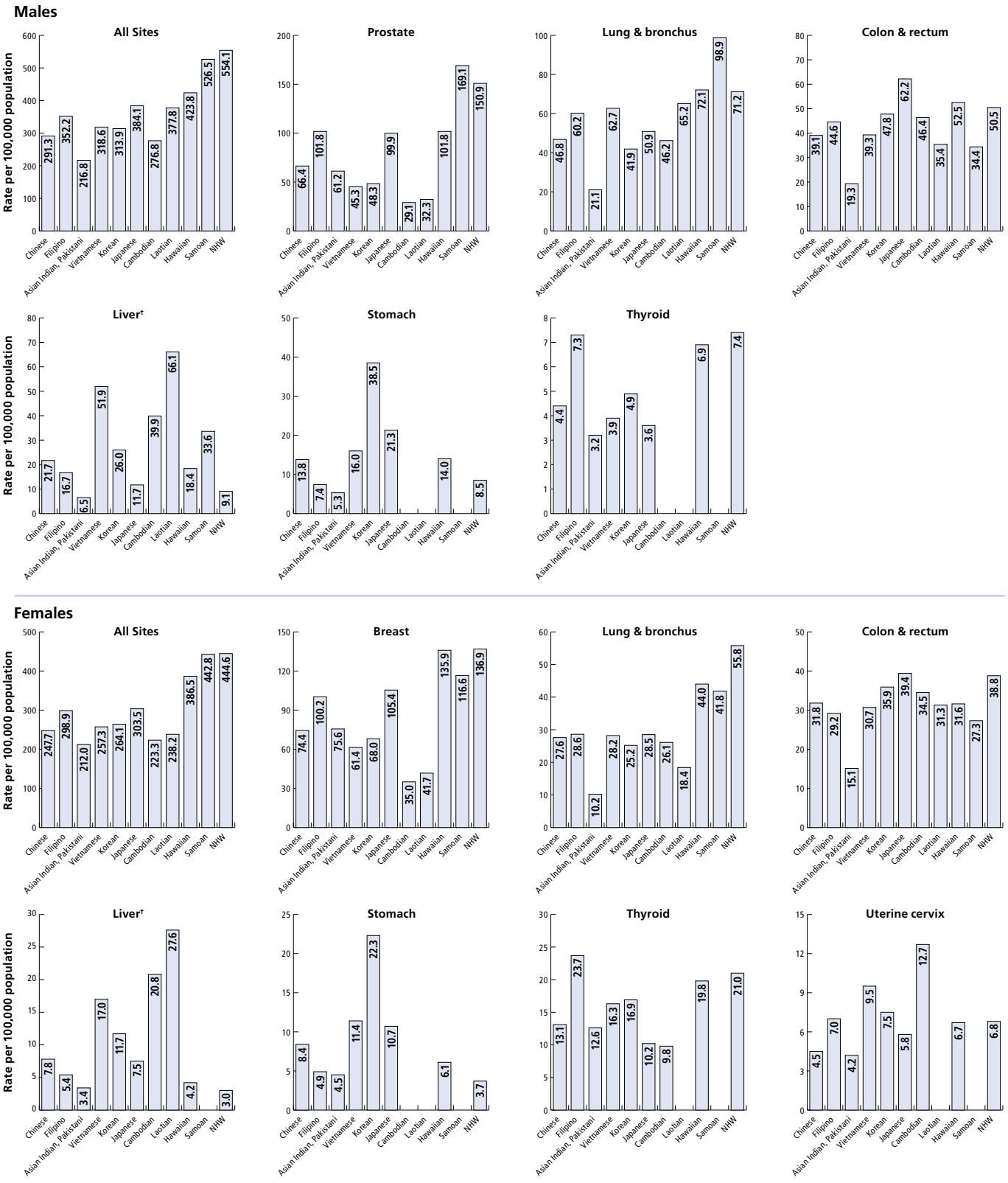
Cancer sites with higher rates among AANHPIs

While AANHPIs generally have lower cancer rates than NHWs overall and for the most common cancers, they are at higher risk for stomach, liver, cervical (some subgroups), and nasopharyngeal cancers, which are associated with infections. The percentage of cancers attributable to infection in Asia ranges from 17% in central Asia to 26% in China, compared to 4% in North America.[41] The risk of infection-related cancers among AANHPIs in the US is particularly high among first-generation immigrants.[42] In addition to infection-related cancers, some AANHPI subgroups have a higher risk of thyroid cancer.

Stomach

Stomach cancer incidence and death rates are about twice as high in AANHPIs as in NHWs (Figure S3). Among AANHPIs, an estimated 980 men and 820 women will be diagnosed with stomach cancer in 2016 (Figure S2, page 29). Incidence is particularly high among Koreans, with rates of 38.5 per 100,000 among males and 22.3 among females, roughly twice as high as those among Japanese, who have the second highest rates (Figure S4). Stomach cancer rates in Korea are the highest in the world for both males and females.[14]

Figure S4. Cancer Incidence Rates* by Sex and AANHPI Subgroup, 2006-2010



AANHPI = Asian American, Native Hawaiian, and Pacific Islander. NHW = Non-Hispanic white. Rates are age adjusted to the 2000 US standard population. *Rates based on <25 cases are omitted. †Includes intrahepatic bile duct. Please note that cancer sites are presented on different scales.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, SEER 11 registries plus Greater California and New Jersey, National Cancer Institute, 2013.

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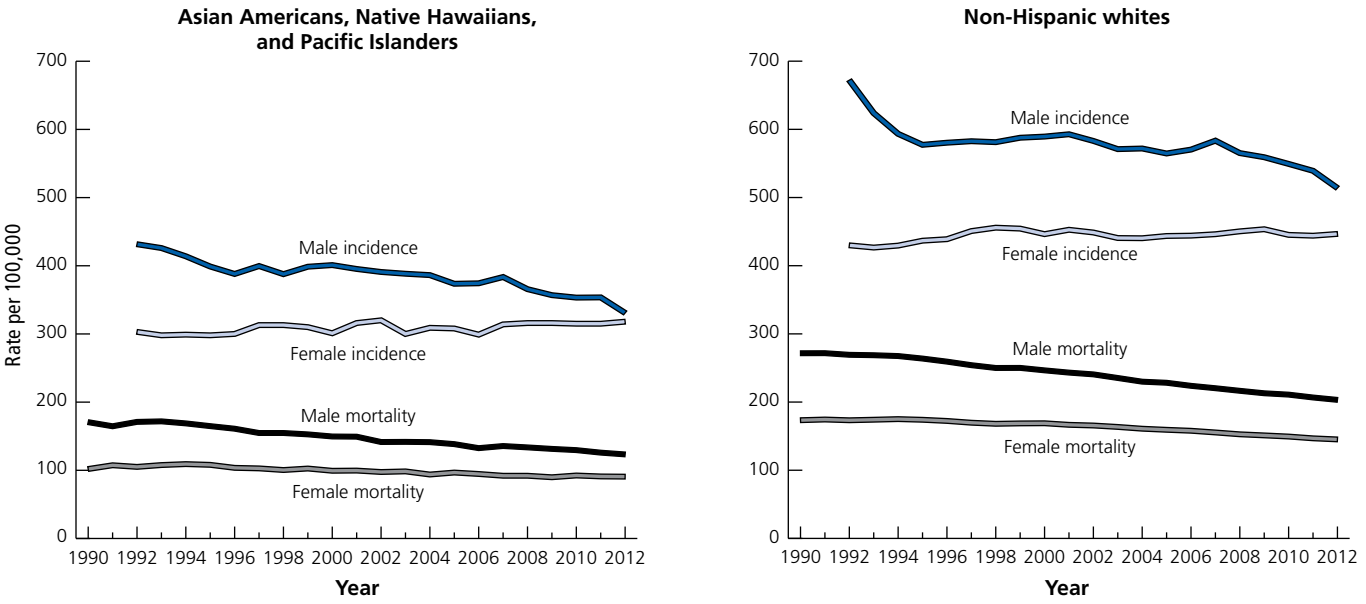
Figure S5. Trends in Incidence and Mortality Rates for All Cancers Combined among NHWs and AANHPIs, 1990-2012



AANHPI = Asian American, Native Hawaiian, and Pacific Islander. NHW = Non-Hispanic white. Rates are age adjusted to the 2000 US standard population.

Sources: Incidence- Surveillance, Epidemiology, and End Results (SEER) Program, SEER 13 registries, National Cancer Institute, 2015. Mortality- US Mortality Data, National Center for Health Statistics, Centers for Disease Control and Prevention, 2015.

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The bacterium *Helicobacter pylori (H. pylori)* is the strongest risk factor for stomach cancer, accounting for the majority of cases worldwide.[43, 44] Other risk factors are thought to include dietary patterns, food storage and preservation practices, and low consumption of fresh produce.[45] Stomach cancer rates have been declining in the US since the early 20th century, and have also been declining more recently in Asian countries with historically high rates, such as Japan, Korea, and China.[46] These declines are thought to be due to improved availability of fresh fruits and vegetables, lower consumption of salt-preserved foods, and reduced prevalence of *H. pylori* infection through improved sanitation and antibiotic treatment.[47] Decreases in smoking may have also contributed to the declines.[48] Stomach cancer rates have been steadily declining among AANHPIs (Figure S7, and Figure S9, page 35), with annual decreases during 2003 to 2012 of about 3% to 4% for both incidence and mortality.[9, 10]

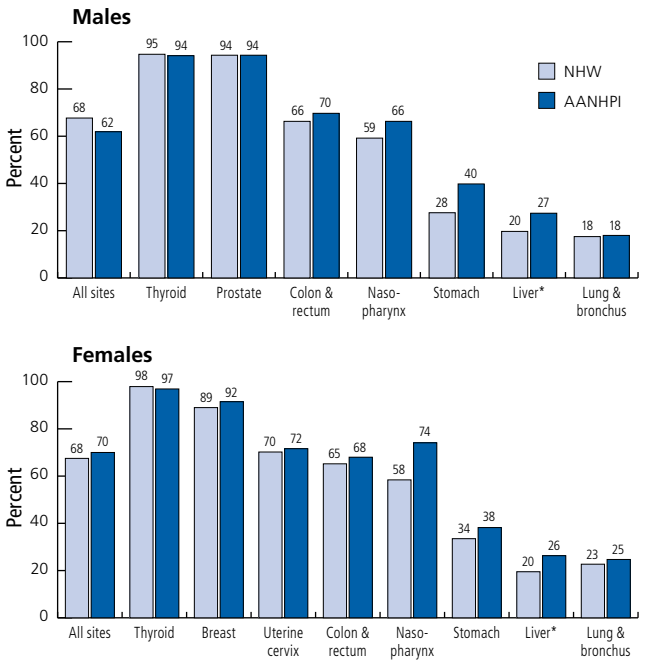
AANHPIs are more likely than NHWs to be diagnosed with stomach cancer at a localized or regional stage (Figure S8, page 34), possibly because of awareness of the higher risk among Asian Americans and/or recommendations by some medical societies for screening among Asian immigrants.[49] Likely due to earlier diagnosis, AANHPIs have higher 5-year survival than NHWs, 40% versus 28% in males and 38% versus 34% in females (Figure S6).

Liver

Liver cancer is one of the most fatal cancers, and incidence and death rates among AANHPIs are about twice as high as those in NHWs (Figure S3, page 30). Among AANHPIs, an estimated 1,760 men and 830 women will be diagnosed with liver cancer in 2016 (Figure S2, page 29). It is the second-leading cause of cancer death among AANHPI men and the fifth-leading cause of cancer death among AANHPI women. Liver cancer rates are particularly elevated in Laotians, Vietnamese, and Cambodians, likely due to a high prevalence of hepatitis B virus (HBV) infection in their country of origin and more recent immigration (Figure S4, page 31).[28, 50]

Chronic infection with HBV or hepatitis C virus (HCV) is the strongest risk factor for hepatocellular carcinoma, the most common type of liver cancer.[51] Other risk factors in Asian and Pacific Island nations include certain toxins and parasitic infections.[52] Risk factors more common in developed countries include obesity, diabetes, alcoholic liver disease, and tobacco smoking. Risk factor prevalence varies both between and within AANHPI subgroups. For example, a study of Asian immigrants in New York City found that those born in Fujian Province, China, were more likely to have HBV infection than those born in other Chinese provinces.[53]

Figure S6. Five-year Cause-specific Survival (%) by Sex and Site for AANHPIs and NHWs, 2005-2011



AANHPI = Asian American, Native Hawaiian, and Pacific Islander. NHW = Non-Hispanic white. *Includes intrahepatic bile duct.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, SEER 18 registries, National Cancer Institute, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

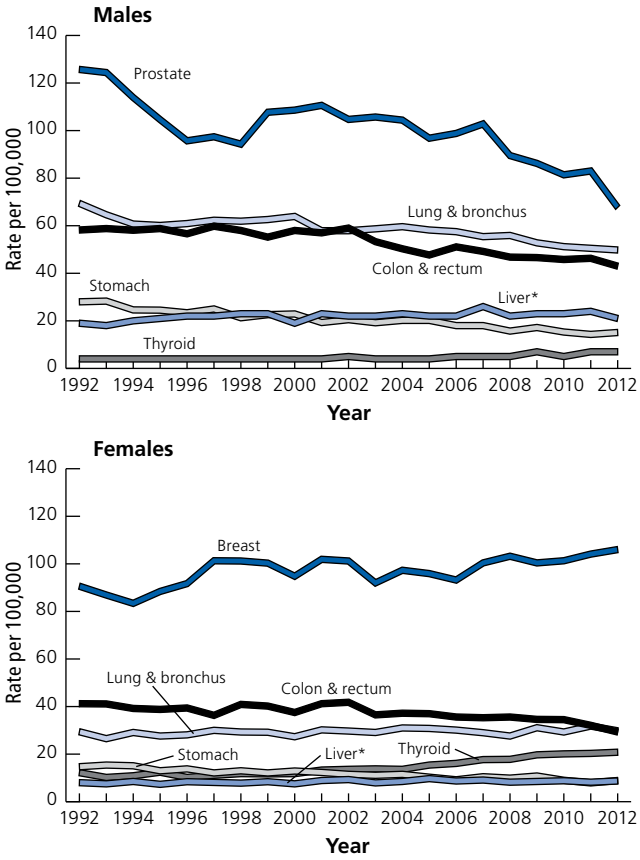
Liver cancer is one of the few cancers for which incidence and mortality trends differ in AANHPIs and NHWs. While it is among the most rapidly increasing cancers among NHWs, incidence rates among both male and female AANHPIs have been stable since the early 1990s (Figure S7).[19] Moreover, death rates increased among NHWs by 2.9% and 2.1% per year in men and women, respectively, from 2003 to 2012, in contrast to downward trends among AANHPI men (0.9% annually) and stable trends in AANHPI women.[10] The increasing rates among NHWs are thought to be due to increased prevalence of chronic infection with HCV as a result of exposure to contaminated blood or medical equipment and injection drug use during the 1960s and 1970s, and possibly increases in obesity and type 2 diabetes more recently.[54] Cultural awareness of HBV screening and treatment among AANHPIs, who have historically had the highest liver cancer rates in the US, may be driving the declining mortality rates.[54]

AANHPIs are more likely than NHWs to be diagnosed with liver cancer at a localized stage (46% versus 42%; Figure S8, page 34) and also have higher five-year survival rates (Figure S6). Better survival among AANHPIs may be due to earlier stage at diagnosis, differences in receipt of treatment, and/or other underlying risk factors, such as cirrhosis.[55,56]

Thyroid

Thyroid cancer is estimated to be the second most frequently diagnosed cancer among AANHPI females in 2016, with 3,320 new cases diagnosed (Figure S2, page 29). However, it is not a leading cause of cancer death because survival is very high (Figure S6). The high ranking of thyroid cancer among AANHPIs is driven by elevated rates among Filipinos, the second largest AANHPI population, and the relatively low rates of most other cancers. Incidence rates per 100,000 among Filipino women are 23.7 compared with 21.0 among NHW women (Figure S4, page 31). Thyroid cancer incidence rates in AANHPIs as a group are slightly lower than those in NHWs, although mortality rates are slightly higher among females, 0.8 per 100,000 versus 0.5 (Figure S3, page 30). AANHPIs are less likely than NHWs to be diagnosed with thyroid cancer at a localized stage, 60% versus 69% (Figure S8, page 34), despite a similar 5-year survival rate of about 95% (Figure S6). The reasons for the elevated rates in Filipinos are not well understood, but are thought to include dietary or environmental factors.[57]

Figure S7. Trends in Cancer Incidence Rates among AANHPIs by Site and Sex, 1992-2012



Rates are age adjusted to the 2000 US standard population. *Includes intrahepatic bile duct.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, SEER 13 registries, National Cancer Institute, 2015.

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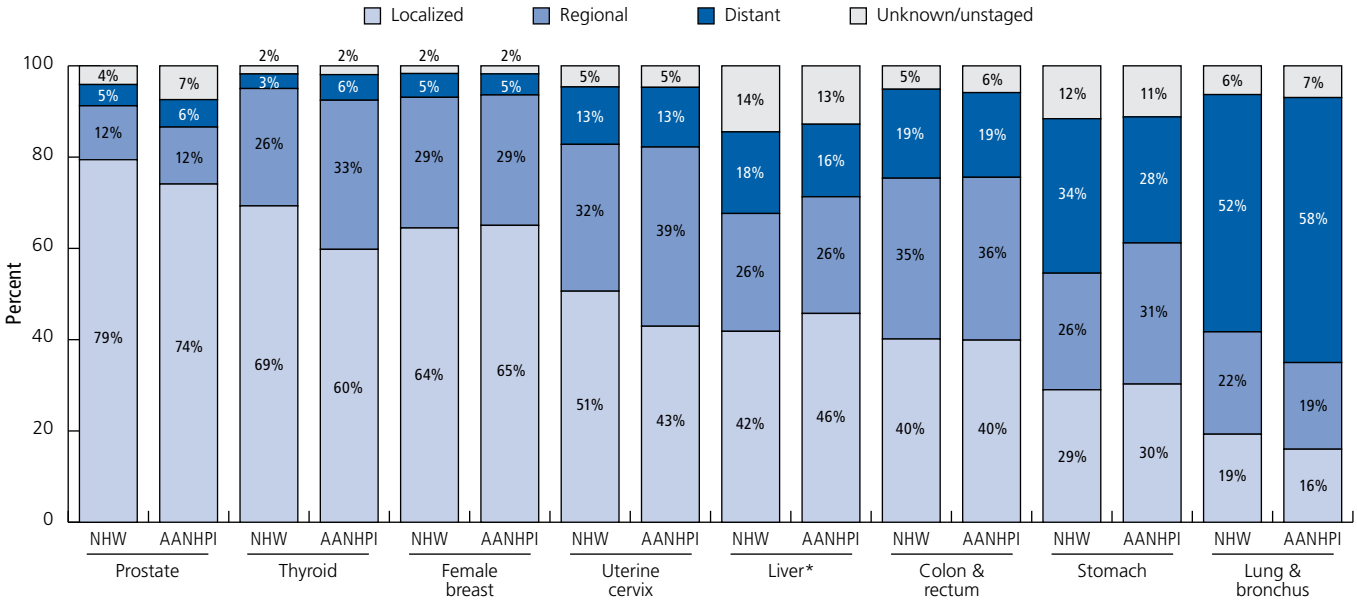
Figure S8. Age-adjusted Stage Distribution for Selected Cancers among AANHPIs and NHWs, 2008-2012



AANHPI = Asian Americans, Native Hawaiians, and Pacific Islanders. NHW = Non-Hispanic whites. Based on rates age adjusted to the 2000 US standard population.
*Includes intrahepatic bile duct.

Source: Surveillance, Epidemiology, and End Results (SEER) Program, SEER 18 registries, National Cancer Institute, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

Thyroid cancer incidence rates have been increasing by more than 5% annually over the past 10 years of data among both AANHPIs and NHWs (Figure S7, page 33).[9] The increasing incidence is thought to be partially due to increased detection because of more sensitive diagnostic procedures and increased use of imaging, although incidental detection of thyroid tumors is unlikely to completely account for these trends.[58, 59] Increases across demographic and socioeconomic groups, as well as for larger and later-stage tumors, also implicate environmental factors.[60] Further research is needed to identify risk factors that may be causing these trends.

Uterine cervix

Cervical cancer incidence rates are higher in several AANHPI subgroups than in NHWs (Figure S4, page 31), despite being lower overall (Figure S3, page 30). Incidence rates (per 100,000) are twice as high in Cambodians (12.7) as in NHWs (6.8), and 40% higher among Vietnamese women (9.5). In contrast, rates among Chinese (4.5) and Asian Indian/Pakistani (4.2) women are lower than those in NHWs.

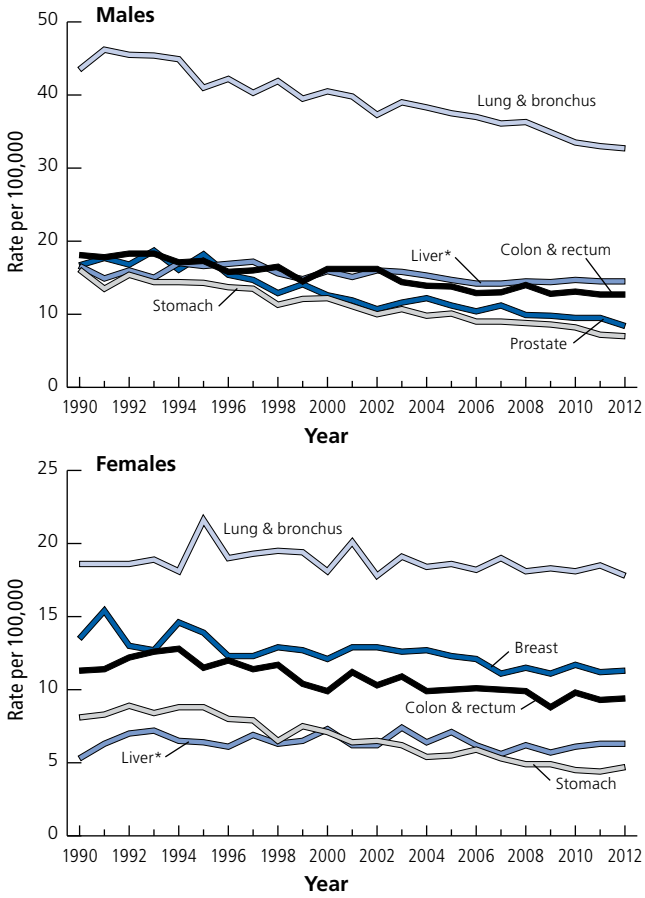
Contemporary disparities in cervical cancer incidence worldwide are attributable to differences in the prevalence of both human papillomavirus (HPV) infection, the cause of cervical cancer, and screening.[61-64] The Pap test has historically been the mainstay for screening in the US and can detect precancerous lesions of the cervix that can be treated to prevent cancer. The rapid declines in cervical cancer occurrence in the US over the second half of the 20th century, including those since 1990 among Vietnamese, Cambodian, and Laotian women, are attributed primarily to increased screening.[65]

Incidence and death rates among AANHPIs decreased by about 3% annually during the past 10 years of data, while incidence rates decreased slightly and mortality rates remained stable in NHW women.[9, 10] AANHPI women are less likely than NHW women to be diagnosed with cervical cancer at a localized stage (43% versus 51%), although five-year survival is about 70% for both groups (Figures S6, page 33, and S8).

Nasopharynx

Nasopharyngeal carcinoma, which is the dominant form of nasopharyngeal cancer, is rare worldwide, although it has elevated incidence in certain regions and populations, including southern China and southeastern Asia.[47] (The nasopharynx is the upper part of the throat, behind the nose.) Incidence rates among AANHPIs overall are about 5 to 6 times higher than among NHWs (Figure S3, page 30), and are particularly elevated for men in certain subpopulations, including Chinese, Samoans, Guamanians/Chamorros, and Hmong.[66-69] Nasopharyngeal carcinoma is thought to be caused by a combination of viral, environmental, and genetic factors.[70] It has been estimated that about 98% of nasopharyngeal carcinoma cases worldwide are related to infection with Epstein-Barr virus (EBV),[47] although only a small fraction of people who are infected with EBV develop the disease. Other environmental risk factors include

Figure S9. Trends in Cancer Mortality Rates among AANHPIs by Site and Sex, 1990-2012



Rates are age adjusted to the 2000 US standard population. *Includes intrahepatic bile duct.

Source: US Mortality Data, National Center for Health Statistics, Centers for Disease Control and Prevention, 2015.

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smoking, alcohol consumption, occupational exposures, and certain preserved foods.[71] Cantonese salted fish, which is high in nitrosamines, was identified as a risk factor for nasopharyngeal carcinoma among southern Chinese in the 1970s,[72] leading to its designation by the International Agency for Research on Cancer as a carcinogen.[73]

Incidence and mortality rates for nasopharyngeal carcinoma in AANHPIs declined by about 2% to 3% annually from 2003 to 2012.[9, 10] Rates have also been declining among some high-risk populations in Asia, possibly due to decreased smoking or consumption of salted fish.[74, 75] The recent declines among AANHPIs are not well understood, but may be attributable to dietary factors and decreased smoking.[74] Five-year cause-specific survival is higher for AANHPIs than NHWs (males 66% versus 59%; females 74% versus 58%; Figure S6, page 33) for reasons that are unknown, but may include lower prevalence of other health conditions and/or less complete follow-up of AANHPI patients after diagnosis.[11, 76]

Prevalence of cancer risk factors

A large proportion of cancers are caused by known risk factors, such as tobacco use, excess body weight, and certain infectious agents.[77, 78] Prevalence of these risk factors within the AANHPI population sheds light on the unique cancer burden in this group as a whole, as well as differences between subgroups.

Tobacco

Smoking among AANHPIs varies by sex, nativity, acculturation, and ethnicity. Overall, 10% of Asian Americans smoked in 2014, compared with 19% of NHWs (Table S4, page 36). National smoking estimates are not available for NHPIs. In Hawaii, where 55% of US Native Hawaiians reside, 27% of Native Hawaiians report being current smokers.[79] While similar percentages of NHW men (20%) and women (18%) are current smokers, Asian American men (14%) are more than twice as likely to smoke as Asian American women (6%). However, while US-born and foreign-born Asian American men are equally likely to be current smokers, among women, the US-born are five times more likely to smoke – 16% versus 3% of the foreign-born. These sex differences reflect smoking norms in home countries, where smoking is more accepted among men than women, and acculturation in the US.[5] Among the three largest Asian American ethnic groups, current smoking is more common among Filipinos (12%) than Chinese (7%) or Asian Indians (6%) (Table S4, page 36). A study of Asians in New York found smoking rates as high as 36% in Korean men.[80] Notably, while current smoking among NHWs is most common among those with lower income and/or less education and the same is true for Asian American men, the reverse is true for Asian American women.[81]

Smoking prevalence in Asian American men decreased from 25% in 1990-1992 to 14% in 2014, while in women, it has remained stable at 6% (Figure S10, page 37). However, national trends do not necessarily reflect those among specific groups or localities. For instance, there was no decline in smoking among Asian males in New York City from 2002 to 2010.[82]

Overweight/obesity

Excess body weight increases the risk of several cancers, and also contributes to the development of other cancer risk factors, such as nonalcoholic fatty liver disease and type 2 diabetes. Worldwide, normal weight is defined as a body mass index (BMI, kg/m^2) of 18.5-24.9, while overweight is 25-29.9 and obese is ≥30. However, it has been shown that Asians have a higher percentage of body fat than whites at the same BMI, as well as a higher risk for type 2 diabetes at a lower BMI.[83] As a result, lower BMI cutpoints established by the American Diabetes Association are used for assessing diabetes risk in Asian Americans.[84, 85] Diabetes is a risk factor for several cancers, including breast, liver, pancreatic, and colorectal.[86] While some studies report elevated cancer risk at a lower BMI among Asians compared with other populations, especially for colon cancer,[87, 88] others do not.[89, 90]

Table S4. Prevalence of Cancer Risk Factors and Health Care Access by Sex and Asian Subgroup, US, 2014

	Asian									Asian subgroups*									Non-Hispanic white		
	Total			Male			Female			Asian Indian			Chinese			Filipino					
	US born	Foreign born	All	US born	Foreign born	All	US born	Foreign born	All	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female	All
Cancer risk factors																					
Smoking (18+ years)																					
Current smoker	14.5	8.4	9.5	14.0	14.1	13.7	15.6	3.3	5.7	8.8	§	5.6	12.2	§	6.8	15.3	10.0	12.1	20.2	18.4	19.3
Former smoker	16.3	11.3	12.2	18.2	18.3	18.3	14.3	5.5	7.0	13.5	§	8.0	12.5	4.5	8.0	28.2	11.3	18.6	27.0	21.2	23.9
Never smoker	69.2	80.3	78.4	67.7	67.5	67.9	70.1	91.2	87.3	77.8	95.9	86.4	75.3	92.7	85.1	56.6	78.7	69.2	52.8	60.5	56.8
Alcohol† (18+ years)																					
Moderate	15.6	7.3	8.9	20.6	12.0	13.7	10.4	3.3	4.8	10.1	§	6.0	6.1	5.5	5.7	16.4	4.7	9.8	25.6	11.5	18.3
Heavy	§	1.0	1.3	§	§	§	§	§	1.5	§	§	1.3	0.7	§	§	§	3.6	2.9	6.5	6.4	6.5
Body weight* (20+ years)																					
Overweight/obese (BMI ≥25 kg/m^2)	–	–	41.7	–	–	50.2	–	–	34.5	–	–	–	–	–	–	–	–	–	74.6	64.2	69.3
Overweight (BMI = 25-29.9)	–	–	29.1	–	–	37.6	–	–	22.1	–	–	–	–	–	–	–	–	–	39.9	26.0	32.9
Obese (BMI ≥ 30)	–	–	12.6	–	–	12.6	–	–	12.4	–	–	–	–	–	–	–	–	–	34.7	38.2	36.4
Physical activity‡ (18+ years)																					
No leisure time physical activity	25.9	28.8	28.8	22.8	24.6	25.5	29.0	32.7	31.7	24.9	30.9	27.9	23.3	27.2	25.7	25.1	32.7	29.5	25.2	27.2	26.3
Met recommended levels of aerobic activity	51.6	47.7	48.1	58.2	53.9	54.3	45.4	42.3	42.8	58.3	40.6	49.8	55.3	47.4	51.0	53.2	44.6	48.3	55.7	51.3	53.4
Health care access (18-64 years)																					
Uninsured	9.4	15.5	13.1	11.0	17.2	14.6	§	13.8	11.7	10.8	11.3	11.0	12.2	11.2	11.7	18.2	13.2	15.3	12.9	10.2	11.5
No regular source of medical care	12.2	20.5	17.3	16.3	24.3	21.1	§	16.8	13.8	20.5	15.9	18.1	17.9	11.6	14.6	21.1	13.4	16.8	20.1	10.6	15.3

BMI = Body mass index. *Estimates from 2013-2014 data combined. †Moderate: 12+ drinks in lifetime and (male) 3-14 drinks/week in past year or (female) 3-7 drinks/week in past year. Heavy: 12+ drinks in lifetime and (male) >14 drinks/week in past year or (female) >7 drinks/week in past year. ‡Aerobic activity recommendations: includes 150 minutes of moderate intensity activity or 75 minutes of vigorous intensity activity each week. §Estimate not provided due to instability. Note: Percentages are age adjusted to the 2000 U.S. standard population.

Sources: All risk factors except BMI – National Center for Health Statistics. National Health Interview Survey, 2013 and 2014. Public-use data file. BMI – National Center for Health Statistics. National Health and Nutrition Examination Survey Data, 2013-14.

American Cancer Society, Inc., Surveillance Research, 2016

Three large pooled studies did not find Asians to be at higher risk for cancer death at a lower BMI.[91-93] Thus, evidence to date is inconclusive about whether cancer risk is increased in Asians at a lower BMI.

Asian Americans are much more likely to be a healthy weight than NHWs.[94] About 42% of Asian Americans are overweight or obese compared to 69% of NHWs (Table S4). In contrast, three-quarters of Native Hawaiians in Hawaii are overweight or obese.[79] Asian American men (50%) are more likely to be overweight or obese than Asian American women (35%). Excess body weight has increased among US-born Asian Americans, as well as recent and long-term immigrants. For instance, the prevalence of overweight among US-born Filipinos increased from 36% in 1992-1995 to 55% in 2003-2008.[95] Prevalence of overweight and obesity varies by Asian American subgroup; a study in California found that only 8% of South Asian and 9% of Chinese children were overweight, compared to 16% of Japanese and Korean children and 18% of Filipino children.[96]

Alcohol

Alcohol consumption is associated with increased risk of several cancers, and it also may interact with HBV and HCV to further promote the development of liver cancer.[97] This is of special concern among Asian Americans, who bear a disproportionate burden of HBV infection. Asian Americans are half as likely as NHWs to be moderate drinkers; however, prevalence among US-born Asian Americans (16%) approaches that of NHWs (18%) (Table S4).

Infectious agents

H. pylori

Chronic infection with *H. pylori* is highly endemic in Asia and prevalence patterns mirror gastric cancer risk.[98] *H. pylori* seroprevalence is close to 60% in China and Korea,[98] whereas it is about 30% in the United States, where *H. pylori* infection has been declining since the late 19th century.[99, 100] Although the spread of *H. pylori* is not well understood, infection occurs primarily during childhood and risk is higher in lower socioeconomic groups.[100] Among Japanese immigrants to the US in the 1970s and 1980s,

the risk of stomach cancer was shown to be lower than Japanese living in Japan, and risk was even lower among Japanese born in the US.[101] Preliminary studies in Asia have shown that eradication of *H. pylori* infection with antibiotics can reduce the risk of stomach cancer.[102]

HBV and HCV

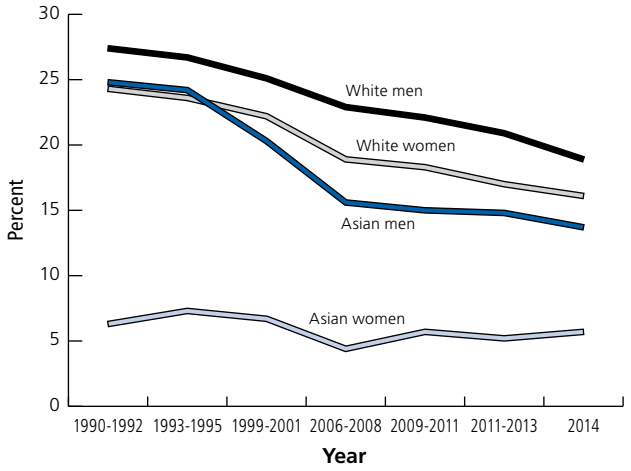
HBV infection is highly endemic in Asia.[103] As a result, Laos, Vietnam, Korea, and China have among the highest liver cancer incidence in the world.[14] Nearly 70% of AANHPIs living in the US were born or have parents who were born in a country where HBV is highly prevalent.[104] AANHPIs account for more than 50% of those infected with HBV in the United States, although most who harbor the virus are unaware.[104] The HBV vaccine was introduced in the early 1980s and has resulted in dramatic declines in liver cancer incidence among vaccinated cohorts in Taiwan.[105] HBV vaccination in the US among AANHPI teens (86%) is slightly lower than other racial/ethnic groups, which all have HBV vaccination coverage above 90%.[106] The United States Preventive Services Task Force (USPSTF) recommends screening all those born in regions with a prevalence of HBV infection ≥2%, which includes all countries of Asia and the Pacific Islands except Australia and New Zealand.[107] Among adults 18 years of age and older, about 28% of both Asian Americans and NHWs had received a hepatitis B test (Table S5, page 38).

While HBV is the leading liver cancer risk factor among Asian Americans in the US, HCV is also an important risk factor, especially in some groups.[108-110] For example, HCV is more common than HBV in Japan, where about 65% of liver cancers are estimated to be attributable to HCV;[111] however, HCV prevalence there has been decreasing due to public health programs.[112] HCV is also more prevalent in Pakistan and among older adults in Taiwan.[108] The USPSTF also recommends HCV screening for all adults born between 1945 and 1965, who account for three-quarters of HCV-infected individuals and HCV-related deaths in the United States.[113] HCV testing coverage in this cohort is 13% among NHWs and 10% among Asian Americans (Table S5, page 38). Through testing, HBV and HCV can be detected and treated, reducing the risk of liver cancer.[114]

HPV

HPV causes nearly all cervical cancers in the US, as well as many oropharyngeal and anogenital cancers.[115] A clinic-based study in 2003-2005 found that 17% of AANHPI women had a high-risk HPV infection (the type most likely to cause cancer), compared with 23% of white women.[116] More recent HPV prevalence data are not available for AANHPI in the US. Worldwide, it is estimated that 5% of women in North America are infected with any type of HPV, compared with 11% of women in Eastern Asia, 7% in Southern Asia, and 14% in Southeastern Asia.[61] Vaccines to prevent infection with the most common cancer-causing types of HPV have been available since 2006 and are recommended for boys and girls at 11 to 12 years of age. Among Asian American girls 13-17 years of age, 36% received the three recommended doses and 72% of those who received the first dose completed all three doses, similar to uptake among NHWs (Table S5, page 38). HPV vaccination uptake in Asian American boys is higher than in NHWs, with 27% receiving the three recommended doses (compared with 19% in NHW boys) and 63% completion (compared with 58% in NHW boys) (Table S5, page 38). HPV vaccine uptake is influenced by caregiver awareness and varies by local context; in a study in Los Angeles, California, only 64% and 44% of Chinese and Korean mothers, respectively, with age-eligible daughters were aware of the vaccine.[117]

Figure S10. Trends in Current Smoking* among Asian American Adults (18 Years and Older), 1990-2014



*Estimates are age adjusted to the 2000 US standard population.

Source: 1990-2013: Health, United States, 2014: With Special Feature on Adults Aged 55-64.[6] 2014: Centers for Disease Control and Prevention. National Health Interview Survey, 2014. Public-use data file.

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Prevalence of cancer screening

Cervical and colorectal screening can detect and remove precancerous lesions, thus preventing the development of cancer. In addition, screening for colorectal, cervical, and breast cancer can detect cancers at an earlier stage when more treatment options are available. Please see page 66 for screening recommendations for people at average cancer risk.

Asian Americans are less likely than NHWs to be current for cervical and colorectal cancer screening, but have similar rates of breast cancer screening (Table S5). Seventy-one percent of Asian American women overall (21-65 years of age) reported having a Pap test within the past 3 years, compared with 83% of NHWs. However, prevalence varies widely by subgroup and in Filipinas is equal to that in NHWs. Slightly more than two-thirds of Asian American (68%) and NHW (69%) women 45 years of age or older

Table S5. Cancer Screening Test Use (%), Vaccination Coverage (%), and Hepatitis Testing (%) by Asian Subgroup, US, 2013-2014

	Asian*		Asian Indian*	Chinese*	Filipino*	NHW	
	All	Uninsured	All	All	All	All	Uninsured
Cervical cancer screening (women 21-65 years)†							
Pap test within past 3 years	70.9	54.9	69.6	65.8	83.0	82.8	57.3
Breast cancer screening (women 45+ years)							
Mammogram within past 2 years	67.7	51.7	64.0	65.6	67.8	68.9	39.8
Colorectal cancer screening (50+ years)							
Endoscopy/FOBT‡							
Total	52.3	‡‡	53.6	53.6	58.9	60.5	29.8
Men	59.0	‡‡	‡‡	55.3	72.4	60.4	21.3
Women	46.6	14.9	‡‡	52.3	46.6	60.8	36.6
FOBT (past year)							
Total	10.7	‡‡	‡‡	15.0	11.3	7.4	2.2
Men	9.7	‡‡	‡‡	‡‡	‡‡	7.6	2.1
Women	11.5	‡‡	‡‡	13.5	14.0	7.2	§§
Endoscopy§							
Total	47.9	‡‡	49.6	46.8	54.2	58.0	28.1
Men	54.6	‡‡	‡‡	47.6	66.8	57.8	19.8
Women	42.2	‡‡	‡‡	46.2	42.9	58.3	34.6
HPV vaccine utilization¶ (13-17 years)							
Girls							
≥1 dose	54.9	–	–	–	–	56.1	–
≥3 doses	35.7	–	–	–	–	37.5	–
Completion rate#	71.7	–	–	–	–	70.6	–
Boys							
≥1 dose	45.8	–	–	–	–	36.4	–
≥3 doses	26.6	–	–	–	–	18.8	–
Completion rate#	63.0	–	–	–	–	57.9	–
Hepatitis B testing (18+ years)**							
Has received hepatitis B test	28.6	26.2	25.4	31.6	30.0	28.1	26.8
Hepatitis C testing (48-69 years)†† **							
Has received hepatitis C test	10.4	‡‡	7.6	11.3	13.8	12.6	12.4

NHW = Non-Hispanic white. *May be of any ethnicity. †Among women with an intact uterus. ‡Either a fecal occult blood test within the past year, sigmoidoscopy within the past five years, or a colonoscopy within the past 10 years. §Sigmoidoscopy in the past 5 years and/or colonoscopy in the past 10 years. ¶Percentages for all Asians exclude Hispanic ethnicity. Data are for 2014. #Percentage who completed the 3-dose vaccination series among those who had at least 1 dose. **Combined 2013 and 2014 NHIS data. ††The US Preventive Services Task Force recommends screening for adults born 1945-1965; these adults would be 48-69 years of age for the 2013-2014 available data. ‡‡Estimate not provided due to instability. Note: Percentages for cancer screening hepatitis testing are age adjusted to the 2000 U.S. standard population.

Source: Cancer screening – National Center for Health Statistics. National Health Interview Survey, 2013. Public-use data file. HPV vaccination – Reagan-Steiner S, et al.[111] Hepatitis testing – National Center for Health Statistics. National Health Interview Survey, 2013 and 2014. Public-use data file.

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report having a mammogram within the past two years. Only about half of Asian Americans (52%) 50 years of age and older received recommended colorectal cancer screening, compared with 61% of NHWs. Notably, this disparity is almost entirely driven by the low screening rate among Asian American women. While endoscopy is generally the preferred screening test among both NHWs and Asian Americans, Asian Americans are more likely than NHWs to have had a fecal occult blood test (11% versus 7%) and less likely to have had endoscopy (48% versus 58%) (Table S5). A recent study reported that Native Hawaiians were more than 30% less likely to get a colonoscopy or mammogram compared to NHWs.[118]

Asian Americans of lower socioeconomic status are less likely to receive recommended cancer screening, often because of less access to health care.[119] Among Asian Americans, 13% of adults 18-64 years of age were uninsured in 2014, including 16% of those who were foreign-born, while 21% of men and 14% of women had no regular source of medical care (Table S4, page 36). Among Native Hawaiians in Hawaii, 8% were uninsured and 16% had no regular source of medical care.[79] Successful interventions to promote cancer screening among Asian Americans utilize lay health workers, one-on-one communications, translated materials, and approaches that not only involve Asian community members, but also health care providers.[120] Patient navigators in particular have been shown to improve the receipt of recommended screening and follow-up.[121]

Additional Resources

American Cancer Society

The American Cancer Society provides information and services for AANHPIs, including:

- Cancer information in Asian languages: **cancer.org/asianlanguagematerials**
- California Chinese Unit: **acsccu.org**
- New York and New Jersey Asian initiatives: **cancer.org/myacs/eastern/programsandservices/asian-initiatives**

Asian American Network for Cancer Awareness, Research, and Training

aancart.org

The Asian American Network for Cancer Awareness, Research, and Training (AANCART) aims to to reduce cancer health disparities by conducting community-based participatory education, training, and research by, for, and with Asian American community.

Asian and Pacific Islander National Cancer Survivors Network

apiahf.org/programs/chronic-diseases/api-national-cancer-survivors-network

The Asian and Pacific Islander National Cancer Survivors Network (APINCSN) links cancer survivors, their family members, health care providers, researchers, health advocates, community members, and organizations who are concerned about the issue of cancer and survivorship in Asian American, Native Hawaiian and Pacific Islander communities.

Asian & Pacific Islander American Health Forum

apiahf.org

The Asian & Pacific Islander American Health Forum (APIAHF) works with communities to influence policy and strengthen their community-based organizations to achieve health equity for Asian Americans and NHPIs across the country.

Tufts University Selected Patient Information Resources in Asian Languages:

spiral.tufts.edu

Tufts University Selected Patient Information Resources in Asian Languages (SPIRAL) is a web resource that connects people to authoritative health information in Asian languages that is freely available on the Internet.

'Imi Hale Native Hawaiian Cancer Network

imihale.org

'Imi Hale collaborates with key local, state, national and international partners to reduce cancer incidence and mortality among NHPIs by increasing access to prevention and healthcare; developing and conduct evidence-based intervention research; and training and developing researchers using community-based participatory research (CBPR) methods to reduce health disparities.

Asian Pacific Islander Cancer Education Materials Tool

The Asian Pacific Islander Cancer Education Materials (APICEM) tool is a searchable web tool where users can access hundreds of patient-focused cancer education materials in 22 Asian and Pacific Islander languages along with their English translations. The tool was created to help clinicians provide information to their Asian and Pacific Islander patients and is continually updated by its contributors, which include cancer research organizations and AANHPI health advocacy and community organizations. APICEM is made possible through the cooperation of the American Cancer Society; the Asian American Network for Cancer Awareness, Research and Training; and the National Cancer Institute.

Visit **cancer.org/apicem** for more information.

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Tobacco Use

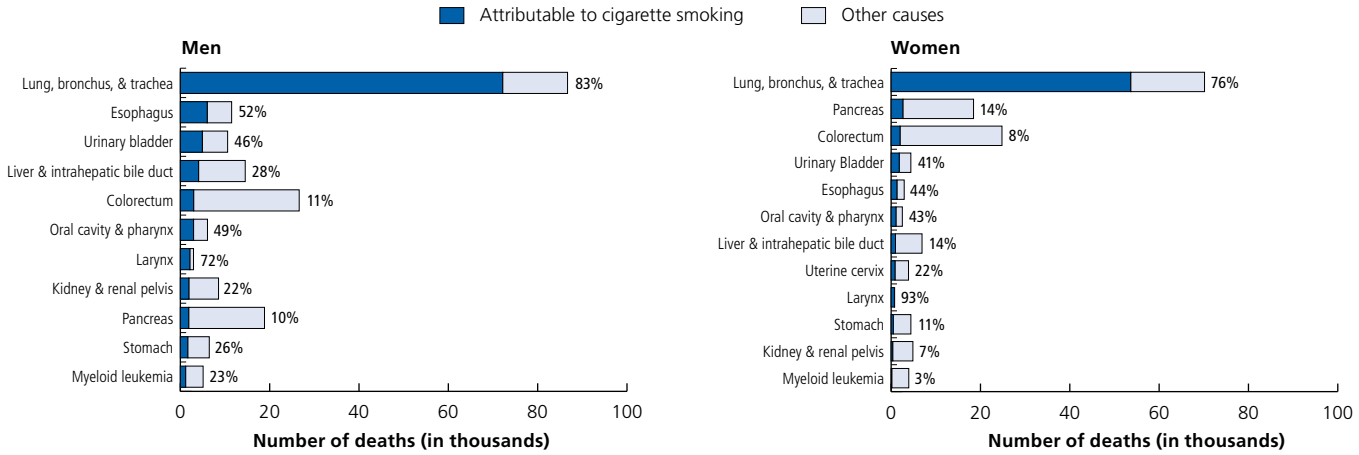
Smoking remains the world's most preventable cause of death. Since the first US Surgeon General's report on smoking and health in 1964, there have been more than 20 million premature deaths attributable to smoking in the US. Each year, cigarette smoking results in an estimated 480,000 premature deaths, 42,000 of which are due to secondhand smoke exposure.[1, 2] The number of people who die prematurely or suffer illness from tobacco use impose substantial health-related economic costs on society. In 2012, smoking accounted for $176 billion in health care-related expenditures in the US.[1]

Cigarette Smoking

Cigarette smoking increases the risk of cancers of the oral cavity and pharynx, larynx, lung, esophagus, pancreas, uterine cervix, kidney, bladder, stomach, colorectum, and liver, as well as acute myeloid leukemia.[1] In addition, the International Agency for Research on Cancer recently concluded that there is some evidence that tobacco smoking causes female breast cancer, and the Surgeon General concluded that smoking increases the risk of advanced-stage prostate cancer.[1,3] Excluding secondhand smoke, smoking is estimated to cause 32% of all cancer deaths in the US,[4] including 83% of lung cancer deaths among men and 76% of lung cancer deaths among women (Figure 4).[5]

- The prevalence of current cigarette smoking (defined as smoking at least 100 cigarettes and currently smoking) among adults 18 years of age and older has declined by more than half, from 42% in 1965 to 17% in 2014; however, reductions vary across population subgroups.[6,7]
- Based on the 2014 National Health Interview Survey (NHIS), approximately 40 million adults (18 years and older) were current smokers,[7] about 4.5 million fewer than in 2004.[8]
- The proportion of daily smokers reporting light or intermittent smoking (fewer than 10 cigarettes per day) increased between 2004 (17%) and 2014 (27%), whereas heavy smoking (30 or more cigarettes per day) declined from 13% to 7%.[7, 8]
- Although uptake of smoking began earlier in men than in women, the gender gap, particularly among non-Hispanic whites, has narrowed. As of 2014, there was a 2 percentage point difference in smoking prevalence between white men (19%) and women (17%), a 9 percentage point difference between non-Hispanic black men (23%) and women (14%), a 7 percentage point difference between Hispanic men (15%) and women (8%), and a 9 percentage point difference between Asian men (14%) and women (5%).[7]
- Smoking is most common, and has declined more slowly, among those with the least education. In 2014, smoking prevalence was 23% among adults 25 years and older with less than a high school diploma and 5% among those with graduate degrees. Smoking was most prevalent among adults with a GED (General Educational Development), or high school equivalency credential (43%).[7]
- Among US states in 2013, the prevalence of adult smoking ranged from 10% in Utah to 27% in West Virginia and Kentucky.[9]

Figure 4. Number and Percentage (%) of Cancer Deaths Attributable to Cigarette Smoking in 2011, Adults 35 Years and Older



Source: Siegel RL, et al.[5]

- Although current cigarette smoking among US high school students (at least once in the past 30 days) increased from 28% in 1991 to 36% in 1997, it declined to 9% in 2014.[10, 11]
- In contrast to the decline in cigarette smoking among teens, current use of hookahs in this age group has increased dramatically, from 4% in 2011 to 9% in 2014, and is now as common as smoking.[11]

Cigar Smoking

Cigar smoking causes many of the same diseases as cigarette smoking and smokeless tobacco. Regular cigar smoking is associated with an increased risk of cancers of the lung, oral cavity, larynx, esophagus, and probably pancreas.[12] Cigar smokers have 4 to 10 times the risk of dying from lung, laryngeal, oral, or esophageal cancer compared to never smokers.[13, 14] Historically, lower tax rates on cigars have caused some smokers to switch from cigarettes to less costly cigars.

- While total cigarette consumption declined by one-third from 2000 to 2011, large cigar consumption more than tripled, from 3.9 billion (cigarette equivalents) to 12.9 billion.[15]
- According to the 2012-2013 National Adult Tobacco Survey (NATS), 2% of adults (3% of men and <1% of women) reported smoking cigars every day or some days.[16]
- Cigar use was highest among non-Hispanic blacks (4%) and those with household incomes <$20,000.[16]
- In 2014, 8% of US high school students had smoked cigars, cigarillos, or little cigars at least once in the past 30 days down from 18% in 1999.[10, 11]
- In contrast to non-Hispanic whites and Hispanics, cigars are the most common form of tobacco use among black high school students (9%, versus 5% to 6% for e-cigarettes, hookahs, and cigarettes).[11]

Secondhand Smoke

There is no safe level of exposure to secondhand smoke (SHS), or environmental tobacco smoke, which contains more than 7,000 chemicals, at least 69 of which cause cancer.[17] Exposure to SHS increases the risk of lung diseases, including lung cancer, coronary artery disease, and heart attacks.[18-20] SHS can also cause coughing, wheezing, chest tightness, and reduced lung function in adult nonsmokers.[21] Laws that prohibit smoking in public places and create smoke-free environments are the most effective approach to prevent exposure to and harm from SHS. In addition, there is strong evidence that smoke-free policies decrease the prevalence of both adult and youth smoking.[20, 22] Momentum to regulate public smoking began to increase in 1990, and smoke-free laws have become increasingly common and comprehensive over time.

- Each year, about 7,330 nonsmoking adults die of lung cancer as a result of breathing SHS.[1]
- Nationwide, SHS exposure among nonsmokers declined from 84% in 1988-1994[23] to 25% in 2011-2012,[24] likely reflecting widespread implementation of smoke-free laws and reduction in smoking prevalence. However, this progress differs by subgroup, and poor individuals remain substantially more likely to be exposed than those who are more affluent.
- In the US, as of July 1, 2015, 763 municipalities and 24 states, the District of Columbia, Puerto Rico, and the US Virgin Islands have laws in place requiring all non-hospitality workplaces, restaurants, and bars to be 100% smoke-free.[25]
- Currently, 49% of the US population is covered by a 100% smoke-free policy in workplaces, restaurants, and bars.[25]

E-cigarettes

Electronic nicotine delivery systems (ENDS) are battery-operated devices that allow the user to inhale a vapor produced from cartridges or tanks filled with a liquid typically containing nicotine, propylene glycol and/or vegetable glycerin, other chemicals, and sometimes flavoring. The term e-cigarettes will be used hereafter to refer to any ENDS, including those not designed to mimic cigarettes. Some studies have shown lower levels of toxic chemicals in aerosol from e-cigarette products than in smoke from combustible cigarettes, and e-cigarettes are promoted as a less harmful alternative to traditional cigarettes and a way to bypass smoke-free laws. However, the long-term health risks of using these products, or being exposed to them secondhand, are unknown and likely vary depending on the specific e-cigarette product and how it is used.

While the health risks of e-cigarettes are not fully known, there is growing concern that e-cigarette use will normalize cigarette smoking and lead to the use of other forms of tobacco products with known health risks. Indeed, a recent study indicates that adolescent e-cigarette users are much more likely to initiate cigarette, cigar, or hookah smoking than nonusers.[26] Also, these products may discourage utilization of evidence-based cessation therapies among those who want to quit. E-cigarettes have been gaining in popularity, particularly among high school students.

- According to the 2012-2013 NATS, 2% of adults were current (every day or some days) e-cigarette users.[16]
- The prevalence of ever use of e-cigarettes among adults doubled between 2010 and 2011, from 3% to 6%.[27]
- E-cigarette use (at least once in the past 30 days) has increased most rapidly among high school students, surpassing cigarette smoking in 2014 to become the most common form of tobacco use; prevalence increased from 2% in 2011 to 13% in 2014.[11]
- In high school students, e-cigarette use is more than twice as high among non-Hispanic whites (15%) and Hispanics (15%) as among blacks (6%).[11]

Smokeless Tobacco Products

Smokeless tobacco products include moist snuff, chewing tobacco, snus (a "spitless," moist powder tobacco pouch), dissolvable nicotine products, and a variety of other tobacco-containing products that are not smoked. These products cause oral, esophageal, and pancreatic cancers; precancerous lesions of the mouth; gum recession; bone loss around the teeth; and tooth staining.[28,29] They can also lead to nicotine addiction. Compared to quitting completely, switching to smokeless tobacco products as a substitute for smoking has been shown to increase the risk of tobacco-related death.[30] Furthermore, smokers who use smokeless products as a supplemental source of nicotine to postpone or avoid quitting will increase rather than decrease their risk of lung cancer.[31]

Recently, the smokeless market in high-income countries, including the US, has been consolidated from smaller tobacco companies into the control of tobacco multinational corporations. In the US, the sales of smokeless tobacco products are growing at a more rapid pace than cigarettes.[32] As part of their marketing strategy, the industry is actively promoting these products both for use in settings where smoking is prohibited and as a way to quit smoking. However, there is no evidence to date that these products are as effective as proven cessation therapies for quitting. When smokeless tobacco was aggressively marketed in the US in the 1970s and 1980s, use of these products increased among adolescent males, but not among older smokers trying to quit. The use of any smokeless tobacco product is not considered a safe substitute for quitting.[33,34]

- The sales of moist snuff increased by 66% between 2005 and 2011.[35]
- According to the 2014 NHIS, 2% of adults 18 years of age and older (4% of men and <1% of women) currently (every day or some days) used smokeless tobacco products.[7]
- According to the 2012-2013 NATS, whites and American Indians/Alaska Natives were more likely to use smokeless tobacco than non-Hispanic black, Hispanics/Latinos, or Asians.[15]
- Current adult smokeless tobacco use (including snus use) varied from <2% in California; Washington, DC; and Massachusetts to 9% in West Virginia in 2013.[9]
- According to the 2014 National Youth Tobacco Survey, 10% of high school boys and 1% of girls used smokeless tobacco in the past 30 days.[11]

Smoking Cessation

Smokers who quit, regardless of age, increase their longevity, with those who quit before middle age generally experiencing a lifespan similar to never smokers.[36] Smoking cessation reduces the risk of lung and other cancers caused by smoking. In addition, cancer survivors who quit smoking have better health outcomes than those who do not.[1]

- According to the 2014 NHIS, 57% (52.2 million) of the 92.3 million Americans who ever smoked at least 100 cigarettes are now former smokers.[7]
- In 2014, 49% of current smokers attempted to quit for at least one day in the past year.[7]
- Smokers with an undergraduate or graduate degree are more likely to succeed in quitting than less educated smokers.[37]
- Although effective cessation treatments can double or triple a smoker's chances of long-term abstinence, only 32% of people who try to quit used counseling or medication. Use of smoking cessation aids is particularly low among smokers with lower educational attainment.[38]
- In 2013, 56% of high school students who were current cigarette smokers tried to quit during the 12 months preceding the survey.[39]

Reducing Tobacco Use and Exposure

There are federal, state, and local initiatives aimed at reducing tobacco exposure. While states have been at the forefront of tobacco control efforts, the importance of the federal government's role was emphasized in a 2007 Institute of Medicine Report.[40] Federal initiatives in tobacco control hold promise for reducing tobacco use, and include regulation of tobacco products, national legislation ensuring coverage of some clinical cessation services, and tax increases. The Family Smoking Prevention and Tobacco Control Act of 2009 granted the US Food and Drug Administration (FDA) the authority to regulate the manufacturing, selling, and marketing of tobacco products. Key provisions that have already gone into effect include the prohibition of misleading descriptors such as light, low, and mild on tobacco product labels and the prohibition of fruit and candy cigarette flavorings. Provisions in the 2010 Affordable Care Act ensure at least minimum coverage of evidence-based cessation treatments, including pharmacotherapy and cessation counseling, to previously uninsured tobacco users, pregnant Medicaid recipients, and eligible Medicare recipients. Furthermore, cost-sharing for evidence-based cessation treatments was eliminated for new or renewed private health plans and Medicare recipients.

In 2000, the US Surgeon General outlined the goals and components of comprehensive statewide tobacco control programs.[41] These programs seek to prevent the initiation of tobacco use among youth, promote quitting at all ages, eliminate nonsmokers' exposure to SHS, and identify and eliminate the disparities related to tobacco use and its effects among different population groups. The Centers for Disease Control and Prevention (CDC) recommends funding levels for comprehensive tobacco use prevention and cessation programs for all 50 states and the District of Columbia. In fiscal year 2015, 7 states allocated 50% or more of CDC-recommended funding levels for tobacco control programs.[24] States that have previously invested in comprehensive

tobacco control programs, such as California, Massachusetts, and Florida, have reduced smoking rates and saved millions of dollars in tobacco-related health care costs.[41] For more information about tobacco control, visit cancer.org/statistics to view the most recent edition of *Cancer Prevention & Early Detection Facts & Figures*.

Conclusion

Substantial progress has been made in reducing the disease burden from tobacco over the 52 years since the first report of the Surgeon General's Advisory Committee on Smoking and Health in 1964. Smoking prevalence has been reduced by more than half, and millions of premature deaths have been averted. Nevertheless, more needs to be done to further reduce the health and economic burden of tobacco. Numerous studies confirm that a comprehensive approach to tobacco control, including higher taxes, 100% smoke-free environments, coverage for tobacco dependence treatment, full implementation of the FDA Family Smoking Prevention and Tobacco Control Act, and vigorous tobacco counter-advertising, can be successful in reducing deaths, disease, and economic disruption from tobacco use.

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Nutrition & Physical Activity

The World Cancer Research Fund estimates that about 20% of cancers that occur in the US are due to the combined effects of excess alcohol consumption, poor nutrition, physical inactivity, and excess weight, and thus could be prevented.[1] For the 83% of people who don't smoke, maintaining a healthy body weight, being physically active on a regular basis, and eating a healthy diet are the most important ways to reduce cancer risk. Studies estimate that adults who follow these healthy lifestyle recommendations, including not smoking, are 36% less likely to be diagnosed with cancer and 40% less likely to die from the disease.[2] The American Cancer Society's nutrition and physical activity guidelines emphasize the importance of weight control, physical activity, healthy dietary patterns, and limited, if any, alcohol consumption in reducing cancer risk and helping people stay well. Unfortunately, the majority of Americans are not meeting these recommendations.[3] The Society's guidelines also include recommendations for community action because of the large influence that physical and social environments have on individual food and activity behaviors.

The following recommendations reflect the best nutrition and physical activity evidence available to help Americans reduce their risk of cancer and promote overall health. See *Cancer Prevention & Early Detection Facts & Figures* at **cancer.org/statistics** for more detailed information on how nutrition, physical activity, and body weight affect cancer risk.

Recommendations for Individual Choices

1. Achieve and maintain a healthy weight throughout life.

- Be as lean as possible throughout life without being underweight.
- Avoid excess weight gain at all ages. For those who are currently overweight or obese, losing even a small amount of weight has health benefits and is a good place to start.
- Engage in regular physical activity and limit consumption of high-calorie foods and beverages as key strategies for maintaining a healthy weight.

Overweight and obesity are clearly associated with increased risk for developing many cancers, including adenocarcinoma of the esophagus and cancers of the breast (in postmenopausal women), colorectum, endometrium, kidney, liver, and pancreas. Overweight and obesity may also be associated with an increased risk of aggressive prostate cancer, non-Hodgkin lymphoma, multiple myeloma, and cancers of the cervix, ovary, and gallbladder. Abdominal fatness in particular is convincingly associated with colorectal cancer, and probably related to higher risk of pancreatic and endometrial cancers. In addition, accumulating evidence suggests that obesity increases the risk for cancer recurrence and decreases survival rates for several cancers.[4, 5] Some studies have shown that intentional weight loss is

associated with decreased cancer risk among women, but the evidence is less clear for men.[6]

The prevalence of obesity among US adults 20-74 years of age more than doubled between 1976-1980 (15%) and 1999-2000 (31%), but since 2005 has remained around 35%.[7] However, among certain subgroups, such as Hispanic (45%) and non-Hispanic black (57%) women, obesity prevalence is much higher. Similar to adults, obesity among children and adolescents has risen rapidly in the past several decades across race, ethnicity, and gender. In 2011-2012, 17% of American children 2 to 19 years of age were obese, including 20% of blacks, 22% of Hispanics, 14% of non-Hispanic whites, and 7% of Asians.[8] However, a recent study suggests that obesity rates among children and adolescents have plateaued over the past decade, with declines reported among children 2 to 5 years of age, perhaps an indication that the obesity epidemic is stalling.[8] Because overweight in youth tends to continue throughout life, efforts to establish healthy body weight patterns should begin in childhood.

The high prevalence of obesity in children and adolescents may impact the future cancer burden. More than likely, the obesity epidemic is already impacting cancer rates. For example, rising endometrial cancer incidence rates likely reflect, to some extent, the increasing prevalence of obesity.[9] Additionally, some researchers have speculated that the longstanding, historic increases in life expectancy in the US may level off or even decline within the first half of this century as a result of the obesity epidemic.

2. Adopt a physically active lifestyle.

- Adults should engage in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity activity each week, or an equivalent combination, preferably spread throughout the week.
- Children and adolescents should engage in at least 1 hour of moderate- or vigorous-intensity activity each day, with vigorous-intensity activity at least three days each week.
- Limit sedentary behavior such as sitting, lying down, and watching television and other forms of screen-based entertainment.
- Doing any intentional physical activity above usual activities can have many health benefits.

Living a physically active lifestyle helps reduce the risk of a variety of cancer types, as well as heart disease, diabetes, and many other diseases. Scientific evidence indicates that physical activity may reduce the risk of cancers of the breast, colon, and endometrium, as well as advanced prostate cancer.[10] Physical activity also indirectly reduces the risk of developing obesity-related cancers because of its role in helping to maintain a healthy weight. Being active is thought to reduce cancer risk largely by improving energy metabolism and reducing circulating concentrations of estrogen, insulin, and insulin-like growth factors. Physical activity also improves the quality of life of cancer patients and has been associated with reduced cancer recurrence and overall mortality in cancer survivor groups, including breast, colorectal, prostate, and ovarian cancer.

Despite the wide variety of health benefits from being active, in 2014 30% of adults reported no leisure-time activity, and only 50% met recommended levels of aerobic activity. Similarly, only 25% of children 12 to 15 years of age and 27% of high school students met recommendations. However, recent data released by the CDC indicate that trends may be slightly improving. The proportion of adults meeting recommended aerobic and muscle-strengthening guidelines increased from 14% in 1998 to 22% in 2014.

3. Consume a healthy diet, with an emphasis on plant foods.

- Choose foods and beverages in amounts that help achieve and maintain a healthy weight.
- Limit consumption of red and processed meat.
- Eat at least 2½ cups of vegetables and fruits each day.
- Choose whole grains instead of refined-grain products.

There is strong scientific evidence that healthy dietary patterns, in combination with regular physical activity, are needed to maintain a healthy body weight and to reduce cancer risk. Studies have shown that individuals who eat more processed and red meat, potatoes, refined grains, and sugar-sweetened beverages and foods are at a higher risk of developing or dying from a variety of cancers. Alternatively, adhering to a diet that contains a variety of fruits and vegetables, whole grains, and fish or poultry and fewer red and processed meats is associated with lower risk. Recent studies found that dietary and lifestyle behaviors consistent with the American Cancer Society nutrition and physical activity guidelines are associated with lower mortality rates for all causes of death combined, and for cancer and cardiovascular diseases specifically.[11, 12] Despite the known benefits of a healthy diet, Americans are not following recommendations; according to the US Department of Agriculture, the majority of Americans would need to substantially lower their intake of added sugars, added fats, refined grains, and sodium, and increase their consumption of fruits, vegetables, whole grains, and low-fat dairy products in order to meet the 2010 Dietary Guidelines for Americans.

The scientific study of nutrition and cancer is highly complex, and many important questions remain unanswered. It is not presently clear how single nutrients, combinations of nutrients, over-nutrition, and energy imbalance, or the amount and distribution of body fat and nutritional exposures at particular stages of life, affect a person's risk of specific cancers. Until more is known about the specific components of diet that influence cancer risk, the best advice is to consume a mostly plant-based diet that limits red and processed meats and emphasizes a variety of vegetables, fruits, and whole grains. A special emphasis should

be placed on controlling total caloric intake to help achieve and maintain a healthy weight.

4. If you drink alcoholic beverages, limit consumption.

People who drink alcohol should limit their intake to no more than two drinks per day for men and one drink per day for women. Alcohol consumption is a risk factor for cancers of the mouth, pharynx, larynx, esophagus, liver, colorectum, female breast, and possibly pancreas.[3, 10, 13, 14] For each of these cancers, risk increases substantially with the intake of more than two drinks per day. Even a few drinks per week may be associated with a slightly increased risk of breast cancer in women.[15] 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.[10]

The American Cancer Society Recommendations for Community Action

Many Americans encounter substantial barriers to consuming a healthy diet and engaging in regular physical activity. Among those barriers that have collectively contributed to increased obesity are: limited access to affordable, healthy foods; increased portion sizes, especially of restaurant meals; marketing and advertising of foods and beverages high in calories, fat, and added sugar, particularly to kids; schools and worksites that are not conducive to good health; community design that hinders physical activity and promotes sedentary behavior; and economic and time constraints.

The Society's nutrition and physical activity guidelines include Recommendations for Community Action because of the tremendous influence that the surrounding environment has on individual food and activity choices. Acknowledging that reversing obesity trends will require extensive policy and environmental changes, the Society calls for public, private, and community organizations to create social and physical environments that support the adoption and maintenance of healthy eating and physical activity behaviors to help people stay well.

Achieving these recommendations requires multiple strategies and bold action, ranging from the implementation of community and workplace health promotion programs to policies that affect community planning, transportation, school-based physical activity, and food services. The tobacco control experience has shown that policy and environmental changes at the national, state, and local levels are critical to achieving changes in individual behavior. Measures such as smoke-free laws and increases in cigarette excise taxes have been 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 are required to help individuals make smart food and physical activity choices and maintain a healthy body weight.

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Cancer Disparities

Eliminating disparities in the cancer burden among different segments of the US population, defined in terms of socioeconomic status (income, education, insurance status, etc.), race/ethnicity, geographic location, sex, and sexual orientation, is an overarching goal of the American Cancer Society. The causes of health disparities within each of these groups are complex and include interrelated social, economic, cultural, environmental, and health system factors. However, disparities predominantly arise from inequities in work, wealth, education, housing, and overall standard of living, as well as social barriers to high-quality cancer prevention, early detection, and treatment services.

Socioeconomic Status

People with lower socioeconomic status (SES) have higher cancer death rates than those with higher SES, regardless of demographic factors such as race/ethnicity. For example, cancer mortality rates among both black and non-Hispanic white men with 12 or fewer years of education are almost 3 times higher than those of college graduates for all cancers combined because of limited access to prevention, early detection, and treatment services.

People with lower SES also have generally higher cancer incidence rates. This is in part because they are more likely to engage in behaviors that increase cancer risk, such as using tobacco, not being physically active, and having an unhealthy diet, but also due to higher prevalence of cancer-causing infections, workplace exposures, and other environmental exposures. Factors that contribute to a higher prevalence of cancer risk factors in this population include marketing strategies by tobacco companies and fast food chains that target these populations and environmental and/or community factors that provide few opportunities for physical activity and access to fresh fruits and vegetables. In addition to higher rates of new cancer diagnoses, lower SES groups are less likely to survive after a cancer diagnosis because the disease is often detected at an advanced stage and because they are less likely to receive standard treatment. Barriers to preventive care, early detection, and optimal treatment include inadequate health insurance; financial, structural, and personal barriers to health care; and low health literacy rates. Progress in reducing cancer death rates has also been slower in people with lower SES because of the delay in the dissemination of improved early detection and treatment in this underserved population.

Racial and Ethnic Minorities

Disparities in the cancer burden among racial and ethnic minorities largely reflect obstacles to receiving health care services related to cancer prevention, early detection, and high-quality treatment, with poverty as the overriding factor. According to the US Census Bureau, in 2014, 26% of blacks and 24% of Hispanics/Latinos lived below the poverty line, compared to 10% of non-Hispanic whites. Moreover, 12% of blacks and 20% of Hispanics/Latinos were uninsured, compared to 8% of non-Hispanic whites.

Discrimination is another factor that contributes to racial/ethnic disparities in cancer mortality. Racial and ethnic minorities tend to receive lower-quality health care than non-Hispanic whites even when insurance status, age, severity of disease, and health status are comparable. Social inequalities, including communication barriers and provider/patient assumptions, can affect interactions between patients and physicians and contribute to miscommunication and/or delivery of substandard care.

In addition to poverty and social discrimination, cancer occurrence in a population may also be influenced by cultural and/or inherited factors that decrease or increase risk. Individuals who maintain a primarily plant-based diet or do not use tobacco because of cultural or religious beliefs have a lower risk of many cancers compared to non-Hispanic whites. For example, Hispanics and Asians have lower rates of lung cancer because they have historically been less likely to smoke (Table 9). Conversely, because these populations include a large number of recent immigrants, they have higher rates of cancers related to infectious agents (e.g., stomach, liver) because of higher prevalence of infection in immigrant countries of origin. Genetic factors may also explain some differences in cancer incidence, such as the higher frequency of mutations in the breast cancer susceptibility genes *BRCA1* and *BRCA2* among women of Ashkenazi Jewish descent. However, it is important to note that genetic differences associated with race or ethnicity make only a minor contribution to the disparate cancer burden between populations.

Following is a brief overview of the cancer burden for the four major minority groups in the US. It is important to note that although cancer data in the US are primarily reported in terms of broad racial and ethnic categories, these populations are very heterogeneous, with substantial variation in the cancer burden within each group. In addition, cancer information for several racial and ethnic groups, especially American Indians and Alaska Natives (AIANs), is known to be incomplete due to misclassification on medical and death records. Although efforts have been made to collect more accurate information, rates presented for AIANs in particular likely do not represent the true cancer burden in this population.

Non-Hispanic Black: Non-Hispanic black (henceforth black) men have higher overall cancer incidence (592.3 per 100,000) and death (267.7) rates than any other major racial or ethnic group, 12% and 27% higher, respectively, than non-Hispanic

Table 9. Incidence and Death Rates* for Selected Cancers by Site, Race, and Ethnicity, US, 2008-2012

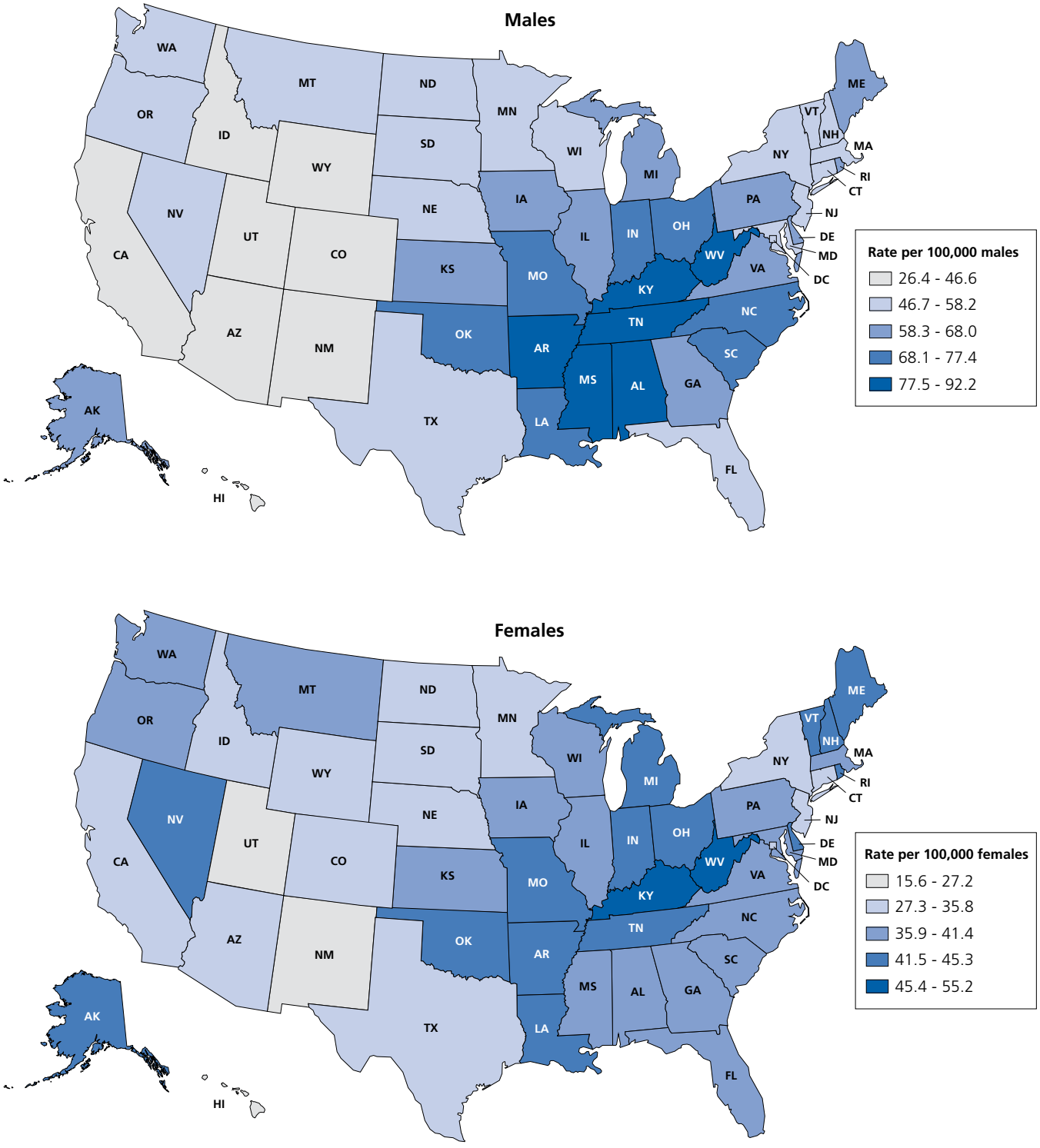
Incidence	Non-Hispanic white	Non-Hispanic black	Asian and Pacific Islander	American Indian and Alaska Native†	Hispanic/Latino
All sites					
Male	528.9	592.3	316.8	423.3	408.5
Female	436.2	408.1	287.5	372.9	330.4
Breast (female)	128.1	124.3	88.3	91.9	91.9
Colon & rectum					
Male	47.4	60.3	39.0	50.4	44.6
Female	36.2	44.1	29.2	40.1	30.6
Kidney & renal pelvis					
Male	21.8	24.2	10.8	29.7	20.6
Female	11.3	13.0	4.9	18.3	11.8
Liver & intrahepatic bile duct					
Male	9.3	16.5	20.6	18.7	19.3
Female	3.2	4.8	7.9	8.9	7.2
Lung & bronchus					
Male	79.3	93.4	47.4	66.2	43.3
Female	58.7	51.4	28.3	52.7	26.0
Prostate	123.0	208.7	67.8	90.5	112.1
Stomach					
Male	7.8	15.1	14.5	12.0	13.5
Female	3.5	8.0	8.5	6.6	7.8
Uterine cervix	7.1	10.0	6.3	9.4	10.2
Mortality					
All sites					
Male	210.6	267.7	128.4	186.7	148.0
Female	149.2	170.4	91.2	133.9	99.4
Breast (female)	21.9	31.0	11.4	15.0	14.5
Colon & rectum					
Male	18.2	27.6	13.0	18.8	15.6
Female	12.9	18.2	9.4	15.6	9.6
Kidney & renal pelvis					
Male	5.9	5.7	2.9	8.7	5.0
Female	2.6	2.6	1.2	4.7	2.4
Liver & intrahepatic bile duct					
Male	7.6	12.8	14.5	13.9	12.9
Female	3.1	4.4	6.1	6.3	5.6
Lung & bronchus					
Male	62.2	74.9	34.0	49.1	29.5
Female	41.4	36.7	18.2	32.1	13.7
Prostate	19.9	47.2	9.4	20.2	17.8
Stomach					
Male	3.6	9.4	7.9	7.4	7.2
Female	1.8	4.5	4.7	3.6	4.2
Uterine cervix	2.0	4.1	1.8	3.5	2.7

Hispanic origin is not mutually exclusive from Asian/Pacific Islander or American Indian/Alaska Native. *Rates are per 100,000 population and age adjusted to the 2000 US standard population. †Data based on Indian Health Service Contract Health Service Delivery Areas. Incidence rates exclude data from Kansas.

Source: Incidence – North American Association of Central Cancer Registries, 2015. Mortality – US mortality data, National Center for Health Statistics, Centers for Disease Control and Prevention, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

Figure 5. Geographic Patterns in Lung Cancer Death Rates* by State, US, 2008-2012



*Rates adjusted to the 2000 US standard population.

Source: US Mortality Data, National Center for Health Statistics, Centers for Disease Control and Prevention, 2015.

American Cancer Society, Inc., Surveillance Research, 2016

whites (528.9 and 210.6) (Table 9, page 51). Cancer death rates in black men are twice those in Asian and Pacific Islanders (128.4), who have the lowest rates. In particular, prostate cancer death rates in black men (47.2) are more than double those of any other group, and are 137% higher than non-Hispanic whites (19.9). Black women have 14% higher cancer death rates than non-Hispanic white women despite 6% lower incidence rates. See *Cancer Facts & Figures for African Americans*, available online at cancer.org/statistics, for more information on cancer in black Americans.

Hispanic/Latino: Cancer patterns in Hispanics generally reflect those in immigrant countries of origin, but become more similar to non-Hispanic white Americans across generations due to acculturation. Hispanics have lower rates of the cancers that are most common in the US (female breast, colorectum, lung, and prostate), but among the highest rates of cancers associated with infectious agents. For example, compared to non-Hispanic whites, cervical cancer incidence rates are 44% higher, and liver and stomach cancer incidence rates are about twice as high (Table 9, page 51). See *Cancer Facts & Figures for Hispanics/Latinos*, available online at cancer.org/statistics for more information.

Asian and Pacific Islander (API): Cancer patterns in APIs are similar to those in Hispanics (Table 9, page 51). APIs have the lowest overall cancer incidence and death rates, but among the highest rates of liver and stomach cancers, about double those among non-Hispanic whites. In contrast to Hispanics, however, APIs overall have the lowest cervical cancer incidence and mortality rates of all major racial/ethnic groups , although rates are elevated among some API subpopulations. For more information, see the special section on page 25.

American Indian and Alaska Native (AIAN): AIANs have the highest kidney cancer incidence and death rates of any racial or ethnic population – 3 times higher than those among APIs, who have the lowest rates (Table 9, page 51). Kidney cancer death rates are highest among AIAN populations in the Northern and Southern Plains, while they are substantially lower in the East and Pacific Coast regions. Rates of lung cancer are also particularly high among AIAN men and women in some regions. For example, AIAN men living in the Northern Plains or Alaska have lung cancer incidence rates about 50% higher than whites living in those areas. Differences in the prevalence of smoking, obesity, and hypertension likely contribute to these disparities.

For information about American Cancer Society advocacy efforts dedicated to reducing the cancer burden among minority and medically underserved populations, see "Advocacy" on page 62.

Geographic Variability

Cancer rates in the US vary by geographic area, with larger differences for some cancer sites than others. Lung cancer, for example, shows the most striking variation by state (Figure 5). Lung cancer death rates are more than 3-fold higher in Kentucky (92 and 55 per 100,000 in men and women, respectively) – the state with the highest rates – than in Utah (26 and 16 per 100,000 in men and women, respectively), which has the lowest rates. These differences reflect the substantial historic variation in smoking prevalence among states, which continues today. For example, smoking prevalence in adults in 2013 ranged from 10% in Utah to 27% in Kentucky and West Virginia. Some of this difference reflects state tobacco control policies. Geographic variations in cancer occurrence also reflect differences in environmental exposures, socioeconomic factors related to population demographics, and screening behaviors. There is little state variation in the occurrence of cancers that are less influenced by behavior and/or early detection tests, such as non-Hodgkin lymphoma (Table 4, page 7).

The Global Fight against Cancer

The ultimate mission of the American Cancer Society is to eliminate cancer as a major health problem. Because cancer knows no boundaries, this mission extends around the world. Cancer is an enormous global health burden, touching every region and socioeconomic group. Today, cancer accounts for about 1 in every 7 deaths worldwide – more than HIV/AIDS, tuberculosis, and malaria combined. In 2012, there were an estimated 14.1 million cases of cancer diagnosed around the world and 8.2 million cancer deaths. More than 60% of cancer deaths occur in low- and middle-income countries, many of which lack the medical resources and health systems to support the disease burden. Moreover, the global cancer burden is growing at an alarming pace; in 2030 alone, about 21.7 million new cancer cases and 13.0 million cancer deaths are expected to occur, simply due to the growth and aging of the population. The future burden may be further increased by the adoption of behaviors and lifestyles associated with economic development and urbanization (e.g., smoking, poor diet, physical inactivity, and reproductive patterns) in low- and middle-income countries. Tobacco use is a major cause of the increasing global burden of cancer as the number of smokers worldwide continues to grow.

Worldwide Tobacco Use

Tobacco-related diseases are the most preventable cause of death worldwide, responsible for the deaths of approximately half of all long-term tobacco users.

- Each year, tobacco use is responsible for almost 6 million deaths, 80% of which are in low- and middle-income countries; by 2030, this number is expected to increase to 8 million.
- Between 2002 and 2030, tobacco-attributable deaths are expected to decrease by 9% in high-income countries, while increasing by 100% (from 3.4 million to 6.8 million) in low- and middle-income countries.

The first global public health treaty under the auspices of the World Health Organization, the Framework Convention on Tobacco Control (FCTC), was unanimously adopted by the World Health Assembly on May 21, 2003, and subsequently entered into force as a legally binding accord for all ratifying states on February 27, 2005. The purpose of the treaty is to fight the devastating health and economic effects of tobacco on a global scale by requiring parties to adopt a comprehensive range of tobacco control measures. It features specific provisions to control both the global supply of and demand for tobacco, including the regulation of tobacco product contents, packaging, labeling, advertising, promotion, sponsorship, taxation, illicit trade, youth access, exposure to secondhand tobacco smoke, and environmental and agricultural impacts. Parties to the treaty are expected to strengthen national legislation, enact effective domestic tobacco control policies, and cooperate internationally to reduce global tobacco consumption. A number of major tobacco-producing nations, including Argentina, Indonesia, Malawi, and the United States, have not ratified the treaty.

- As of November 2015, 180 out of 196 eligible parties have ratified or acceded to the treaty, representing approximately 89% of the world's population.
- About one-third of the world's population was covered by at least one comprehensive tobacco control measure in 2014, up from about 15% in 2008.
- The WHO estimates that 18% of the world's population lives in smoke-free environments.
- Although tobacco excise tax increases are among the most cost-effective tobacco control strategies, only 10% of the world population is covered by comprehensive tobacco tax policy.

The Role of the American Cancer Society

With more than a century of experience in cancer control, the American Cancer Society is uniquely positioned to help in leading the global fight against cancer and tobacco by assisting and empowering the world's cancer societies and anti-tobacco advocates. The Society's Global Cancer Control and Intramural Research departments are raising awareness about the growing global cancer burden and promoting evidence-based cancer and tobacco control programs.

The Society works to reduce the global burden of cancer by preventing cancer, saving lives, diminishing suffering, catalyzing local responses, and shaping the global policy agenda. Our efforts focus on low- and middle-income countries.

Make cancer control a political and public health priority. Noncommunicable diseases (NCDs) such as cancer, heart disease, and diabetes account for about 65% of the world's deaths. Although 67% of these deaths occur in low- and middle-income countries, less than 3% of private and public health funding is allocated to prevent and control NCDs in these areas. In September 2011, world leaders gathered at a special United Nations High-level Meeting and adopted a Political Declaration that elevates cancer and other NCDs on the global health and development agenda and includes key commitments to address these diseases. In 2012, the decision-making body of the World Health Organization (WHO) approved a resolution calling for a 25% reduction in premature deaths from NCDs by 2025 (also known as 25 by 25). This ambitious goal set the stage for the adoption of a comprehensive framework aimed at monitoring NCD risk factors (e.g., smoking prevalence) and indicators of increased access to breast and cervical cancer screening, palliative care, and vaccination coverage. At a United Nations summit in September 2015, government leaders formally adopted the Sustainable Development Goals, including a stand-alone target on NCDs and a number of NCD-related targets. This is the first time that NCDs have been included in these goals as a priority for all countries. To maintain the momentum for making cancer and other NCDs a global priority, the Society collaborates with key partners, including the NCD Alliance, the Union for International Cancer Control, the WHO's International Agency for Research on Cancer, the NCD Roundtable, and the Taskforce on Women and Non-Communicable Diseases.

Last year (2015) was also a critical time for making women's cancers a global health and development priority. Cervical and breast cancers are the most commonly diagnosed cancers among women in most areas of the world. Focusing on fighting these cancers is a priority for the American Cancer Society, not only because they affect so many women, but also because cost-effective and proven prevention, screening, and treatment options exist. To strengthen the case for greater investments in cervical cancer prevention and control, the Society commissioned Harvard University's T.H. Chan School of Public Health to estimate the cost of achieving comprehensive global cervical cancer prevention over the next decade in low- and middle-income countries. The study found that scaling up comprehensive prevention steadily from 2015 through 2024 would cost $18.3 billion

($8.6 billion for vaccination and $9.7 billion for screening) and that 480 million women would be screened and 290 million girls would be vaccinated.

Develop cancer control capacity globally. Many governments in low- and middle-income countries are ill-prepared to adequately address the increasing burden of cancer. In many cases, civil society actors (nongovernmental organizations, institutions, and individuals) are also not yet fully engaged in cancer control efforts.

The Society's Global Capacity Development program is intended to strengthen the civil society response to cancer in focus countries around the world, taking advantage of more than 100 years of institutional experience and expertise in cancer control. This program provides intensive and culturally appropriate technical assistance to targeted organizations in low- and middle-income countries. The program's areas of intervention include the basic elements of organizational capacity development, such as governance, financial management, fundraising, program design and management, and monitoring and evaluation.

Make effective pain treatment available to all in need. Untreated moderate to severe pain, which is experienced by about 80% of people with advanced cancer, is a consistent feature of cancer care in resource-limited settings. Improved access to essential pain medicines is arguably the easiest and least expensive need to meet, would do the most to relieve suffering, and may also extend survival, according to recent data. The Society has projects in Nigeria, Ethiopia, Kenya, Uganda, and Swaziland to improve access to essential pain medicines. In Nigeria, the Society collaborated with the government to make morphine available for the first time in several years and set up a local production system in 27 teaching hospitals that lowered the price for patients by 80% to 90%. The Society continues to support the national morphine production facility in Uganda, which has been operating since 2010, and is supporting Kenya to replicate the model in the national hospital in Nairobi. The Society is also training health workers in more than 25 teaching and referral hospitals across the 5 countries through the Pain-Free Hospital Initiative, a 1-year hospital-wide quality improvement initiative designed to change clinical practice by integrating effective, high-quality pain treatment into hospital-based services.

Increase awareness about the global cancer burden. The Society continues to work with global collaborators to increase awareness about the growing global cancer and tobacco burdens and their impact on low- and middle-income countries. In addition to print publications, the Society website, cancer.org, provides cancer information to millions of individuals throughout the world. In 2014, 40% of visits to the website came from outside the US. Information is currently available in English, Spanish, Chinese, Bengali, Hindi, Korean, Urdu, and Vietnamese.

Visit the Society's Global Health program website at cancer.org/international and global.cancer.org for more information on the global cancer burden. In addition, recent publications by the Intramural Research department include:

- *Global Cancer Facts & Figures, 3rd Edition* (cancer.org/statistics)
- *The Cancer Atlas, Second Edition* (canceratlas.cancer.org)
- *The Tobacco Atlas, Fifth Edition* (tobaccoatlas.org)

The American Cancer Society

In 1913, 10 physicians and 5 laypeople founded the American Society for the Control of Cancer. Its purpose was to raise awareness about cancer symptoms, treatment, and prevention; to investigate the causes of cancer; and to compile cancer statistics. Later renamed the American Cancer Society, Inc., the organization now works with approximately 2.5 million volunteers to save lives by helping people stay well and get well, by finding cures, and by fighting back against the disease. We combine our relentless passion with the wisdom of over a century of experience to make this vision a reality, and we get results. Thanks in part to our contributions, more than 1.7 million cancer deaths have been averted in the US in the past two decades.

How the American Cancer Society Is Organized

The American Cancer Society, Inc., is a 501(c)(3) nonprofit corporation governed by a Board of Directors that sets policy, establishes long-term goals, monitors general operations, and approves organizational outcomes and allocation of resources.

The Society's structure includes a central corporate office in Atlanta, Georgia, as well as regional and local offices supporting 11 geographic Divisions, and more than 300 local offices in those Divisions. The corporate office is responsible for overall strategic planning; corporate support services such as human resources, financial management, IT, etc.; development and implementation of global and nationwide endeavors such as our groundbreaking research program, our global program, and our

24-hour call center; and technical support and materials for Divisions and their local offices.

Our Divisions and local offices are organized to engage communities in the cancer fight, delivering patient programs and services and raising money at the local level. Offices are strategically located around the country in an effort to maximize the impact of our efforts and be as efficient as possible with the money donated to the Society to help finish the fight against cancer.

In addition, the Society has a nonprofit, nonpartisan 501(c)(4) advocacy affiliate called the American Cancer Society Cancer Action Network℠ (ACS CAN). Headquartered in Washington, DC but including staff and volunteers in all 50 states, ACS CAN uses applied policy analysis, direct lobbying, grassroots action, and media advocacy to ensure elected officials nationwide pass and effectively implement laws that help save lives from cancer.

Volunteers

The Society relies on the strength of millions of dedicated volunteers. Supported by professional staff, Society volunteers drive every part of our mission. They raise funds to support crucial research, provide cancer patients rides to and from treatments, and give one-on-one support to those facing a cancer diagnosis – and that's just the beginning.

How the American Cancer Society Saves Lives

As an organization of 2.5 million strong, the American Cancer Society is committed to a world free from the pain and suffering of cancer.

Prevention and Early Detection

The American Cancer Society is doing everything in our power to prevent cancer. We are diligent in encouraging cancer screenings for early detection and promote healthy lifestyles by bringing attention to obesity, healthy diets, physical activity, and avoiding tobacco.

Prevention

The **Quit For Life®** Program is the nation's leading tobacco cessation program, offered by 27 states and more than 700 employers and health plans throughout the US. A collaboration between the American Cancer Society and Alere Health, the program is built on the organizations' more than 35 years of combined experience in tobacco cessation. The Quit For Life Program employs an evidence-based combination of physical, psychological, and behavioral strategies to enable participants to take responsibility for and overcome their addiction to tobacco. A critical mix of medication support, phone-based cognitive behavioral coaching, text messaging, web-based learning, and support tools produces an average 6-month quit rate of 49%.

More than 5 million new cases of skin cancer will be diagnosed in the US this year. That's why the American Cancer Society and other members of the National Council on Skin Cancer Prevention have designated the Friday before Memorial Day as Don't Fry Day. The Society promotes skin cancer prevention and awareness educational messages in support of Don't Fry Day and year-round.

The Society also offers many products to employers and other systems to help their employees stay well and reduce their cancer risk, too. These include:

- The **Workplace Health Assessment** program, which surveys a company's health and wellness practices to provide recommended strategies for increasing effectiveness of current programs, developing target initiatives to meet employees' needs, and strengthening the culture of health for the organization. Targeted behaviors include organizational readiness, tobacco control, cancer screening, healthy eating, physical activity, and cancer care.
- The **Freshstart®** group-based tobacco cessation program, which is designed to help employees plan a successful quit attempt by providing essential information, skills for coping with cravings, and social support
- **The Content Subscription Service**, an electronic toolkit subscription offered by the Society to employers that supports the health and wellness needs of employees with information about cancer prevention and early detection, as well as support services and resources for those facing the disease
- ***Healthy Living***, a monthly electronic newsletter produced by the American Cancer Society that teaches the importance of making healthy lifestyle choices. The e-newsletter focuses on exercising, eating better, and maintaining a healthy weight. Healthy Living is available in both English and Spanish, and the content has been edited by the Society's scientific staff to ensure that the most up-to-date and accurate information is being provided.
- The 10-week **Active For Life℠** online program, which uses evidence-based practices like individual goal-setting, social support, and frequent logging of activity to help employees become more physically active on a regular basis
- **Tobacco Policy Planner**, an online assessment of company policies, benefits, and programs related to tobacco control. Following the completion of the survey, the company receives a detailed report that includes information needed to help create new – or enhance existing – workplace tobacco policies, programs, and benefits. The resource can assist employers in creating a safe, tobacco-free environment that enhances employee well-being.

- **Nutrition and Physical Activity Planner**, an online assessment of company policies, benefits, and programs related to eating better and being more physically active. Following the completion of the survey, the company receives a detailed report that includes information needed to help create new-or enhance existing workplace policies, programs and benefits.
- The **Meeting Well** guidebook, which offers companies healthy food ideas and suggestions for physical activity that energize meeting participants and demonstrate how easy it can be to live a healthier lifestyle every day

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

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. Those guidelines are assessed regularly to ensure that recommendations are based on the most current scientific evidence.

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

Throughout its history, the Society has implemented a number of aggressive awareness campaigns targeting the public and health care professionals. Campaigns to increase usage of Pap testing and mammography have contributed to a 70% decrease in cervical cancer death rates since 1969 and a 36% decline in breast cancer death rates since 1989. Building on previous and ongoing colorectal cancer prevention and early detection efforts, the Society joined the National Colorectal Cancer Roundtable in its 80% by 2018 initiative in 2013. The bold goal of this campaign is to increase the rate of regular colorectal cancer screening among adults 50 and older to 80% by 2018, with an emphasis on economically disadvantaged individuals, who are least likely to be tested. The Society also continues to encourage the early detection of breast cancer through public awareness and other efforts targeting poor and underserved communities.

Treatment

For the more than 1.6 million cancer patients diagnosed this year and the nearly 14.5 million US cancer survivors, the American Cancer Society is available 24 hours a day, seven days a week to provide – among other things – the latest cancer information, emotional support, or free lodging when patients need treatment away from home.

Information, 24 Hours a Day, 7 Days a Week

The American Cancer Society is available 24 hours a day, 7 days a week online at cancer.org and by calling 1-800-227-2345. Callers are connected with a cancer information specialist who can help them locate a hospital, understand cancer and treatment options, learn what to expect and how to plan, address insurance concerns, find financial resources, find a local support group, and more. The Society can also help people who speak languages other than English or Spanish find the assistance they need, offering services in more than 200 languages.

Information on every aspect of the cancer experience, from prevention to survivorship, is also available through cancer.org, the Society's website. The site contains in-depth information on every major cancer type, as well as on treatments, side effects, caregiving, and coping.

The Society also publishes a wide variety of brochures and books that cover a multitude of topics, from patient education, quality of life, and caregiving issues to healthy living. Visit cancer.org/bookstore for a complete list of Society books that are available to order.

The Society publishes three peer-reviewed journals for health care providers and researchers: *Cancer*, *Cancer Cytopathology*, and *CA: A Cancer Journal for Clinicians*. Visit acsjournals.com to learn about the journals and their content.

Day-to-day Help and Emotional Support

The American Cancer Society can help cancer patients and their families find the resources they need to make decisions about the day-to-day challenges that can come from a cancer diagnosis, such as transportation to and from treatment, financial and insurance needs, and lodging when treatment is needed away from home. The Society also connects people with others who have been through similar experiences to offer emotional support.

Help navigating the health care system: Learning how to navigate the cancer journey and the health care system can be overwhelming for anyone, but it is particularly difficult for those who are medically underserved, those who experience language or health literacy barriers, and those with limited resources. The

American Cancer Society Patient Navigator Program reaches those most in need. The largest oncology-focused patient navigator program in the country, it has specially trained patient navigators at more than 120 sites across the nation. Patient navigators can help: find transportation to and from cancer-related appointments; assist with medical financial issues, including insurance navigation; identify community resources; and provide information on a patient's cancer diagnosis and treatment process. In 2014, 56,000 people relied on the Patient Navigator Program to help them through their diagnosis and treatment. The Society collaborates with a variety of organizations, including the National Cancer Institute's Center to Reduce Cancer Health Disparities, the Center for Medicare and Medicaid Services, numerous cancer treatment centers, and others to implement and evaluate this program.

Transportation to treatment: Having cancer is hard. Finding a ride to treatment shouldn't be. The American Cancer Society Road To Recovery® program provides free rides to cancer patients to and from treatments and cancer-related appointments. Trained volunteer drivers donate their time and the use of their personal vehicles to help patients get to the treatments they need. In 2014, the American Cancer Society provided more than 341,000 rides to cancer patients.

Lodging during treatment: The American Cancer Society Hope Lodge® program provides free overnight lodging to patients and their caregivers who have to travel away from home for treatment. Not having to worry about where to stay or how to pay for it allows patients to focus on what's important: getting well. In 2014, the 31 Hope Lodge locations provided more than 276,000 nights of free lodging to 44,000 patients and caregivers – saving them $36 million in hotel expenses. Through its Hotel Partners Program, the Society also partners with local hotels across the country to provide free or discounted lodging to patients and their caregivers in communities without a Hope Lodge facility.

Breast cancer support: Through the American Cancer Society Reach To Recovery® program, trained breast cancer survivor volunteers are matched to people facing or living with breast cancer. Program volunteers give cancer patients and their family members the opportunity to ask questions, talk about their fears and concerns, and express their feelings. The Reach To Recovery volunteers have been there, and they offer understanding, support, and hope. In 2014, the program assisted nearly 8,000 patients.

Cancer education classes: The I Can Cope® online educational program is available free to people facing cancer and their families and friends. The program consists of self-paced classes that can be taken anytime, day or night. People are welcome to take as few or as many classes as they like. Among the topics offered are information about cancer, managing treatments and side effects, healthy eating during and after treatment, communicating with family and friends, finding resources, and more. Visit cancer.org/icancope to learn more about the classes that are available.

Hair-loss and mastectomy products: Some women wear wigs, hats, breast forms, and special bras to help cope with the effects of a mastectomy and hair loss. The American Cancer Society *"tlc" Tender Loving Care*® publication offers affordable hair loss and mastectomy products, as well as advice on how to use those products. The *"tlc"*™ products and catalogs may be ordered online at tlcdirect.org or by calling 1-800-850-9445. All proceeds from product sales go back into the Society's survivorship programs and services.

Help with appearance-related side effects of treatment: The Look Good Feel Better® program is a collaboration of the American Cancer Society, the Personal Care Products Council Foundation, and the Professional Beauty Association that helps women with cancer manage the appearance-related side effects of treatment. The free program engages certified, licensed beauty professionals trained as Look Good Feel Better volunteers to teach simple techniques on skin care, makeup, and nail care, and give practical tips on hair loss, wigs, and head coverings. Information and materials are also available for men and teens. To learn more, visit the Look Good Feel Better website at lookgoodfeelbetter.org or call 1-800-395-LOOK (1-800-395-5665).

Finding hope and inspiration: People with cancer and their loved ones do not have to face cancer alone. The American Cancer Society Cancer Survivors Network® is a free online community created by and for people living with cancer and their families. At csn.cancer.org, they can get and give support, connect with others, find resources, and tell their own story through personal expressions like music and art.

Research

Research is at the heart of the American Cancer Society's mission. For 70 years, the Society has been finding answers that save lives – from changes in lifestyle to new approaches in therapies to improving cancer patients' quality of life. No single nongovernmental, not-for-profit organization in the US has invested more to find the causes and cures of cancer than the Society. We relentlessly pursue the answers that help us understand how to prevent, detect, and treat all cancer types. We combine the world's best and brightest researchers with the world's largest, oldest, and most effective community-based anticancer organization to put answers into action.

The Society's comprehensive research program consists of extramural grants, as well as intramural programs in epidemiology, surveillance and health services research, behavioral research, economic and health policy research, and statistics and evaluation. Intramural research programs are led by the Society's own staff scientists.

Extramural Research

The American Cancer Society's Extramural Research program currently supports research and training in a wide range of cancer-related disciplines at more than 200 institutions. As of August 1, 2015, the Society is funding 816 research and training grants totaling more than $441 million. Grant applications are solicited through a nationwide competition and are subjected to a rigorous external peer-review process, ensuring that only the most promising research is funded. The Society primarily funds investigators early in their research careers, thus giving the best and the brightest a chance to explore cutting-edge ideas at a time when they might not find funding elsewhere. The Extramural Research department is comprised of six programs that span areas from the most basic research to public policy.

Molecular Genetics and Biochemistry of Cancer: This research program focuses on the genes involved in cancer and how alterations in those genes (mutations, deletions, and amplifications) play a role in the cancer process. Also of interest is the examination of molecules involved in cancer (proteins, nucleic acids, lipids, and carbohydrates) and how alterations in those molecules affect the disease. The program highlights potential targets for new cancer treatments.

Cancer Cell Biology and Metastasis: The primary goal of this program is to provide an understanding of the nature of cancer cells so they can be more effectively detected and eliminated. Emphases include understanding the fundamental controls of both normal cells and cancer cells, with a focus on how cells regulate when to grow, when to divide and when to die; how and when to develop from one cell type into another; how cells relate to the local environment and to other cells; and how cells regulate when and how to move from one site to another. To reach the program goals, a wide variety of cell and tumor types are utilized so that all aspects of cell biology can be examined.

Preclinical and Translational Cancer Research: This research program focuses on the interface between laboratory investigations and human testing. The scope of the program includes investigations of the role of infectious diseases in cancer, the synthesis and discovery of cancer drugs, the creation and use of cancer animal models, and the role of individual or groups of genes in different types of cancer.

Clinical Cancer Research, Nutrition, and Immunology: This program focuses on investigations including basic, preclinical, clinical, and epidemiological studies. Areas of interest include new modalities for cancer prevention, diagnosis, and treatment. In addition, the program seeks to improve understanding of cancer-related inflammatory responses and the use of the immune system for cancer prevention and therapy. The program also focuses on increased understanding of the effects of nutrition and the environment on cancer prevention, initiation, progression, and treatment.

Cancer Control and Prevention Research: This research program focuses on the study of behaviors (of individuals, health care professionals, or health care systems) and how interventions to change these behaviors or systems can reduce cancer risk, help detect cancer early, better inform treatment decisions, or improve the quality of life of patients and families. Special emphasis is placed on reducing disparities in disadvantaged groups.

Health Professional Training in Cancer Control: The goals of this program are to encourage highly qualified individuals to enter careers in cancer prevention and control practice and to accelerate the application of research findings in this area. Toward that end, this program provides grants in support of nurses, physicians, and social workers to pursue training in cancer prevention and control programs that meet high standards for excellence.

In addition to funding across the continuum of cancer research and training, from basic science to clinical and quality-of-life research, the Society also focuses on needs that are unmet by other funding organizations. For instance, for 10 years, the Society supported a targeted research program to address the causes of higher cancer mortality in the poor and medically underserved. To date, 47 Nobel Prize winners have received grant support from the Society, most of them early in their careers, a number unmatched in the nonprofit sector and proof that the organization's approach to funding young researchers truly helps launch high-quality scientific careers.

Intramural Research

In 1946, under the direction of E. Cuyler Hammond, ScD, a small group of researchers was created at the American Cancer Society. Since that time, the Society's Intramural Research program has grown into 5 programs that conduct and publish high-quality research to advance the understanding of cancer and evaluate Society programs to ensure that they are effective and reaching the cancer patients that are most in need.

Epidemiology: The Epidemiology Research program seeks to reduce the cancer burden by conducting large, nationwide prospective studies that advance our understanding of cancer etiology and survival to inform cancer prevention and control programs, policies, and guidelines. To accomplish this work, in 1952 Hammond pioneered the idea of working with the extensive network of Society volunteers nationwide to enroll and follow large cohorts to provide insights into the causes of cancer. The first cohort, known as the Hammond-Horn Study, was conducted from 1952 through 1955 and provided the first US prospective evidence to confirm the association between cigarette smoking and death from lung cancer, cardiovascular disease, and other conditions in men. The success of this early study established the foundation on which the Society invested in a series of large prospective studies – the Cancer Prevention

Studies – and in the creation and growth of the Epidemiology Research program. Indeed, with help from more than 150,000 Society volunteers to enroll and collect information from more than 2.2 million US men and women, findings from the Hammond-Horn Study, Cancer Prevention Study-I (CPS-I, 1959-1972), and CPS-II (1982-ongoing) have played a major role in cancer prevention initiatives at the Society, as well as in other national and international efforts. For example:

- The Hammond-Horn Study, which linked smoking to lung cancer and higher overall death rates, contributed to the Surgeon General's landmark 1964 conclusion that smoking causes lung cancer and helped drive a decline in adult smoking rates to less than 20% today. American Cancer Society epidemiologic studies continue to document the ongoing health impact of smoking. In 2014, the Surgeon General used our results to show that more than 480,000 Americans die each year from smoking cigarettes.
- CPS-I provided the first epidemiologic evidence that obesity increases risk of premature death, and subsequent studies from CPS-II helped to establish the link between obesity and death from breast, colorectal, and other cancers.
- In the early 1990s, CPS-II was the first prospective study to find a link between regular aspirin use and lower risk of colorectal cancer, a finding confirmed by many later studies. These results opened the door to ongoing studies in the US and internationally to find out if aspirin might lower the risk of other cancers and to better understand the overall risks and benefits of aspirin use.
- Our studies showing that high red and processed meat and alcohol intake, low physical activity, and longer sitting time increase the risk of cancer or mortality have contributed to the scientific evidence used to develop the Society's Guidelines on Nutrition and Physical Activity for Cancer Prevention. Moreover, findings from CPS-II were used to demonstrate the lifesaving potential of a lifestyle consistent with our guidelines.
- Findings from CPS-II contributed substantially to the scientific evidence associating increasing levels of specific types of air pollution with higher deaths rates from cardiovascular disease and lung cancer. These studies are cited prominently by both the Environmental Protection Agency and World Health Organization in policies and recommendations for US and worldwide air pollution limits.
- CPS-II data and biospecimens have been included in the identification or validation of nearly every confirmed breast, prostate, and pancreatic cancer genetic susceptibility variant known to date. This work has led to a better understanding of the heritable component of these cancers.

While landmark findings from the CPS-II cohort have informed multiple areas of public health policy and clinical practice, this cohort is aging and a new cohort is essential to continue exploring the effects of changing exposures and to provide greater opportunity to integrate biological and genetic factors into studies of other cancer risk factors. Therefore, following on the long history of partnering with Society volunteers and supporters, CPS-3 was established. From 2006 through 2013, more than 304,000 men and women, ages 30 to 65, were enrolled in CPS-3, and nearly all provided a blood sample at the time of enrollment. Although over the past decade very large cohorts have been established in some European and Asian countries, CPS-3 is the only nationwide study of this magnitude in the US. The blood specimens and questionnaire data collected from CPS-3 participants will provide unique opportunities for research in the United States.

Surveillance and Health Services Research: The Surveillance and Health Services Research (SHSR) program analyzes and disseminates data on cancer occurrence, risk factors, prevention, early detection, treatment, and outcomes to strengthen the scientific basis for cancer prevention and control nationally and globally. Researchers in the SHSR program produce *Cancer Facts & Figures*, published since 1951, and the accompanying Cancer Statistics article, published in *CA: A Cancer Journal for Clinicians* (cacancerjournal.com) since 1967. These publications are the most widely cited sources for cancer statistics and are available on the Society's website at cancer.org/statistics and in hard copy from Society Division offices.

In addition, SHSR staff produces seven supplemental *Cancer Facts & Figures* reports with accompanying Cancer Statistics articles. Some of these publications focus on a specific cancer site (e.g., breast) or subpopulation (e.g., Hispanics). *Cancer Prevention & Early Detection Facts & Figures* provides the prevalence of cancer risk factors and screening, along with Society recommendations, policy initiatives, and evidence-based cancer control programs. In addition, staff collaborates with the International Agency for Research on Cancer (IARC) to publish *Global Cancer Facts & Figures,* as well as joining with additional international collaborators to produce *The Cancer Atlas*.

Surveillance epidemiologists also conduct and publish high-quality epidemiologic research in order to advance the understanding of cancer. Since 1998, Society epidemiologists have collaborated with the National Cancer Institute, the Centers for Disease Control and Prevention, the National Center for Health Statistics, and the North American Association of Central Cancer Registries to produce the Annual Report to the Nation on the Status of Cancer, a highly cited, peer-reviewed journal article that reports current information related to cancer rates and trends in the US. Other research topics include exploring socioeconomic, racial, and geographic disparities in cancer risk factors, screening, and occurrence; describing global cancer trends; generating scientific evidence to support Society

priority areas for cancer prevention, control, and advocacy; and demonstrating the association between public health interventions, such as tobacco control, and cancer incidence and mortality. Recent surveillance studies have reported the identification of colorectal cancer "hotspots" where death rates are particularly high; an increase in colorectal cancer screening among low-income individuals following the elimination of cost-sharing for preventive services by the Affordable Care Act; the public health impact of achieving the 80% colorectal cancer screening rate by 2018 among adults 50 and older; cancer death rates by US congressional district; and global patterns in smoking related to tobacco control policies.

Health Services Research (HSR) activities began in the late 1990s, with the primary objective of performing high-quality, high-impact research to evaluate disparities in cancer treatment and outcomes in support of the Society's mission to reduce health care inequalities. Researchers in the HSR program use secondary data sources such as the National Cancer Data Base (NCDB), a hospital-based cancer registry jointly sponsored by the American Cancer Society and the American College of Surgeons. The NCDB has been key to the program's research on the impact of insurance on cancer diagnosis, treatment, and outcomes, as well as for broader cancer treatment patterns. Other data sources include the SEER-Medicare database, a linkage of population-based cancer registry data with Medicare claims data, and the Medical Expenditure Panel Survey Data linked with National Health Interview Survey Data. The findings from the Health Services Research group have been instrumental in the Society's and the American Cancer Society Cancer Action Network's (ACS CAN) support of the Affordable Care Act (ACA). Recent studies include the effect of the ACA on receipt of preventive services; the benefit of radiation therapy in the treatment of lymph node positive prostate cancer; racial disparities in treatment and outcomes for men with early stage breast cancer; and treatment disparities associated with geographic distribution of oncologists and travel distance.

Economic and Health Policy Research: The predecessor of the Economic and Health Policy Research (EHPR) program, the International Tobacco Control Research (ITCR) program, was created in 2006 to support collaborative tobacco control efforts involving the Society and numerous international organizations and academic institutions such as the WHO Tobacco Free Initiative, the Centers for Disease Control and Prevention (CDC), the Campaign for Tobacco-Free Kids, Johns Hopkins University, and the University of Illinois, among others. The ITCR program focused on economic and policy research in tobacco control and research capacity building for the collection and analysis of economic data to provide the evidence base for tobacco control, particularly in low- and middle-income countries. This was an important investment by the Society because not only do economic factors contribute greatly to the global tobacco epidemic, but economic solutions – such as taxation and better trade and investment policies – are also among the most effective and least expensive solutions. Major donors in global health, such as the Bloomberg Philanthropies, the Bill & Melinda Gates Foundation, and the US National Institutes of Health, supported this effort by granting the ITCR program additional funding.

Due to the high demand for the type of economic and policy analysis generated by the ITCR program, the Society's leadership made a strategic decision in early 2013 to expand the program to the areas of nutrition and physical activity, and change its name to the EHPR program. Moreover, the team is increasingly applying its expertise to a number of cancer-related challenges, including the economic and policy aspects of additional risk factors, patient access to potentially lifesaving medicines, and the direct and indirect costs of cancer and its treatment. The dissemination of this research comes in multiple forms, including publications in high-impact, peer-reviewed scientific journals; the release of public scientific reports; and local, national, and international capacity-building programs with governments, international governmental organizations, and civil society.

The flagship service publication of the EHPR program is *The Tobacco Atlas*, which is produced in collaboration with the Society's Global Health department and the World Lung Foundation. *The Tobacco Atlas, Fifth Edition* and its corresponding website, **tobaccoatlas.org**, were released at the 16th World Conference on Tobacco or Health (WCTOH) in March 2015 in Abu Dhabi, United Arab Emirates, and will be available in six other languages – French, Spanish, Portuguese, Chinese, Mandarin, and Arabic.

Behavioral Research Center: The American Cancer Society was one of the first organizations to recognize the importance of behavioral and psychosocial factors in the prevention and control of cancer and to fund extramural research in this area. In 1995, the Society established the Behavioral Research Center (BRC) within the Intramural Research department. The BRC's work currently focuses on cancer survivorship, quality of life, tobacco control, and health disparities. The BRC's ongoing projects include:

- Studies of the quality of life of cancer survivors, which include the American Cancer Society Study of Cancer Survivors-I (SCS-I), a nationwide longitudinal study of a cohort of more than 3,000 cancer survivors that explores the physical and psychosocial adjustment to cancer and identifies factors affecting quality of life. Results from this research have informed the Society's informational materials and support programs for cancer patients, survivors, and their loved ones.
- Studies of family caregivers, which include a nationwide longitudinal study of a cohort of more than 1,500 cancer caregivers that explores the impact of the family's involvement in cancer care on the quality of life of the cancer survivor and the caregiver

- A study of side effects of cancer treatment, such as pain, fatigue, or depression, which often go underreported and/or undertreated. Data from this collaboration between the Society, the National Cancer Institute, and the American College of Surgeons could play an important role in improving symptom control, which would ultimately lead to improvements in quality of life, functioning, and treatment adherence.
- Studies to identify and prioritize gaps in information and resources for 1,250 breast, colorectal, and prostate cancer survivors as they transition from active treatment under the care of the oncology team back to the community care setting. Research results will inform interventions by the Society and others by describing the issues cancer survivors continue to face after their treatment ends, the key variables that interventions should target, and the best time to intervene.
- Studies investigating how social, psychological, and other factors impact smokers' motivation and ability to quit in order to improve existing Society programs for smoking cessation (e.g., the Freshstart and the Great American Smokeout® programs) or to develop new technology-based interventions for smokers who seek cessation assistance
- Contributions to the development of a National Cancer Survivorship Resource Center (cancer.org/survivorshipcenter), meant to advance survivorship as a distinct phase of cancer care, promote healthy behaviors to reduce long-term and late effects of cancer and its treatment, improve surveillance and screening practices to detect the return of cancer, and provide primary care clinicians with survivorship clinical care guidelines for their patients with a history of breast, prostate, colorectal, or head and neck cancer
- Studies to better understand cancer prevention and control behavior in underserved populations and identify effective strategies for connecting these groups to cancer information, programs, and services
- Research to identify, test, and disseminate evidence-based behavioral interventions that are appropriate and effective for underserved populations to help achieve cancer health equity

Statistics and Evaluation Center: The mission of the Statistics and Evaluation Center (SEC) is to deliver valid, reliable, accurate, and timely information to American Cancer Society staff for evidence-based decision making that ensures the Society continues to provide effective, high-quality programs. Staffed by professional statisticians and evaluators, the SEC has 3 main responsibilities: 1) to provide leadership on evaluations of Society mission and income delivery programs, including study design, data analysis, and report preparation; 2) to provide operational support for surveys and other data collection related to Society constituents and consumers; and 3) to support the broader Society mission through information integration, including mapping and return on investment studies. SEC expertise and assistance are available to Society staff at the Corporate Center in Atlanta, Georgia, and across the Society's 11 geographic Divisions.

SEC staff designs and conducts process and outcome evaluations of Society programs, projects, and initiatives using focus groups, structured and semi-structured interviews, and online surveys. The SEC continues to be engaged in evaluations of the Society's externally funded community-based cancer prevention initiatives. Working with the Society's Cancer Control department, the SEC secured funding from the CDC to create a national HPV roundtable and is providing evaluation and operational support to initiatives aimed at increasing HPV vaccination rates among adolescents. The SEC also partners with the Behavioral Research Center and the Society's Cancer Control department in the systematic evaluation of all Society survivorship and quality-of-life programs, in the development of guidelines for support of cancer survivors who have completed their cancer treatments, and in developing and evaluating fundraising activities in support of these programs. The SEC has partnered with the Surveillance and Health Services Research program to further analyze the geographical distribution of cancer and the needs of cancer patients with the goal of providing information in support of American Cancer Society mission and advocacy programming. The SEC and SHSR recently computed and published estimated mortality rates for selected cancer for each US congressional district.

Advocacy

Conquering cancer is as much a matter of public policy as scientific discovery. Lawmakers play a critical role in determining how much progress we make as a country to defeat cancer – whether it's advocating for quality, affordable health care for all Americans, increasing funding for cancer research and programs, improving quality of life for patients and their families, or enacting laws and policies that help communities to promote good health. The American Cancer Society Cancer Action Network (ACS CAN), the Society's nonprofit, nonpartisan advocacy affiliate, works with elected officials to achieve these goals.

Created in 2001, ACS CAN is the force behind a powerful grassroots movement uniting and empowering cancer patients, survivors, caregivers, and their families to fight back against cancer. As the nation's leading voice advocating for public policies that are helping to defeat cancer, ACS CAN works to encourage elected officials and candidates to make the fight against cancer a top national priority. In recent years, ACS CAN has successfully worked to pass and implement laws at the federal, state, and local levels that: assure cancer patients access to adequate and affordable health insurance coverage, increase funding for groundbreaking cancer research; improve access to prevention and early detection measures, treatment, and follow-up care; and improve quality of life for cancer patients.

Some of ACS CAN's recent advocacy accomplishments on behalf of cancer patients are outlined in the following sections.

Access to Care

ACS CAN successfully advocated for the enactment of key patient protections in the Affordable Care Act (ACA) that eliminated insurance coverage exclusions, prevented pre-existing condition exclusions, eliminated caps on annual and lifetime coverage benefits, and removed copays for key cancer preventive services and early detection screenings like mammography and colonoscopy. The legislation also required coverage of routine care for participants in clinical trials, and created a new dedicated Prevention and Public Health Fund, providing billions of dollars each year for national and community-based prevention efforts. Finally, the legislation provided for the expansion of Medicaid to cover low-income individuals and families who previously lacked any access to affordable insurance coverage.

The organization continues to monitor implementation of this important law to ensure:

- Continuation of the Prevention and Public Health Fund
- Continued expansion of Medicaid in all 50 states in the face of a 2012 Supreme Court ruling making the expansion a state-by-state option
- Passage of state legislation to ensure cost-sharing for chemotherapy and other vital treatment options are affordable to patients
- Full public access to health plan information for consumers shopping for health insurance coverage
- Full federal funding for community health centers, which provide community-oriented primary care in areas that are underserved or do not have access to other health care services

Funding the Research

ACS CAN is a leader in the effort to ensure full funding for the nation's public cancer research institutions, including the National Institutes of Health and its National Cancer Institute. Each year, nearly $5 billion in grant funding for cancer research is distributed to investigators working in cancer centers, universities, and labs in every state of the country. Federal budget pressures threaten this funding every year, and ACS CAN views protection of this account to be of prime importance in the search for cures.

Prevention and Early Detection

ACS CAN is supporting legislation that focuses on the prevention and early detection of cancer by:

- Leading the advocacy partnership that pushed the 2009 enactment of the Family Smoking Act giving the US Food and Drug Administration authority, for the first time, to regulate the production and marketing of tobacco products. ACS CAN is now working to expedite full implementation of the law, including the regulation of new and emerging products.
- Leading efforts to pass comprehensive smoke-free laws –currently covering about half of the US population – including 24 states, the District of Columbia, Puerto Rico, the US Virgin Islands, and countless local jurisdictions requiring all workplaces, restaurants, and bars to be smoke-free
- Working to increase federal and state taxes on all tobacco products and defending against tax rollbacks. The average state tax rate for cigarettes rose from $1.54 at the end of 2014 to $1.60 in 2015 (current as of September 2015)
- Working to increase and protect state funding for tobacco control programs
- Continuing its role as an intervener in the long-pending legal review of the federal government's lawsuit against the tobacco industry, in which specific manufacturers were convicted under the Racketeer Influenced and Corrupt Organizations statute for decades of fraudulent practices aimed at addicting generations of smokers to their deadly products.
- Continuing to support implementation of the Healthy, Hunger-Free Kids Act of 2010, important legislation to reauthorize the federal child nutrition programs and strengthen school nutrition
- Advocating for state and local requirements to increase the quality and quantity of physical education and physical activity in K-12 schools and hold schools accountable for increasing students' physical activity and fitness
- Supporting the federal government's development of the 2015 edition of the Dietary Guidelines for Americans, which forms the basis of all federal nutrition policies and programs, and helping to ensure it reflects the current science linking diet and cancer risk
- Advocating for science-based updates to the Nutrition Facts label that appears on most packaged foods and beverages
- Supporting the implementation of menu labeling in restaurants and other food retail establishments
- Working with states to pass legislation prohibiting minors from accessing indoor tanning devices
- Advocating for coverage of cancer screenings and other recommended preventive services without financial barriers in private insurance, Medicare, and Medicaid
- Advocating for full funding for the National Breast and Cervical Cancer Early Detection Program and the Colorectal Cancer Control Program, which provides free evidence-based cancer screenings and treatment to low-income, uninsured, and medically underserved men and women
- Supporting a federal bill to eliminate an unexpected cost-sharing requirement imposed on Medicare beneficiaries who have a polyp removed during colonoscopy.

Quality of Life

- ACS CAN supports balanced pain policies at the federal and state levels that ensure continued patient and survivor access to the pain relief medications that they need to live and work independently and have good quality of life.
- ACS CAN supports the enactment of legislation that would assure cancer patients' full access to palliative care services, along with curative treatment, from the point of diagnosis through treatment and survivorship or end of life as the case may be. Palliative care for pain and symptoms of treatment has been shown to improve patient, survivor, and family quality of life and in some cases improves survival for cancer patients. The legislation provides for increased training and professional development in palliative care, a nationwide public and provider education campaign to disseminate information about the benefits of palliative care, and additional research into the biologic bases of pain, and other symptoms such as breathlessness, fatigue, and cognitive impairment, for which there are few treatment options available today. ACS CAN has worked to mitigate the public impact of cancer drug shortages that periodically plague the industry. The organization is making sure the voice of the cancer community is heard in the halls of government and is empowering communities everywhere to fight back.

Another way that the American Cancer Society is championing the cause of the cancer community is through our Relay For Life® and Making Strides Against Breast Cancer® programs. The Relay For Life movement is the world's largest grassroots fundraising event to end every cancer in every community. Rallying the passion of four million people worldwide, Relay For Life events raise critical funds that help fuel the mission of the Society, an organization whose reach touches so many lives – those who are currently battling cancer, those who may face a diagnosis in the future, and those who may avoid a diagnosis altogether thanks to education, prevention, and early detection. The Making Strides Against Breast Cancer walk is a powerful event to raise awareness and funds to end breast cancer. It is the largest network of breast cancer events in the nation, uniting nearly 300 communities to finish the fight. The walks raise critical funds that enable the Society to fund groundbreaking breast cancer research; provide free comprehensive information and services to patients, survivors, and caregivers; and ensure access to mammograms for women who need them so more lives are saved.

Sources of Statistics

Estimated new cancer cases in 2016. The number of new cancer cases in the US in 2016 was projected using a spatiotemporal model based on incidence data from 49 states and the District of Columbia for the years 1998-2012 that met the North American Association of Central Cancer Registries' (NAACCR) high-quality data standard for incidence. This method considers geographic variations in sociodemographic and lifestyle factors, medical settings, and cancer screening behaviors as predictors of incidence, and also accounts for expected delays in case reporting. (For more information on the estimation of new invasive cases, see "A" in Additional information on page 65.)

The number of new cases among Asian Americans, Native Hawaiians, and Pacific Islanders (AANHPIs), as well as those for female breast carcinoma in situ and melanoma in situ, were estimated by projecting the average annual percent change in the estimated number of cases during the most recent 10 years of data (2003-2012) to 2016. Cases from 2003 through 2012 were estimated by applying age-specific incidence rates from 44 states and the District of Columbia to population counts. Estimates for AANHPIs were adjusted for delays in case reporting. Delay adjustment was unavailable for in situ breast and in situ melanoma estimates.

Incidence rates. Incidence rates are defined as the number of people who are diagnosed with cancer during a given time period divided by the number of people who were at risk for the disease in the population. Incidence rates in this publication are presented per 100,000 people and are age adjusted to the 2000 US standard population to allow comparisons across populations with different age distributions. State-, race-, and ethnicity-specific incidence rates were previously published in NAACCR's publication *Cancer Incidence in North America, 2008-2012*. (See "B" in Additional information on page 65 for full reference.)

Trends in cancer incidence rates provided in this publication are based on delay-adjusted incidence rates from registries in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program. Delay-adjustment accounts for delays and error corrections that occur in the reporting of cancer cases, which is substantial for some sites, particularly those less often diagnosed in a hospital, such as leukemia. Delay-adjustment is not available for some cancer types. Trends were originally published in the *SEER Cancer Statistics Review (CSR) 1975-2012*. (See "C" in Additional information on page 65 for full reference.)

Estimated cancer deaths in 2016. The estimated number of US cancer deaths was calculated by fitting the number of cancer deaths from 1998 to 2012 to a statistical model that forecasts the number of deaths expected to occur in 2016. The estimated number of cancer deaths for each state was calculated similarly

using state-level data. For both US and state estimates, data on the number of deaths were obtained from the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention. (For more information on this method, see "D" in Additional information.)

Mortality rates. Mortality rates, or death rates, are defined as the number of people who die from cancer during a given year divided by the number of people at risk in the population. In this publication, mortality rates are based on counts of cancer deaths compiled by the NCHS and population data from the US Census Bureau. Death rates in this publication are presented per 100,000 people and are age adjusted to the 2000 US standard population to allow comparisons across populations with different age distributions. These rates should be compared only to other statistics that are age adjusted to the US 2000 standard population. Trends in cancer mortality rates provided for selected cancer sites were based on mortality data from 1975 to 2012 and were first published in the *CSR 1975-2012*. (See "C" in Additional information for full reference.)

Important note about estimated cancer cases and deaths for the current year. The methodology for the 4-years-ahead projection of new cancer cases and deaths is model-based and is updated over time as we continually strive to achieve the most accurate estimates. As a result, the numbers may vary from year to year for reasons other than changes in cancer occurrence. Therefore, these estimates should be interpreted with the understanding that they provide a reasonably accurate portrayal of the current cancer burden, but cannot be used to track year-to-year changes in cancer occurrence. Age-adjusted incidence and mortality rates reported by the SEER program and the NCHS, respectively, are the preferred statistics to track cancer trends in the US. Rates from state cancer registries are useful for tracking local trends.

Survival. This report presents relative survival rates for whites, blacks, and all races combined to describe cancer survival. Relative survival adjusts for normal life expectancy by comparing survival among cancer patients to that of people not diagnosed with cancer who are of the same age, race, and sex. Cause-specific survival is used for AANHPIs due to data limitations and should not be compared to relative survival statistics. Five-year survival statistics presented in this publication were originally published in *CSR 1975-2012*, with all patients followed through 2012. Trends in survival are based on data from the nine oldest SEER registries, which go back to 1975, whereas all other survival rates are based on data from all 18 SEER registries, which provide greater population coverage. In addition to 5-year relative survival rates, 1-, 10-, and 15-year survival rates are presented for selected cancer sites. These survival rates were generated using the National Cancer Institute's SEER 18 database and SEER*Stat software version 8.2.1. (See "E" in Additional information for full references.) One-year survival rates were based on cancer patients diagnosed from 2008 to 2011, 10-year survival rates were based on diagnoses from 1999 to 2011, and 15-year survival rates were based on diagnoses from 1994 to 2011; all patients were followed through 2012.

Probability of developing cancer. Probabilities of developing cancer were calculated using DevCan (Probability of Developing Cancer) software version 6.7.3, developed by the National Cancer Institute. (See "F" in Additional information for full reference.) These probabilities reflect the average experience of people in the US and do not take into account individual behaviors and risk factors. For example, the estimate of 1 man in 14 developing lung cancer in a lifetime underestimates the risk for smokers and overestimates the risk for nonsmokers.

Additional information. More information on the methods used to generate the statistics for this report can be found in the following publications:

A. Zhu L, Pickle LW, Naishadham D, et al. Predicting US and state-level cancer counts for the current calendar year: part II – evaluation of spatio-temporal projection methods for incidence. *Cancer* 2012;118(4): 1100-9.

B. Copeland G, Lake A, Firth R, et al. (eds). *Cancer in North America: 2008-2012. Volume Two: Registry-specific Cancer Incidence in the United States and Canada*. Springfield, IL: North American Association of Central Cancer Registries, Inc. June 2015. Available at naaccr.org/DataandPublications/CINAPubs.aspx.

C. Howlader N, Noone AM, Krapcho M, et al. (eds). *SEER Cancer Statistics Review, 1975-2012*. National Cancer Institute. Bethesda, MD, 2015. Available at seer.cancer.gov.

D. Chen HS, Portier K, Ghosh K, et al. Predicting US and State-level counts for the current calendar year: part I – evaluation of temporal projection methods for mortality. *Cancer* 2012;118(4): 1091-9.

E. SEER 18 database: Surveillance, Epidemiology, and End Results (SEER) Program (seer.cancer.gov) SEER*Stat Data- base: Incidence – SEER 18 Regs Research Data + Hurricane Katrina Impacted Louisiana Cases, Nov 2014 Sub (1973-2012 varying) – Linked To County Attributes – Total U.S., 1969-2013 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, Cancer Statistics Branch, released April 2015, based on the November 2014 submission. SEER*Stat software: Surveillance Research Program, National Cancer Institute SEER*Stat software (seer.cancer.gov/seerstat) version 8.2.1.

F. DevCan: Probability of Developing or Dying of Cancer Software, Version 6.7.3; Statistical Research and Applications Branch, National Cancer Institute, April 2015. http://srab.cancer.gov/devcan.

American Cancer Society Recommendations for the Early Detection of Cancer in Average-risk Asymptomatic People*

Cancer Site	Population	Test or Procedure	Recommendation
Breast	Women, ages 40-54	Mammography	Women should undergo regular screening mammography starting at age 45 years. Women ages 45 to 54 should be screened annually. Women should have the opportunity to begin annual screening between the ages of 40 and 44.
	Women, ages 55+		Transition to biennial screening, or have the opportunity to continue annual screening. Continue screening as long as overall health is good and life expectancy is 10+ years.
Cervix	Women, ages 21-29	Pap test	Screening should be done every 3 years with conventional or liquid-based Pap tests.
	Women, ages 30-65	Pap test & HPV DNA test	Screening should be done every 5 years with both the HPV test and the Pap test (preferred), or every 3 years with the Pap test alone (acceptable).
	Women, ages 66+	Pap test & HPV DNA test	Women ages 66+ who have had ≥3 consecutive negative Pap tests or ≥2 consecutive negative HPV and Pap tests within the past 10 years, with the most recent test occurring in the past 5 years should stop cervical cancer screening.
	Women who have had a total hysterectomy		Stop cervical cancer screening.
Colorectal†	Men and women, ages 50+	Guaiac-based fecal occult blood test (gFOBT) with at least 50% sensitivity or fecal immunochemical test (FIT) with at least 50% sensitivity, **OR**	Annual testing of spontaneously passed stool specimens. Single stool testing during a clinician office visit is not recommended, nor are "throw in the toilet bowl" tests. In comparison with guaiac-based tests for the detection of occult blood, immunochemical tests are more patient-friendly and are likely to be equal or better in sensitivity and specificity. There is no justification for repeating FOBT in response to an initial positive finding.
		Stool DNA test, **OR**	Every 3 years
		Flexible sigmoidoscopy (FSIG), **OR**	Every 5 years alone, or consideration can be given to combining FSIG performed every 5 years with a highly sensitive gFOBT or FIT performed annually.
		Double-contrast barium enema, **OR**	Every 5 years
		Colonoscopy, **OR**	Every 10 years
		CT Colonography	Every 5 years
Endometrial	Women at menopause		Women should be informed about risks and symptoms of endometrial cancer and encouraged to report unexpected bleeding to a physician.
Lung	Current or former smokers ages 55-74 in good health with 30+ pack-year history	Low-dose helical CT (LDCT)	Clinicians with access to high-volume, high-quality lung cancer screening and treatment centers should initiate a discussion about annual lung cancer screening with apparently healthy patients ages 55-74 who have at least a 30 pack-year smoking history, and who currently smoke or have quit within the past 15 years. A process of informed and shared decision making with a clinician related to the potential benefits, limitations, and harms associated with screening for lung cancer with LDCT should occur before any decision is made to initiate lung cancer screening. Smoking cessation counseling remains a high priority for clinical attention in discussions with current smokers, who should be informed of their continuing risk of lung cancer. Screening should not be viewed as an alternative to smoking cessation
Prostate	Men, ages 50+	Prostate-specific antigen test with or without digital rectal examination	Men who have at least a 10-year life expectancy should have an opportunity to make an informed decision with their health care provider about whether to be screened for prostate cancer, after receiving information about the potential benefits, risks, and uncertainties associated with prostate cancer screening. Prostate cancer screening should not occur without an informed decision-making process.

CT-Computed tomography. *All individuals should become familiar with the potential benefits, limitations, and harms associated with cancer screening. †All positive tests (other than colonoscopy) should be followed up with colonoscopy.

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