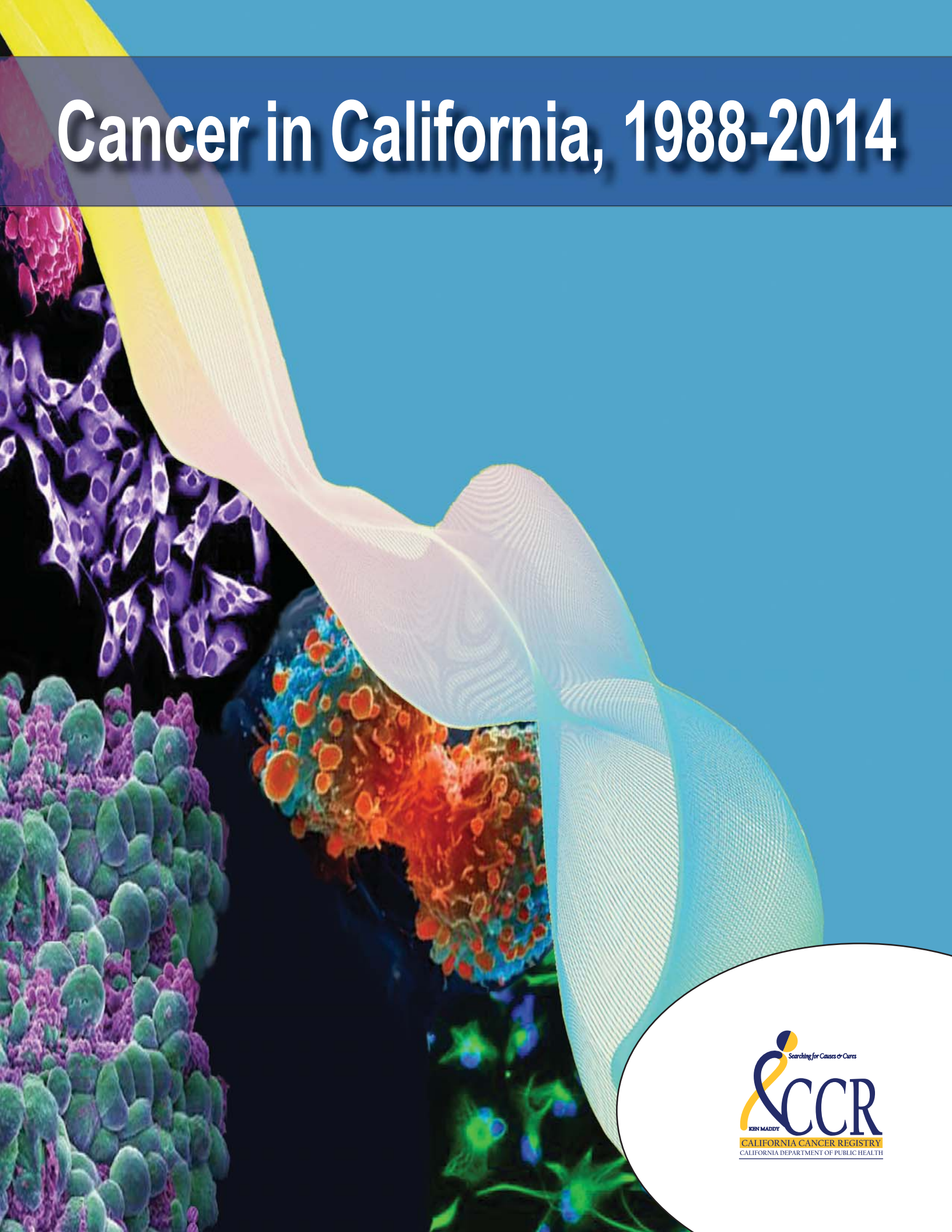
Cancer in California, 1988-2014



Searching for Causes & Cures

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CALIFORNIA CANCER REGISTRY

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

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Chronic Disease Surveillance and Research Branch
California Department of Public Health
1631 Alhambra Boulevard, Suite 200
Sacramento, CA 95816
(916) 731-2500
http://www.cdph.ca.gov or http://www.ccrcal.org

The CalCARES Program partners with the California Department of Public Health to manage the operations of the state-mandated California Cancer Registry Program.

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http://www.ucdmc.ucdavis.edu/iphi

Prepared By:

Jordan A. Killion, M.P.H., C.P.H.
CalCARES Program
Institute for Population Health Improvement
UC Davis Health System

Brenda M. Giddings, M.A.
CalCARES Program
Institute for Population Health Improvement
UC Davis Health System

Yi Chen
CalCARES Program
Institute for Population Health Improvement
UC Davis Health System

Cyllene R. Morris, D.V.M., Ph.D.
Research Program Director
CalCARES Program
Institute for Population Health Improvement
UC Davis Health System

Arti Parikh-Patel, Ph.D., M.P.H.
Program Director
CalCARES Program
Institute for Population Health Improvement
UC Davis Health System

Kenneth W. Kizer, M.D., M.P.H.
Distinguished Professor, UC Davis School of Medicine and Betty Irene Moore School of Nursing;
Principal Investigator, CalCARES Program; and
Director, Institute for Population Health Improvement
UC Davis Health System

Sandy L. Kwong, M.P.H.
Chronic Disease Surveillance and Research Branch
California Department of Public Health

Kurt P. Snipes, M.S., Ph.D., Chief
Chronic Disease Surveillance and Research Branch
California Department of Public Health

Edmund G. Brown Jr. Governor
State of California

Diana S. Dooley, Secretary
California Health and Human Services Agency

Karen L. Smith, MD, MPH,
Director & State Public Health Officer
California Department of Public Health

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Inquiries regarding the content of this report should be directed to:

California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program
c/o Institute for Population Health Improvement
1631 Alhambra Boulevard, Suite 200
Sacramento, CA 95816
(916) 731-2500
http://www.cdph.ca.gov or http://www.ccrcal.org

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Overview

In 2014, there were 160,925 new cases of cancer diagnosed in California. This corresponds to an age-adjusted cancer incidence (new cases) rate of 391.9 cases per 100,000 people. The age-adjusted cancer incidence rate in California has decreased significantly by 15.4 percent, from 463.0 per 100,000 people, since statewide cancer reporting began in 1988.

From 1988 to 2014, the age-adjusted cancer incidence rate among California women decreased significantly by 9.4 percent, from 416.4 cases per 100,000 women in 1988 to 377.3 per 100,000 women in 2014. Interpreting the trend in the age-adjusted cancer incidence rate among men is complicated by changes in prostate cancer screening procedures that occurred in the late 1980s. The age-adjusted cancer incidence rate among California men increased from 544.8 cases per 100,000 men in 1988 to 628.6 cases per 100,000 men in 1992. This increase was partly due to the establishment and widespread use of the prostate specific antigen (PSA) test which increased the number of prostate cancers detected. After 1992, the cancer incidence rate among men declined, and the rate in 2014 was 417.4 cases per 100,000. Overall, between 1988 and 2014, the age-adjusted cancer incidence rate among California men decreased significantly by 23.4 percent.

In 2014, cancer surpassed heart disease as the leading cause of death in California. A total of 58,098 deaths among Californians were due to cancer whereas 57,401 were due to heart disease. Despite cancer causing the greatest number of deaths, the age-adjusted cancer mortality (death) rate has actually decreased significantly by 30.1 percent, from 205.4 per 100,000 people in 1988 to 143.5 per 100,000 people in 2014. The age-adjusted cancer mortality rate has declined significantly among both males and females by 34.2 percent and 27.9 percent, respectively.

The risk of being diagnosed with or dying from cancer varies by race/ethnicity. In 2014, non-Hispanic white persons had the highest age-adjusted cancer incidence rate of 438.5 per 100,000, followed by American Indians (419.4 per 100,000), African Americans (416.3 per 100,000), Hispanics (316.0 per 100,000), and Asian/Pacific Islanders (285.5 per 100,000). African Americans had the highest overall age-adjusted cancer mortality rate of 185.7 per 100,000 persons, followed by non-Hispanic whites (154.1 per 100,000), American Indians (152.2 per 100,000), Hispanics (124.3 per 100,000), and Asian/Pacific Islanders (107.4 per 100,000).

When race/ethnicity was further analyzed by sex, African American men had the highest age-adjusted cancer mortality rate of 224.5 per 100,000, followed by non-Hispanic white men (181.2 per 100,000), American Indian men (170.7 per 100,000), Hispanic men (145.6 per 100,000), and Asian/Pacific Islander men (127.2 per 100,000). For women, African American women had the highest age-adjusted cancer mortality rate of 161.8 per 100,000, followed by American Indian women (139.8 per 100,000), non-Hispanic white women (134.3 per 100,000), Hispanic women (110.0 per 100,000), and Asian/Pacific Islander women (93.3 per 100,000).

All Ages
Leading Cancer Sites by Sex

Tables 1 through 4 present the ten most common types of cancer incidence and mortality among California men and women in 2014. These cancers accounted for 77.8 percent of all new cancer diagnoses and 81.1 percent of all cancer-related deaths. For men, prostate cancer remained the most commonly diagnosed cancer, accounting for 21.4 percent (16,822 cases) of all newly diagnosed cancers and the second leading cause of cancer-related death, accounting for 10.6 percent (3,191 deaths) of all cancer-related deaths. For women, breast cancer remained the most commonly diagnosed cancer, accounting for 31.2 percent (25,614 cases) of all newly diagnosed cancers and the second leading cause of cancer-related death, accounting for 15.8 percent (4,427 deaths) of all cancer-related deaths.

The second most commonly diagnosed cancer among both men and women was cancer of the lung and bronchus, which accounted for 10.7 percent (8,419 cases) of newly diagnosed cancers among men and 10.3 percent (8,444 cases) of newly diagnosed cancers among women. Lung and bronchus cancer was the leading cause of cancer-related death among both men and women and accounted for 21.2 percent (6,363 deaths) of all cancer-related deaths among men and 20.9 percent (5,868 deaths) of all cancer-related deaths among women.

Colon and rectum cancer was the third most commonly diagnosed cancer and the third leading cause of cancer-related death among both men and women. Among men, colon and rectum cancer accounted for 9.9 percent (7,770 cases) of newly diagnosed cancers and 9.1 percent (2,750 deaths) of cancer-related deaths. Among women, colon and rectum cancer accounted for 8.3 percent (6,834 cases) of newly diagnosed cancers and 8.7 percent (2,445 deaths) of cancer related–deaths.

Table 1: Most Common Types of Cancer Incidence Among California Males, 2014			
Rank	Cancer Type	Count	Rate
1	Prostate	16,822	85.2
2	Lung and Bronchus	8,419	46.9
3	Colon and Rectum	7,770	41.3
4	Melanoma of the Skin	5,625	30.2
5	Urinary Bladder	5,198	29.5
6	Non-Hodgkin Lymphoma	4,249	22.9
7	Kidney and Renal Pelvis	3,717	19.2
8	Leukemia	2,847	15.5
9	Oral Cavity and Pharynx	2,980	15.1
10	Liver and Intrahepatic Bile Duct	3,029	14.9
Rates are per 100,000 and age-adjusted to the 2000 U.S. Standard Population. *Source: California Cancer Registry, California Department of Public Health*			

Table 2: Most Common Types of Cancer Mortality Among California Males, 2014			
Rank	Cancer Type	Count	Rate
1	Lung and Bronchus	6,363	36.1
2	Prostate	3,191	19.4
3	Colon and Rectum	2,750	15.3
4	Pancreas	2,087	11.6
5	Liver and Intrahepatic Bile Duct	2,064	10.7
6	Leukemia	1,425	8.2
7	Non-Hodgkin Lymphoma	1,156	6.7
8	Urinary Bladder	1,109	6.6
9	Esophagus	1,066	5.8
10	Brain and Other Nervous System	999	5.3
Rates are per 100,000 and age-adjusted to the 2000 U.S. Standard Population. *Source: California Cancer Registry, California Department of Public Health*			

Table 3: Most Common Types of Cancer Incidence Among California Females, 2014			
Rank	Cancer Type	Count	Rate
1	Breast	25,614	118.3
2	Lung and Bronchus	8,444	38.2
3	Colon and Rectum	6,834	30.9
4	Uterus	5,666	25.2
5	Thyroid	3,991	19.7
6	Melanoma of the Skin	3,775	17.4
7	Non-Hodgkin Lymphoma	3,395	15.6
8	Ovary	2,440	11.3
9	Pancreas	2,308	10.2
10	Kidney and Renal Pelvis	2,041	9.3
Rates are per 100,000 and age-adjusted to the 2000 U.S. Standard Population. *Source: California Cancer Registry, California Department of Public Health*			

Table 4: Most Common Types of Cancer Mortality Among California Females, 2014			
Rank	Cancer Type	Count	Rate
1	Lung and Bronchus	5,868	26.4
2	Breast	4,427	19.9
3	Colon and Rectum	2,445	10.7
4	Pancreas	2,036	9.0
5	Ovary	1,575	7.0
6	Leukemia	1,066	4.8
7	Liver and Intrahepatic Bile Duct	1,080	4.7
8	Uterus	1,015	4.5
9	Non-Hodgkin Lymphoma	977	4.4
10	Brain and Other Nervous System	741	3.4
Rates are per 100,000 and age-adjusted to the 2000 U.S. Standard Population. *Source: California Cancer Registry, California Department of Public Health*			

Leading Cancer Sites by Sex and Race/Ethnicity

The ten most commonly diagnosed cancers in California from 2010 to 2014 among males and females in 15 racial/ethnic groups are displayed in tables 5 and 6. The race/ethnicity categories examined are: African American, American Indian, Chinese, Filipino, Hawaiian, Hispanic, Japanese, Kampuchean, Korean, Laotian/Hmong, Pacific Islander, South Asian, Thai, Vietnamese, and non-Hispanic white.

Prostate cancer was the most commonly diagnosed cancer among men in most racial/ethnic groups, with colon and rectum cancer and lung and bronchus cancer ranking second and third. Exceptions to this were Kampuchean males for whom colon and rectum cancer was the most commonly diagnosed cancer, followed by liver and intrahepatic bile duct (IBD) cancer, and lung and bronchus cancer. Colon and rectum cancer was also the most commonly diagnosed cancer among Korean males, followed by lung and bronchus cancer and prostate cancer. Laotian, Hmong, and Vietnamese males were most commonly diagnosed with lung and bronchus cancer, followed by liver and IBD cancer, and colon and rectum cancer. For Thai males, liver and IBD cancer was the third most commonly diagnosed cancer.

For women in all of the 15 racial/ethnic groups, breast cancer was the most commonly diagnosed cancer. Colon and rectum cancer and lung and bronchus cancer were the second and third most commonly diagnosed cancers among women in most of the racial/ethnic groups. Exceptions were Filipino, Hawaiian, and Pacific Islander women for whom uterine cancer was the second most commonly diagnosed cancer and Hispanic women for whom uterine cancer was the third most commonly diagnosed cancer. Additionally, thyroid cancer was the second most commonly diagnosed cancer among South Asian women followed by uterine cancer. Among Korean women, thyroid cancer was the third most commonly diagnosed cancer.

Table 5: Ten Most Commonly Diagnosed Types of Cancer by Race/Ethnicity Among California Males, 2010-2014

Rank	1	2	3	4	5	6	7	8	9	10
African American	Prostate (9,559)	Lung and Bronchus (3,388)	Colon and Rectum (2,720)	Kidney and Renal Pelvis (1,320)	Liver and IBD* (1,071)	Urinary Bladder (1,030)	Non-Hodgkin Lymphoma (939)	Pancreas (819)	Myeloma (770)	Oral Cavity and Pharynx (741)
American Indian	Prostate (421)	Lung and Bronchus (246)	Colon and Rectum (195)	Liver and IBD* (145)	Kidney and Renal Pelvis (134)	Non-Hodgkin Lymphoma (107)	Urinary Bladder (98)	Oral Cavity and Pharynx (95)	Pancreas (61)	Leukemia (59)
Chinese	Prostate (2,063)	Lung and Bronchus (1,639)	Colon and Rectum (1,511)	Liver and IBD* (753)	Non-Hodgkin Lymphoma (591)	Urinary Bladder (538)	Stomach (511)	Oral Cavity and Pharynx (467)	Pancreas (369)	Kidney and Renal Pelvis (353)
Filipino	Prostate (2,376)	Lung and Bronchus (1,502)	Colon and Rectum (1,152)	Non-Hodgkin Lymphoma (503)	Liver and IBD* (477)	Kidney and Renal Pelvis (455)	Urinary Bladder (310)	Leukemia (293)	Oral Cavity and Pharynx (275)	Pancreas (268)
Hawaiian	Prostate (119)	Lung and Bronchus (75)	Colon and Rectum (70)	Non-Hodgkin Lymphoma (25)	Oral Cavity and Pharynx (24)	Kidney and Renal Pelvis (23)	Urinary Bladder (21)	Liver and IBD* (20)	Pancreas (19)	Thyroid (19)
Hispanic	Prostate (17,442)	Colon and Rectum (7,664)	Lung and Bronchus (4,949)	Kidney and Renal Pelvis (4,327)	Non-Hodgkin Lymphoma (4,184)	Liver and IBD* (4,129)	Leukemia (3,163)	Urinary Bladder (2,818)	Stomach (2,454)	Testis (2,188)
Japanese	Prostate (705)	Colon and Rectum (489)	Lung and Bronchus (412)	Urinary Bladder (230)	Non-Hodgkin Lymphoma (203)	Stomach (199)	Pancreas (152)	Kidney and Renal Pelvis (131)	Liver and IBD* (101)	Oral Cavity and Pharynx (91)
Kampuchean	Colon and Rectum (77)	Liver and IBD* (76)	Lung and Bronchus (65)	Prostate (32)	Oral Cavity and Pharynx (23)	Non-Hodgkin Lymphoma (19)	Leukemia (15)	Pancreas (14)	Stomach (12)	Kidney and Renal Pelvis (11)
Korean	Colon and Rectum (486)	Lung and Bronchus (467)	Prostate (434)	Stomach (374)	Liver and IBD* (287)	Urinary Bladder (205)	Pancreas (142)	Kidney and Renal Pelvis (136)	Non-Hodgkin Lymphoma (119)	Thyroid (98)
Laotian/Hmong	Lung and Bronchus (89)	Liver and IBD* (79)	Colon and Rectum (64)	Non-Hodgkin Lymphoma (30)	Stomach (30)	Prostate (29)	Oral Cavity and Pharynx (28)	Leukemia (21)	Pancreas (19)	Brain and Other Nervous System (12)
Pacific Islander^	Prostate (189)	Lung and Bronchus (121)	Colon and Rectum (86)	Liver and IBD* (55)	Oral Cavity and Pharynx (42)	Leukemia (38)	Kidney and Renal Pelvis (38)	Non-Hodgkin Lymphoma (37)	Urinary Bladder (34)	Stomach (28)
South Asian†	Prostate (737)	Colon and Rectum (302)	Lung and Bronchus (231)	Non-Hodgkin Lymphoma (211)	Urinary Bladder (180)	Leukemia (175)	Oral Cavity and Pharynx (147)	Kidney and Renal Pelvis (128)	Liver and IBD* (102)	Brain and Other Nervous System (87)

Rank	1	2	3	4	5	6	7	8	9	10
Thai	Prostate (71)	Colon and Rectum (43)	Liver and IBD˟ (40)	Lung and Bronchus (34)	Non-Hodgkin Lymphoma (19)	Oral Cavity and Pharynx (11)	Stomach (11)	Kidney and Renal Pelvis (11)	Thyroid (11)	Pancreas (10)
Vietnamese	Lung and Bronchus (819)	Liver and IBD˟ (721)	Colon and Rectum (630)	Prostate (597)	Non-Hodgkin Lymphoma (258)	Stomach (198)	Oral Cavity and Pharynx (185)	Pancreas (148)	Leukemia (142)	Urinary Bladder (139)
Non-Hispanic White	Prostate (59,841)	Lung and Bronchus (28,553)	Melanoma of the Skin (22,295)	Colon and Rectum (21,382)	Urinary Bladder (19,651)	Non-Hodgkin Lymphoma (12,229)	Kidney and Renal Pelvis (10,353)	Oral Cavity and Pharynx (10,082)	Leukemia (8,612)	Pancreas (7,182)

^ Pacific Islander includes: Micronesian, Chamorran, Guamanian, Polynesian, Tahitian, Samoan, Tongan, Melanesian, Fiji Islander, New Guinean, and Pacific Islander not specified

† South Asian Includes: Asian Indian and Pakistani

˟ IBD: Intrahepatic Bile Duct

Source: California Cancer Registry, California Department of Public Health

Table 6: Ten Most Commonly Diagnosed Types of Cancer by Race/Ethnicity Among California Females, 2010-2014

Rank	1	2	3	4	5	6	7	8	9	10
African American	Breast (8,093)	Lung and Bronchus (3,058)	Colon and Rectum (2,630)	Uterus (1,674)	Pancreas (856)	Non-Hodgkin Lymphoma (782)	Thyroid (775)	Kidney and Renal Pelvis (772)	Myeloma (631)	Ovary (604)
American Indian	Breast (671)	Lung and Bronchus (233)	Colon and Rectum (212)	Uterus (170)	Thyroid (87)	Kidney and Renal Pelvis (79)	Cervix Uteri (75)	Non-Hodgkin Lymphoma (75)	Ovary (63)	Leukemia (62)
Chinese	Breast (3,919)	Lung and Bronchus (1,394)	Colon and Rectum (1,291)	Uterus (751)	Thyroid (680)	Non-Hodgkin Lymphoma (463)	Ovary (398)	Stomach (370)	Pancreas (363)	Liver and IBD* (331)
Filipino	Breast (5,113)	Uterus (1,187)	Colon and Rectum (1,149)	Lung and Bronchus (1,051)	Thyroid (1,031)	Non-Hodgkin Lymphoma (524)	Ovary (429)	Pancreas (373)	Cervix Uteri (287)	Leukemia (283)
Hawaiian	Breast (217)	Uterus (66)	Colon and Rectum (54)	Lung and Bronchus (51)	Thyroid (33)	Ovary (25)	Leukemia (18)	Cervix Uteri (17)	Non-Hodgkin Lymphoma (15)	Kidney and Renal Pelvis (14)
Hispanic	Breast (23,284)	Colon and Rectum (6,579)	Uterus (5,631)	Thyroid (5,399)	Lung and Bronchus (4,513)	Non-Hodgkin Lymphoma (3,623)	Kidney and Renal Pelvis (2,881)	Ovary (2,849)	Cervix Uteri (2,619)	Leukemia (2,455)
Japanese	Breast (1,485)	Colon and Rectum (570)	Lung and Bronchus (485)	Uterus (228)	Non-Hodgkin Lymphoma (209)	Pancreas (208)	Stomach (168)	Thyroid (136)	Ovary (110)	Urinary Bladder (105)
Kampuchean	Breast (105)	Lung and Bronchus (59)	Colon and Rectum (54)	Liver and IBD* (36)	Thyroid (28)	Cervix Uteri (27)	Uterus (23)	Ovary (21)	Stomach (20)	Non-Hodgkin Lymphoma (14)
Korean	Breast (1,016)	Colon and Rectum (474)	Thyroid (304)	Lung and Bronchus (290)	Stomach (235)	Uterus (166)	Pancreas (156)	Liver and IBD* (131)	Ovary (131)	Non-Hodgkin Lymphoma (113)
Laotian/Hmong	Breast (87)	Colon and Rectum (70)	Lung and Bronchus (46)	Uterus (37)	Thyroid (30)	Oral Cavity and Pharynx (28)	Liver and IBD* (24)	Cervix Uteri (22)	Pancreas (21)	Leukemia (19)
Pacific Islander^	Breast (412)	Uterus (225)	Lung and Bronchus (98)	Colon and Rectum (88)	Thyroid (72)	Ovary (50)	Cervix Uteri (49)	Non-Hodgkin Lymphoma (34)	Stomach (33)	Leukemia (24)
South Asian±	Breast (1,290)	Thyroid (254)	Uterus (235)	Colon and Rectum (192)	Ovary (151)	Non-Hodgkin Lymphoma (134)	Lung and Bronchus (124)	Leukemia (104)	Pancreas (68)	Brain and Other Nervous System (68)

Rank	1	2	3	4	5	6	7	8	9	10
Thai	Breast (173)	Colon and Rectum (55)	Lung and Bronchus (49)	Uterus (34)	Thyroid (34)	Ovary (18)	Non-Hodgkin Lymphoma (17)	Liver and IBD˟ (16)	Pancreas (15)	Cervix Uteri (14)
Vietnamese	Breast (1,334)	Colon and Rectum (540)	Lung and Bronchus (490)	Thyroid (291)	Uterus (255)	Liver and IBD˟ (226)	Non-Hodgkin Lymphoma (176)	Ovary (158)	Stomach (154)	Cervix Uteri (127)
Non-Hispanic White	Breast (75,697)	Lung and Bronchus (29,328)	Colon and Rectum (19,891)	Uterus (15,180)	Melanoma of the Skin (13,599)	Non-Hodgkin Lymphoma (9,282)	Thyroid (9,097)	Ovary (6,951)	Pancreas (6,482)	Leukemia (5,807)

^ Pacific Islander includes: Micronesian, Chamorran, Guamanian, Polynesian, Tahitian, Samoan, Tongan, Melanesian, Fiji Islander, New Guinean, and Pacific Islander not specified

† South Asian Includes: Asian Indian and Pakistani

˟ IBD: Intrahepatic Bile Duct

Source: California Cancer Registry, California Department of Public Health

Cancer Incidence and Mortality Trends (2004-2013)

Figures 1 and 2 depict the trends in cancer incidence and mortality rates for the most common cancers, by sex, over the most recent ten-year period (2004-2013). Looking at cancer trends over the most recent time period allows for any new or emerging trends to become evident. A bar to the right of zero (i.e., a positive percentage) means that, on average, the rate increased and a bar to the left of zero (i.e., a negative percentage) means that the rate decreased, on average. An asterisk indicates that the change was statistically significant.

Although cancer remains a major cause of illness and death in California, the incidence and mortality rates for many of the common types of cancer declined among both men and women from 2004 to 2013. While all of the reasons for these declines are not known, some of the declines can be attributed to lower rates of smoking and the decline of smoking-related cancers (e.g., cancers of the lung and bronchus, larynx, stomach, cervix uteri, and urinary bladder).

For men, when all cancers were examined together, there was a statistically significant decrease in incidence and mortality rates over the most recent ten-year period. When cancers were examined separately, the incidence of seven frequently diagnosed cancers decreased significantly including cancers of the prostate, lung and bronchus, larynx, colon and rectum (i.e., colorectal), urinary bladder, stomach, and esophagus. Additionally, mortality from six of these seven cancers also decreased significantly, the exception being urinary bladder cancer. The incidence of seven cancers increased significantly among men over the most recent ten-year period including cancers of the pancreas, oral cavity and pharynx, testis, kidney and renal pelvis, melanoma of the skin, liver and intrahepatic bile duct (IBD), and thyroid. Mortality from all but one of these cancers did not change significantly. Only mortality from liver and IBD cancer increased significantly among men during the time period.

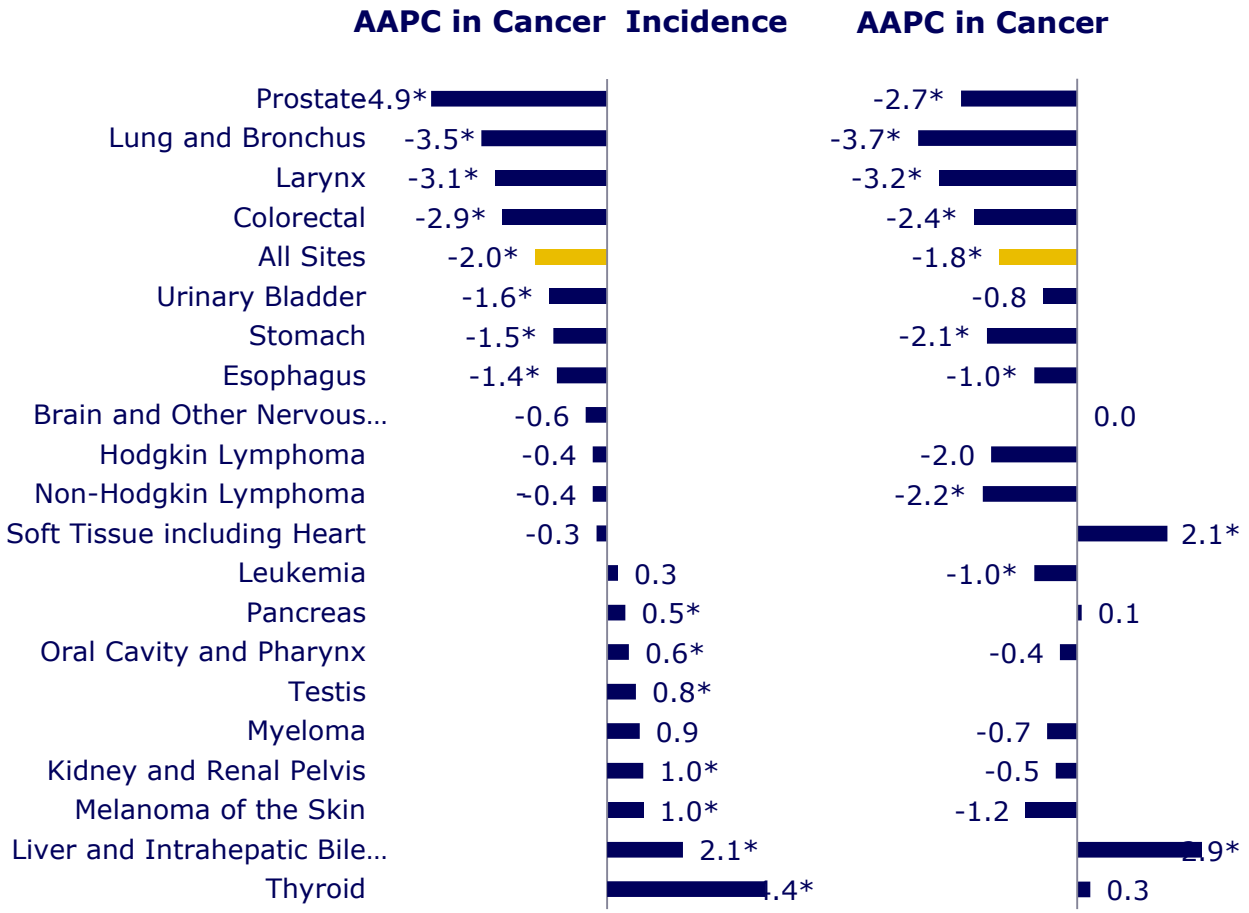
Although the incidence of non-Hodgkin lymphoma, cancer of the soft tissue including the heart, and leukemia did not change significantly for men during the most recent ten-year period, mortality from these cancers did change significantly. Mortality from non-Hodgkin lymphoma and leukemia decreased significantly and mortality from cancer of the soft tissue including the heart increased significantly.

For women, when all cancers were examined together, incidence and mortality decreased significantly during the most recent ten-year period. When cancers were examined separately, the incidence of seven frequently diagnosed cancers among women decreased significantly including colorectal, lung and bronchus, Hodgkin lymphoma, urinary bladder, cervix uteri, ovary, and non-Hodgkin lymphoma. Mortality also decreased significantly for five of these cancers, the exceptions being Hodgkin lymphoma and cervical cancer.

The incidence of five frequently diagnosed cancers among women increased significantly over the most recent ten-year period including cancers of the kidney and renal pelvis, soft tissue

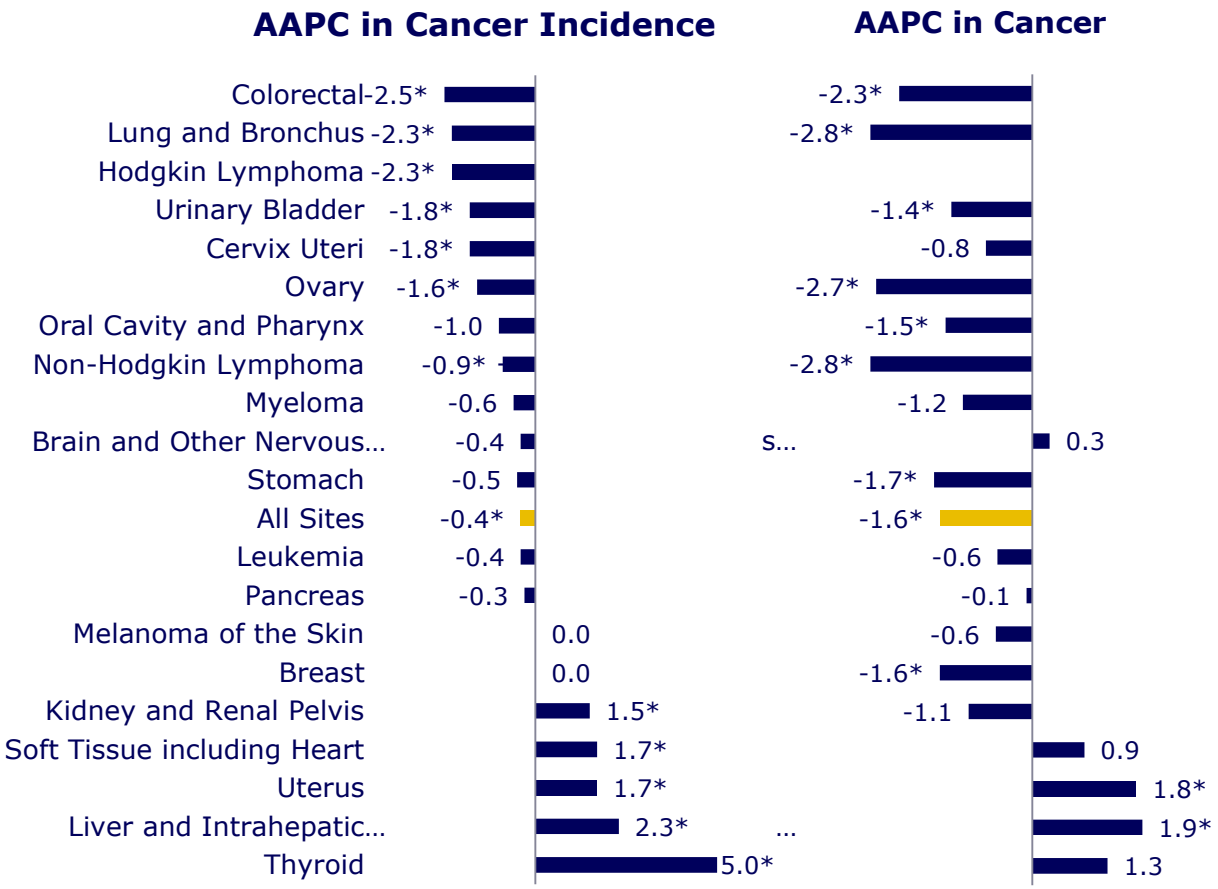
including the heart, uterus, liver and IBD, and thyroid. Mortality from uterine cancer and liver and IBD cancer also increased significantly. Additionally, mortality from breast and stomach cancers decreased significantly among women, but incidence from these two cancers did not change significantly.

Figure 1: Average Annual Percent Change (AAPC) in Cancer Incidence and Mortality Trends among California Males, 2004-2013



*AAPC is significantly different from zero at $p < 0.05$.
Rates are per 100,000 and age-adjusted to the 2000 U.S. Standard Population.
For testicular cancer mortality, the AAPC could not be calculated due to small counts.
Source: California Cancer Registry, California Department of Public Health

Figure 2: Average Annual Percent Change (AAPC) in Cancer Incidence and Mortality Trends among California Females, 2004-2013



*AAPC is significantly different from zero at $p < 0.05$.
Rates are per 100,000 and age-adjusted to the 2000 U.S. Standard Population.
For Hodgkin Lymphoma mortality, the AAPC could not be calculated due to small counts.
Source: California Cancer Registry, California Department of Public Health

For more details about these cancer trends and those of other cancer sites, please see "Trends in Cancer Incidence and Mortality in California, 1988-2010," which is available on the UC Davis Institute for Population Health Improvement website.

Five-Year Relative Survival by Stage at Diagnosis (2005-2014)

Cancer survival is usually expressed as a rate or percentage of all persons diagnosed with cancer during a particular time period who survive for a defined number of years after diagnosis. Five-year relative survival estimates the probability that an individual will not die from a given cancer during the first five years following diagnosis, after adjusting for the expected mortality from other causes. Over the past several decades in California, five-year relative survival has improved for many types of cancer.

One of the strongest predictors of survival is the stage at which the cancer is diagnosed. Stage refers to the degree the cancer has spread at the time of diagnosis. The following terms are used to describe the different stages of diagnosis used in this report:

Localized: The tumor broke through the first layer of cells (the basement membrane), but is still confined to the organ in which it originated.

Regional: The tumor has spread to lymph nodes or adjacent tissues.

Distant: The tumor has spread to other parts of the body (metastasized).

Table 7 presents data on five-year relative survival by stage at diagnosis for the most common types of cancer incidence and mortality for Californians diagnosed between 2005 and 2014. The percentages listed in the table represent the probability that an individual will not die from a given cancer during the five years after diagnosis.

Table 7: Five-Year Relative Survival (Percentage) by Cancer Type and Stage at Diagnosis, California, 2005-2014				
Cancer Type	**All Stages**	**Localized**	**Regional**	**Distant**
Breast (Female)	91.4	99.4	86.2	28.9
Brain and Nervous System	33.5	36.6	21.8^	
Cervix Uteri	69.5	92.3	59.5	18.7
Colorectal	67.7	91.9	72.1	14.2
Uterus	83.3	96.4	69.9	18.1
Esophagus	18.1	39.7	22.0	4.1
Kidney and Renal Pelvis	74.2	92.5	67.3	12.1
Leukemia	58.8	N/A: All leukemias are staged as distant disease; thus survival cannot be calculated for other stages		58.8
Liver and Intrahepatic Bile Duct	20.2	32.0	11.7	3.2
Lung and Bronchus	18.5	57.3	29.4	4.8
Melanoma	92.1	98.8	63.3	18.6
Non-Hodgkin Lymphoma	70.4	83.4	74.0	62.4
Oral Cavity and Pharynx	66.6	85.2	65.0	39.5
Ovary	49.7	92.0	76.3	30.8
Pancreas	8.2	31.4	11.0	2.6
Prostate	99.5	100.0	100.0	30.5
Stomach	31.2	68.6	31.9	5.0
Testis	94.5	98.8	95.8	71.5
Thyroid	97.8	99.9	97.9	58.2
Urinary Bladder	60.0	71.9	39.7	5.9

*Follow-up is through December 31, 2014. Cancers that were unstaged at time of diagnosis were excluded.
^For brain and other nervous system tumors, regional and distant stages were combined.
Source: California Cancer Registry, California Department of Public Health

Childhood (Ages 0-14 years) and Adolescent (Ages 15-19 years) Cancers

Each year from 2010 to 2014, approximately 1,800 children and adolescents were diagnosed with cancer in California. These cases represent slightly more than one percent of all new cancer cases diagnosed among California residents during this time period. Although childhood and adolescent cancer incidence rates have increased since 1988, progress in treatment has resulted in an improved five-year relative survival. Overall, children and adolescents diagnosed with cancer in California between 2005 and 2014 had a five-year relative survival of 81.9 percent and 82.7 percent, respectively.

Incidence Rates and Number of Cases by International Classification of Childhood Cancer (ICCC) Group (2010-2014)

Childhood and adolescent cancers are classified differently than adult cancers; they are categorized according to the ICCC. The classification of childhood and adolescent cancers is based on the form and structure of the tumor (more commonly referred to as the tumor morphology) and the primary site (e.g., lung, colon, etc.), with an emphasis on morphology. Adult cancers are also categorized based on morphology and primary site, but the emphasis is on primary site. The ICCC is broken down into the following twelve site groups:[1]

I. Leukemias, myeloproliferative diseases, and myelodysplastic diseases
II. Lymphomas and reticuloendothelial neoplasms
III. CNS (central nervous system) and miscellaneous intracranial and intraspinal neoplasms
IV. Neuroblastoma and other peripheral nervous cell tumors
V. Retinoblastoma
VI. Renal tumors
VII. Hepatic tumors
VIII. Malignant bone tumors
IX. Soft tissue and other extraosseous sarcomas
X. Germ cell tumors, trophoblastic tumors, and neoplasms of gonads
XI. Other malignant epithelial neoplasms and malignant melanomas
XII. Other and unspecified malignant neoplasms

[1] Additional information about the ICCC variable definitions may be obtained from:

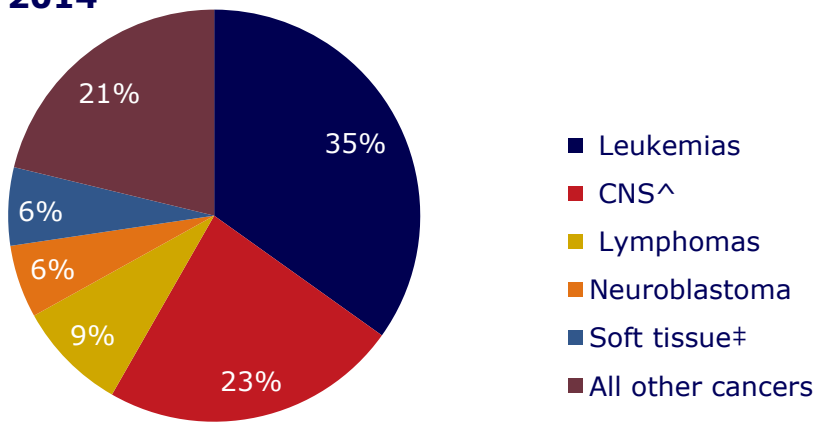
Between 2010 and 2014, leukemias were the most commonly diagnosed cancer among California children (ages 0-14 years) and accounted for 35 percent of all cancers diagnosed in this age group (Figure 3). CNS tumors were the second most commonly diagnosed cancer and accounted for 23

percent of all childhood cancers. For additional information on childhood cancer incidence rates and case counts, see Table 8.

For adolescents (ages 15-19 years), the most commonly diagnosed cancers between 2010 and 2014 were CNS tumors and other malignant epithelial neoplasms (which include malignant melanomas) (Figure 4). Lymphomas were the second most frequently diagnosed cancers among adolescents and accounted for 18 percent of all cancers diagnosed in this age group. For additional data regarding adolescent cancer incidence rates and case counts, see Table 9.

Of note, childhood and adolescent cancer incidence rates are presented as rates per 1,000,000 persons, while adult cancer incidence rates (as presented earlier in this report) are per 100,000 persons.

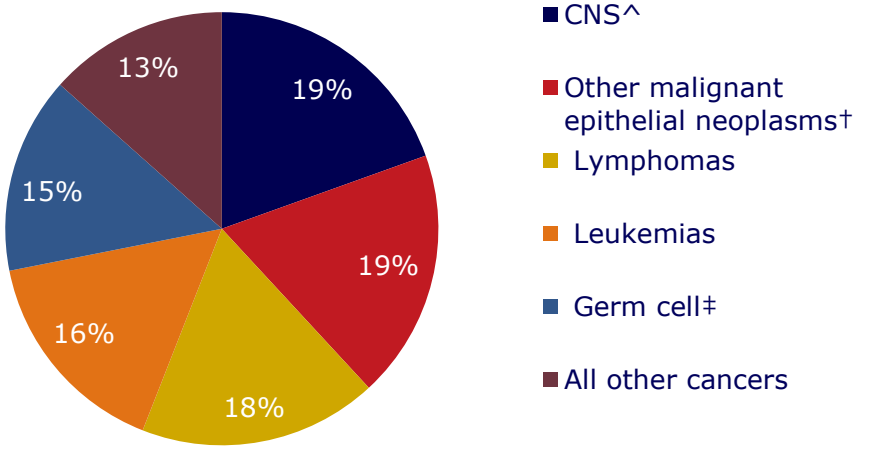
Figure 3: Distribution of Cancer Types Among Children Ages 0-14 Years in California, 2010-2014*



*Includes myelodysplastic syndromes and benign brain/CNS tumors.
^Includes miscellaneous intracranial and intraspinal neoplasms.
‡Includes other extraosseous sarcomas.
Source: California Cancer Registry, California Department of Public Health

Table 8: Childhood Cancer (0-14 years) Average Incidence Rates and Counts in California, 2010-2014 (including myelodysplastic syndromes and benign brain/CNS tumors)		
Cancer Type	**Rate**	**Count**
All cancers combined (including benign brain/CNS tumors)	173.0	6,608
All cancers combined (excluding benign brain/CNS tumors)	160.9	6,150
Leukemias, myeloproliferative and myelodysplastic diseases	60.1	2,304
CNS and miscellaneous intracranial and intraspinal neoplasms	40.6	1,546
Lymphomas and reticuloendothelial neoplasms	15.2	573
Soft tissue and other extraosseous sarcomas	10.6	405
Neuroblastoma and other peripheral nervous cell tumors	9.7	378
Renal tumors	7.6	293
Other malignant epithelial neoplasms and melanomas	8.1	306
Malignant bone tumors	6.5	243
Germ cell and trophoblastic tumors and neoplasms of gonads	6.3	240
Retinoblastoma	4.6	178
Hepatic tumors	3.1	121
Other and unspecified malignant neoplasms	0.5	21
Rates are per 1,000,000 and age-adjusted to the 2000 U.S. Standard Population. *Source: California Cancer Registry, California Department of Public Health*		

Figure 4: Distribution of Cancer Types Among Adolescents Ages 15-19 Years in California, 2010-2014*



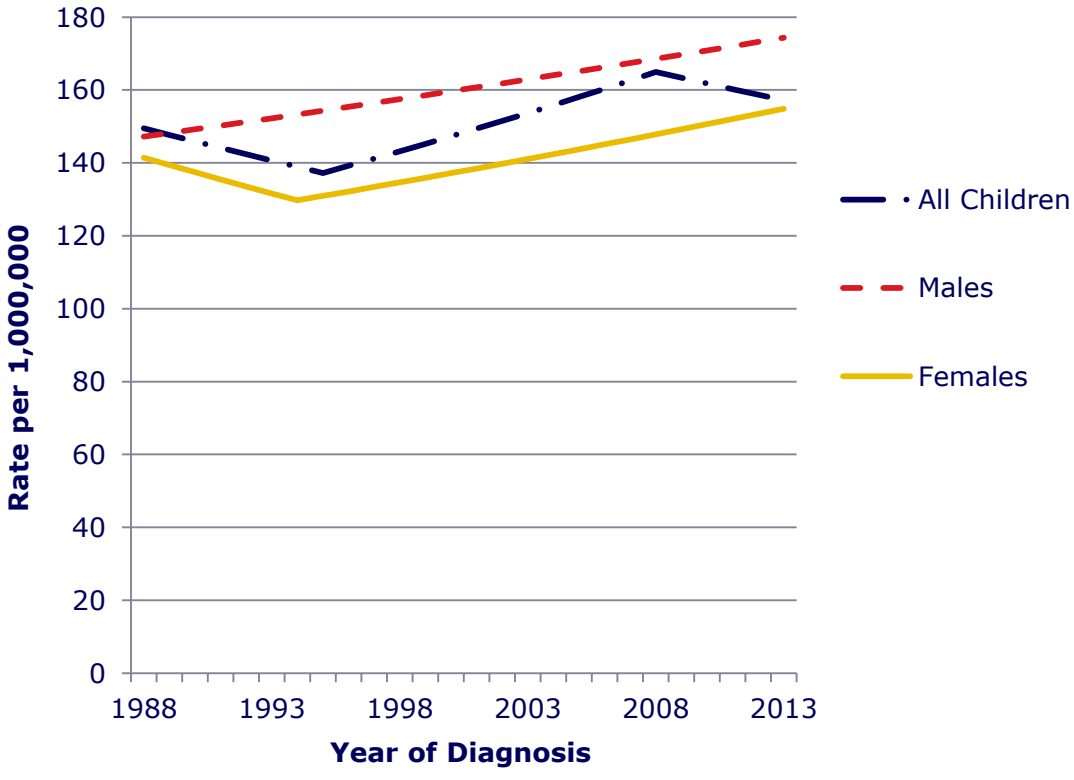
*Includes myelodysplastic syndromes and benign brain/CNS tumors.
^Includes miscellaneous intracranial and intraspinal neoplasms.
†Includes melanomas. ‡Includes trophoblastic tumors and neoplasms of gonads.
Source: California Cancer Registry, California Department of Public Health

Table 9: Adolescent Cancer (15-19 years) Average Incidence Rates and Counts in California, 2010-2014 (including myelodysplastic syndromes and benign brain/CNS tumors)		
Cancer Type	**Rate**	**Count**
All cancers combined (including benign brain/CNS tumors)	249.3	3,376
All cancers combined (excluding benign brain/CNS tumors)	220.4	2,985
CNS and miscellaneous intracranial and intraspinal neoplasms	48.7	659
Other malignant epithelial neoplasms and melanomas	46.4	628
Lymphomas and reticuloendothelial neoplasms	44.5	602
Leukemias, myeloproliferative and myelodysplastic diseases	39.7	538
Germ cell and trophoblastic tumors and neoplasms of gonads	36.6	496
Soft tissue and other extraosseous sarcomas	17.0	230
Malignant bone tumors	12.4	168
Renal tumors	1.7	23
Hepatic tumors	1.0	13
Neuroblastoma and other peripheral nervous cell tumors	0.7	10
Other and unspecified malignant neoplasms	0.7	9
Retinoblastoma	0.0	0
Rates are per 1,000,000 and age-adjusted to the 2000 U.S. Standard Population. *Source: California Cancer Registry, California Department of Public Health*		

Childhood Cancer Incidence Trends by Sex and Cancer Type (1988-2013)

Overall, the age-adjusted incidence rate of childhood cancer (ages 0 to 14 years) increased from 152.8 per 1,000,000 in 1988 to 163.6 per 1,000,000 in 2013. The age-adjusted incidence rate seemed to decrease from 1988 to 1995 and then increased significantly from 1995 to 2008. From 2008 to 2013, the age-adjusted incidence rate decreased again but this decrease was not statistically significant (Figure 5 and Table 10). The trend in the age-adjusted incidence rate differed for males and females. For male children, there was a slight but significant increase in the age-adjusted incidence rate from 1988 to 2013. For female children, the age-adjusted incidence rate decreased from 1988 to 1994, and then increased significantly from 1994 to 2013.

Figure 5: Age-Adjusted Cancer Incidence Trends Among Children Ages 0-14 years in California by Sex, 1988-2013*

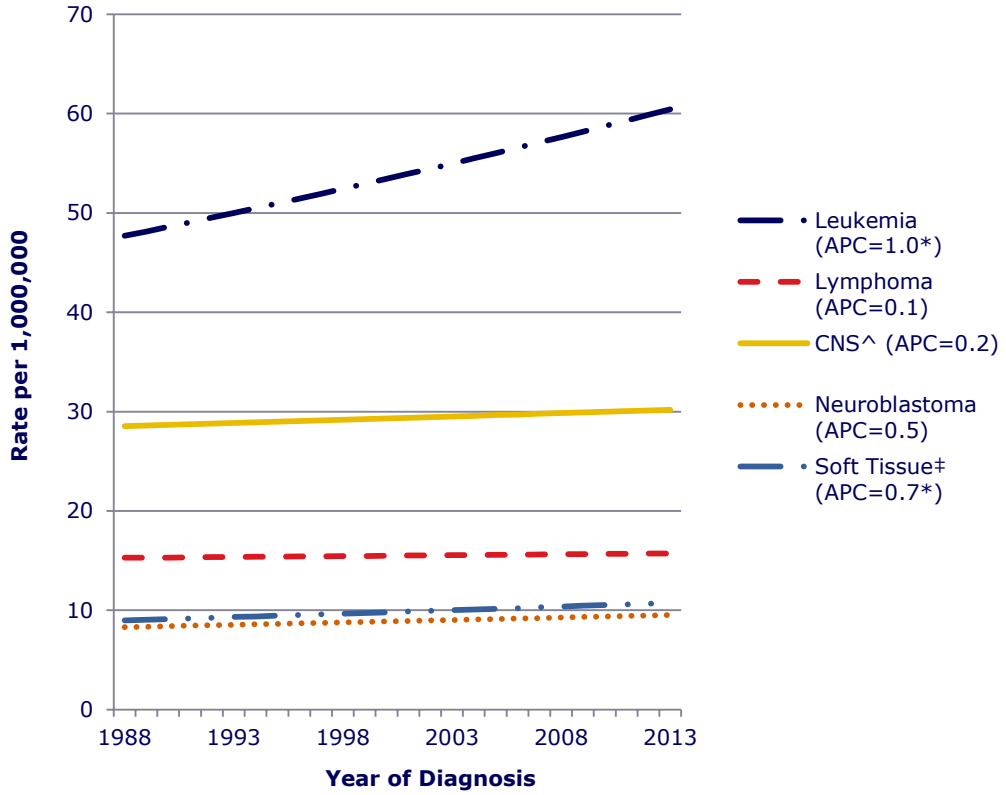


*Excludes myelodysplastic syndromes and benign brain/CNS tumors.
Source: California Cancer Registry, California Department of Public Health

Table 10: Age-Adjusted Cancer Incidence Trends Among Children Ages 0-14 Years in California by Sex, 1988-2013[§]		
Sex	**Time Period**	**Annual Percent Change (APC)**
All Children	1988-1995	-1.2
	1995-2008	1.4*
	2008-2013	-0.9
Males	1988-2013	0.7*
Females	1998-1994	-1.4
	1994-2013	0.9*
[§]Excludes myelodysplastic syndromes and benign brain/CNS tumors. *The APC is significantly different from zero at $p < 0.05$. *Source: California Cancer Registry, California Department of Public Health*		

Incidence trends for the most commonly diagnosed types of childhood cancer are presented in Figure 6. The incidence of leukemia and cancer of the soft tissue increased significantly from 1988 to 2013 by 1.0 percent per year and 0.7 percent per year, respectively. The incidence of lymphoma, CNS tumors, and neuroblastoma did not change significantly during this time period.

Figure 6: Age-Adjusted Cancer Incidence Trends for the Most Commonly Diagnosed Cancer Types Among Children Ages 0-14 Years in California, 1988-2013†

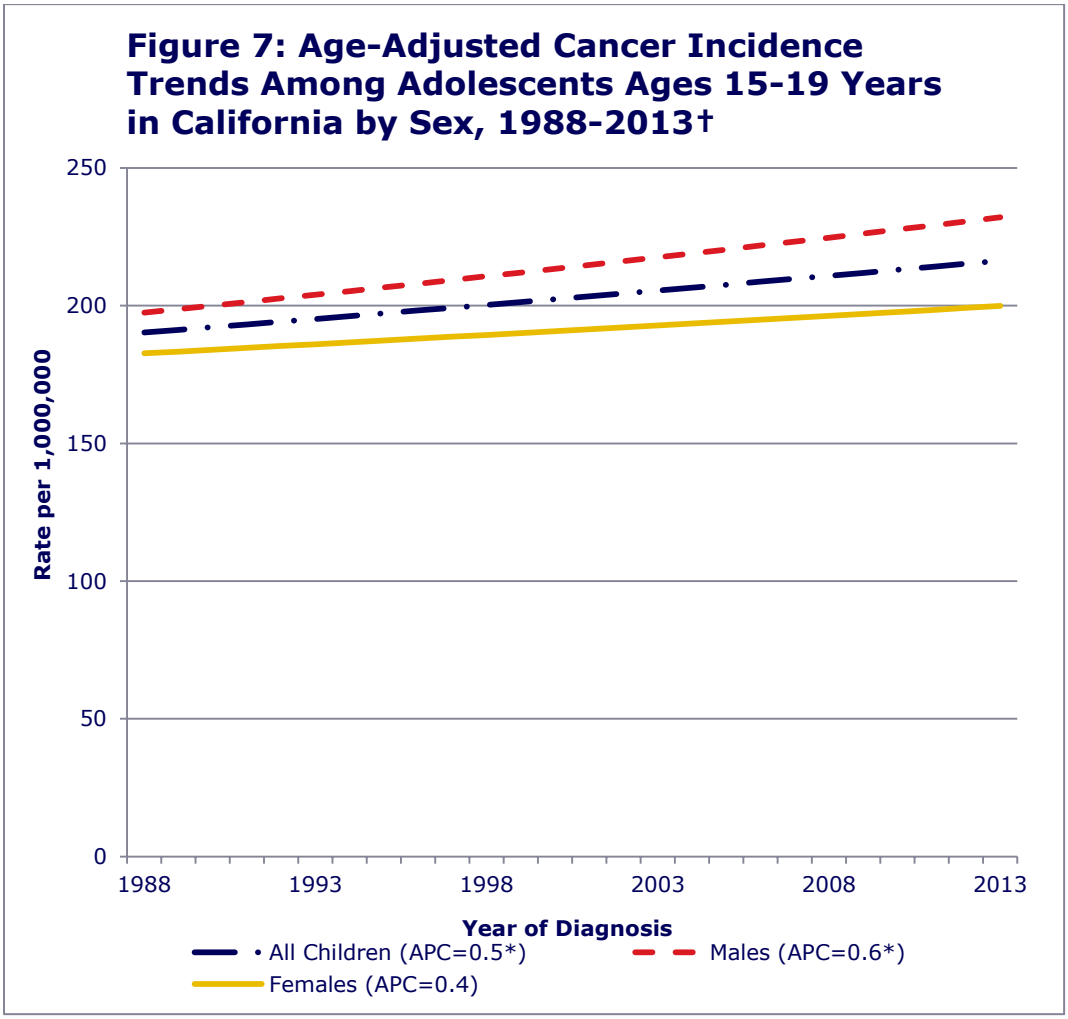


† Excludes myelodysplastic syndromes and benign brain/CNS tumors.
* The APC is significantly different from zero at $p < 0.05$.
^ Includes miscellaneous intracranial and intraspinal neoplasms.
‡ Includes other extraosseous sarcomas.
Source: California Cancer Registry, California Department of Public Health

Adolescent Incidence Trends by Sex and Cancer Type (1988-2013)

From 1988 to 2013, the age-adjusted cancer incidence rate for adolescents (ages 15-19 years) increased significantly by 0.5 percent per year. The age-adjusted cancer incidence rate for male adolescents was higher than that of female adolescents and the trend in the age-adjusted incidence rate among males increased significantly. The trend in the age-adjusted cancer incidence rate among female adolescents also appeared to increase during the time period but the increase was not statistically significant.

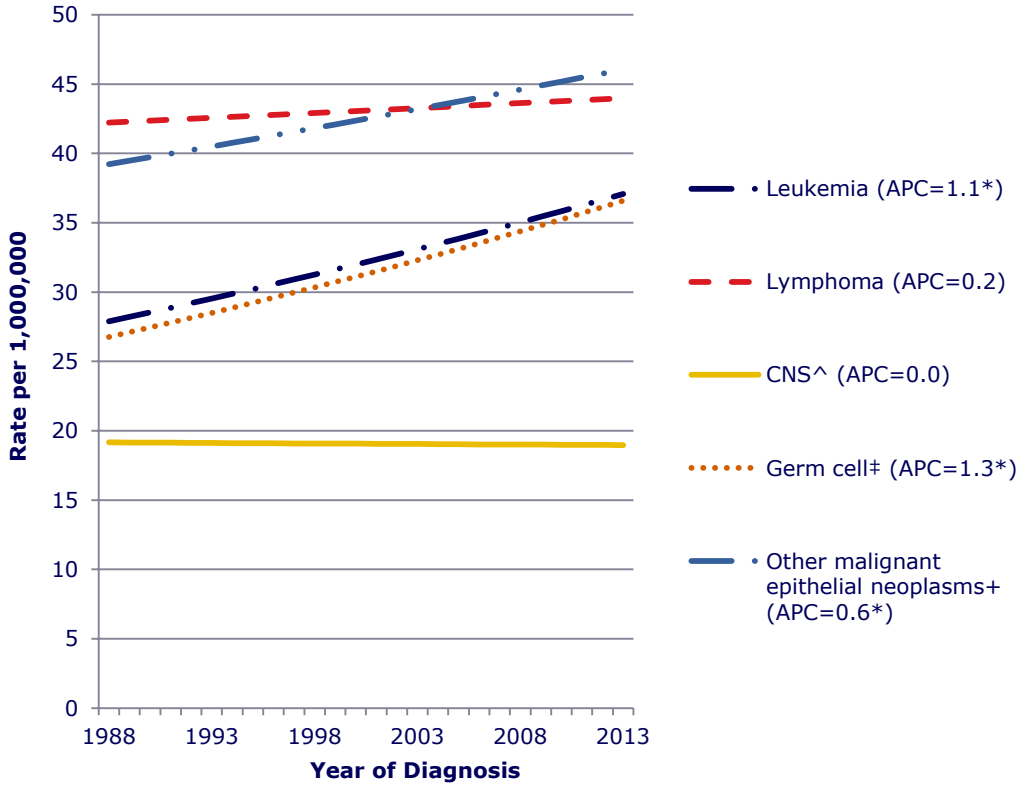
Figure 7: Age-Adjusted Cancer Incidence Trends Among Adolescents Ages 15-19 Years in California by Sex, 1988-2013†



† Excludes myelodysplastic syndromes and benign brain/CNS tumors.
* The annual percent change (APC) is significantly different from zero at $p < 0.05$.
Source: California Cancer Registry, California Department of Public Health

Incidence trends for the most commonly diagnosed types of adolescent cancer are presented in Figure 8. From 1988 to 2013, the incidence of leukemia, germ cell tumors, and other malignant epithelial neoplasms (including melanoma) increased significantly by 1.1 percent per year, 1.3 percent per year and 0.7 percent per year, respectively. The incidence of lymphoma and CNS tumors did not change significantly during this time period.

Figure 8: Age-Adjusted Cancer Incidence Trends for the Most Commonly Diagnosed Cancer Types Among Adolescents Ages 15-19 Years in California, 1988-2013†

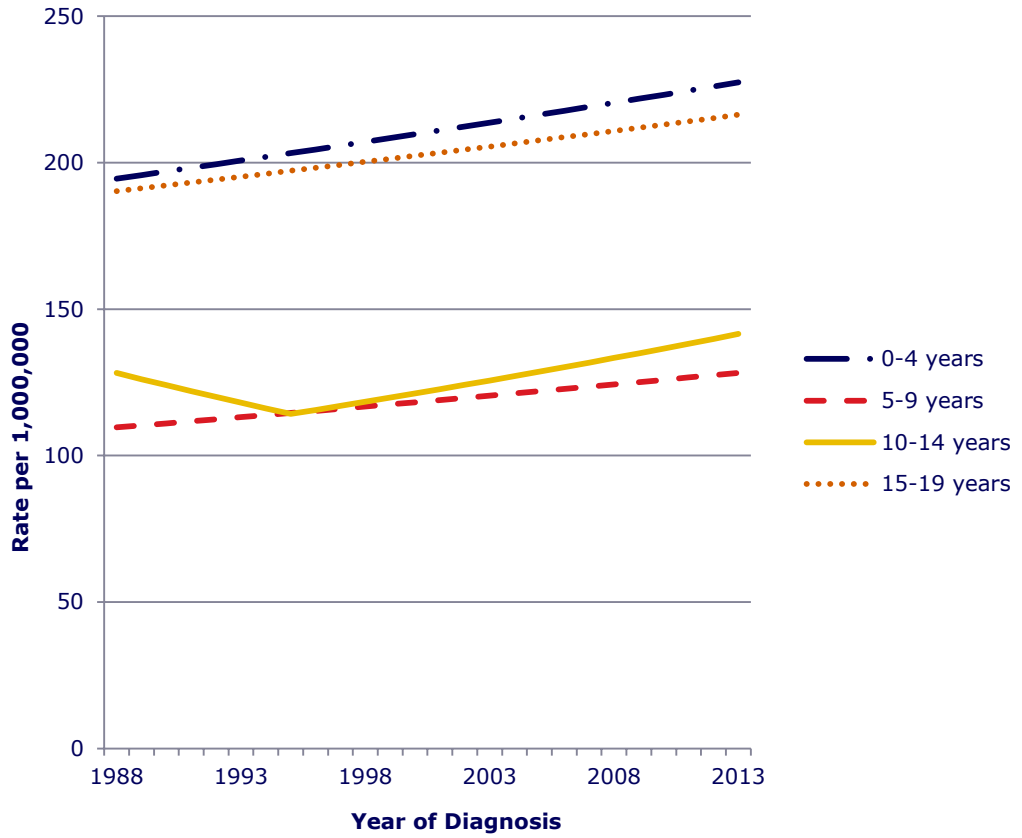


† Excludes myelodysplastic syndromes and benign brain/CNS tumors.
* The annual percent change (APC) is significantly different from zero at $p < 0.05$.
^ Includes miscellaneous intracranial and intraspinal neoplasms.
‡ Includes trophoblastic tumors and neoplasms of gonads.
+Includes melanomas.
Source: California Cancer Registry, California Department of Public Health

Childhood and Adolescent Incidence Trends by Age Group (1988-2013)

Figure 9 and Table 11 display the cancer incidence trends for children and adolescents, separated into five-year age groups (ages 0-4, 5-9, 10-14, and 15-19 years). From 1988 to 2013, cancer incidence among children ages 0-4 years, 5-9 years, and 15-19 years increased significantly by less than 1.0 percent per year. For children ages 10-14 years, cancer incidence appeared to decrease from 1988 to 1995 and then significantly increased by 1.2 percent per year from 1995 to 2013.

Figure 9: Age-Adjusted Cancer Incidence Trends Among Children and Adolescents in California by Age Group, 1988-2013†



† Excludes myelodysplastic syndromes and benign brain/CNS tumors.
Source: California Cancer Registry, California Department of Public Health

Table 11: Age-Adjusted Cancer Incidence Trends Among Children and Adolescents in California by Age Group, 1988-2013[†]		
Age Group	**Time Period**	**Annual Percent Change (APC)**
0-4 years	1998-2013	0.6*
5-9 years	1988-2013	0.6*
10-14 years	1988-1995	-1.6
	1995-2013	1.2*
15-19 years	1988-2013	0.5*

[†]Excludes myelodysplastic syndromes and benign brain/CNS tumors.
*APC is significantly different from zero at $p < 0.05$.
Source: California Cancer Registry, California Department of Public Health

Five-Year Relative Survival by ICCC Group (2005-2014)

There has been improvement in the five-year relative survival rates for childhood and adolescent cancers, in part due to progress in cancer treatments. The five-year relative survival in California, from 2005 to 2014, for all cancers combined (excluding benign brain/CNS tumors) was 82.0 percent for children and 82.7 percent for adolescents (Table 12). When benign brain/CNS tumors were included, the five-year relative survival was the same for children and 0.1 percent lower for adolescents. See Table 12 for the five-year relative survival for each of the major ICCC groups by sex and age group.

Table 12: Five-Year Relative Survival (Percentage) by International Classification of Childhood Cancer (ICCC) Groups, Age, and Sex in California, 2005-2014

Cancer Type (ICCC Group)	Ages 0-14 years			Ages 15-19 years		
	Total	Male	Female	Total	Male	Female
All cancers combined (excluding benign brain/CNS Tumors	82.0	81.8	82.1	82.7	80.4	85.4
All cancers combined (including benign brain/CNS Tumors)	82.0	81.8	82.1	82.6	80.3	85.4
Leukemias (including myelodysplastic syndromes)	84.8	84.4	85.3	69.6	70.5	68.1
Lymphomas and reticuloendothelial neoplasms	93.2	93.8	92.0	93.8	93.0	94.6
CNS and other intracranial and intraspinal neoplasm (includes benign brain/CNS tumors)	70.1	71.3	68.8	77.5	75.4	80.2
Neuroblastoma and other peripheral nervous cell tumors	76.6	74.9	78.3	-	-	-
Retinoblastoma	97.9	95.9	100.0	-	-	-
Renal tumors	88.8	86.7	90.6	67.3	-	-
Hepatic tumors	77.5	77.8	76.9	58.6	-	-
Malignant bone tumors	71.8	71.6	72.0	63	60.5	67.4
Soft tissue and other extraosseous sarcomas	70.8	70.5	71.1	67.2	62.4	71.5
Germ cell, trophoblastic tumors, neoplasms of gonads	92.7	94.9	90.7	91.1	90.8	92.1
Other malignant epithelial neoplasms and melanomas	91.5	90.2	92.3	91.1	84.2	94.0

*Follow-up is through December 31, 2014. Cancers that were unstaged at time of diagnosis were excluded.
- Statistics not calculated due to less than 25 cases
Source: California Cancer Registry, California Department of Public Health

Technical Notes

Incidence: This report includes cases of cancer diagnosed between January 1, 1988, and December 31, 2014, and reported to the California Cancer Registry (CCR) as of October 2016. A "case" is defined as a primary cancer. Tumors that result from the spread, or metastasis, of a primary cancer to another organ are not considered new cases. Only invasive cancers (those that have infiltrated the tissue of the organ of origin) are included in this report except where noted. Regional registries covering the entire state report cancer incidence data to the CCR, Chronic Disease Surveillance and Research Branch of the California Department of Public Health (CDPH). Standards for data abstracting, collection, and reporting are specified by the CCR. Only cases diagnosed in California residents are included in this report. Individuals who were treated for cancer in California, but were residents of another state or country are not included.

Mortality: Computerized files containing information on cancer-related deaths were obtained from the CDPH, Center for Health Statistics. Beginning in 1999, cause of death was coded by the International Classification of Disease, Tenth Edition (ICD-10). All mortality analyses presented in this report are the responsibility of the authors and were not reviewed or endorsed by the Center for Health Statistics prior to publication. Only deaths among California residents were included in these analyses.

Statistical Methods:

Calculation of Age-Adjusted Rates: Rates for adults were calculated as the number of new cases (incidence) or deaths (mortality) in specific age groups per 100,000 persons each year and were age-adjusted to the 2000 United States standard population. Incidence rates for children and adolescents were calculated as the number of new cases in specific age groups per 1,000,000 persons each year and were age-adjusted to the 2000 United States standard population. Age-adjusted rates are weighted averages of age-specific rates, where the weights represent the age distribution of a standard population. Such adjustment eliminates differences in rates due to changes in the age of a population over time or differences in the age distribution between population groups. Rates in this report were calculated using the Surveillance Research Program, National Cancer Institute, SEER*Stat software version 8.3.2 or higher (https://seer.cancer.gov/seerstat).

Annual Percent Change: The estimated annual percent change (APC) represents the average percent increase or decrease in cancer rates per year over a specified time period. It is calculated by first fitting a linear regression to the natural logarithm of the annual age-adjusted rates (r), using calendar year as the predictor value: $\ln(r) = m(\text{year}) + b$. From the slope of the regression line, the APC is calculated as $APC = 100*(e^m - 1)$. Testing the hypothesis that the APC is equal to zero is equivalent to testing the hypothesis that the slope of the line in the regression is equal to zero. Statistical significance was set at alpha = 0.05.

Joinpoint Analysis of Trends: Joinpoint linear regression was used to determine trends in cancer incidence and mortality. In this analysis, a statistical algorithm detects joinpoints, or points in time where the slope of the regression line significantly changes. Thus, the model describes trends during different time segments. At each segment, trends in rates are measured using the estimated APC, which assumes that rates change by a constant percentage each year. The Statistical Research and Applications Branch, National Cancer Institute, JoinPoint Regression Software version 4.3.1 or higher was used for all trend analyses in this report (https://surveillance.cancer.gov/joinpoint).

Average Annual Percent Change: The Average Annual Percent Change (AAPC) is a summary measure of a trend over a pre-specified fixed interval. It allows us to use a single number to describe the average APCs (Annual Percent Changes) over a period of multiple years. It is valid even if the joinpoint model indicates that there were changes in trends during those years. It is computed as a weighted average of the APCs from the joinpoint model, with the weights equal to the length of the APC interval.