UCDAVIS HEALTH | COMPREHENSIVE CANCER CENTER

ASSESSING THE BURDEN OF CANCER AMONG CALIFORNIANS, 1988-2018

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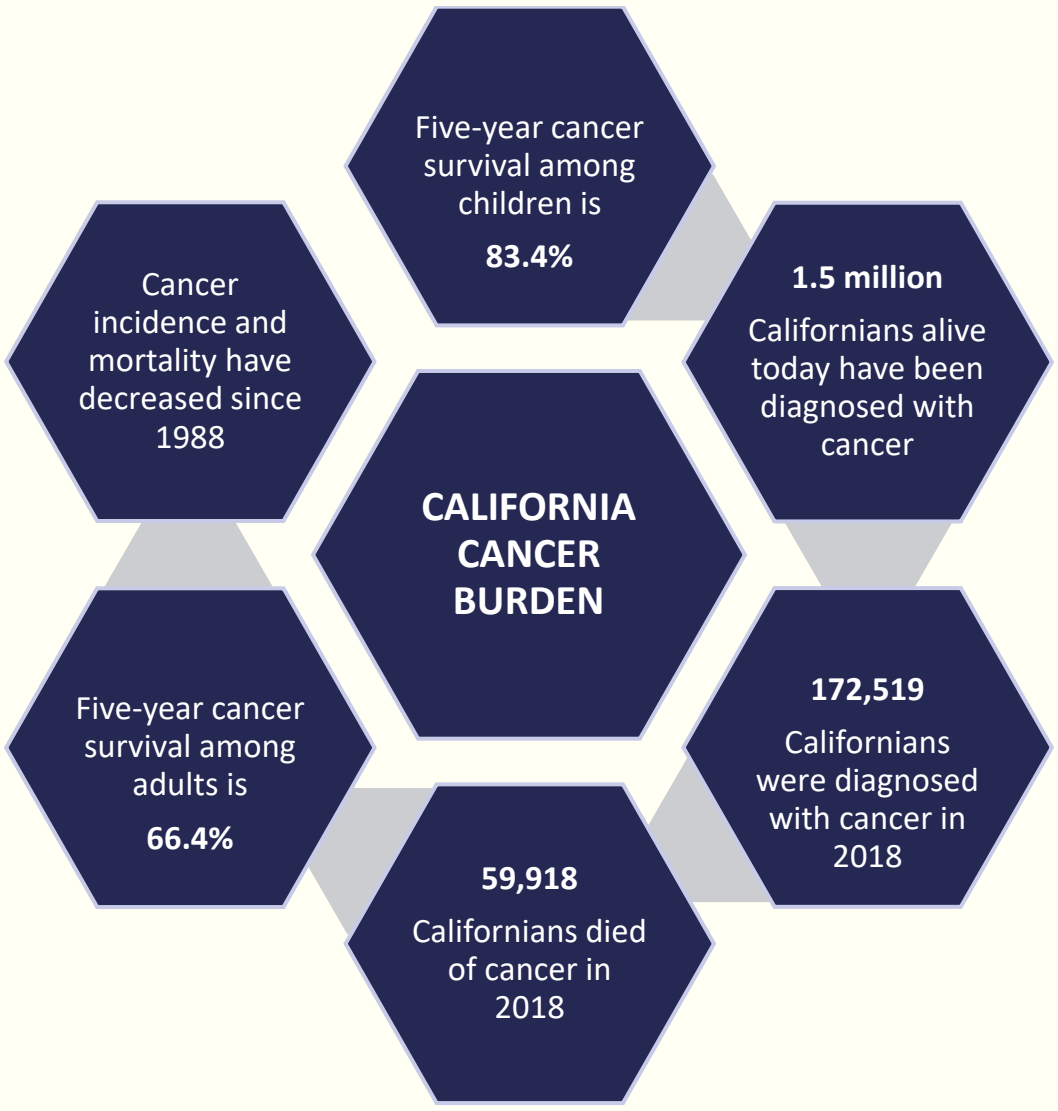
EXECUTIVE SUMMARY

This report provides a broad overview of the cancer burden in California with chapters dedicated to incidence, mortality, and survival. The final chapter evaluates progress toward meeting objectives outlined in the California Department of Public Health's (CDPH), California Wellness Plan (CWP). CWP objectives evaluated were those designed to reduce the overall cancer burden and eliminate existing disparities.



KEY FINDINGS OF THIS REPORT INCLUDE:

- Approximately 1.5 million Californians alive today have been diagnosed with cancer at some point in their lives.
- In 2018, 172,519 new cancer cases and 59,918 cancer deaths occurred among Californians.
- Since 1988, overall cancer incidence and mortality rates significantly decreased in California by 0.4 percent per year and 1.4 percent per year, respectively.
- The most diagnosed cancers among men were prostate, lung, colorectal, melanoma, and bladder. The most diagnosed cancers among women were breast, lung, colorectal, uterine, and thyroid.
- Men had higher cancer incidence (408.7 per 100,000) and mortality (158.8 per 100,000) rates than women (379.5 per 100,000 and 117.7 per 100,000, respectively). However, men had greater decreases in cancer incidence and mortality rates (AAPC: average annual percentage change in incidence=-1.7; AAPC in mortality=-1.8) compared to women (AAPC in incidence=-0.3; AAPC in mortality=-1.6).
- The risk of certain types of cancer varied by age. Among children under 14 years, leukemia and brain tumors were the most diagnosed cancers. Among adults aged 50 years and older, breast, prostate, lung, and colorectal were the most diagnosed cancers.
- American Indians had the highest cancer incidence rate (433.1 per 100,000) compared to non-Latino/Hispanic Whites (430.6 per 100,000), Black/African Americans (393.6 per 100,000), Latino/Hispanics (320.5 per 100,000), and Asian/Pacific Islanders (289.9 per 100,000). Additionally, cancer incidence significantly decreased from 2009 to 2018 among all racial/ethnic groups except for American Indians, for whom it significantly increased over the time-period.
- Black/African Americans (175.8 per 100,000) and American Indians (163.3 per 100,000) had the highest cancer mortality rates, followed by non-Latino/Hispanic Whites (144.3 per 100,000), Latino/Hispanics (118.8 per 100,000), and Asian/Pacific Islanders (102.6 per 100,000).
- Five-year cancer survival among California adults aged 20 years and older was 66.4 percent, whereas five-year cancer survival among children aged birth to 19 years was 83.4 percent.

- Among men, five-year survival was highest for prostate (96.5 percent), thyroid (94.3 percent), and testicular (93.7 percent) cancers and lowest for pancreatic (8.9 percent), lung (15.1 percent), and esophagus (17.8 percent) cancers. Among women, five-year survival was highest for thyroid (98.4 percent), melanoma (93.0 percent), and breast (90.2 percent) cancers and lowest for pancreatic (9.1 percent), liver (19.4 percent), and lung (22.2 percent) cancers.
- Five-year cancer survival improved among each racial/ethnic group in California between 1988 and 2013. However, Black/African Americans had the lowest five-year cancer survival (61.6 percent) in 2013 compared to non-Latino/Hispanic Whites (67.1 percent), Latino/Hispanics (65.3 percent), and Asian/Pacific Islanders (63.4 percent).
- Cancers detected at an early stage have the best prognosis. Seven screen-detectable cancers have the greatest possibility of early diagnosis, including female breast, cervical, prostate, colorectal, melanoma, oral, and lung cancers. However, large proportions of lung (75 percent), oral (62 percent), colorectal (54 percent), and cervical (50 percent) cancers were diagnosed at a late (regional or distant) - versus early (localized) stage.
- California has met or exceeded the CWP goals in reducing cancer mortality rates for female breast cancer by ten percent, colorectal cancer by 17.5 percent and prostate cancer among Black/African American men by ten percent since 2008. Since 2012, lung cancer mortality decreased by ten percent.
- Progress has been made to meet the CWP goals to reduce the mortality rate of prostate cancer and incidence rates of lung and cervical cancer. Prostate cancer mortality rates significantly declined 1.3 percent per year since 2008 and the incidence rates of lung cancer declined by 2.9 percent per year since 2012. California is close to meeting the goal of reducing the incidence rate of cervical cancer to 7.0 per 100,000 (7.5 per 100,000 in 2018).
- More progress is needed in the California Wellness Plan goals to increase the proportion of early-stage breast and colorectal cancer diagnoses. However, the proportions of late-stage diagnoses of colorectal cancer overall and among Black/African Americans and Asian/Pacific Islanders are approximately five percentage points lower than in 2017.

INTRODUCTION

This report focuses on the burden of cancer in California where approximately 1.5 million Californians living today have been diagnosed with cancer and each year 170,000 new cases are diagnosed. The number of new cases will increase as the number of older adults (age 60 years and older) continues to grow. Cancer takes a physical, emotional, and financial toll on the patient and their loved ones.

Factors such as socioeconomic status, access to health care, neighborhood and community attributes, social support systems, genetics, and personal behaviors all contribute to an individual's risk of developing and surviving cancer.[1,2] As a result, cancer disproportionally affects certain subgroups of our population. As much as 40 percent of cancers can be prevented by modifying risk factors such as smoking, alcohol intake, excess body weight, physical inactivity, exposure to ultraviolet radiation, consumption of red and processed meat, low consumption of fruits, vegetables, and dietary fiber, and infection with some pathogens (human papillomavirus, human immunodeficiency virus, hepatitis B and C, helicobacter pylori, human herpes virus type 8).[1] This report provides detailed information on cancer incidence, mortality, and survival by sex, race/ethnicity, and age and identifies areas where disparities exist. Identification of such disparities can inform policy decisions about where more work needs to be done to reduce the cancer burden experienced by subgroups of our population.

Data in this report came from the California Cancer Registry (CCR). CCR is a program of the California Department of Public Health (CDPH), Chronic Disease Surveillance and Research Branch (CDSRB). CCR is a comprehensive, statewide, cancer surveillance system. Enacted into law in 1985 (Health & Safety Code Sections 103875-103885), CCR was established to monitor the burden of cancer in California. CCR's mission is to serve the public by collecting timely, standardized, statewide data across the cancer continuum to target action toward high impact data use. CCR is recognized for its high-quality data and routinely meets the standards of the Centers for Disease Control and Prevention's National Program of Cancer Registries (NPCR) and the North American Association of Central Cancer Registries (NAACCR). Since 2012, CCR has partnered with the California Cancer Reporting and Epidemiologic Surveillance (CalCARES) Program at UC Davis Comprehensive Cancer Center/UC Davis Health to manage the day-to-day operations of CCR.

CHAPTER 1. CANCER INCIDENCE AND PREVALENCE

Incidence is an important measure of the cancer burden; it informs health care providers, public health professionals, policy makers, and other stakeholders on the effectiveness of **primary** and **secondary prevention** measures. **Prevalence** is useful for determining how many resources are needed to diagnose and treat cancer, and where resources should be directed to minimize disparities in the cancer burden. In 2018, 172,519 new cancers were diagnosed among Californians and 1.5 million Californians alive today have been diagnosed with cancer. This corresponds to an **age-adjusted incidence rate (AAIR)** of 389.3 per 100,000. Since 1988, the a**verage annual percent change (AAPC)** of all cancers has decreased **significantly** by 0.4 percent per year.

INCIDENCE BY SEX

In 2018, 88,137 women and 84,382 men were diagnosed with cancer. The most common cancers among women were breast (28,183), lung (8,351), colorectal (7,024), uterus (6,532), and thyroid (4,095), whereas the most common cancers among men were prostate (20,345), lung (8,185), colorectal (7,905), melanoma (6,090), and bladder (5,221) (Table 1.1).

The AAIR of all cancers combined among men (408.7 per 100,000; 95 percent Confidence Interval (CI), 405.8 - 411.5) was higher than among women (379.5 per 100,000; 95 percent CI, 377.0 – 382.1), indicating that men have a higher burden of cancer incidence than women.

KEY TERMS

Incidence is the number of new cancer cases diagnosed in a population in a defined time period.
Primary Prevention refers to measures that can prevent cancer before it starts such as healthy behaviors and HPV vaccines.
Secondary Prevention refers to measures, such as regular exams and screening tests, that can diagnose cancer early, before symptoms appear.
Prevalence is a measure of existing cases in a population at a defined point or period in time.
Age-adjusted Incidence Rate (AAIR) is the number of new cancer cases diagnosed in a population in a defined time period per 100,000 people, adjusted to the age structure of a standard population (2000 U.S. Standard Population). The AAIR is used to compare incidence rates between populations.
Average Annual Percent Change (AAPC) is a summary measure of the trend in cancer incidence or mortality over a predetermined time interval.
Risk Factor is something that increases a person's chance of developing cancer.
Differences or changes considered statistically **significant** if p-value < 0.05

TABLE 1.1 MOST COMMON TYPES OF CANCER INCIDENCE AND PREVALENCE AMONG MEN AND WOMEN IN CALIFORNIA, 2018

MEN
84,382
NEW CASES
AAIR* = 408.7

WOMEN
88,137
NEW CASES
AAIR* = 379.5

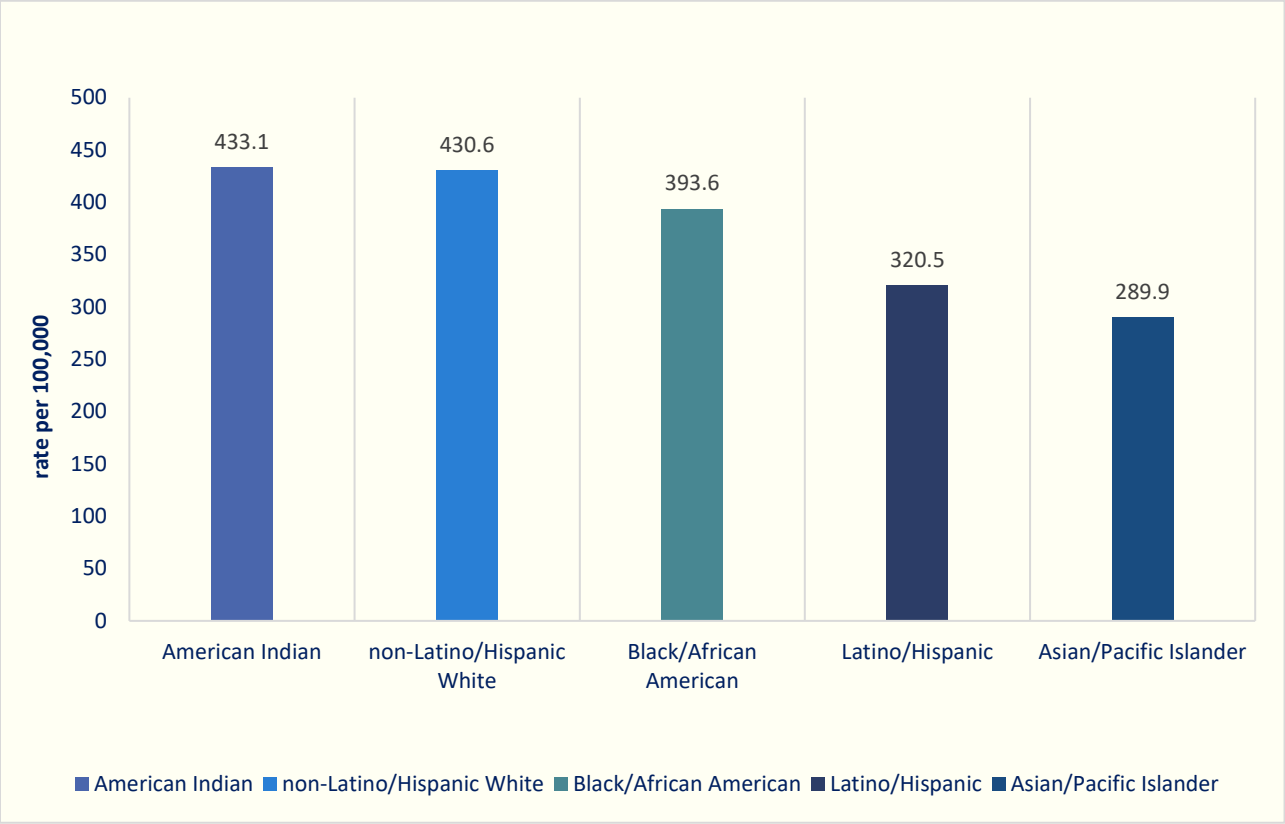
CANCER TYPE	NEW CASES	AAIR*	EXISTING CASES	CANCER TYPE	NEW CASES	AAIR*	EXISTING CASES
Prostate	20,345	93.5	298,085	Breast	28,183	122.7	358,816
Lung	8,185	40.8	21,195	Lung	8,351	34.4	28,430
Colorectal	7,905	38.6	68,771	Colorectal	7,024	29.7	65,916
Melanoma	6,090	30.1	61,617	Uterus	6,532	27.3	70,747
Bladder	5,221	26.7	48,199	Thyroid	4,095	19.7	60,317
Non-Hodgkin Lymphoma	4,388	21.7	38,118	Melanoma	4,090	17.8	53,155
Kidney	4,045	19.4	33,546	Non-Hodgkin Lymphoma	3,482	14.9	33,126
Oral	3,227	15.2	26,314	Pancreas	2,652	10.9	4,099
Leukemia	2,919	14.7	24,565	Ovary	2,365	10.3	22,011
Liver	2,961	13.6	8,567	Kidney	2,388	10.2	20,683
Pancreas	2,752	13.5	4,054	Leukemia	2,047	9.1	18,172
Stomach	1,877	9.3	7,305	Cervix	1,542	7.5	25,666
Brain & Other Nervous System	1,427	7.0	8,194	Bladder	1,645	6.7	14,953
Myeloma	1,417	6.9	7,801	Oral	1,369	5.8	12,061
Thyroid	1,368	6.6	16,830	Stomach	1,294	5.6	5,864
Testis	1,260	6.3	25,199	Liver	1,353	5.5	3,642
Esophagus	1,210	5.8	3,159	Myeloma	1,115	4.7	6,117
Soft Tissue	851	4.3	7,780	Brain & Other Nervous System	1,018	4.6	7,026
Larynx	647	3.1	6,169	Soft Tissue	664	3.0	6,801
Hodgkin Lymphoma	472	2.4	9,133	Anus	515	2.1	4,595

**AAIR: Age-adjusted incidence rate Source: California Cancer Registry, California Department of Public Health.*

INCIDENCE BY RACE/ETHNICITY

Cancer incidence varies by race/ethnicity. In 2018, American Indians had the highest cancer incidence compared to other racial/ethnic groups in the state. The AAIR of invasive cancer among American Indians was 433.1 per 100,000 (95 percent CI, 406.2 – 461.4) compared to 430.6 per 100,000 (95 percent CI, 427.8 – 433.4) among non-Latino/Hispanic Whites, 393.6 per 100,000 (95 percent CI, 385.8 – 401.5) among Black/African Americans, 320.5 per 100,000 (95 percent CI, 317.0 – 323.9) among Latino/Hispanics, and 289.9 per 100,000 (95 percent CI, 285.9 – 293.9) among Asian/Pacific Islanders (Figure 1.1).

FIGURE 1.1 AGE-ADJUSTED INCIDENCE RATE OF INVASIVE CANCER BY RACE/ETHNICITY, CALIFORNIA, 2018



Source: California Cancer Registry, California Department of Public Health.

In the most recent ten-year period covered in this report (2009-2018), most racial/ethnic groups experienced a significant decline in cancer incidence. The AAPC of invasive cancer among Asian/Pacific Islanders decreased by 0.8 percent per year; among Black/African Americans by 1.8 percent per year; and among non-Latino/Hispanic Whites by 1.1 percent per year. The AAPC of invasive cancer among American Indians significantly increased by 1.6 percent per year and for Latino/Hispanics there was no significant change.

In the most recent five-year period covered in this report (2014-2018), Tables 1.2 and 1.3 show the distribution of the five most common cancers among fifteen detailed racial/ethnic groups by sex. Among men in ten racial/ethnic groups, prostate, lung, and colorectal cancer were the three most common cancers. Notable exceptions were in Latino/Hispanic men where kidney cancer was one of the three most common cancers; Kampuchean, Laotian/Hmong, and Vietnamese men where liver cancer was one of the three most common cancers; and non-Latino/Hispanic White men where melanoma was one of the three most common cancers. Among women, breast cancer was the most common cancer in each racial/ethnic group. For women in ten racial/ethnic groups, lung and colorectal cancers were among the top three most common cancers. Notable exceptions were Filipino, Hawaiian, Latino/Hispanic, Pacific Islander, and South Asian women where uterine cancer was one of the three most common cancers.

From 2009 to 2018, cancer incidence significantly increased among American Indians and significantly decreased among Asian/Pacific Islanders, Black/African Americans, and non-Hispanic/Latino Whites.

TABLE 1.2 NUMBER OF CASES FOR THE FIVE MOST COMMON CANCERS AMONG CALIFORNIA MEN BY DETAILED RACE/ETHNICITY, 2014-2018

Rank*	1	2	3	4	5
Black/African American	Prostate (8,371)	Lung (3,140)	Colorectal (2,424)	Kidney (1,349)	Liver (1,068)
American Indian	Prostate (413)	Lung (259)	Colorectal (233)	Liver (204)	Kidney (139)
Chinese	Prostate (2,068)	Lung (1,967)	Colorectal (1,571)	Liver (798)	NHL†(684)
Filipino	Prostate (2,207)	Lung (1,491)	Colorectal (1,190)	NHL† (571)	Liver (533)
Hawaiian	Prostate (129)	Lung (74)	Colorectal (59)	Liver (36)	NHL† (34)
Latino/Hispanic	Prostate (17,670)	Colorectal(9,112)	Kidney (5,624)	Lung (5,402)	Liver (4,782)
Japanese	Prostate (685)	Colorectal (463)	Lung (362)	NHL† (210)	Bladder (173)
Kampuchean	Colorectal (102)	Liver (77)	Lung (68)	Prostate (31)	NHL† (23)
Korean	Colorectal (597)	Lung (522)	Prostate (477)	Stomach (364)	Liver (241)
Laotian/Hmong	Colorectal (100)	Lung (93)	Liver (90)	Oral (33)	Pancreas (29)
Pacific Islander‡	Prostate (214)	Lung (123)	Colorectal (112)	Liver (60)	NHL† (57)
South Asian§	Prostate (786)	Colorectal (396)	Lung (291)	NHL† (283)	Bladder (246)
Thai	Prostate (66)	Colorectal (56)	Lung (42)	Liver (32)	NHL† (27)
Vietnamese	Lung (1,056)	Liver (774)	Colorectal (720)	Prostate (661)	NHL† (305)
Non-Latino/Hispanic White	Prostate (54,348)	Lung (26,421)	Melanoma (25,431)	Colorectal (20,659)	Bladder (19,378)

**The order is based on age-adjusted rates and not the counts that are shown in parentheses.*
†NHL: Non-Hodgkin Lymphoma.
‡Pacific Islander includes Micronesian, Chamorran, Guamanian, Polynesian, Tahitian, Samoan, Tongan, Melanesian, Fiji Islander, New Guinean, and Pacific Islander (not otherwise specified).
§South Asian Includes: Asian Indian and Pakistani.
Source: California Cancer Registry, California Department of Public Health.

TABLE 1.3 NUMBER OF CASES FOR THE FIVE MOST COMMON CANCERS AMONG CALIFORNIA WOMEN BY DETAILED RACE/ETHNICITY, 2014-2018

Rank*	1	2	3	4	5
Black/African American	Breast (8,466)	Lung (3,136)	Colorectal (2,429)	Uterus (2,005)	Pancreas (978)
American Indian	Breast (766)	Lung (305)	Colorectal (246)	Uterus (216)	Kidney (119)
Chinese	Breast (4,882)	Lung (1,776)	Colorectal (1,409)	Uterus (938)	Thyroid (844)
Filipino	Breast (6,003)	Uterus (1,456)	Lung (1,272)	Thyroid (1,164)	Colorectal (1,162)
Hawaiian	Breast (333)	Uterus (107)	Colorectal (78)	Lung (64)	Thyroid (49)
Latino/Hispanic	Breast (28,007)	Colorectal (7,938)	Uterus (7,540)	Thyroid (6,619)	Lung (5,189)
Japanese	Breast (1,568)	Colorectal (519)	Lung (473)	Uterus (291)	NHL† (223)
Kampuchean	Breast (143)	Colorectal (85)	Lung (63)	Liver (46)	Thyroid (29)
Korean	Breast (1,357)	Colorectal (508)	Lung (336)	Thyroid (302)	Stomach (251)
Laotian/Hmong	Breast (117)	Colorectal (85)	Lung (53)	Uterus (42)	Cervix (40)
Pacific Islander‡	Breast (480)	Uterus (258)	Lung (118)	Colorectal (98)	Thyroid (67)
South Asian§	Breast (1,665)	Thyroid (337)	Uterus (328)	Colorectal (214)	Lung (179)
Thai	Breast (222)	Lung (70)	Colorectal (63)	Uterus (44)	Thyroid (43)
Vietnamese	Breast (1,640)	Lung (685)	Colorectal (584)	Thyroid (367)	Uterus (331)
Non-Latino/Hispanic White	Breast (77,171)	Lung (28,638)	Colorectal (18,948)	Uterus (16,355)	Melanoma (15,665)

**The order is based on age-adjusted rates and not the counts that are shown in parentheses.*
†NHL: Non-Hodgkin Lymphoma.
‡Pacific Islander includes Micronesian, Chamorran, Guamanian, Polynesian, Tahitian, Samoan, Tongan, Melanesian, Fiji Islander, New Guinean, and Pacific Islander (not otherwise specified).
§South Asian Includes: Asian Indian and Pakistani.
Source: California Cancer Registry, California Department of Public Health.

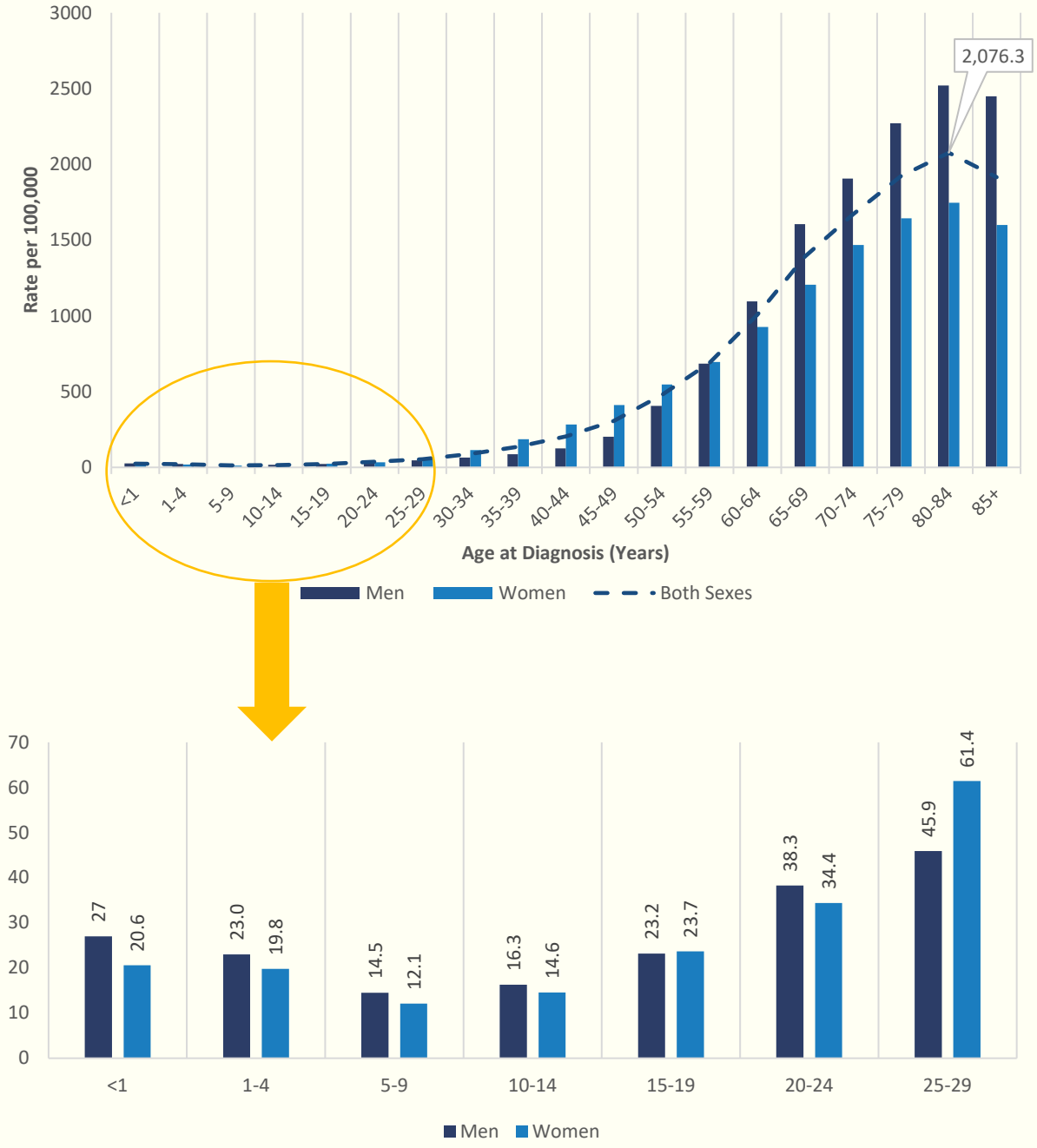
INCIDENCE BY AGE

Advancing age is a risk factor for cancer. Overall, cancer is more common among older than younger persons with incidence peaking between the ages of 80 and 84 years (2,076.3 per 100,000; 95 percent CI, 2,041.7 – 2,111.2) (Figure 1.2). Among those under 24 years, cancer incidence rates did not differ significantly by sex. However, among those aged 25 to 54 years, women had significantly higher cancer incidence rates than men and, among those aged 60 years and older, men had significantly higher cancer incidence rates than women.

The risk of certain types of cancer varies by age. Among children under 14 years, leukemia (35.1 percent) and brain tumors (29.0 percent) were the most common cancers. Among adolescents aged 15 to 29 years, the most common cancers were thyroid (16.6 percent) and testicular (15.4 percent). Among adults aged 30 to 49 years, breast (26.5 percent) and thyroid (10.2 percent) cancers were the most common. For adults aged 50 to 69 years, the most common cancers were breast (17.9 percent) and prostate (15.2 percent). Among adults aged 70 to 84 years, the most common cancers were lung (14.0 percent), breast (13.5 percent), and prostate (12.8 percent). Among adults aged 85 years and older, lung (13.9 percent), colorectal (11.8 percent), and breast (10.6 percent) were the most common (Figure 1.3).

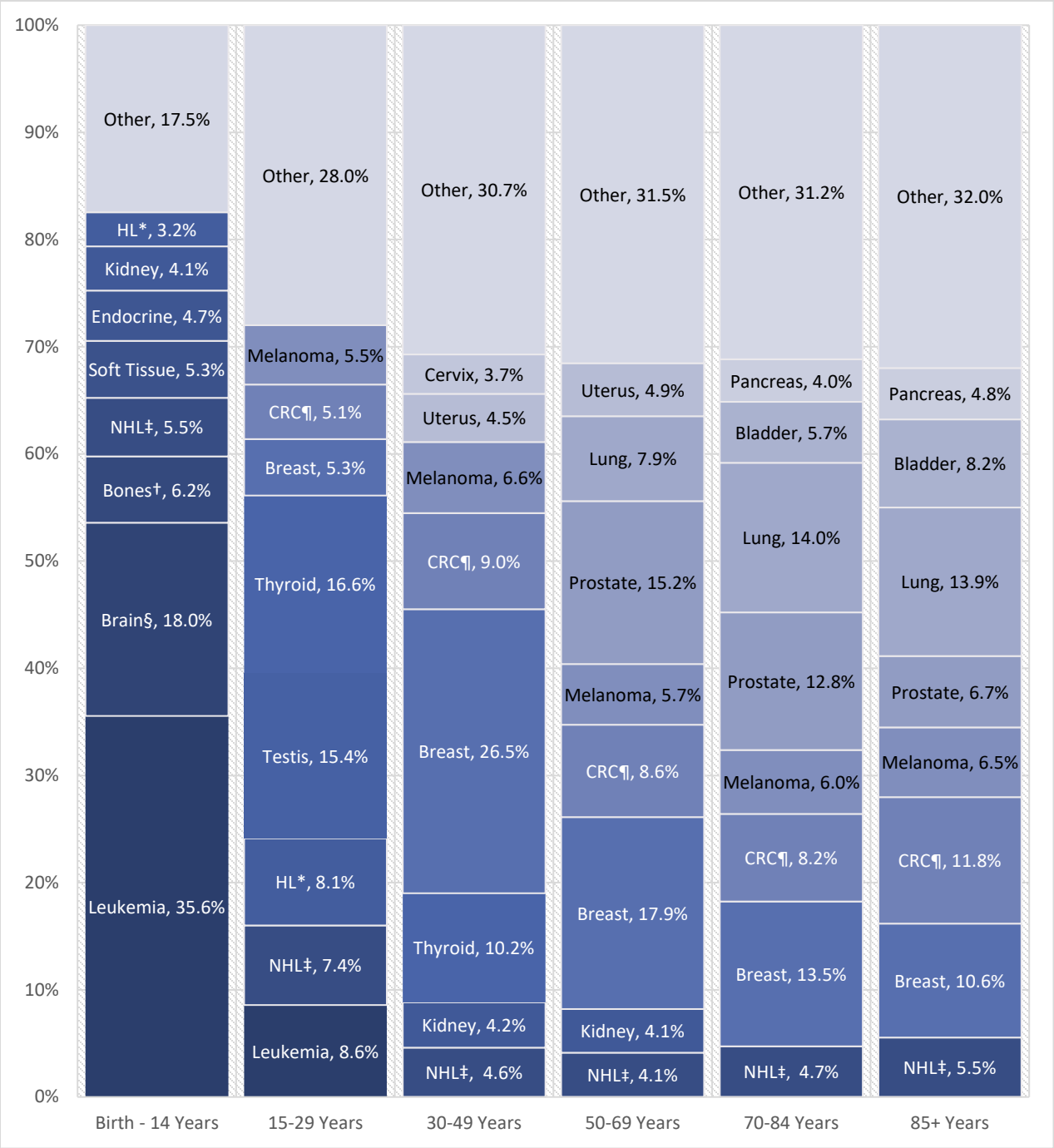
Screening methods can prevent some cancers before they start or detect some cancers early when they are more likely to respond to treatment. The United States Preventive Services Task Force now recommends individuals of average risk get screened for colorectal cancer beginning at age 45 and continue through age 75.[3] In 2018, 14,929 new cases of colorectal cancer were diagnosed among Californians. Among those individuals, 8,532 (57 percent) were diagnosed between the ages of 50 and 75 years and 38 percent of those tumors were diagnosed at an early stage. Additionally, the task force recommends women of average risk get screened for breast cancer beginning at age 50 and continue through age 74.[4] In 2018, 28,183 women were diagnosed with breast cancer in California. Among those women, 17,492 (62 percent) were diagnosed between the ages of 50 and 74 years and 67 percent of those tumors were diagnosed at an early stage. Better adherence to screening guidelines could decrease the incidence of colorectal cancer through the removal of precancerous adenomatous polyps as well as increase the proportion of colorectal and female breast cancers diagnosed at an early stage.

FIGURE 1.2 AGE-SPECIFIC CANCER INCIDENCE RATES BY SEX, CALIFORNIA, 2018



Source: California Cancer Registry, California Department of Public Health.

FIGURE 1.3 DISTRIBUTION OF NEW CANCER CASES BY AGE AT DIAGNOSIS, CALIFORNIA, 2018



HL: Hodgkin Lymphoma; Bones†: Bones & Joints; NHL‡: Non-Hodgkin Lymphoma; Brain§: Brain and Other Nervous System; CRC¶: Colorectal; Endocrine#: Other endocrine including thymus.*
Source: California Cancer Registry, California Department of Public Health.

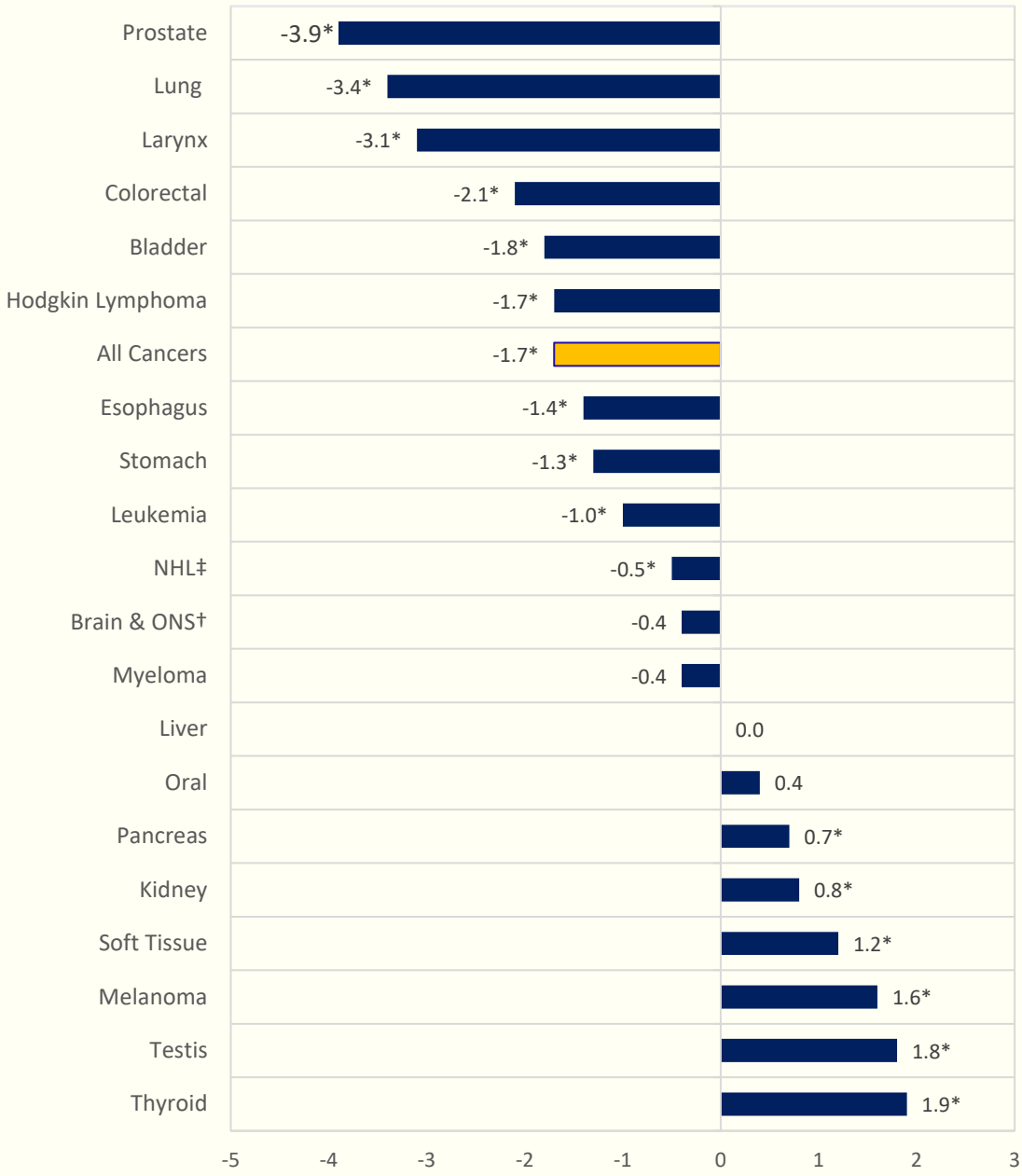
INCIDENCE TRENDS

Monitoring cancer trends provides useful information regarding the efficacy of cancer control efforts. Incidence trends for the most recent ten-year period are presented to highlight current progress in reducing the cancer burden or areas where more work needs to be done. The **average annual percent change (AAPC)** provides a summary measure of the trend in cancer incidence over a predetermined time interval. All trends described here were statistically significant. Between 2009 and 2018, overall cancer incidence among men in California decreased significantly by 1.7 percent per year. Of the 20 most common cancers among men, ten decreased and six increased significantly. Cancers that decreased significantly include: prostate, lung, larynx, colorectal, bladder, Hodgkin lymphoma, esophagus, stomach, leukemia, and non-Hodgkin lymphoma. Cancers that increased significantly include: pancreas, kidney, soft tissue, melanoma, testis, and thyroid (Figure 1.4).

Between 2009 and 2018, overall cancer incidence among women in California decreased significantly by 0.3 percent per year. Of the 20 most common cancers among women, seven decreased and five increased significantly. Cancers that decreased significantly include: lung, colorectal, bladder, ovary, brain, leukemia, and non-Hodgkin lymphoma. Cancers that increased significantly include: kidney, soft tissue, thyroid, melanoma, and uterus (Figure 1.5).

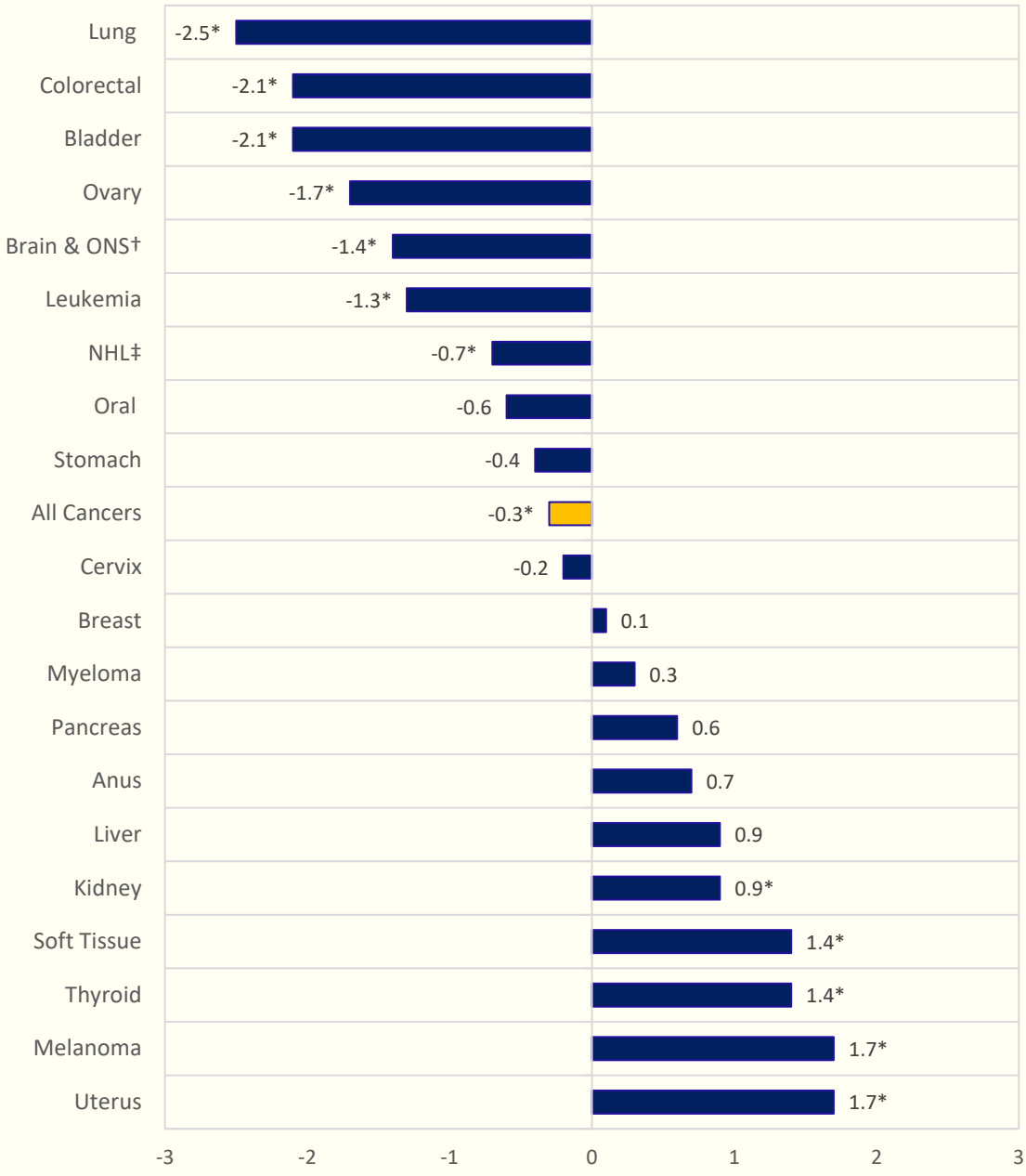
Between 2009 and 2018, the incidence rate of 12 cancers significantly decreased and the incidence rate of seven cancers significantly increased.

FIGURE 1.4 AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE AMONG MEN, CALIFORNIA, 2009-2018



**The AAPC is significantly different from zero at p < 0.05.*
†ONS: Other Nervous System.
‡NHL: Non-Hodgkin Lymphoma.
Source: California Cancer Registry, California Department of Public Health.

FIGURE 1.5 AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE AMONG WOMEN, CALIFORNIA, 2009-2018



**The AAPC is significantly different from zero at $p < 0.05$.*
†ONS: Other Nervous System.
‡NHL: Non-Hodgkin Lymphoma.
Source: California Cancer Registry, California Department of Public Health.

KEY TERMS

Mortality is the number of deaths due to cancer in a population.

Secondary Prevention refers to measures that can diagnose cancer early such as regular exams and screening tests.

Age-adjusted Mortality Rate (AAMR) is the number of cancer deaths in a population in a defined time period per 100,000 people, adjusted to the age structure of a standard population (2000 U.S. Standard Population). The AAMR is used to compare mortality rates between populations.

Average Annual Percent Change (AAPC) is a summary measure of the trend in cancer incidence or mortality over a predetermined time interval.

Differences or changes considered statistically **significant** if p-value < 0.05

Mortality refers to the number of deaths that occur due to cancer. Mortality is a strong indicator of progress in cancer control, and informs health care providers, public health professionals, policy makers, and other stakeholders on the effectiveness of **secondary prevention** measures and treatment regimens. In 2018, 59,918 Californians died of cancer. This corresponds to **an age-adjusted mortality rate (AAMR) of 135.0 per 100,000. Since 1988, the AAPC of cancer mortality for all cancers combined has decreased significantly by 1.4 percent per year.**

MORTALITY BY SEX

In 2018, more men (31,193) than women (28,725) died of cancer. The most common types of cancer death among men were: lung (5,810), prostate (3,720), colorectal (2,885), pancreas (2,304), and liver (2,298), whereas the most common types of cancer death among women were: lung (5,261), breast (4,569), colorectal (2,503), pancreas (2,243), and ovary (1,576) (Table 2.1).

The AAMR of all cancers combined among men (158.8 per 100,000; 95 percent CI, 157.0 – 160.6) was higher than among women (117.7 per 100,000; 95 percent CI, 116.3 – 119.1), indicating that men have a higher burden of cancer mortality than women.

Since 1988, cancer mortality significantly declined in California by 1.4 percent per year.

TABLE 2.1 MOST COMMON TYPES OF CANCER MORTALITY AMONG MEN AND WOMEN IN CALIFORNIA, 2018

MEN

31,193

DEATHS

WOMEN

28,725

DEATHS

CANCER TYPE	DEATHS	AAMR*	CANCER TYPE	DEATHS	AAMR*
Lung	5,810	29.7	Lung	5,261	21.4
Prostate	3,720	20.1	Breast	4,569	19.0
Colorectal	2,885	14.5	Colorectal	2,503	10.2
Pancreas	2,304	11.5	Pancreas	2,243	9.0
Liver	2,298	10.8	Ovary	1,576	6.5
Leukemia	1,399	7.4	Uterus	1,290	5.2
Bladder	1,199	6.4	Liver	1,259	5.1
Non-Hodgkin Lymphoma	1,204	6.3	Leukemia	1,020	4.3
Brain and Other Nervous System	1,164	5.7	Non-Hodgkin Lymphoma	919	3.7
Esophagus	1,058	5.2	Brain and Other Nervous System	797	3.4
Stomach	969	4.9	Stomach	672	2.9
Kidney	914	4.5	Cervix	469	2.1
Oral	758	3.7	Kidney	514	2.1
Myeloma	708	3.7	Myeloma	500	2.0
Melanoma	541	2.7	Bladder	447	1.7
Soft Tissue	320	1.6	Oral	322	1.3
Larynx	229	1.1	Esophagus	304	1.2
Mesothelioma	169	0.9	Soft Tissue	261	1.1
Bones and Joints	110	0.6	Melanoma	280	1.1
Thyroid	117	0.6	Gallbladder	177	0.7

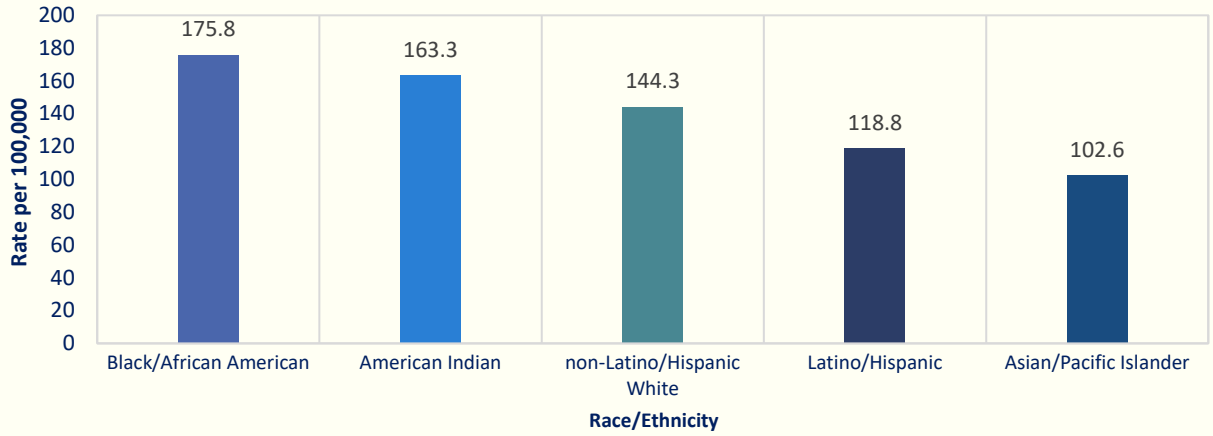
**AAMR: Age-adjusted mortality rate.*

Source: California Cancer Registry, California Department of Public Health.

MORTALITY BY RACE/ETHNICITY

Cancer mortality varies by race/ethnicity. In 2018, Black/African American and American Indians had higher age-adjusted mortality rates (175.8 per 100,000; 95 percent CI, 170.5 – 181.2 and 163.3 per 100,000; 95 percent CI, 146.9 – 181.0, respectively) than non-Latino/Hispanic Whites (144.3 per 100,000; 95 percent CI, 142.7 – 145.8), Latino/Hispanics (118.8 per 100,000; 95 percent CI, 116.6 – 121.0), and Asian/Pacific Islanders (102.6 per 100,000; 95 percent CI, 100.3 – 105.0) (Figure 2.1).

FIGURE 2.1 AGE-ADJUSTED MORTALITY RATE OF CANCER BY RACE/ETHNICITY, CALIFORNIA, 2018



In the most recent ten-year period covered in this report (2009-2018), most racial/ethnic groups experienced a significant decline in cancer mortality. The AAPC of cancer mortality among Asian/Pacific Islanders decreased by 1.2 percent per year; among Black/African Americans by 2.0 percent per year; among Latino/Hispanics by 1.3 percent per year; and among non-Latino/Hispanic Whites by 1.5 percent per year. However, for American Indians, the AAPC of cancer mortality significantly increased by 1.0 percent per year. In the most recent five-year period covered in this report (2014-2018), Tables 2.2 and 2.3 show the distribution of the five most common types of cancer mortality among five racial/ethnic groups by sex. Among men, lung cancer was the most common cause of cancer mortality for each racial/ethnic group. Among Asian/Pacific Islander and American Indian men, liver cancer was the second leading cause of cancer mortality. Among Black/African American, Latino/Hispanic, and non-Latino/Hispanic White men, prostate cancer was the second leading cause of cancer mortality. Among non-Latino/Hispanic White, Black/African American, Asian/Pacific Islander, and American Indian women, lung cancer was the leading cause of cancer mortality followed by breast and colorectal cancers. Among Latino/Hispanic women, breast cancer was the leading cause of cancer mortality followed by lung and colorectal cancers.

TABLE 2.2 NUMBER OF DEATHS FOR THE FIVE MOST COMMON TYPES OF CANCER MORTALITY AMONG MEN BY RACE/ETHNICITY, CALIFORNIA, 2014-2018

Rank*	1	2	3	4	5
Black/African American	Lung (2,476)	Prostate (1,901)	Colorectal (1,118)	Pancreas (796)	Liver (805)
American Indian	Lung (186)	Liver (123)	Prostate (87)	Colorectal (83)	Pancreas (59)
Asian/Pacific Islander	Lung (4,417)	Liver (2,126)	Colorectal (1,857)	Prostate (1,292)	Pancreas (1,302)
Latino/Hispanic	Lung (3,936)	Prostate (2,874)	Liver (3,295)	Colorectal (3,033)	Pancreas (2,132)
Non-Latino/Hispanic White	Lung (19,672)	Prostate (11,101)	Colorectal (7,709)	Pancreas (6,807)	Leukemia (4,469)

Source: California Cancer Registry, California Department of Public Health
**The order is based on age-adjusted rates and not the counts that are shown in parentheses.*

TABLE 2.3 NUMBER OF DEATHS FOR THE FIVE MOST COMMON TYPES OF CANCER MORTALITY AMONG WOMEN BY RACE/ETHNICITY, CALIFORNIA, 2014-2018

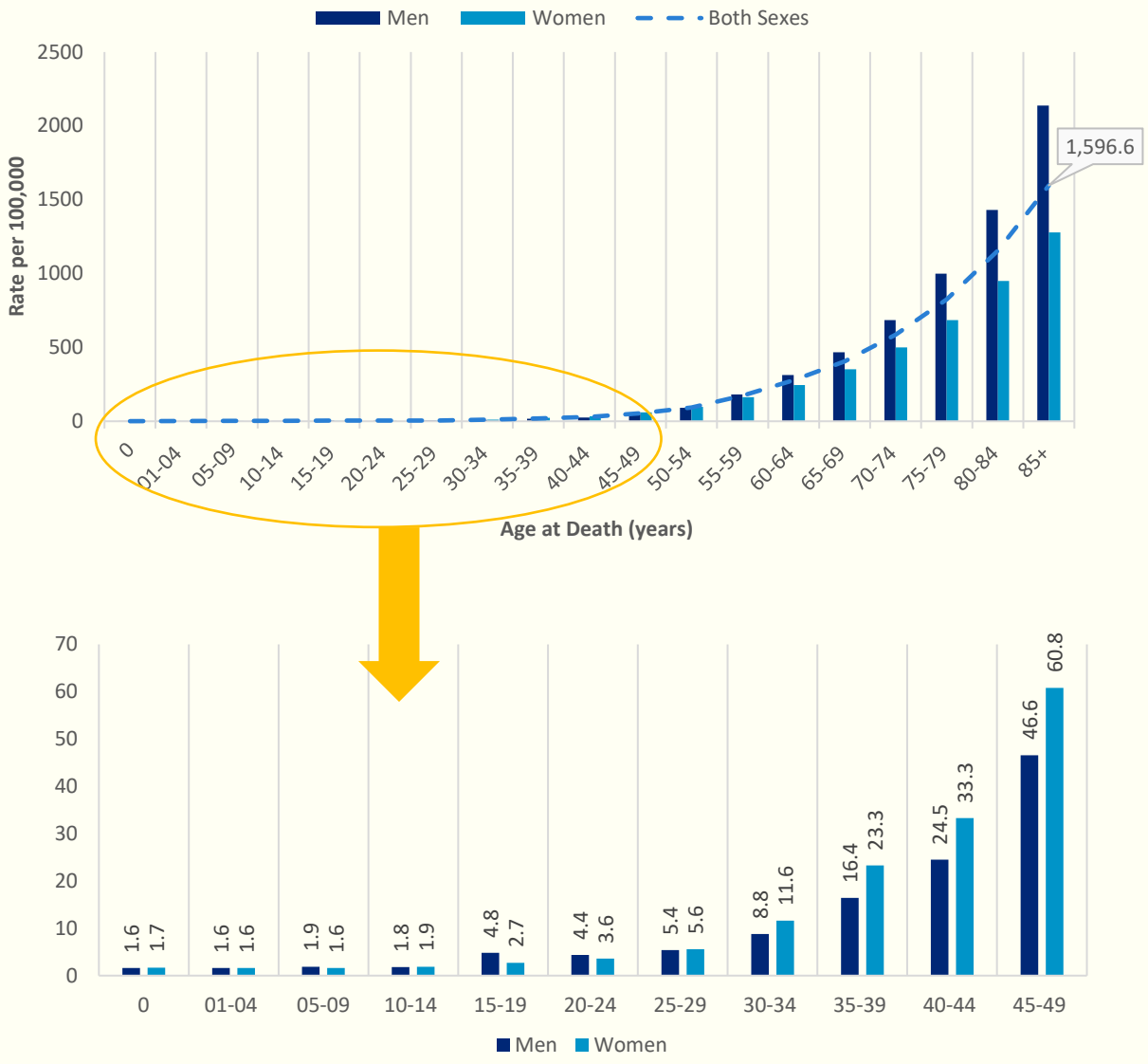
Rank*	1	2	3	4	5
Black/African American	Lung (2,110)	Breast (2,017)	Colorectal (1,023)	Pancreas (792)	Uterus (654)
American Indian	Lung (189)	Breast (114)	Colorectal (82)	Pancreas (62)	Liver (65)
Asian/Pacific Islander	Lung (3,266)	Breast (2,563)	Colorectal (1,740)	Pancreas (1,478)	Liver (1,095)
Latino/Hispanic	Breast (4,284)	Lung (3,234)	Colorectal (2,510)	Pancreas (2,273)	Liver (1,882)
Non-Latino/Hispanic White	Lung (19,260)	Breast (13,301)	Colorectal (7,262)	Pancreas (6,092)	Ovary (4,842)

Source: California Cancer Registry, California Department of Public Health
**The order is based on age-adjusted rates and not the counts that are shown in parentheses.*

MORTALITY BY AGE

Cancer mortality increased with age, peaking in the oldest age group of 85 years and older (1,596.6 per 100,000; 95 percent CI, 1,568.0 – 1,625.6) (Figure 2.2). Among those 34 years and younger and those 50 to 54 years, cancer mortality did not vary significantly by sex. Among those aged 35 to 49 years, women had significantly higher cancer mortality than men. Among those aged 55 years and older, men had significantly higher cancer mortality than women.

FIGURE 2.2 AGE-SPECIFIC CANCER MORTALITY RATES BY SEX, CALIFORNIA, 2016

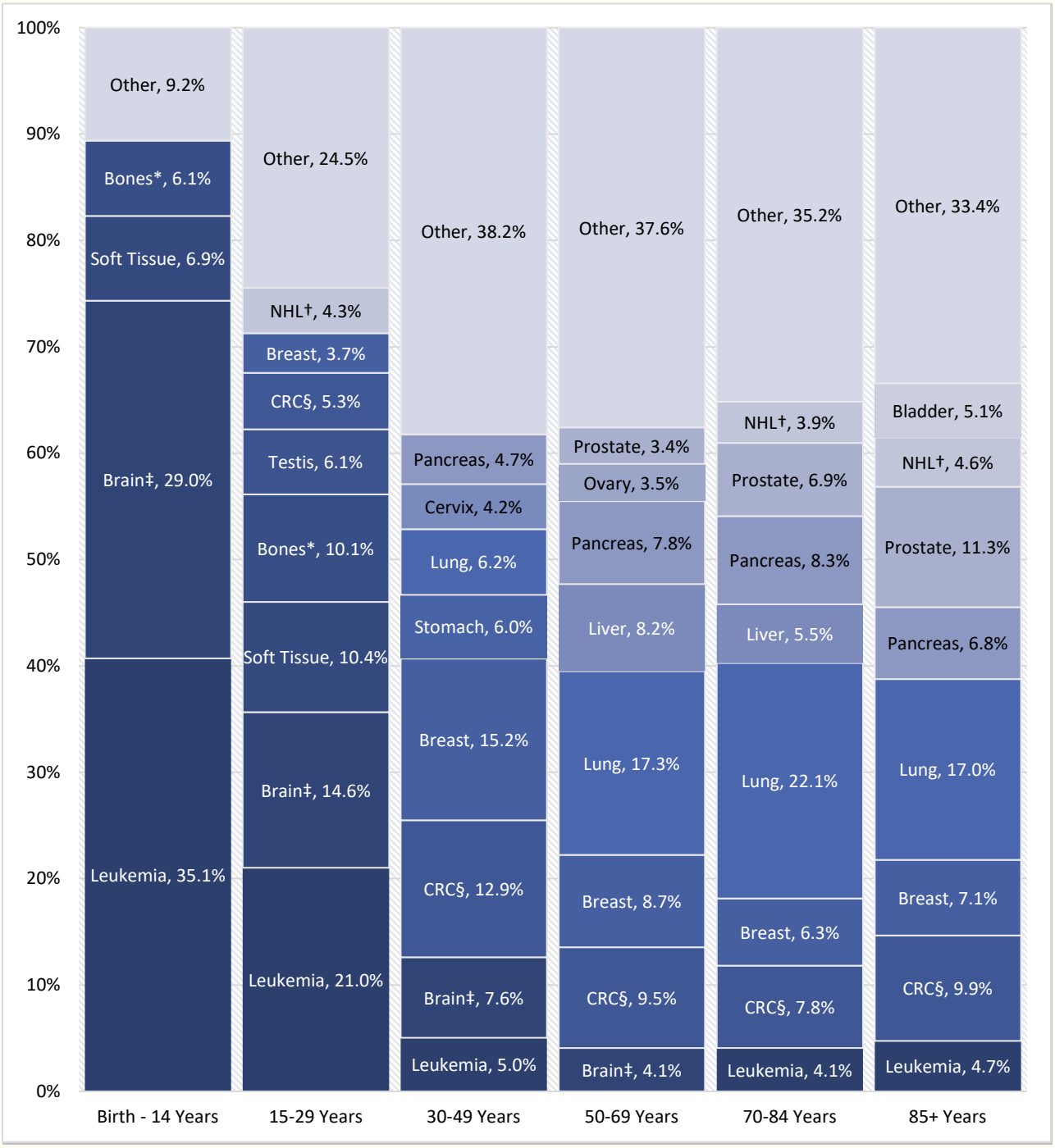


Source: California Cancer Registry, California Department of Public Health.

The distribution of cancer mortality type varied by age group (Figure 2.3). Among children under 14 years and adolescents/young adults aged 15 to 29 years, leukemia (35.1 percent <14 years; 21.0 percent 15-29 years) and brain tumors (29.0 percent <14 years; 14.6 percent 15-29 years) accounted for the most cancer deaths. Among adults aged 30 to 49 years, breast (15.2 percent) and colorectal (12.9 percent) cancers accounted for the most cancer deaths. Among adults aged 50 to 69 years, lung (17.3 percent) and colorectal (9.5 percent) cancers accounted for the most cancer deaths. Among adults aged 70 to 84 years, lung (22.1 percent) and pancreatic (8.3 percent) cancers accounted for the most cancer deaths. Finally, among adults aged 85 years and older, lung (17.0 percent) and prostate (11.3 percent) cancers accounted for the most cancer deaths.

Cancer mortality increased with age, peaking in the oldest age group of 85 years and older.

FIGURE 2.3 DISTRIBUTION OF CANCER DEATHS BY AGE, CALIFORNIA, 2018



Bones: Bones & Joints; NHL†: Non-Hodgkin Lymphoma; Brain‡: Brain and Other Nervous System; CRC§: Colorectal.*
Source: California Cancer Registry, California Department of Public Health.

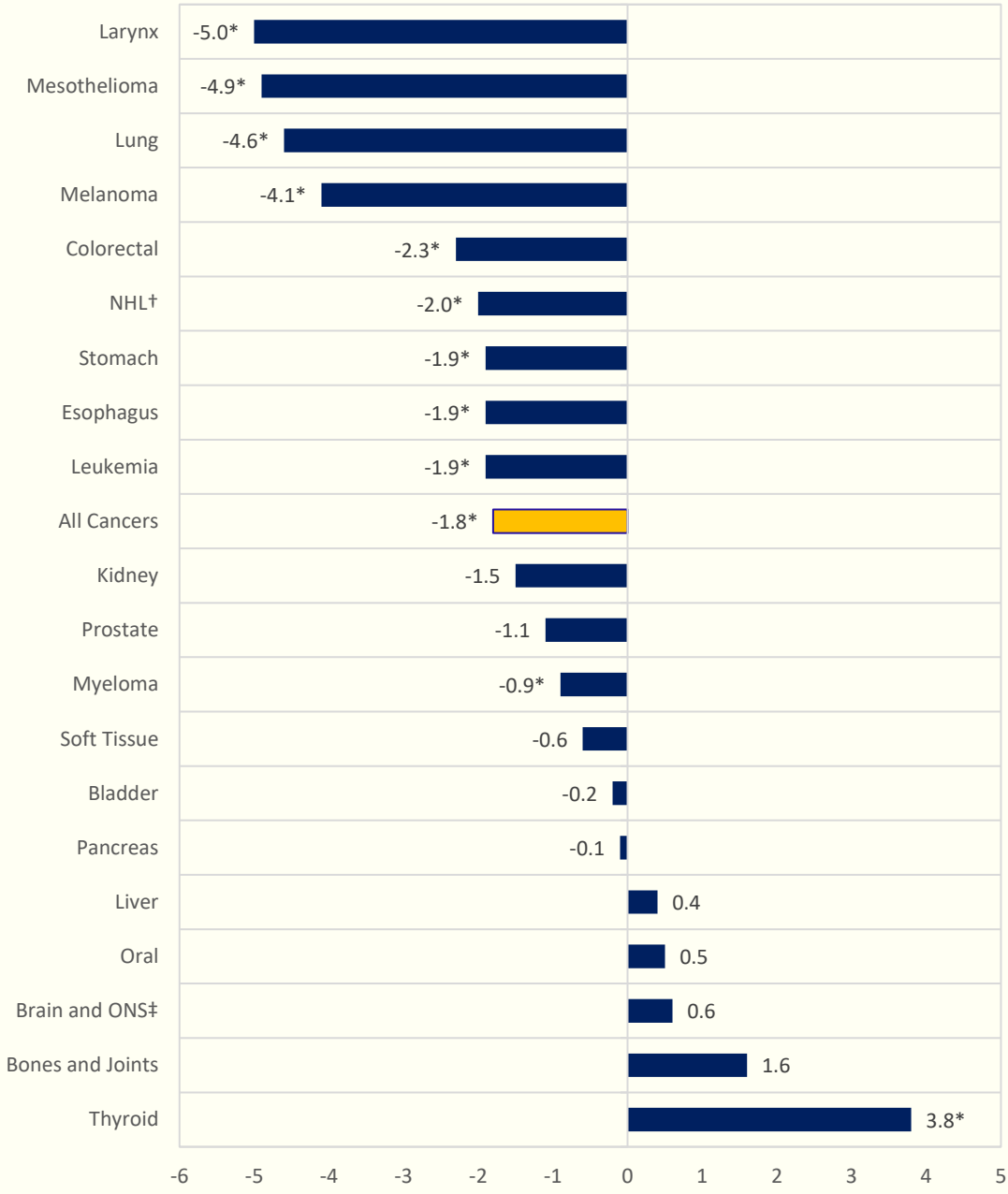
MORTALITY TRENDS

Between 2009 and 2018, overall cancer mortality among men in California decreased significantly by approximately two percent per year. Significant decreases in mortality among men were observed for ten cancers, including cancer of the larynx, lung, stomach, esophagus, and myeloma, as well as for mesothelioma, melanoma, colorectal cancer, non-Hodgkin lymphoma, and leukemia. A significant increase in mortality was observed among men for thyroid cancer (Figure 2.4).

During the same time period, overall cancer mortality among women in California decreased significantly by just under two percent per year. Significant decreases in mortality among women were observed for ten cancers including cancer of the lung, pancreas, ovary, breast, and stomach, as well as melanoma, leukemia, colorectal cancer, non-Hodgkin lymphoma, and myeloma cancers. A significant increase in mortality was observed among women for cancers of the uterus and liver (Figure 2.5).

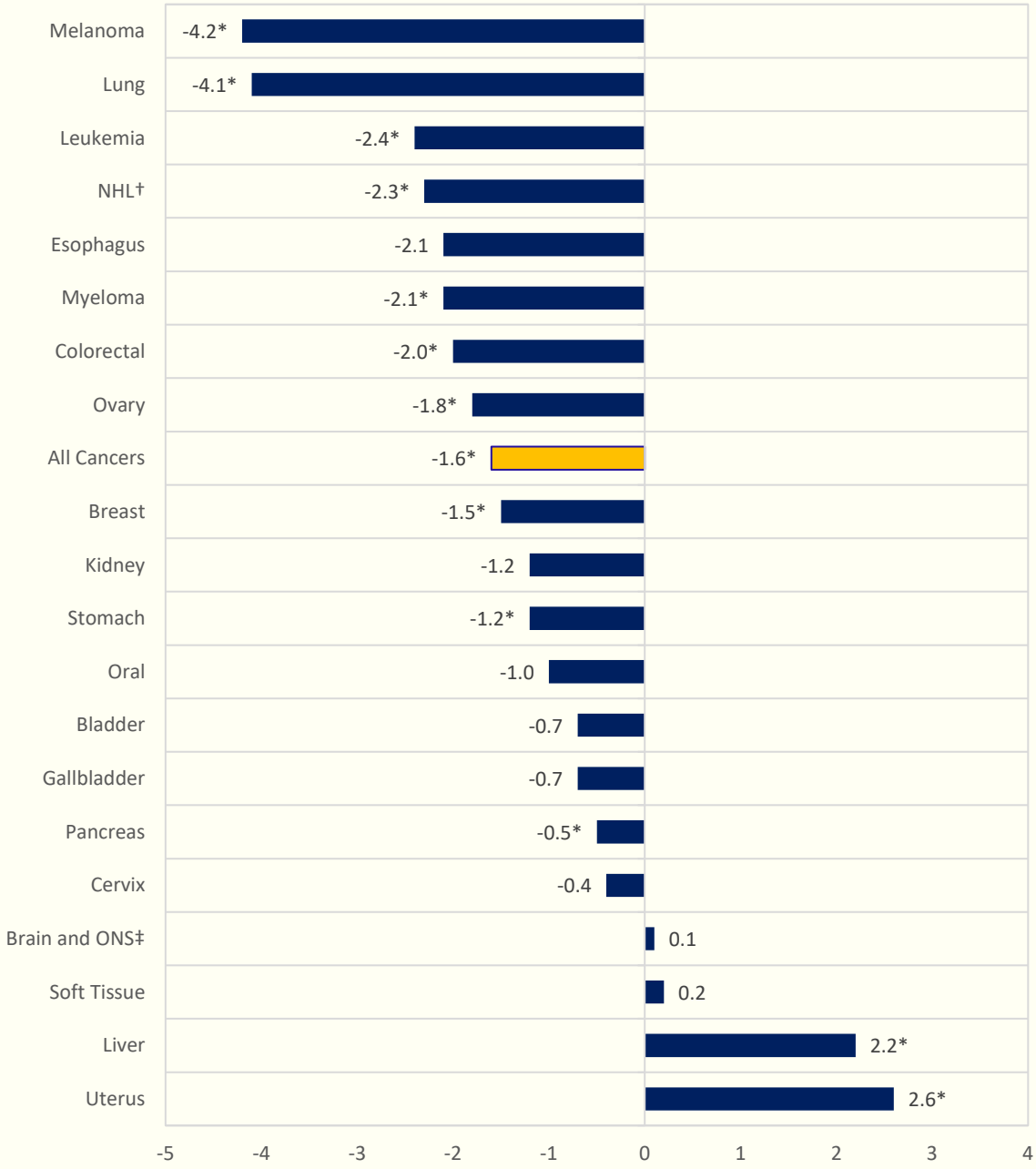
Between 2009 and 2018, the mortality rate of 13 cancers significantly decreased and the mortality rate of two cancers significantly increased.

FIGURE 2.4 AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER MORTALITY AMONG MEN, CALIFORNIA, 2009-2018



**The AAPC is significantly different from zero at p < 0.05.*
†NHL: Non-Hodgkin Lymphoma.
‡ ONS: Other Nervous System.
Source: California Cancer Registry, California Department of Public Health.

FIGURE 2.5 AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER MORTALITY AMONG WOMEN, CALIFORNIA, 2009-2018



**The AAPC is significantly different from zero at p < 0.05.*
†NHL: Non-Hodgkin Lymphoma.
‡ ONS: Other Nervous System.
Source: California Cancer Registry, California Department of Public Health.

CHAPTER 3. SURVIVAL

Survival measures how long a person lives after a cancer diagnosis and is a key measure of the effectiveness of cancer treatment and management.[5] Monitoring cancer survival in a population is essential to understanding whether or not all subgroups of the population benefit equally from advances in treatment and early detection or if disparities exist.[6] The measure of cancer survival presented in this report is five-year **relative survival** which estimates the probability of surviving cancer during the five-year period following diagnosis. The most recent five-year time period that allows for at least five years of follow-up for all California adults and children is 2009 to 2013. California adults aged 20 years and older, diagnosed with cancer between 2009 and 2013, experienced a five-year relative survival of 66.4 percent (95 percent CI, 66.3 percent - 66.5 percent). California children age birth to 19 years, diagnosed with cancer during the same time period, experienced a five-year relative survival of 83.4 percent (95 percent CI, 82.6 percent - 84.2 percent).

SURVIVAL BY SEX

Among adults, women had a slight survival advantage over men. The five-year relative survival for women diagnosed with cancer between 2009 and 2013 was 67.8 percent (95 percent CI, 67.7 percent - 68.0 percent), whereas the five-year relative survival for men was 65.4 percent (95 percent CI, 65.2 percent - 65.6 percent). Figures 3.1 and 3.2 show the five-year relative survival for the 20 most common cancers diagnosed among men and women, respectively. Among men, five-year relative survival was highest for cancers of the prostate, thyroid, testis and lowest for pancreas, lung, and esophagus. Among women, five-year relative survival was highest for cancers of the thyroid, melanoma, breast and lowest for pancreas, liver, and lung.

KEY TERMS

Relative Survival estimates the probability of surviving cancer during a specified time period. Relative survival is the ratio (expressed as a percent) of cancer patients who survived for a given time period following diagnosis (observed survival rate) to the expected survival rate of a similar group of cancer-free individuals based on age, race/ethnicity, and sex. A relative survival of 100 percent means that patients diagnosed with cancer are just as likely to survive the specified time period as a similar group of individuals in the general population without cancer.

Stage at Diagnosis refers to how far a cancer has spread from its point of origin at the time of diagnosis.

FIGURE 3.1 FIVE-YEAR RELATIVE SURVIVAL AMONG MEN AGED 20 YEARS AND OLDER BY CANCER TYPE, CALIFORNIA, 2009-2013

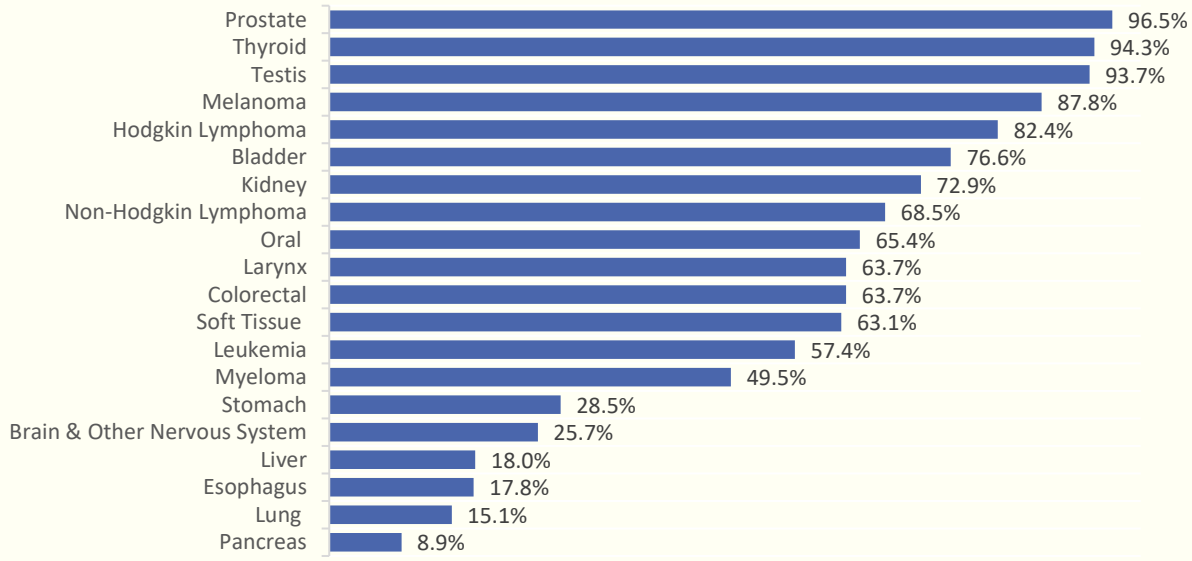
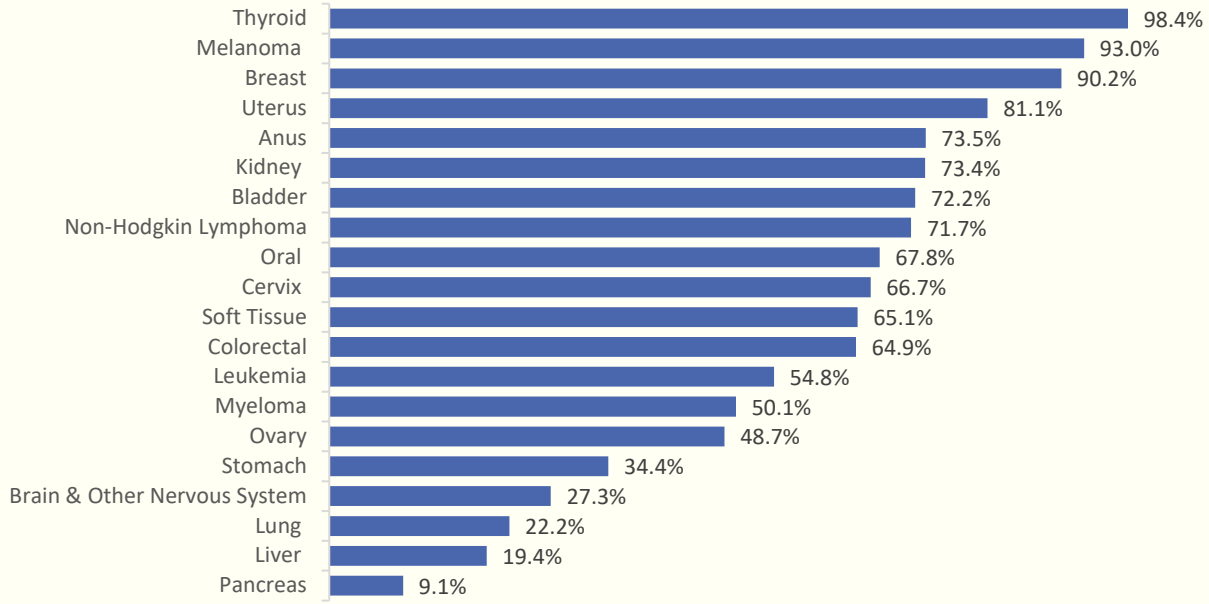


FIGURE 3.2 FIVE-YEAR RELATIVE SURVIVAL AMONG WOMEN AGED 20 YEARS AND OLDER BY CANCER TYPE, CALIFORNIA, 2009-2013

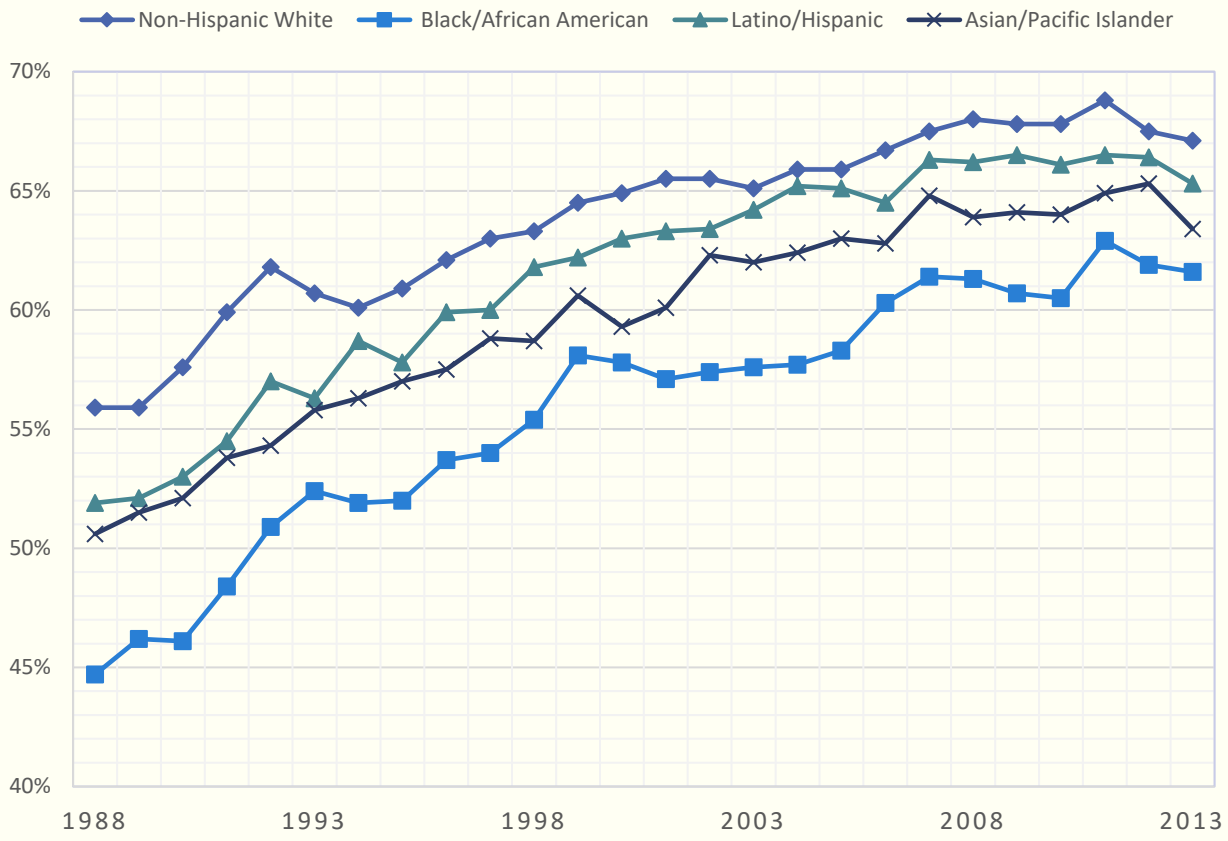


Source: California Cancer Registry, California Department of Public Health.

SURVIVAL BY RACE/ETHNICITY

Five-year relative survival of all cancers combined varied by race/ethnicity in California. From 1988 to 2013, non-Latino/Hispanic Whites had the highest five-year relative survival followed by Latino/Hispanics, Asian/Pacific Islanders, and Black/African Americans (Figure 3.3). Although survival disparities were observed, five-year relative survival increased over time among each racial/ethnic group. Despite this improvement, Black/African Americans still had the lowest five-year relative survival in 2013 (61.6 percent; 95 percent CI, 60.4 percent - 62.8 percent) compared to non-Latino/Hispanic Whites (67.1 percent; 95 percent CI, 66.7 percent - 67.5 percent), Latino/Hispanics (65.3 percent; 95 percent CI, 64.6 percent - 65.9 percent), and Asian/Pacific Islanders (63.4 percent; 95 percent CI, 62.5 percent - 64.2 percent).

FIGURE 3.3 FIVE-YEAR RELATIVE SURVIVAL BY RACE/ETHNICITY, CALIFORNIA, 1988-2013



Source: California Cancer Registry, California Department of Public Health.

SURVIVAL BY STAGE AT DIAGNOSIS

In this section, stage at diagnosis was classified using the SEER Program's Summary Stage system. With this classification scheme, the following stage groups were created:

Localized

Includes tumors which have penetrated the basement membrane but are still confined to the organ in which they originated.

Regional

Includes tumors that have extended beyond the limits of the organ of origin by means of direct extension to adjacent tissue or via lymph node involvement.

Distant

Includes tumors that have spread to other parts of the body (metastasized).[7]

Stage at diagnosis is one of the strongest predictors of survival. Cancers detected at an early stage are more likely to respond to treatment and have the potential to be cured. Seven cancers have the greatest possibility for early diagnosis through screening, including female breast, cervical, prostate, colorectal, oral, lung, and melanoma. For each of these screen-detectable cancers, five-year relative survival was highest when the cancer was diagnosed at localized stage and lowest when diagnosed at distant stage (Figures 3.4a through 3.4g). The only exception was prostate cancer which had excellent five-year relative survival when diagnosed at localized (100 percent) and regional (100 percent) stage (Figure 3.4g).

Despite screening tests existing for these cancers, a large proportion of lung (75 percent), oral (62 percent), colorectal (54 percent), and cervical (50 percent) cancers were diagnosed at regional and distant stage (Figures 3.5a, 3.5b, 3.5f). Melanoma (83 percent), prostate (74 percent), and female breast (63 percent) each had a larger proportion of cases diagnosed at localized stage than at regional and distant stage (Figures 3.5d, 3.5g, and 3.5e).

It should be noted that the United States Preventive Services Task Force updated its lung cancer screening guidelines in 2021. The guidelines recommend annual screening for lung cancer with low-dose computed tomography in adults aged 50 to 80 years who have a 20 pack-year smoking history and currently smoke or have quit within the past 15 years.[8] It is hoped that in the coming years increased screening will reduce late-stage diagnoses in lung cancer.

FIGURE 3.4A FIVE-YEAR RELATIVE SURVIVAL OF ORAL CANCER, CALIFORNIA, 2009-2013

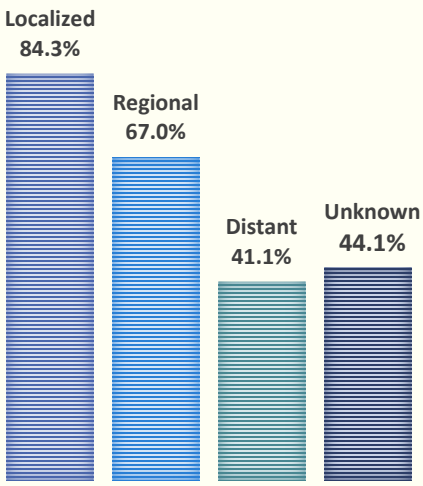


FIGURE 3.5A PERCENT OF ORAL CANCER BY STAGE AT DIAGNOSIS, CALIFORNIA, 2009-2013

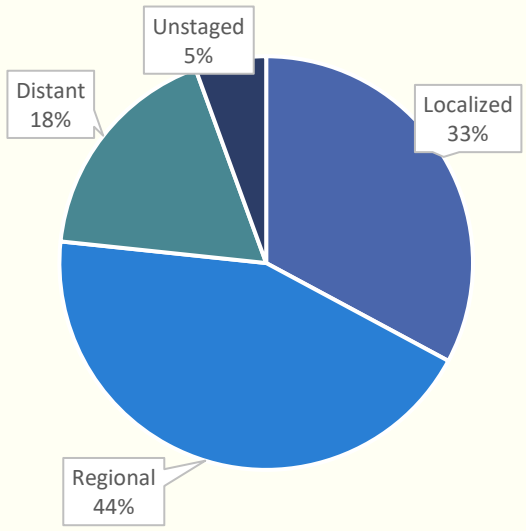


FIGURE 3.4B FIVE-YEAR RELATIVE SURVIVAL OF COLORECTAL CANCER, CALIFORNIA, 2009-2013

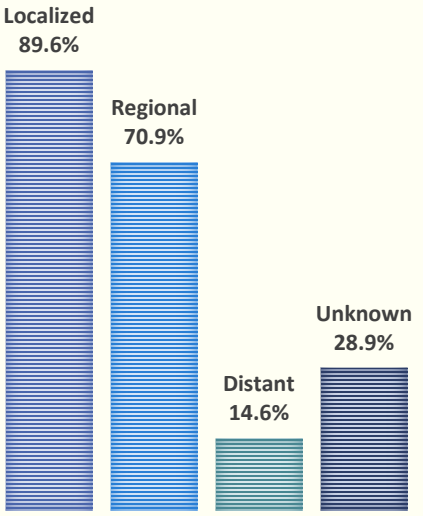
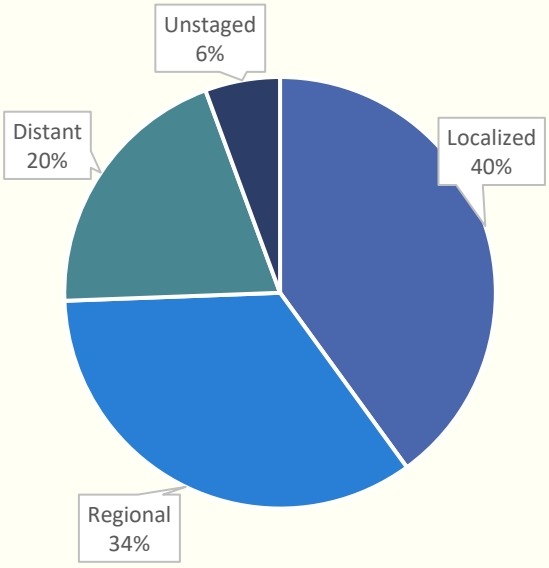


FIGURE 3.5B PERCENT OF COLORECTAL CANCER BY STAGE AT DIAGNOSIS, CALIFORNIA, 2009-2013



Source: California Cancer Registry, California Department of Public Health.

FIGURE 3.4C FIVE-YEAR RELATIVE SURVIVAL OF LUNG CANCER, CALIFORNIA, 2009-2013

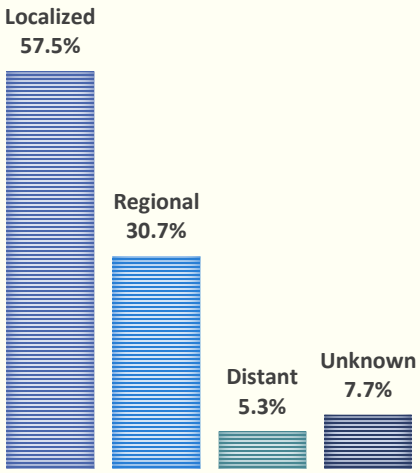


FIGURE 3.5C PERCENT OF LUNG CANCER BY STAGE AT DIAGNOSIS, CALIFORNIA 2009-2013

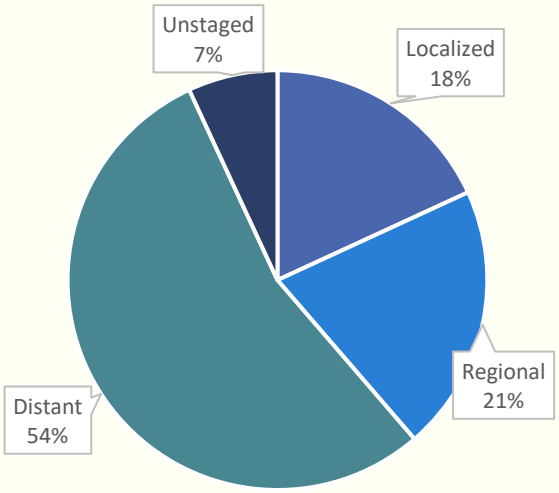


FIGURE 3.4D FIVE-YEAR RELATIVE SURVIVAL OF MELANOMA, CALIFORNIA, 2009-2013

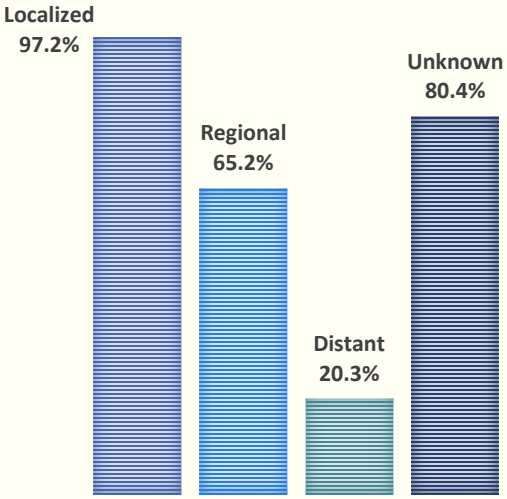
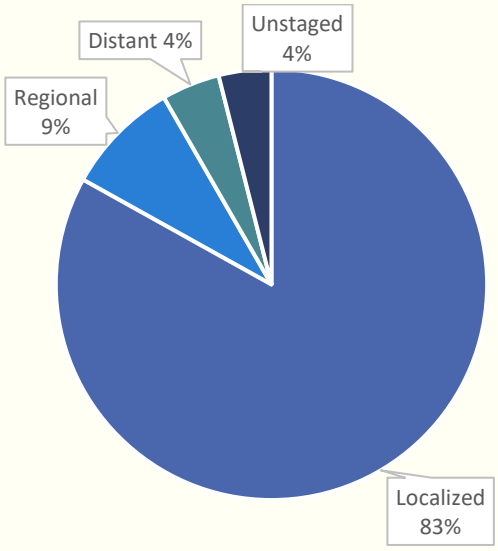


FIGURE 3.5D PERCENT OF MELANOMA BY STAGE AT DIAGNOSIS, CALIFORNIA 2009-2013



Source: California Cancer Registry, California Department of Public Health.

FIGURE 3.4E FIVE-YEAR RELATIVE SURVIVAL OF FEMALE BREAST CANCER, CALIFORNIA, 2009-2013

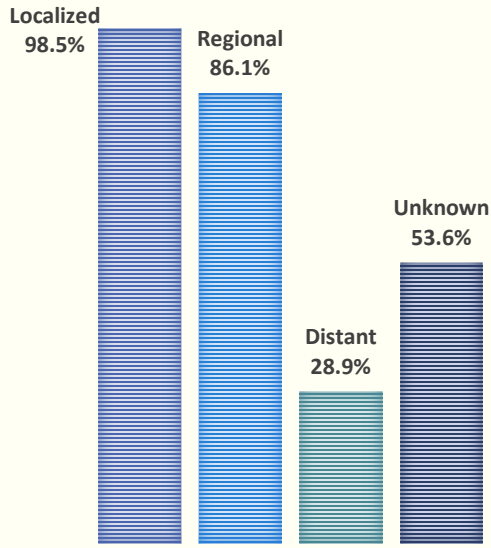


FIGURE 3.5E PERCENT OF FEMALE BREAST CANCER BY STAGE AT DIAGNOSIS, CALIFORNIA 2009-2013

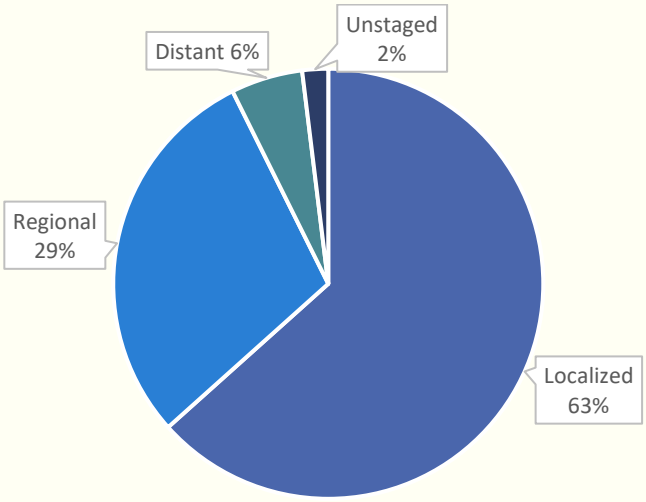


FIGURE 3.4F FIVE-YEAR RELATIVE SURVIVAL OF CERVICAL CANCER, CALIFORNIA, 2009-2013

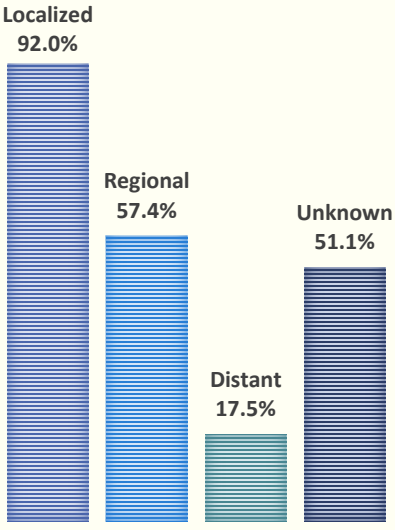
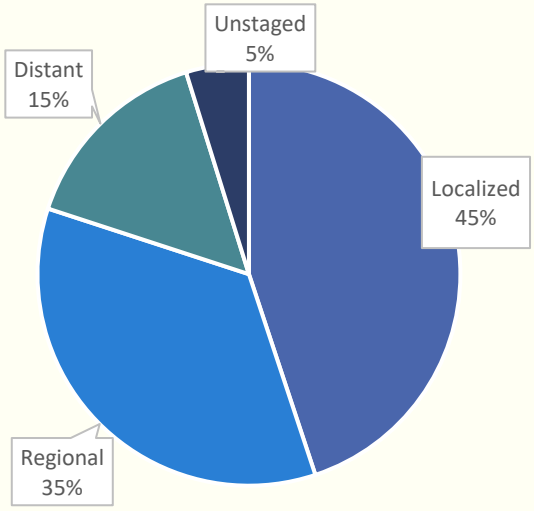


FIGURE 3.5F PERCENT OF CERVICAL CANCER BY STAGE AT DIAGNOSIS, CALIFORNIA 2009-2013



Source: California Cancer Registry, California Department of Public Health.

FIGURE 3.4G FIVE-YEAR RELATIVE SURVIVAL OF PROSTATE CANCER, CALIFORNIA, 2009-2013

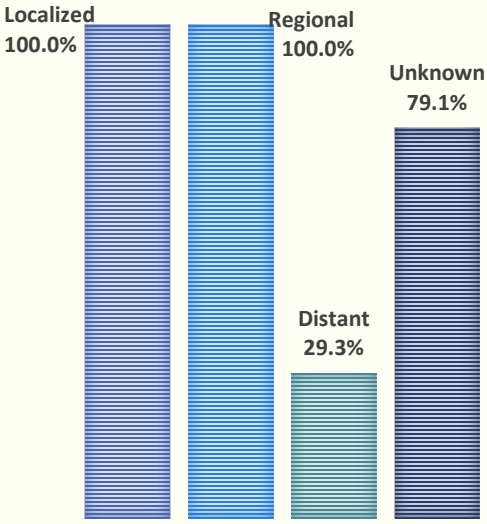
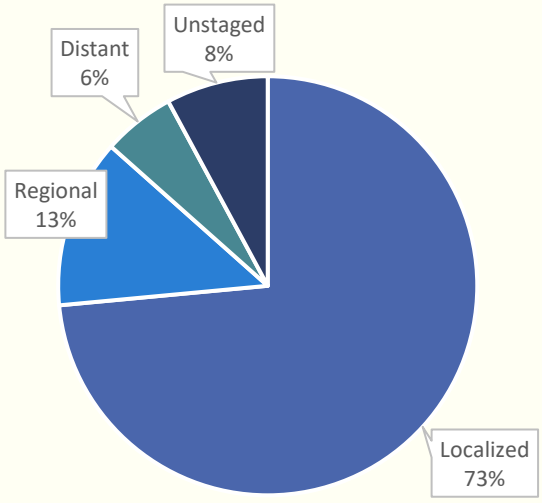


FIGURE 3.5G PERCENT OF PROSTATE CANCER BY STAGE AT DIAGNOSIS, CALIFORNIA, 2009-2013



Source: California Cancer Registry, California Department of Public Health.

Of screen-detectable cancers, melanoma (83 percent), prostate (74 percent), and female breast (63 percent) had a larger proportion of cases diagnosed early (localized)-versus late-stage (regional or distant). Lung had the highest proportion diagnosed late-stage (75 percent).

CDPH developed the CWP to coordinate efforts among public and private chronic disease prevention and health promotion programs to decrease the burden of chronic disease among all Californians.[9]

Several objectives in the CWP pertain to reducing the burden of cancer among Californians and eliminating existing disparities. CCR is poised to monitor the burden of cancer and measure progress toward meeting the objectives in the CWP.

The 2014 CWP had several objectives aimed at decreasing the cancer burden as well as eliminating existing disparities by 2015 or 2020. A summary of all these objectives and the progress California has made toward reaching them with the most recent 2018 data is outlined in Table 4.1.

TABLE 4.1 CALIFORNIA WELLNESS PLAN (CWP) GOALS AND CURRENT OUTCOMES

CWP Goal	Target	Most Recent Data (2018)	Goal Met
CWP Objective 2.2.4I: By 2015, increase the proportion of early-stage (in situ or localized) diagnoses of breast cancer among all women by 29 percent, from 69.0 percent in 2008 to 89.0 percent.	89.0 percent	70.5 percent	
CWP Objective 2.2.5I: By 2015, decrease the proportion of late-stage (regional or distant) diagnoses of colorectal cancer among Californians by 15 percent, from 47.1 percent in 2008 to 40.0 percent.	40.0 percent	53.0 percent	
CWP Objective 2.2.6I: By 2015, decrease the proportion of late-stage (regional or distant) diagnoses of colorectal cancer among Black/African Americans and Asian/Pacific Islanders by 20 percent, from 51.5 percent in 2008 to 41.2 percent for Black/African Americans, and from 51.8 percent in 2008 to 41.1 percent for Asian/Pacific Islanders.	Black/African American, 41.2 percent Asian/Pacific Islander, 41.1 percent	Black/African American, 52.6 percent Asian/Pacific Islander, 54.1 percent	
CWP Objective 2.21L: By 2015, reduce the mortality rate of female breast cancer by ten percent, from 21.4 per 100,000 in 2008 to 19.3 per 100,000.	19.3 per 100,000	19.0 per 100,000 AAPC: -1.4* (2008-2018)	

CWP Objective 2.2.2L: By 2015, decrease the mortality rate of colorectal cancer by 17.5 percent, from 14.5 per 100,000 in 2008 to 12.0 per 100,000.	12.0 per 100,000	12.1 per 100,000 AAPC: -2.0* (2008-2018)	
CWP Objective 2.2.3L: By 2015, decrease the mortality rate of prostate cancer by ten percent, from 21.7 per 100,000 in 2008 to 19.5 per 100,000.	19.5 per 100,000	20.1 per 100,000 AAPC: -1.3* (2008-2018)	
CWP Objective 2.2.4L: By 2015, decrease the mortality rate of prostate cancer among Black/African American men by ten percent, from 51.6 per 100,000 in 2008 to 46.4 per 100,000.	46.4 per 100,000	41.6 per 100,000 AAPC: -2.0* (2008-2018)	
CWP Objective 2.2.5L: By 2020, decrease the mortality rate of lung cancer from 36.2 per 100,000 in 2012 to 32.6 per 100,000.	32.6 per 100,000	25.0 per 100,000 AAPC: -4.6* (2012-2018)	
CWP Objective 2.2.6L: By 2020, decrease the incidence of lung cancer from 44.8 per 100,000 in 2012 to 31.3 per 100,000.	31.3 per 100,000	37.3 per 100,000 AAPC: -2.9* (2012-2018)	
CWP Objective 2.8.1L: By 2015, decrease the incidence of cervical cancer by 15 percent, from 8.2 per 100,000 in 2008 to 7.0 per 100,000.	7.0 per 100,000	7.5 per 100,000 AAPC: -0.7 (2008-2018)	

: CWP Goal Met *: CWP Goal Not Met*

AAPC: Average Annual Percent Change.

**p-value is significant at p<0.05.*

Source: California Wellness Plan, California Department of Public Health.
California Cancer Registry, California Department of Public Health.

CWP OBJECTIVE 2.2.4I: BY 2015, INCREASE THE PROPORTION OF EARLY-STAGE (IN SITU OR LOCALIZED) DIAGNOSES OF BREAST CANCER AMONG ALL WOMEN BY 29 PERCENT, FROM 69 PERCENT IN 2008 TO 89 PERCENT.

As of 2018, California has not met the goal of increasing the proportion of early-stage female breast cancer diagnoses to 89 percent. In 2018, 70.5 percent of female breast cancers were diagnosed at an early stage.

CWP OBJECTIVE 2.2.5I: BY 2015, DECREASE THE PROPORTION OF LATE-STAGE (REGIONAL OR DISTANT) DIAGNOSES OF COLORECTAL CANCER AMONG CALIFORNIANS BY 15 PERCENT, FROM 47.1 PERCENT IN 2008 TO 40 PERCENT.

As of 2018, California has not met the goal of decreasing the proportion of late-stage colorectal cancer diagnoses to 40 percent. In 2018, 53.0 percent of colorectal cancers were diagnosed late-stage. However, this is a decrease of nearly five percentage points from 2017 when it was 57.6 percent.

CWP OBJECTIVE 2.2.6I: BY 2015, DECREASE THE PROPORTION OF LATE-STAGE (REGIONAL OR DISTANT) DIAGNOSES OF COLORECTAL CANCER AMONG BLACK/AFRICAN AMERICANS AND ASIAN/PACIFIC ISLANDERS BY 20 PERCENT, FROM 51.5 PERCENT IN 2008 TO 41.2 PERCENT FOR BLACK/AFRICAN AMERICANS, AND FROM 51.8 PERCENT IN 2008 TO 41.1 PERCENT FOR ASIAN/PACIFIC ISLANDERS.

California has not met the goal of decreasing the proportion of late-stage colorectal cancer diagnoses among Black/African Americans and Asian/Pacific Islanders to 41 percent. In 2018, 52.6 percent and 54.1 percent of colorectal cancers were diagnosed late-stage among Black/African Americans and Asian/Pacific Islanders, respectively. Although the goals have not yet been met, these proportions are approximately five percentage points lower than in 2017.

CWP OBJECTIVE 2.21L: BY 2015, REDUCE THE MORTALITY RATE OF FEMALE BREAST CANCER BY TEN PERCENT, FROM 21.4 PER 100,000 IN 2008 TO 19.3 PER 100,000.

California met the goal of reducing the mortality rate of female breast cancer by ten percent. In 2018, the age-adjusted mortality rate of female breast cancer was 19.0 per 100,000. Since 2008, the age-adjusted mortality rate has significantly decreased by 1.4 percent per year.

CWP OBJECTIVE 2.2.2L: BY 2015, DECREASE THE MORTALITY RATE OF COLORECTAL CANCER BY 17.5 PERCENT, FROM 14.5 PER 100,000 IN 2008 TO 12 PER 100,000.

California has made progress in meeting the goal of reducing the mortality rate of colorectal cancer by 17.5 percent. In 2018, the age-adjusted mortality rate of colorectal cancer was 12.1 per 100,000. Since 2008, the age-adjusted mortality rate has significantly decreased by 2.0 percent per year.

CWP OBJECTIVE 2.2.3L: BY 2015, DECREASE THE MORTALITY RATE OF PROSTATE CANCER BY TEN PERCENT, FROM 21.7 PER 100,000 IN 2008 TO 19.5 PER 100,000.

In 2018, California was close to the goal of reducing the mortality rate of prostate cancer by ten percent with an age-adjusted mortality rate of 20.1 per 100,0000. Although prostate cancer mortality has significantly declined 1.3 percent per year from 2008 to 2018, most of the decline occurred from 2008 to 2012 (AAPC=-3.5, p-value=0.01). From 2012 to 2018 there has been little change in the AAMR (AAPC=0.3, p-value=0.62).

CWP OBJECTIVE 2.2.4L: BY 2015, DECREASE THE MORTALITY RATE OF PROSTATE CANCER AMONG BLACK/AFRICAN AMERICAN MEN BY TEN PERCENT, FROM 51.6 PER 100,000 IN 2008 TO 46.4 PER 100,000.

California exceeded the goal of reducing the mortality rate of prostate cancer among Black/African American men by ten percent. In 2018, the age-adjusted mortality rate of prostate cancer among Black/African American men was 41.6 per 100,000. Since 2008, the age-adjusted mortality rate of prostate cancer among Black/African American men has significantly decreased by 2.0 percent per year.

CWP OBJECTIVE 2.2.5L: BY 2020, DECREASE THE MORTALITY RATE OF LUNG CANCER FROM 36.2 PER 100,000 IN 2012 TO 32.6 PER 100,000.

California exceeded the goal of reducing the mortality rate of lung cancer to 36.2 per 100,000 by 2020. In 2018, the age-adjusted mortality rate of lung cancer was 25.0 per 100,000. Since 2012, the age-adjusted mortality rate of lung cancer has significantly decreased by 4.6 percent per year.

CWP OBJECTIVE 2.2.6L: BY 2020, DECREASE THE INCIDENCE OF LUNG CANCER FROM 44.8 PER 100,000 IN 2012 TO 31.3 PER 100,000.

California is making progress toward decreasing the incidence of lung cancer to 31.3 per 100,000 by 2020. In 2018, the age-adjusted incidence rate of lung cancer was 37.3 per 100,000. Since 2012, the age-adjusted incidence rate of lung cancer has significantly decreased by 2.9 percent per year.

CWP OBJECTIVE 2.8.1L: BY 2015, DECREASE THE INCIDENCE OF CERVICAL CANCER BY 15 PERCENT, FROM 8.2 PER 100,000 IN 2008 TO 7.0 PER 100,000.

California has come close to meeting the goal of reducing the incidence of cervical cancer by 15 percent. In 2018, the age-adjusted incidence rate of cervical cancer was 7.5 per 100,000.

CONCLUSION

Findings from this report indicate that some progress has been made in reducing the cancer burden in California.

- Since 1988, overall cancer incidence has significantly declined by 0.4 percent per year and overall cancer mortality has significantly declined by 1.4 percent per year.
- Between 2009 and 2018 the incidence rate of 12 cancers significantly decreased. For men and women, incidence rates for cancers of the lung, colon and rectum, bladder, non-Hodgkin lymphoma, and leukemia significantly decreased. For men, incidence rates for cancers of the prostate, larynx, esophagus, stomach, and Hodgkin lymphoma significantly decreased, and for women incidence rates of ovarian and brain cancers significantly decreased.
- Between 2009 and 2018 the mortality rate of 13 cancers significantly decreased. For men and women, mortality rates for melanoma, myeloma, leukemia, non-Hodgkin lymphoma, and cancers of the stomach, lung, and colon and rectum significantly decreased. For men mortality rates for mesothelioma and cancers of the larynx and esophagus significantly decreased, and for women mortality rates of ovarian, breast, and pancreatic cancers decreased.
- Cancer incidence significantly decreased for Asian/Pacific Islanders, Black/African Americans, and non-Latino/Hispanic Whites from 2009 to 2018.
- Cancer mortality significantly decreased for Asian/Pacific Islanders, Black/African Americans, Latino/Hispanics, and non-Latino/Hispanic Whites from 2009 to 2018.
- Five-year relative survival improved among Asian/Pacific Islanders, Black/African Americans, Latino/Hispanics, and non-Latino/Hispanic Whites.
- Several California Wellness Plan goals have been met including reductions in the mortality rates of female breast cancer, colorectal cancer, lung cancer, and Black/African American prostate cancer.

However, other findings indicate the need for more targeted prevention efforts:

- For men, both the incidence and mortality rates of thyroid cancer significantly increased from 2009 to 2018.
- For women, both the incidence and mortality rates of uterine cancer significantly increased from 2009 to 2018 and liver cancer mortality increased over the time-period.

- Among the five major racial/ethnic groups, Black/African Americans had the third highest incidence rate of cancer but the highest mortality rate. Black/African Americans had the lowest cancer survival rate compared to other racial/ethnic groups.
- American Indians had the highest cancer incidence rate and second highest mortality rate. Cancer incidence and mortality significantly increased for American Indians from 2009 to 2018.
- Of the screen-detectable cancers, lung (75 percent), oral (62 percent), colorectal (54 percent), and cervical (50 percent) cancers had large proportions of late-stage (regional or distant) at time of diagnosis.
- While progress has been made, several CWP objectives have not yet reached their goals, including increasing early-stage diagnoses of female breast cancer, decreasing late-stage diagnoses of late-stage colorectal cancer among all and among Black/African Americans and Asian/Pacific Islanders, decreasing the incidence rate of lung cancer, and decreasing the incidence of cervical cancer.
- Cervical cancer incidence and mortality rates remained flat from 2009 to 2018 and cervical cancer was among the top five most diagnosed cancers among Laotian/Hmong women.

In conclusion, the findings described in this report indicate progress has been made in decreasing the burden of cancer in California; however, racial/ethnic disparities persist in cancer incidence, mortality, and survival. More work needs to be done to reduce modifiable risk factors for cancer and increase adherence to screening guidelines, particularly among Black/African American and American Indian populations. Additionally, efforts must be made to ensure that all populations receive timely and guideline concordant care.

Additional cancer rate information for individual counties and regions can be found at the following sites: CAL Explorer and California Health Maps.

METHODS AND TECHNICAL NOTES

CANCER TYPE

This report uses the National Cancer Institute's, Surveillance, Epidemiology, and End Results (SEER) site recode ICD-O-3/WHO 2008 definition for cancer type (https://seer.cancer.gov/siterecode/icdo3_dwhoheme/index.html). The individual cancer types presented in this report do not overlap. For example, cancer of the uterus does not include cancer of the cervix which has a separate category.

INCIDENCE

This report includes cases of cancer diagnosed between January 1, 1988 and December 31, 2018 reported to CCR as of December 22, 2020. 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 CCR, Chronic Disease Surveillance and Research Branch of CDPH. Cases that were reported from the Department of Veterans Affairs were not included in this report. Standards for data abstracting, collection, and reporting are specified by CCR. Only cases diagnosed among 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 CDPH, Center for Health Statistics. From 1988 through 1998, cause of death was coded according to the International Classification of Diseases, Ninth Edition (ICD-9). Beginning in 1999, cause of death was coded according to the International Classification of Diseases, 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.

LIMITED-DURATION PREVALENCE (EXISTING CASES)

The number of existing cases, also known as prevalence, accounts for all Californians alive today that have a history of the specific cancer from January 1, 1988 to January 1, 2018. These existing cases include individuals that no longer have evidence of cancer and those undergoing treatment that still have evidence of disease. SEER*Stat software was used to calculate 30-year limited-duration prevalence.[10]

RELATIVE-SURVIVAL

The measure of cancer survival used in this report was relative survival. Relative survival estimates the probability of surviving a particular type of cancer during a specified time period. Relative survival is the ratio (expressed as a percent) of cancer patients who survived for a given time period following diagnosis (observed survival rate) to the expected survival rate of a similar group of cancer-free individuals based on age, race/ethnicity, and sex. The expected survival rates used in this report were based on life tables specific to the California population. A relative survival of 100 percent means that patients diagnosed with a particular type of cancer are just as likely to survive the specified time period as a similar group of individuals in the general population without cancer. Survival was calculated using SEER*Stat software.[10]

STAGE AT DIAGNOSIS

Stage at diagnosis was defined according to the Surveillance, Epidemiology, and End Results (SEER) Program's Summary Stage classification scheme.[7] In this scheme, tumors are classified as *in situ*, localized, regional, or distant. *In situ* tumors are non-invasive and do not penetrate the basement membrane. Localized tumors are confined entirely to the organ of origin. Regional tumors extend into surrounding organs, tissues, or regional lymph nodes. Distant tumors have metastasized to other parts of the body. *In situ* tumors were excluded from survival calculations as they are detected through screening and are non-lethal.

AGE-ADJUSTED RATES

Rates 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. 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 SEER*Stat software.[10]

JOINPOINT ANALYSIS OF TRENDS – AVERAGE ANNUAL PERCENT CHANGE

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, with the APC estimated for each segment.

AAPC is a summary measure of a trend over a pre-specified fixed interval. It allows for the use of a single number to describe the average APCs 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. Joinpoint software was used for all the trend analyses in this report.[11]

STATISTICAL SIGNIFICANCE

The statistical significance of observed differences in age-adjusted rates was determined by comparing 95 percent confidence intervals around each rate. A 95 percent confidence interval is the range of values that is estimated to contain the true population value 95 percent of the time. Whenever confidence intervals overlapped differences were deemed non-significant, otherwise they were considered significant at $p < 0.05$.

RACE CLASSIFICATION

Race codes were self-reported by patients and obtained through medical records. If no race was stated in the medical record, documentation was reviewed for a statement of a race category. In case the patient's race was reported differently by two or more sources within the medical record, race was coded using the patient's self-declared identification, or documentation in the medical record (dictated reports and Nurses' notes). Death certificate information was used when race was coded as unknown in the patient record or when the death certificate information was more specific. Because information on the patient's origin is not always reported, the term "Black/African American" is used throughout this report. Additionally, the North American Association of Central Cancer Registries' Hispanic and Asian/Pacific Islander Identification Algorithm (NHAPIIA) was applied to identify Latino/Hispanic and Asian/Pacific islander persons.[12]

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