CANCER IN CALIFORNIA 1988-2019

ASSESSING THE BURDEN OF CANCER AMONG CALIFORNIANS

UC DAVIS HEALTH | COMPREHENSIVE CANCER CENTER

THIS REPORT WAS PREPARED BY THE CALIFORNIA CANCER REPORTING AND EPIDEMIOLOGIC SURVEILLANCE (CALCARES) PROGRAM, UNIVERSITY OF CALIFORNIA DAVIS COMPREHENSIVE CANCER CENTER, UNIVERSITY OF CALIFORNIA DAVIS HEALTH

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

- This report provides a broad overview of the cancer burden in California with particular attention to differences by sex, race/ethnicity, age group, and county.
- In 2019, 180,942 new cancer cases and 59,099 cancer deaths occurred among Californians.
- The most common cancers diagnosed in 2019 were breast, prostate, lung, colorectal, and melanoma while the most common types of cancer death were lung, colorectal, pancreas, breast, and prostate.
- Since 1988, overall cancer incidence has declined by 0.4 percent per year and overall cancer mortality has declined by 1.4 percent per year.
- Men had higher cancer incidence and mortality than women.
- Among men, overall cancer incidence and mortality declined in the most recent ten-year period, 2010 to 2019. Incidence and mortality decreases were for cancers of the lung, colon and rectum, and leukemia. Prostate cancer incidence decreased, while kidney cancer incidence and mortality increased.
- Among women, incidence remained unchanged, while mortality declined from 2010-2019. As with men, incidence and mortality decreased for cancers of the lung, colon and rectum, and leukemia. For liver and uterine cancers, incidence and mortality increased and, for breast cancer, incidence increased.
- From 2010 to 2019, overall cancer incidence and mortality decreased for all racial/ethnic groups, except American Indians.
- For American Indians, overall cancer incidence and mortality increased by 2.4 and 3.8 percent, respectively, per year since 1988. In 2019, American Indians had the highest incidence and mortality of all racial/ethnic groups.
- Uterine cancer incidence increased among all racial/ethnic groups, except non-Hispanic Whites, and mortality increased among Hispanics, Asian/Pacific Islanders, and American Indians. Prostate cancer incidence decreased among all racial/ethnic groups, except American Indians. Breast cancer incidence increased among Asian/Pacific Islanders and Hispanics.
- From 2000 to 2019, overall cancer incidence increased for children 0 to 14 years and adolescent and young adults (AYAs, ages 15 to 39), while cancer incidence decreased for all other age groups. During the same time period, mortality decreased for all age groups.

- Breast cancer was the most common cancer among AYAs and those ages 40 to 64 years. For those ages 65 to 74 years, prostate cancer was most common and for those ages 75 years or more, lung cancer was most common.
- For AYAs, the most common cause of cancer death was breast cancer, while for those 40 years and over, the most common cause of cancer death was lung cancer.
- From 2010 to 2019, the incidence of colorectal and uterine cancer increased among AYAs and those 40 to 64 years. Breast cancer incidence increased for those 40 to 64 years.
- From 2017 to 2019, the counties with the highest cancer incidence and mortality were mostly in the northern part of the state and included Humboldt, Shasta, Tehama, Glenn, Butte, Lake, and Amador counties.
- From 2010 to 2019, only one county, Yuba, had significant increases in cancer incidence, while no counties had significant increases in mortality.
- The majority of four screen detectable cancers, including lung (68 percent), oral (63 percent), colorectal (56 percent), and cervical (51 percent) cancers, were diagnosed at a late stage.
- Californians residing in low socioeconomic status neighborhoods had greater proportions of late-stage diagnoses of oral, lung, melanoma, breast, and cervical cancers.
- Greater proportions of Black/African American, Asian/Pacific Islander, Hispanic, and American Indian patients (compared to non-Hispanic Whites) were diagnosed with late-stage melanoma, lung, and breast cancers.

INTRODUCTION

Cancer is a major disease burden in California where approximately 180,000 new cases are diagnosed annually and an estimated 1.6 million Californians living today have had a cancer diagnosis. Although various factors (genetics, behaviors, exposures) contribute to an individual's risk of developing cancer, cancer disproportionately affects certain subgroups of the population. Socioeconomic status, access to health care, neighborhood and community attributes, and social support systems can impact cancer risk and timely diagnosis.

This report describes trends in cancer incidence and mortality over time and differences by sex, race/ethnicity, age, and county. Demographic differences in late-stage diagnoses of screen detectable cancers are also described.

Data in this report came from the California Cancer Registry (CCR). CCR was established to monitor the burden of cancer in California. It is a comprehensive, statewide, cancer surveillance system enacted into law in 1985 (Health & Safety Code Sections 103875-103885) and is a program of the California Department of Public Health (CDPH), Chronic Disease Surveillance and Research Branch (CDSRB). CCR's mission is to serve the public by collecting timely, standardized, statewide data across the cancer continuum that can be used to describe cancer trends in the state, identify disparities, and inform policy decisions. High quality data is an essential first step in understanding the cancer burden in California and where to focus efforts to reduce it. 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.

We hope the information provided in this report can be used by members of the public to understand cancer trends and the current burden of cancer in California. We hope it will be used by researchers, health care providers, public health professionals, and policy makers to develop strategies to address the highlighted inequities.

KEY TERMS

Incidence is the number of new cancer cases diagnosed in a population in a defined time period.
Mortality is the number of deaths due to cancer in a population.
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.
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.
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

CHAPTER 1. CANCER INCIDENCE AND MORTALITY

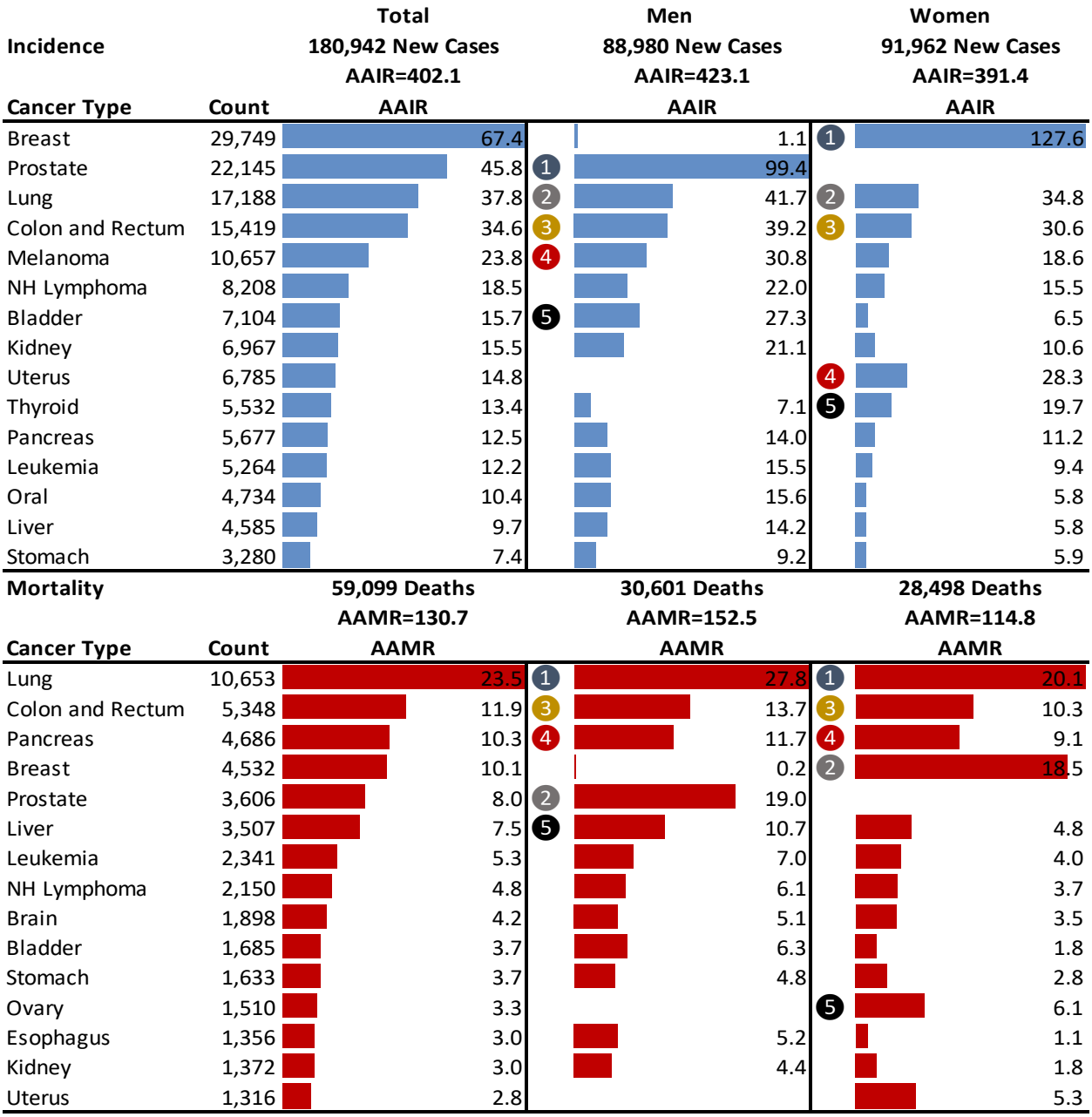
Incidence is the number of new cancers diagnosed over a period of time. It is an important measure of the cancer burden in a population. Mortality is the number of cancer deaths in a specified time-period. It can be an indicator of late-stage diagnoses, aggressiveness of a cancer, and efficacy of treatment regimens. Regular surveillance of incidence and mortality helps to identify trends and inform health care providers, public health professionals, policy makers, and other stakeholders on the effectiveness of primary and secondary prevention measures and progress in cancer control and treatment. In 2019, 180,942 new cancers were diagnosed and 59,099 people died in California (Figure 1). This corresponds to an age-adjusted incidence rate (AAIR) of 402.1 per 100,000 and an age-adjusted mortality rate (AAMR) of 130.7 per 100,000. Since 1988, the average annual percent change (AAPC) in the AAIR of all cancers has decreased significantly by 0.4 percent per year and the AAPC in the AAMR has decreased significantly by 1.4 percent per year (Figure 2). The most common cancers diagnosed in 2019 were breast, prostate, lung, colorectal, and melanoma while the most common types of cancer death were lung, colorectal, pancreas, breast, and prostate.

By Sex

In 2019, men had a higher AAIR (423.1 per 100,000) and AAMR (152.5 per 100,000) than

women (AAIR=391.4 per 100,000; AAMR=114.8 per 100,000). Among men, the most common cancers were prostate, lung, colorectal, melanoma, and bladder while among women they were breast, lung, colorectal, uterus, and thyroid. The most common types of cancer death among men were lung, prostate, colorectal, pancreas, and liver while for women they were lung, breast, colorectal, pancreas, and ovary.

FIGURE 1. MOST COMMON TYPES OF CANCER INCIDENCE AND MORTALITY, CALIFORNIA, 2019

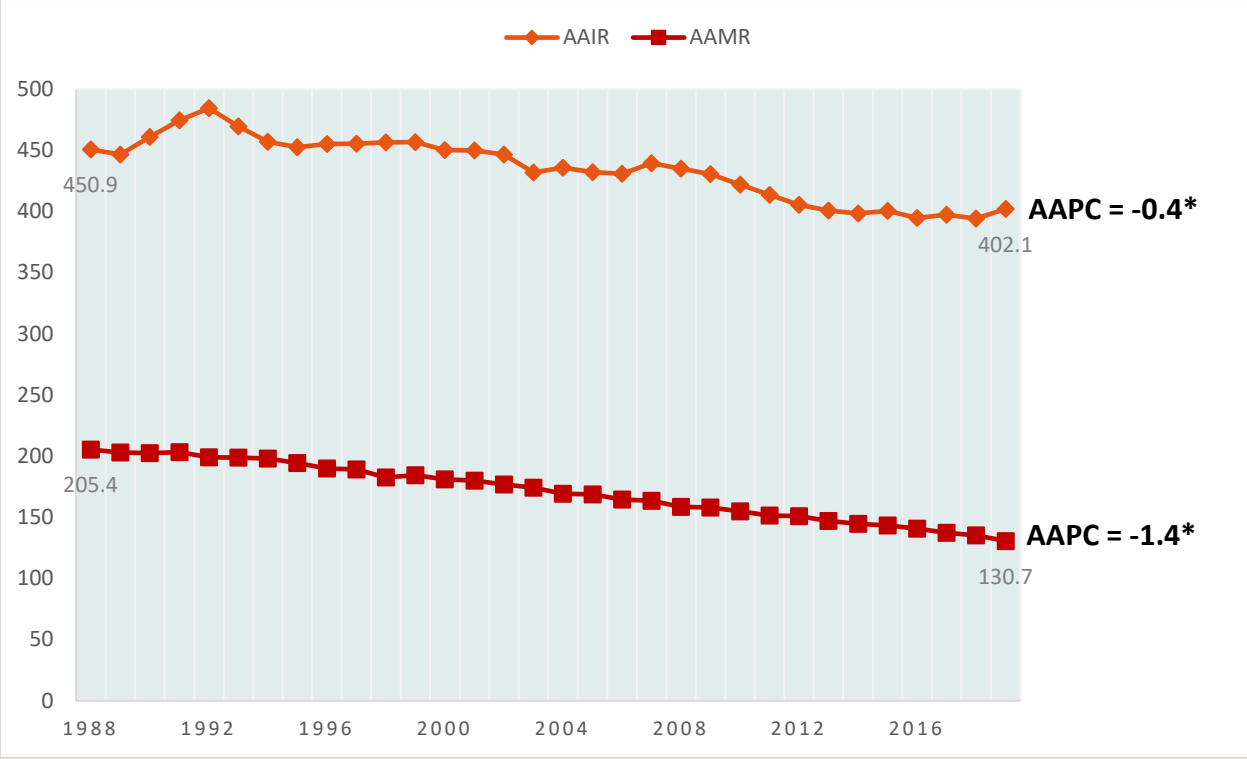


NH, NON-HODGKIN

AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

FIGURE 2. TRENDS IN AAIR AND AAMR FOR ALL MALIGNANT CANCERS, CALIFORNIA, 1988-2019



AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION.

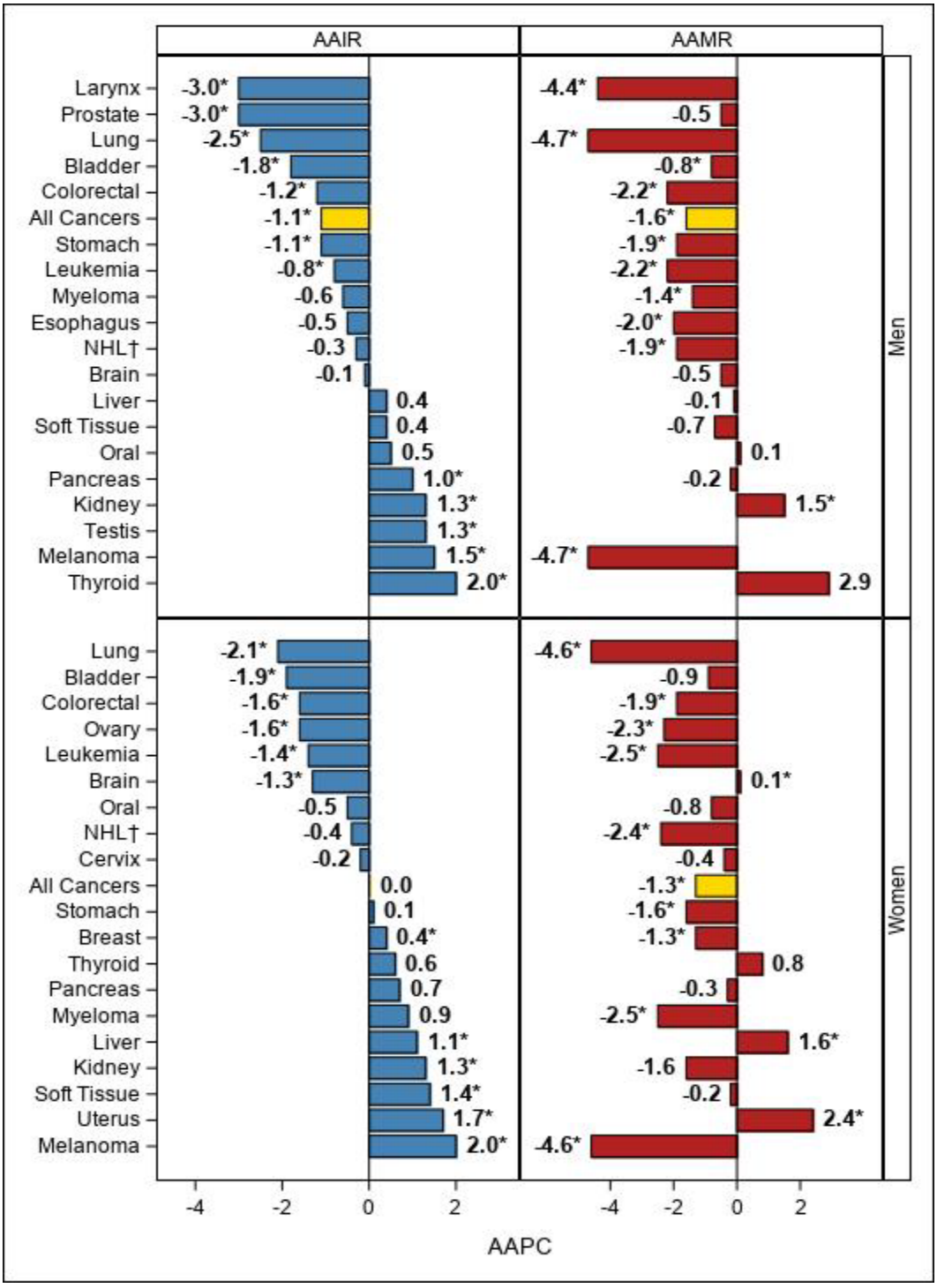
AAPC: AVERAGE ANNUAL PERCENT CHANGE.

** THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT P < 0.05. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.*

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

In the most recent ten-year period for which data is available, 2010 to 2019, overall cancer incidence and mortality significantly decreased for men; for women, incidence remained unchanged, while mortality significantly decreased (Figure 3). Among men, both incidence and mortality significantly decreased for cancers of the larynx, lung, bladder, colon and rectum, stomach, and leukemia. Although incidence of prostate cancer significantly decreased, mortality did not. Among cancer sites with significantly increasing incidence (pancreas, testis, kidney, melanoma, thyroid), mortality significantly increased for kidney and significantly decreased for melanoma. Among women, incidence and mortality significantly decreased for cancers of the lung, colon and rectum, ovary, and leukemia. Incidence for cancers of the brain significantly decreased, but mortality significantly increased. Incidence significantly increased for breast cancer and melanoma, but mortality for both significantly decreased. For cancers of the liver and uterus, both incidence and mortality significantly increased.

FIGURE 3. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE (AAIR) AND MORTALITY (AAMR) AMONG MEN AND WOMEN, CALIFORNIA, 2010-2019



*THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT $p < 0.05$. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.

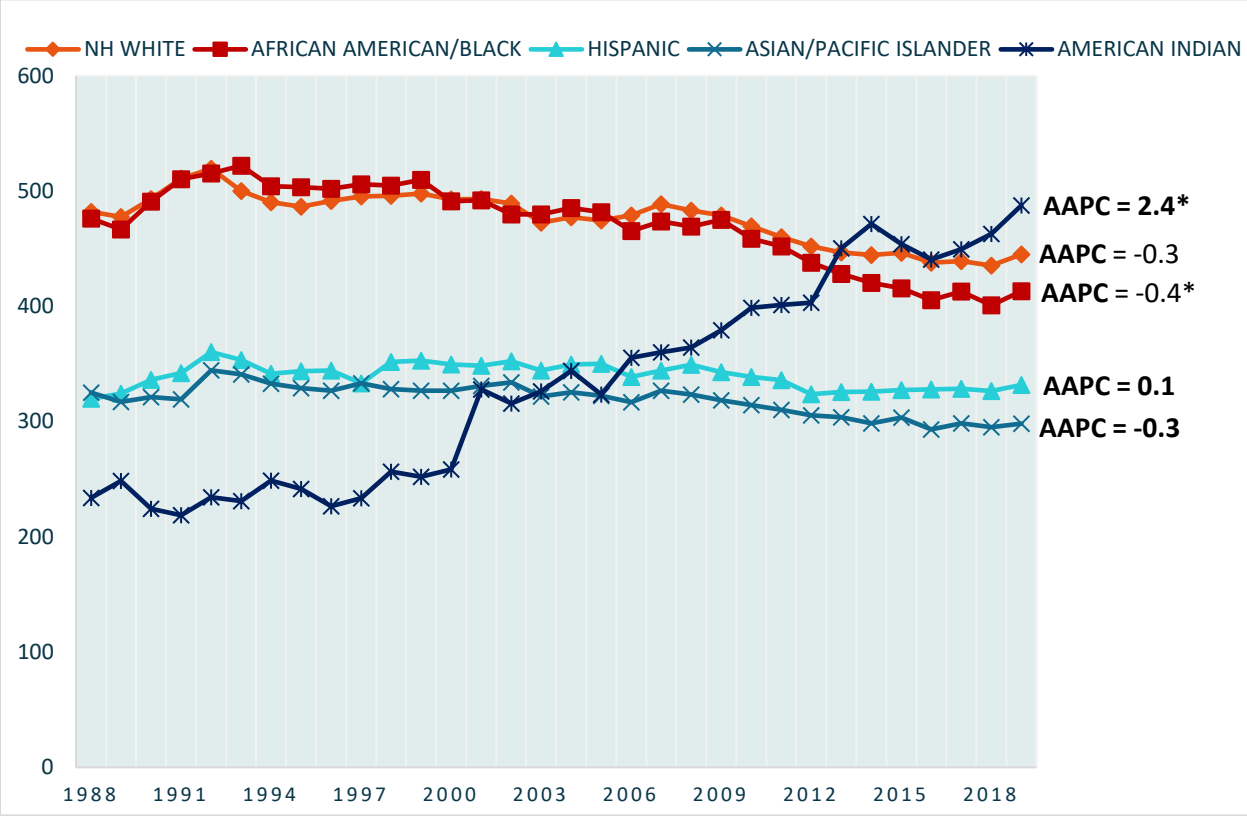
AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; †NHL: NON-HODGKIN LYMPHOMA.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

By Race/Ethnicity

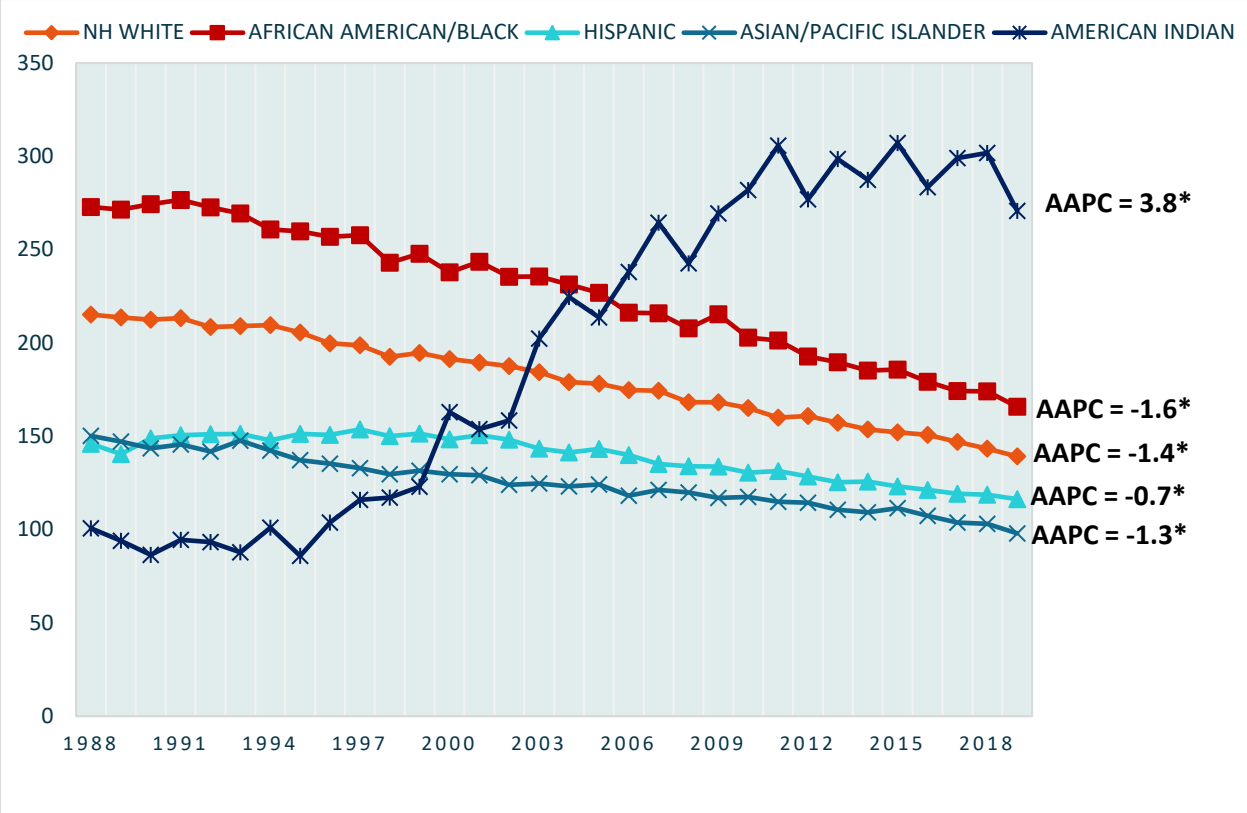
From 1988 to 2019, the AAIR for all malignant cancers significantly declined by 0.4 percent per year for African Americans/Blacks, remained relatively unchanged for non-Hispanic Whites, Hispanics, and Asian/Pacific Islanders, and significantly increased by 2.4 percent per year for American Indians (Figure 4). From 1988 to 2019, the AAMR for all cancers significantly declined by 1.6 percent per year for African American/Blacks, 1.4 percent per year for non-Hispanic Whites, 0.7 percent per year for Hispanics, 1.3 percent per year for Asian/Pacific Islanders, but for American Indians it significantly increased by 3.8 percent per year (Figure 5).

Figure 4. Trends in AAIR for all malignant cancers by race/ethnicity, California, 1988-2019



AAIR: Age-adjusted incidence rate; Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population.
AAPC: Average annual percent change. A negative AAPC means rates are decreasing, a positive number means rates are increasing.
** The AAPC is significantly different from zero at $p < 0.05$.*
Source: California Cancer Registry, California Department of Public Health.

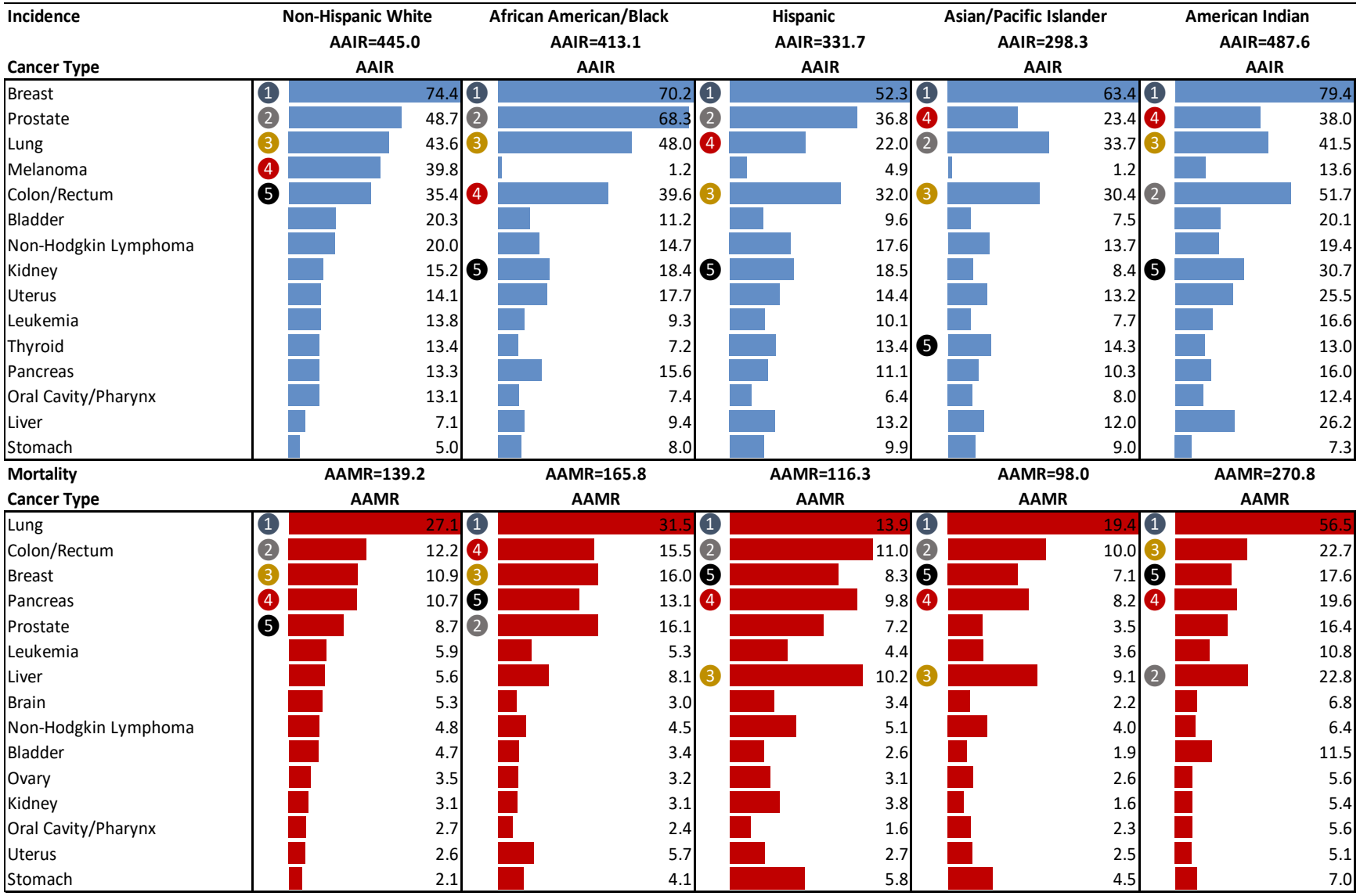
FIGURE 5. TRENDS IN AAMR FOR ALL MALIGNANT CANCERS BY RACE/ETHNICITY, CALIFORNIA, 1988-2019



AAMR: AGE-ADJUSTED MORTALITY RATE; RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION.
AAPC: AVERAGE ANNUAL PERCENT CHANGE. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.
** THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT $P < 0.05$.*
SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

In 2019, the AAIR was highest for American Indians followed by non-Hispanic Whites, African American/Blacks, Hispanics, and Asian/Pacific Islanders (Figure 6). The AAMR was highest for American Indians, followed by African American/Blacks, non-Hispanic Whites, Hispanics, and Asian/Pacific Islanders. The most commonly diagnosed cancers and the most common types of cancer death varied by race/ethnicity. Across all racial/ethnic groups, breast cancer had the highest AAIR. Among non-Hispanic White, African American/Black, and Hispanic patients, prostate cancer had the second highest AAIR; for Asian/Pacific Islander patients, the second highest was lung cancer and for American Indian patients, the second highest was colorectal cancer. Lung cancer had the highest AAMR across all racial/ethnic groups. For non-Hispanic White, Hispanic, and Asian/Pacific Islander patients, colorectal cancer had the second highest AAMR while prostate cancer had the second highest AAMR among African American/Black patients and liver cancer had the second highest AAMR among American Indians.

FIGURE 6. MOST COMMON TYPES OF CANCER INCIDENCE AND MORTALITY BY RACE/ETHNICITY, CALIFORNIA, 2019

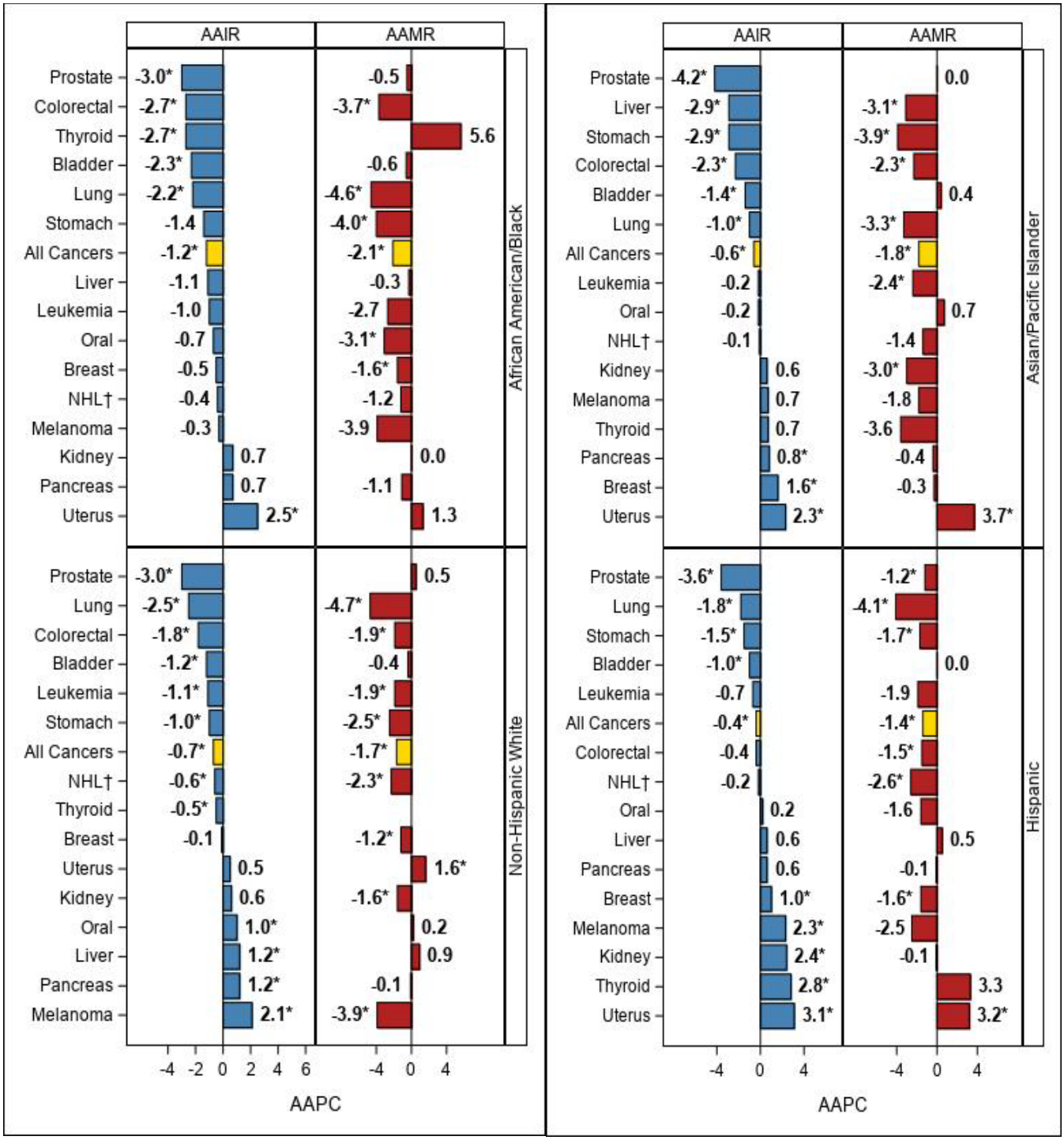


AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

From 2010 to 2019, overall cancer incidence and mortality significantly decreased for all racial/ethnic groups except American Indians where it significantly increased for incidence and remained unchanged for mortality (Figures 7 and 8). Among non-Hispanic Whites, African American/Blacks, and Asian/Pacific Islanders, incidence and mortality rates significantly decreased for lung and colorectal cancers. Stomach cancer incidence and mortality rates significantly decreased for non-Hispanic Whites, Hispanics, and Asian/Pacific Islanders. Among non-Hispanic Whites, incidence and mortality rates significantly decreased for non-Hodgkin lymphoma and leukemia. Hispanics were the only racial/ethnic group to experience significant decreases in both incidence and mortality rates for prostate cancer, while Asian/Pacific Islanders were the only racial/ethnic group to experience significant decreases in incidence and mortality rates for liver cancer. Prostate cancer incidence significantly declined among all racial/ethnic groups except American Indians. Breast cancer incidence significantly increased among Asian/Pacific Islanders and Hispanics. Uterine cancer incidence and mortality rates significantly increased among Hispanics, Asian/Pacific Islanders, and American Indians. Bladder cancer incidence and mortality rates significantly increased among American Indians.

FIGURE 7. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE (AAIR) AND MORTALITY (AAMR) AMONG AFRICAN AMERICAN/BLACK, NON-HISPANIC WHITE, ASIAN/PACIFIC ISLANDER, AND HISPANIC PATIENTS, CALIFORNIA, 2010-2019

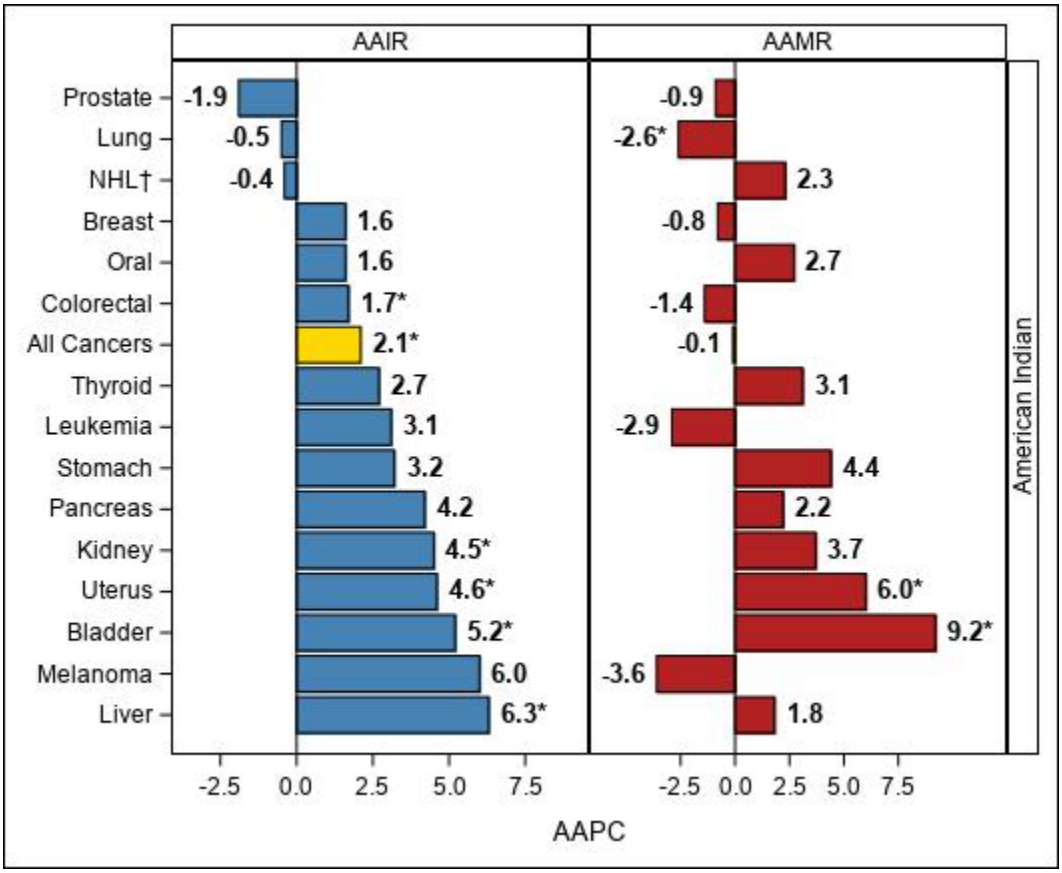


**THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT P < 0.05. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.*

AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; †NHL: NON-HODGKIN LYMPHOMA.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

FIGURE 8. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE (AAIR) AND MORTALITY (AAMR) AMONG AMERICAN INDIAN PATIENTS, CALIFORNIA, 2010-2019



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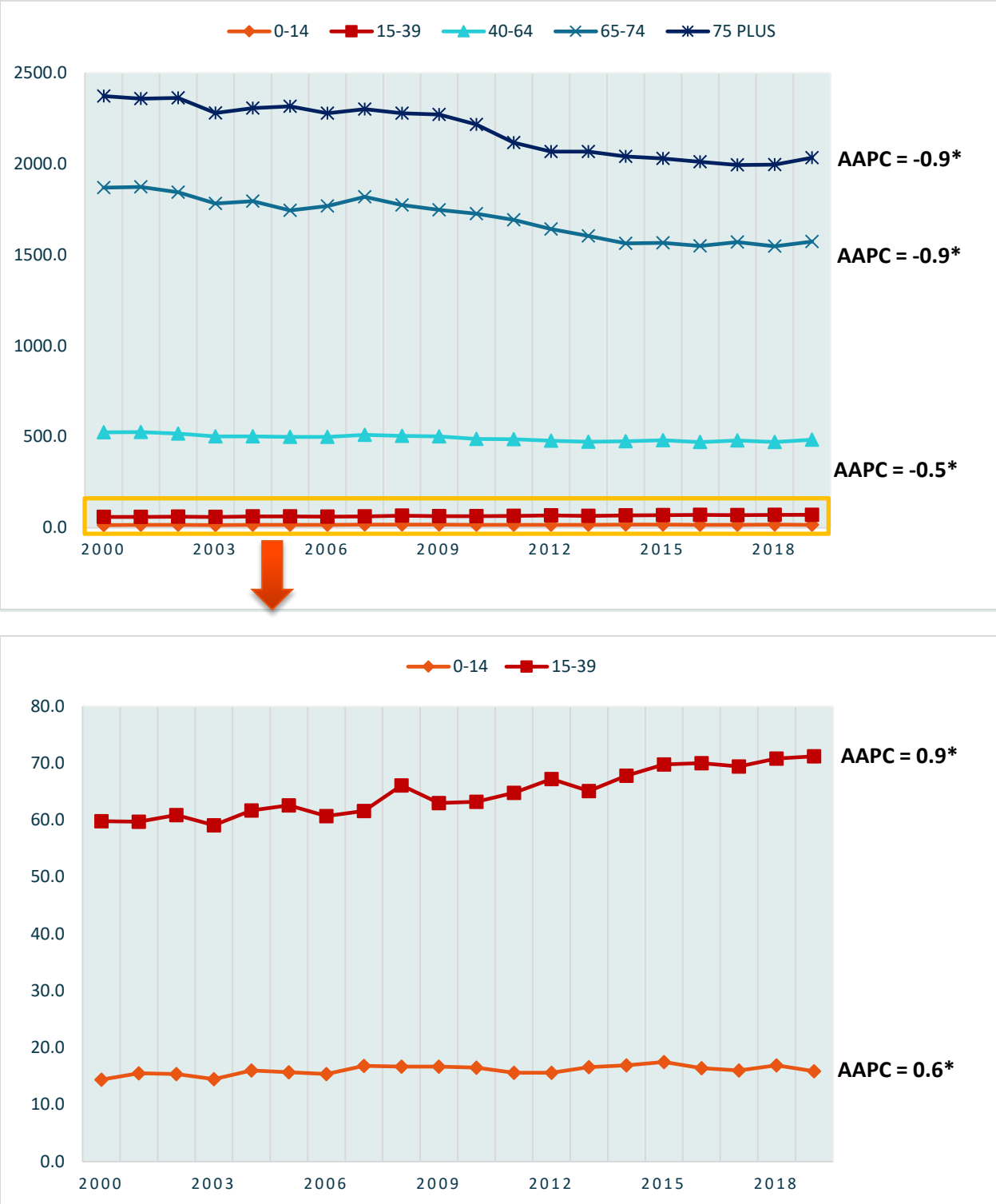
AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; †NHL: NON-HODGKIN LYMPHOMA.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

BY AGE GROUP

From 2000 to 2019, the AAIR for all malignant cancers significantly declined for all age groups except children 0 to 14 years and adolescent and young adults (AYAs) where it significantly increased (Figure 9). During the same time period, AAMR significantly decreased for all age groups (Figure 10). From 2017 to 2019, the most commonly diagnosed cancers among children were leukemias, central nervous system cancers, and lymphomas (Figure 11). The most common types of cancer death were for brain cancers, leukemias, and bone tumors.

FIGURES 9. TRENDS IN AAIR FOR ALL MALIGNANT CANCERS BY AGE GROUP, CALIFORNIA, 2000-2019

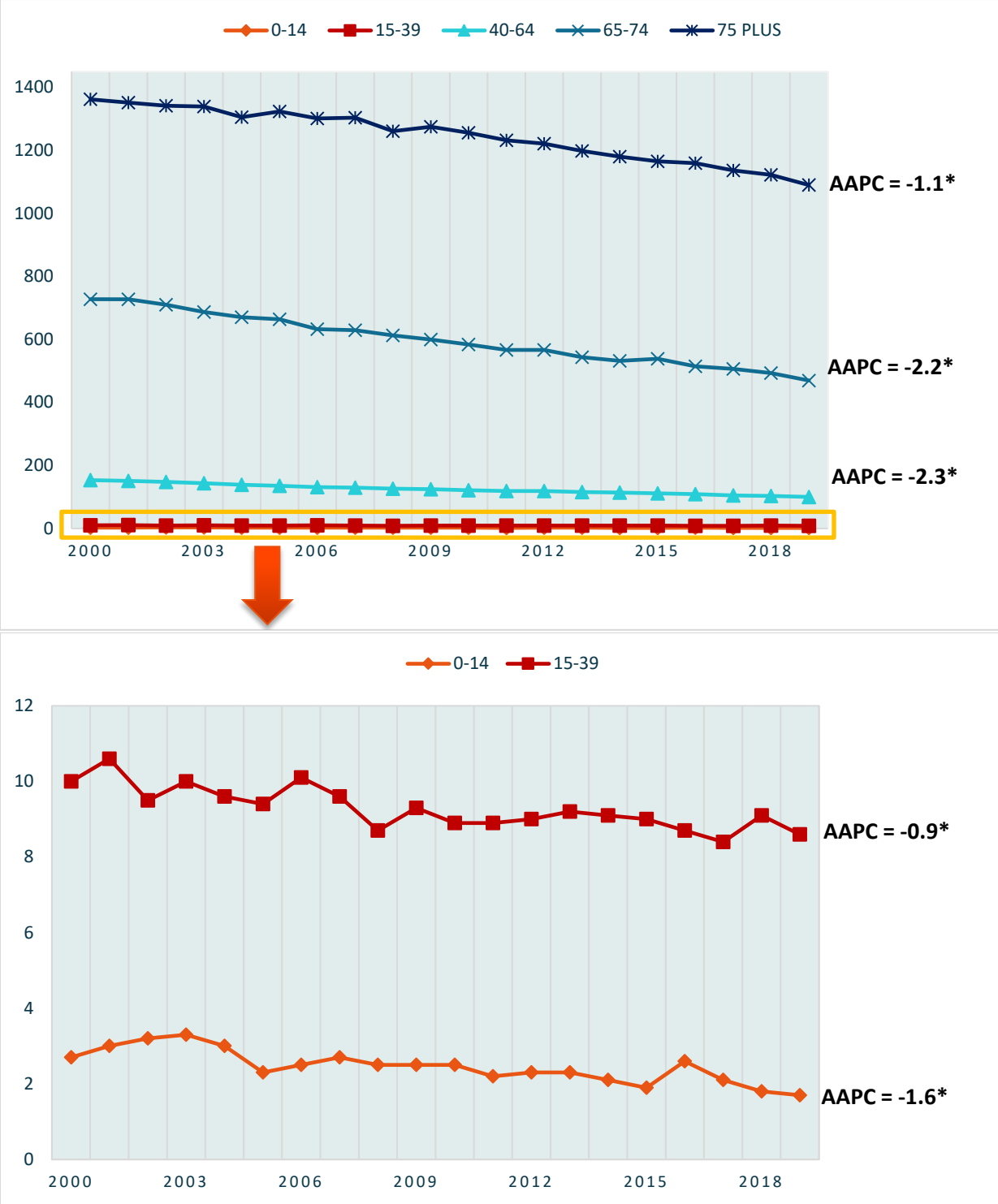


AAIR: AGE-ADJUSTED INCIDENCE RATE. RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION. AAPC: AVERAGE ANNUAL PERCENT CHANGE.

**THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT P < 0.05. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.*

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

FIGURES 10. TRENDS IN AAMR FOR ALL MALIGNANT CANCERS BY AGE GROUP, CALIFORNIA, 2000-2019

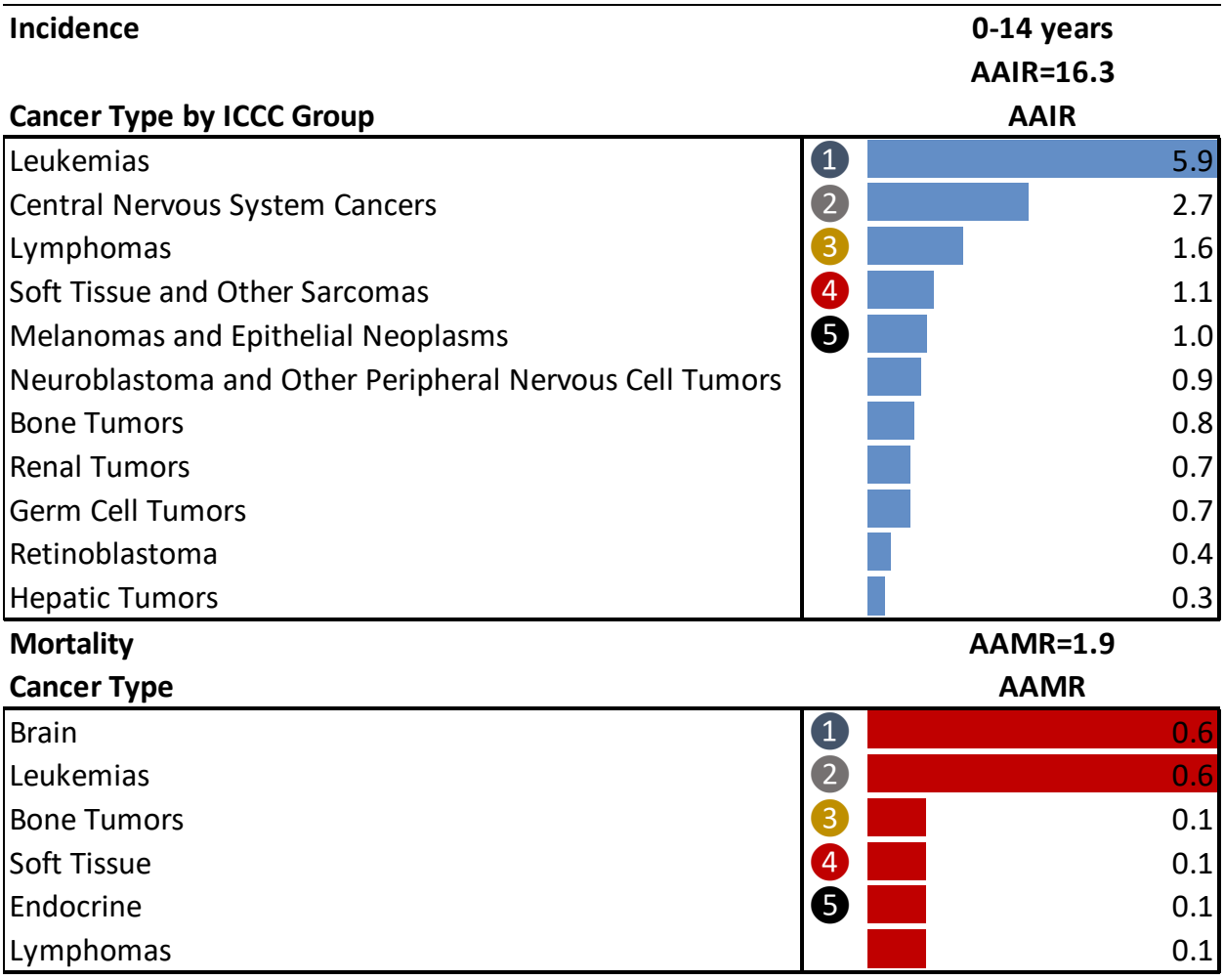


AAMR: AGE-ADJUSTED MORTALITY RATE. RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION; AAPC: AVERAGE ANNUAL PERCENT CHANGE.

**THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT P < 0.05. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.*

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

FIGURE 11. INCIDENCE AND MORTALITY RATES OF THE MOST COMMON CANCERS AMONG CHILDREN, CALIFORNIA, 2017-2019



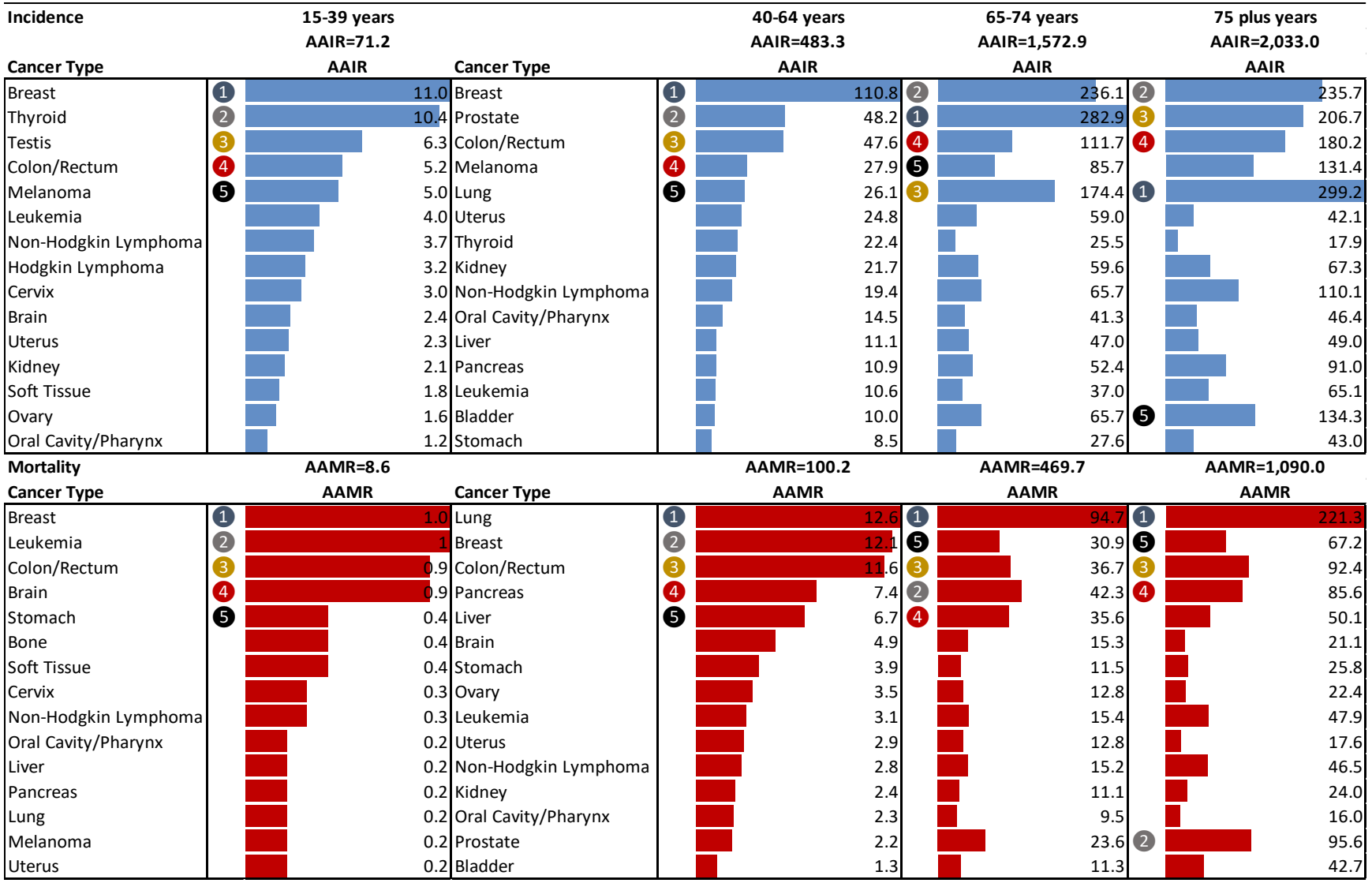
AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; RATES ARE PER 100,000 AND AGE-ADJUSTED TO THE 2000 U.S. STANDARD POPULATION.

ICCC: INTERNATIONAL CLASSIFICATION OF CHILDHOOD CANCER.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

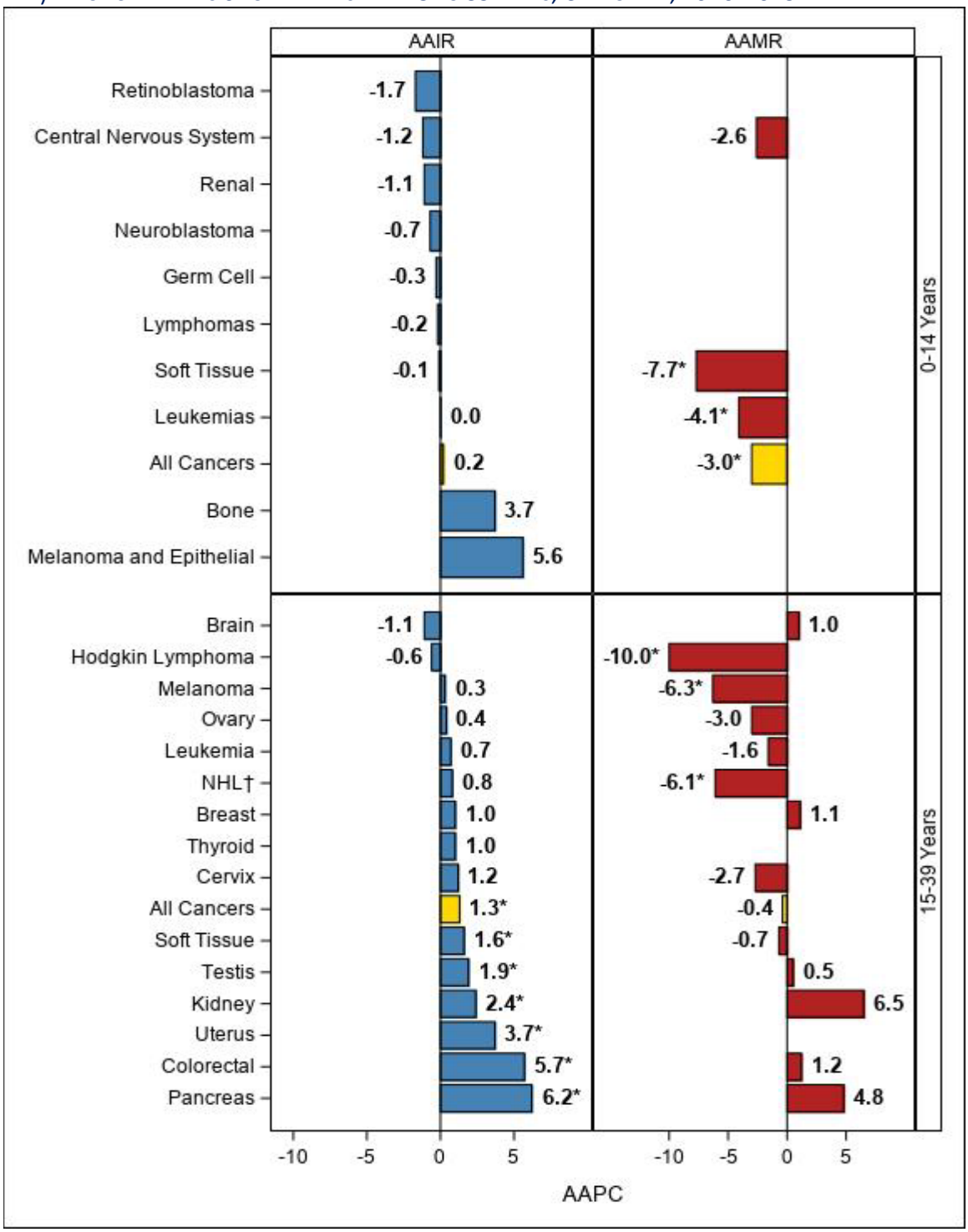
In 2019, the AAIR and AAMR were highest for those 75 years and older, followed by those ages 65 to 74, 40 to 64, and 15 to 39 (Figure 12). The most commonly diagnosed cancers and the most common types of cancer death varied by age group. Among AYAs and those ages 40 to 64 years, breast cancer had the highest AAIR. The highest AAIR for those ages 65 to 74 years was for prostate cancer and for those ages 75 years or more it was for lung cancer. For AYAs, the most common cause of cancer death was for breast cancer, while for the three other age groups, the most common cause of cancer death was for lung cancer.

FIGURE 12. INCIDENCE AND MORTALITY RATES OF THE MOST COMMON CANCERS BY AGE GROUP, CALIFORNIA, 2019



AAIR: Age-adjusted incidence rate; AAMR: Age-adjusted mortality rate; Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population. Source: California Cancer Registry, California Department of Public Health.

FIGURE 13. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE (AAIR) AND MORTALITY (AAMR) AMONG PATIENTS 0 TO 14 YEARS AND 15 TO 39 YEARS, CALIFORNIA, 2010-2019

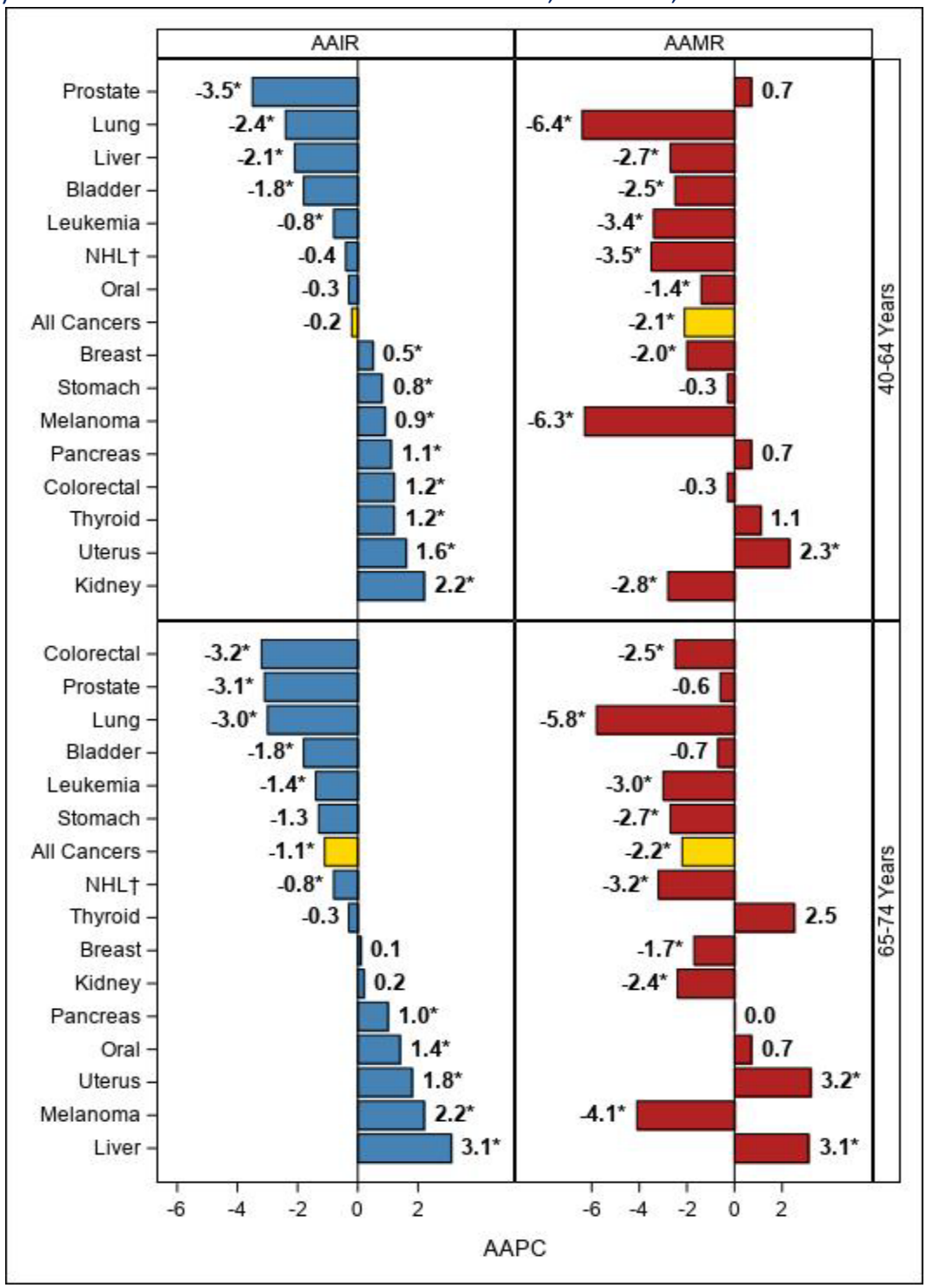


*THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT $P < 0.05$. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.

AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; †NHL: NON-HODGKIN LYMPHOMA.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

FIGURE 14. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE (AAIR) AND MORTALITY (AAMR) AMONG PATIENTS 40 TO 64 YEARS AND 65 TO 74 YEARS, CALIFORNIA, 2010-2019

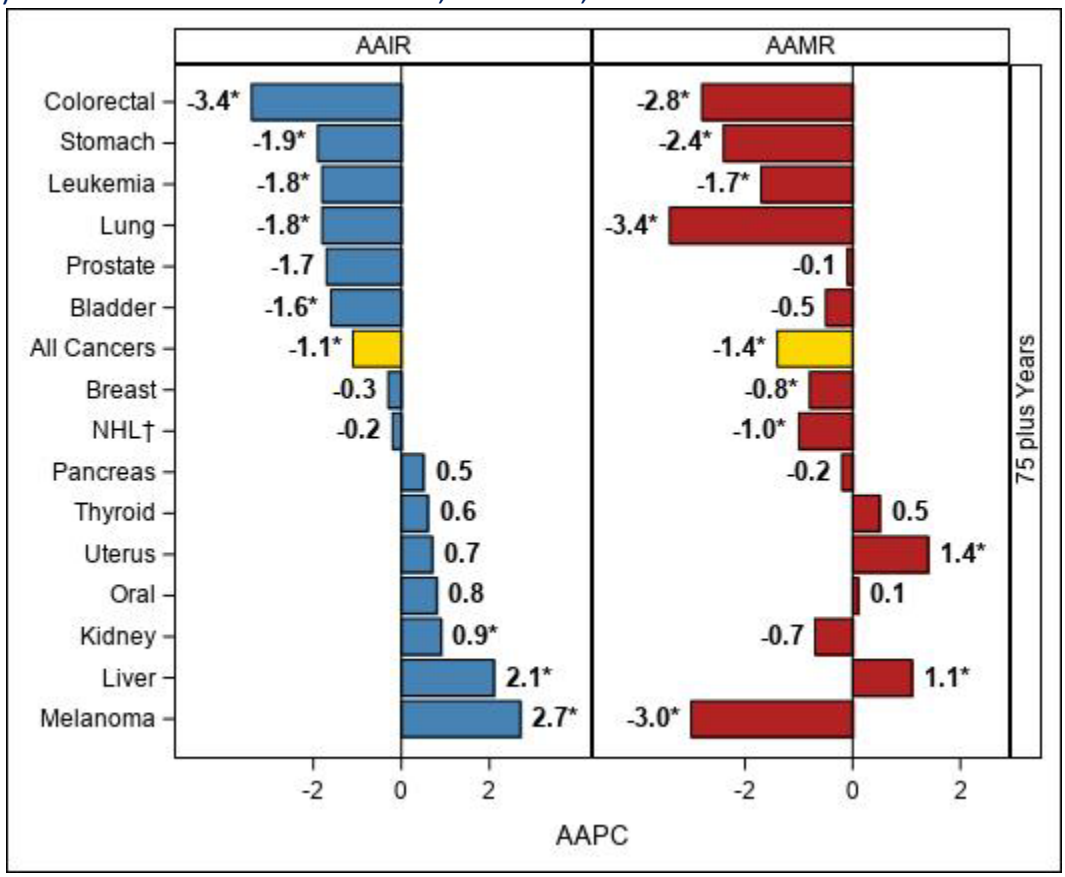


**THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT P < 0.05. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.*

AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; †NHL: NON-HODGKIN LYMPHOMA.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH.

FIGURE 15. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN CANCER INCIDENCE (AAIR) AND MORTALITY (AAMR) AMONG PATIENTS 75 YEARS AND OVER, CALIFORNIA, 2010-2019



**THE AAPC IS SIGNIFICANTLY DIFFERENT FROM ZERO AT P < 0.05. A NEGATIVE AAPC MEANS RATES ARE DECREASING, A POSITIVE NUMBER MEANS RATES ARE INCREASING.*

AAIR: AGE-ADJUSTED INCIDENCE RATE; AAMR: AGE-ADJUSTED MORTALITY RATE; †NHL: NON-HODGKIN LYMPHOMA.

SOURCE: CALIFORNIA CANCER REGISTRY, CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

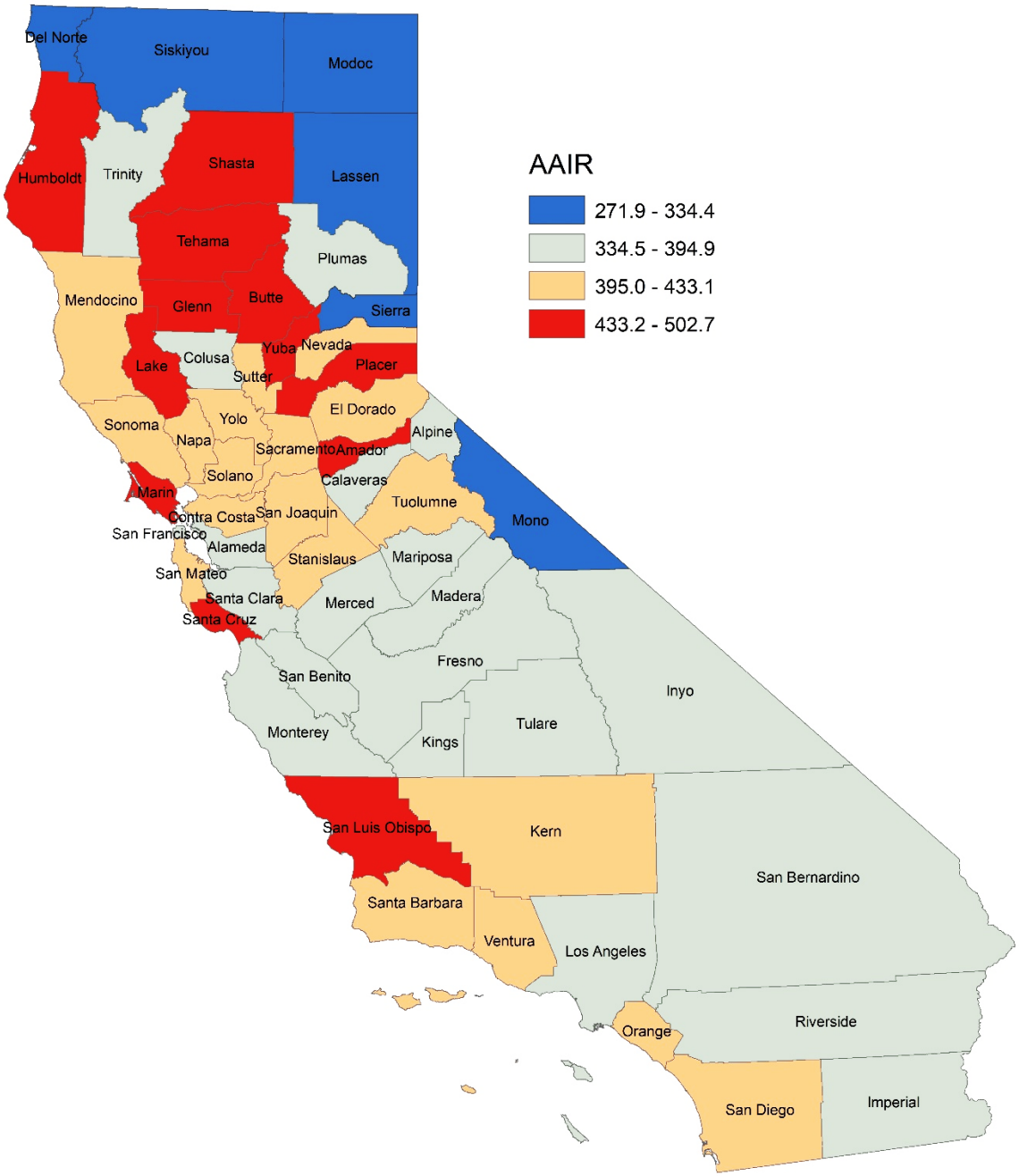
From 2010 to 2019, overall cancer incidence and mortality rates significantly decreased only for those 65 years and older (Figures 13, 14 and 15). For children and those 40 to 64 years, overall cancer mortality rates significantly decreased, but overall cancer incidence rates remained stable. For AYAs, overall cancer incidence rates significantly increased while overall cancer mortality rates remained stable. Among children, incidence rates did not significantly change for any sites, but mortality rates significantly decreased for soft tissue sarcomas and leukemias. Among AYAs, incidence rates significantly increased for cancers of soft tissues, testis, kidney, uterus, colon and rectum, and pancreas. Among those 40 years and older, incidence and mortality rates significantly decreased for lung cancer and leukemia. Incidence and mortality rates significantly decreased for colorectal cancer among those 65 years and older, while among AYAs and those 40 to 64 years, incidence rates significantly increased. Incidence and mortality rates of liver cancer significantly decreased for those 40 to 64 years, while they

significantly increased for those 65 years and older. Prostate cancer incidence rates significantly decreased for those ages 40 to 74 years and breast cancer incidence rates significantly increased for those 40 to 64 years, while breast cancer mortality rates significantly decreased for those 40 years and over. Uterine cancer incidence and mortality rates significantly increased for AYAs and those ages 40 to 74 and for those 75 years and older, mortality rates significantly increased.

BY COUNTY

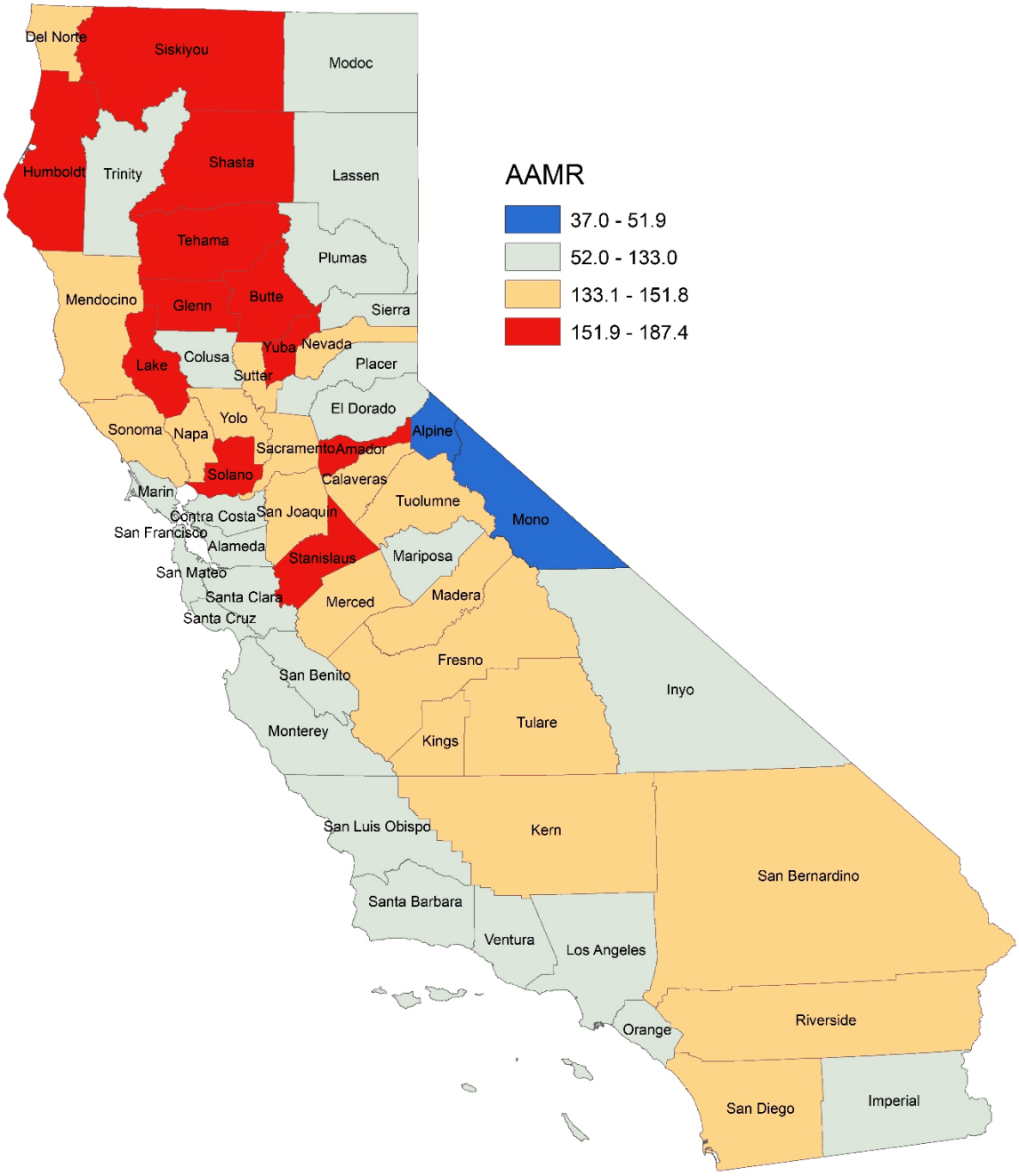
The AAIR and AAMR varied by county. From 2017 to 2019, the counties with the highest AAIR and AAMR for all cancers combined were mostly in the northern part of the state and included Humboldt, Shasta, Tehama, Glenn, Butte, Lake, and Amador counties (Figures 16 and 17). Marin, Santa Cruz, San Luis Obispo, and Placer counties had high AAIRs but low AAMRs while Del Norte and Siskiyou counties had low AAIRs but high AAMRs. From 2010 to 2019, 14 counties had significantly decreasing cancer incidence rates, while 28 counties had significantly decreasing mortality rates (Figures 18 and 19). One county, Yuba, had significantly increasing cancer incidence rates, while no counties had significantly increasing mortality rates.

FIGURE 16. AGE-ADJUSTED INCIDENCE RATE (AAIR) OF ALL MALIGNANT CANCERS BY COUNTY, CALIFORNIA, 2017-2019



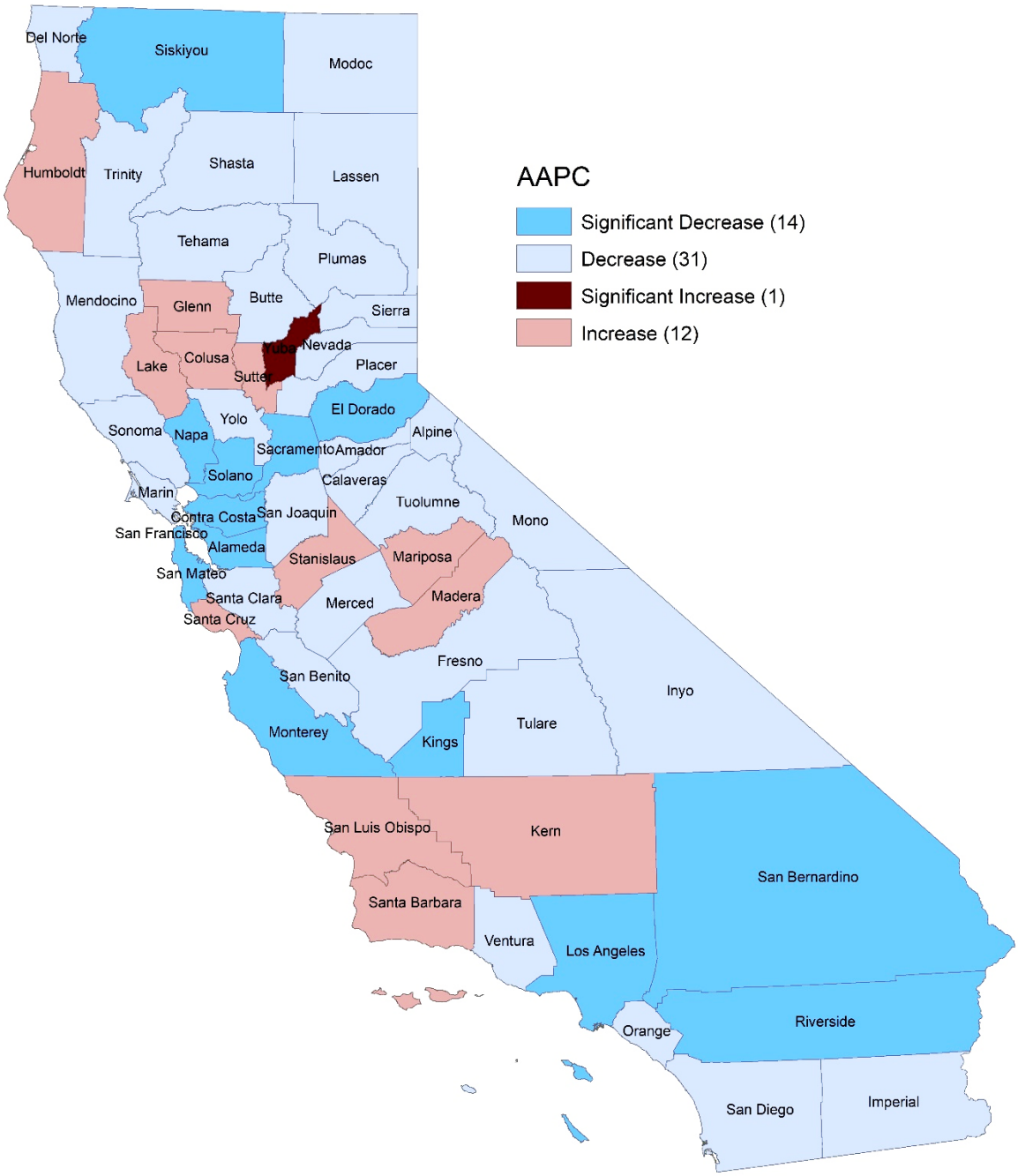
Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population
Source: California Cancer Registry, California Department of Public Health

FIGURE 17. AGE-ADJUSTED MORTALITY RATE (AAMR) OF ALL MALIGNANT CANCERS BY COUNTY, CALIFORNIA, 2017-2019



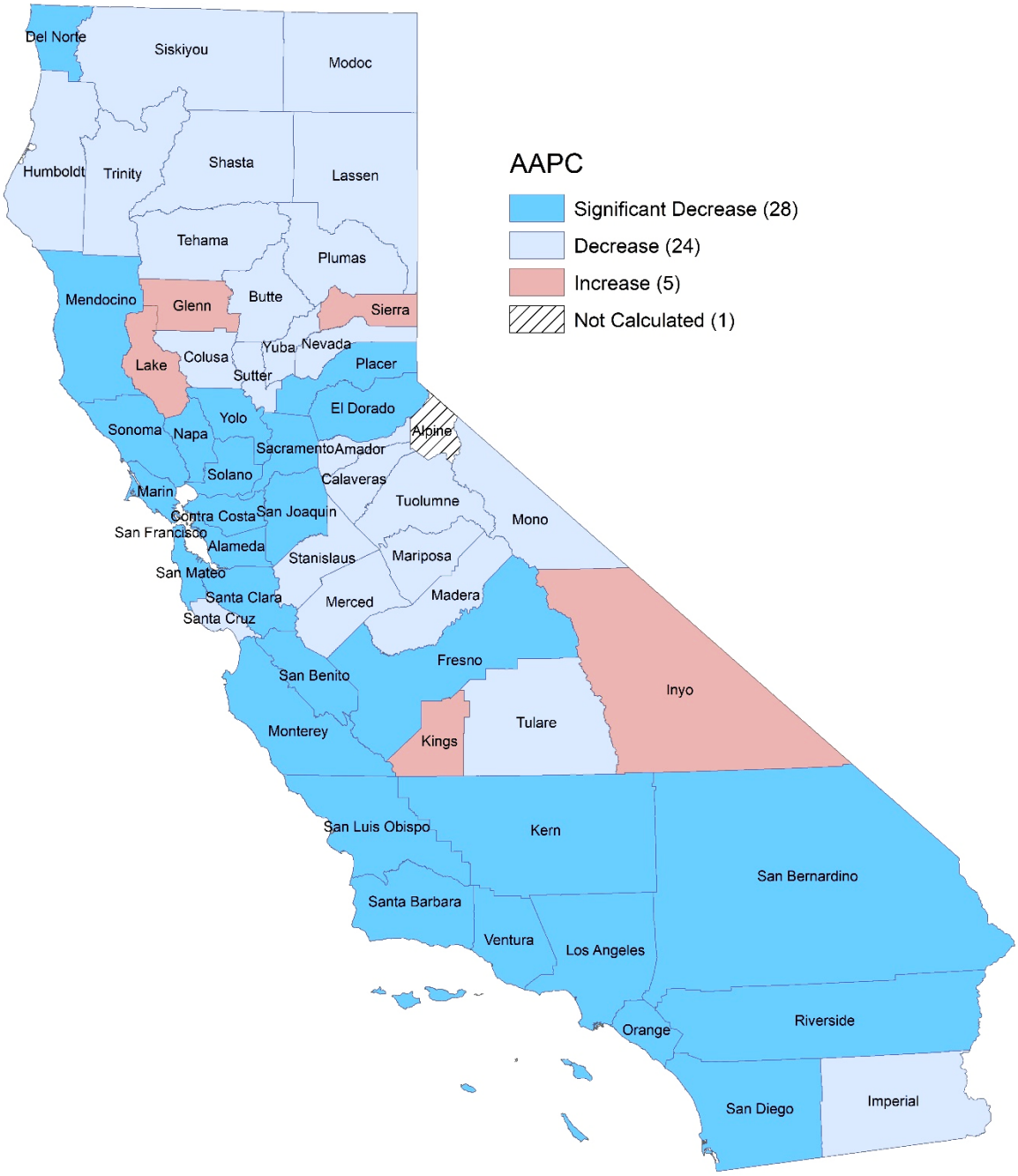
Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population
Source: California Cancer Registry, California Department of Public Health

FIGURE 18. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN AGE ADJUSTED INCIDENCE RATES FOR ALL MALIGNANT CANCERS BY COUNTY, CALIFORNIA, 2010-2019



Significant changes mean the AAPC is significantly different from zero at $p < 0.05$.
A significant decrease in AAPC means rates are decreasing,
a significant increase in AAPC means rates are increasing.
Source: California Cancer Registry, California Department of Public Health

FIGURE 19. AVERAGE ANNUAL PERCENT CHANGE (AAPC) IN AGE ADJUSTED MORTALITY RATES FOR ALL MALIGNANT CANCERS BY COUNTY, CALIFORNIA, 2010-2019



Significant changes mean the AAPC is significantly different from zero at $p < 0.05$.
A significant decrease in AAPC means rates are decreasing,
a significant increase in AAPC means rates are increasing.
AAPC not calculated for Alpine county because of low counts.
Source: California Cancer Registry, California Department of Public Health

CHAPTER 2. SCREEN-DETECTABLE CANCERS

Stage at diagnosis is one of the strongest predictors of survival. Cancers detected at an early stage have a greater potential to be cured. Screening tests which allow for the possibility of early detection are available for seven cancers including oral, colorectal, lung, melanoma, female breast, cervical, and prostate.

A large proportion of lung (68 percent), oral (63 percent), colorectal (56 percent), and cervical (51 percent) cancers were diagnosed at regional and distant stage (Figures 20 A, B, C, F). On the other hand, melanoma (73 percent), prostate (65 percent), and female breast (64 percent) each had a larger proportion of cases diagnosed at localized stage than at regional and distant stages (Figures 20 D, E, G).

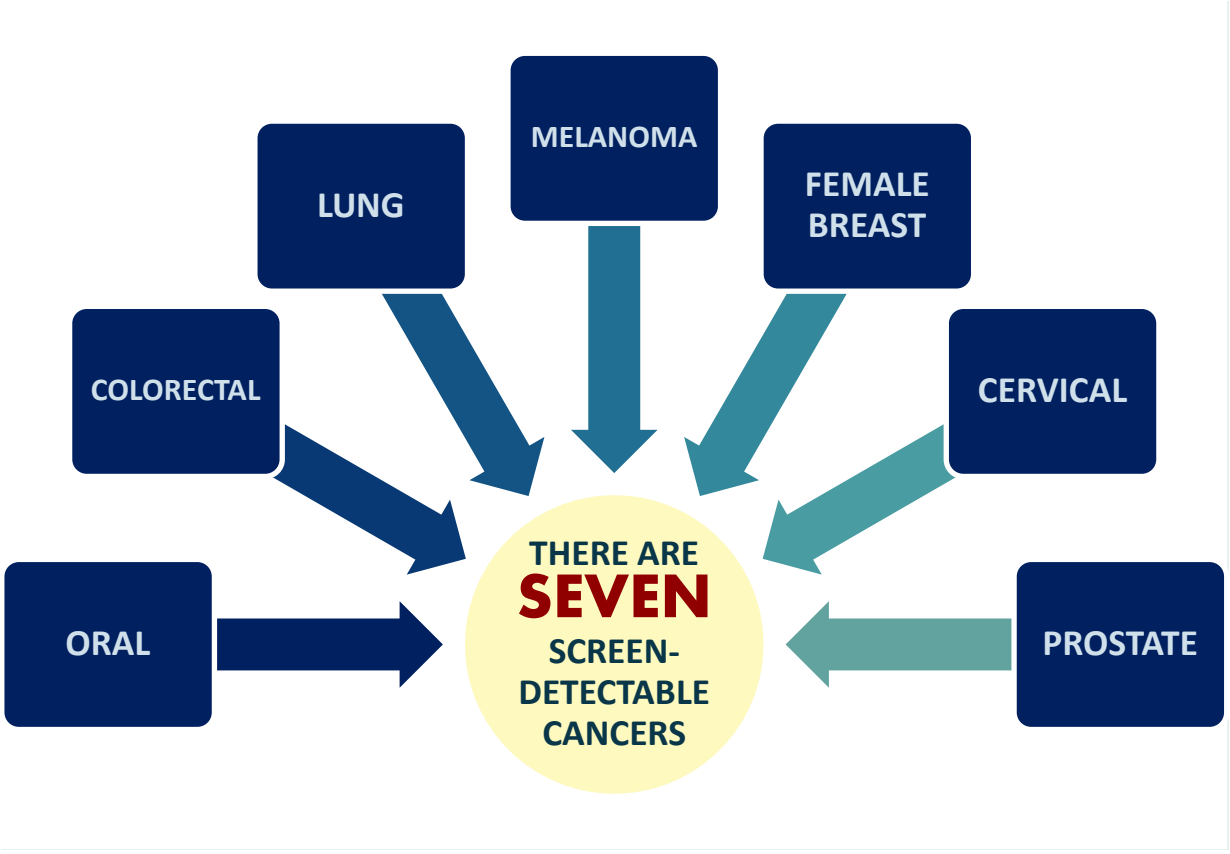
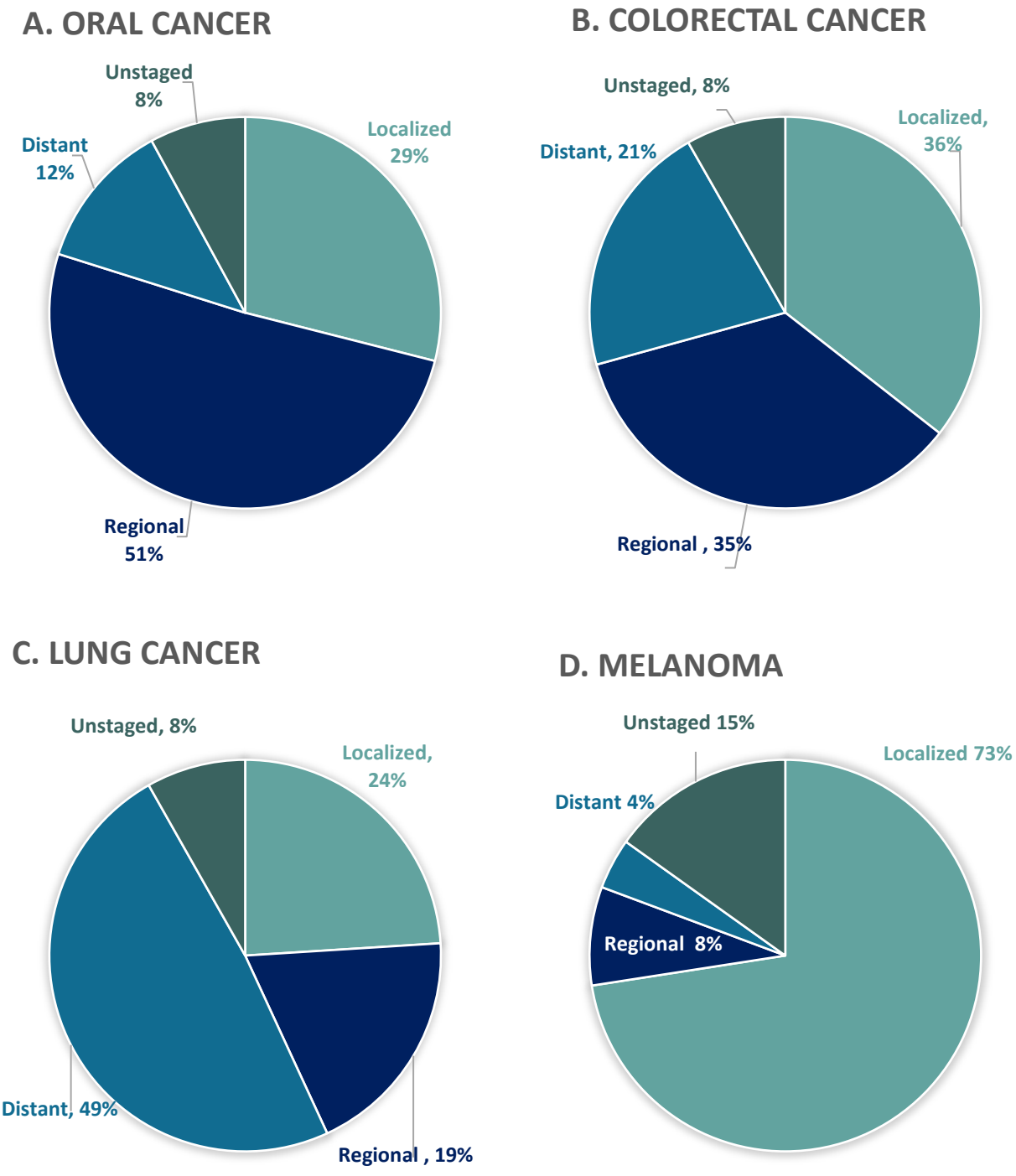
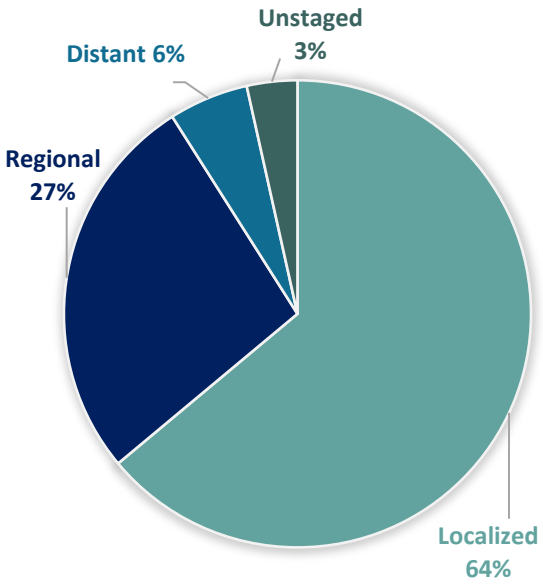


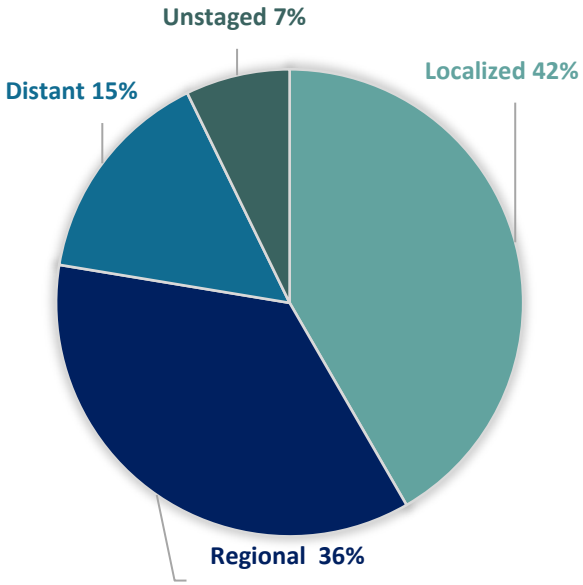
FIGURE 20 A-G. PERCENT OF CANCER BY STAGE AT DIAGNOSIS FOR SCREEN DETECTABLE CANCERS, CALIFORNIA, 2015-2019



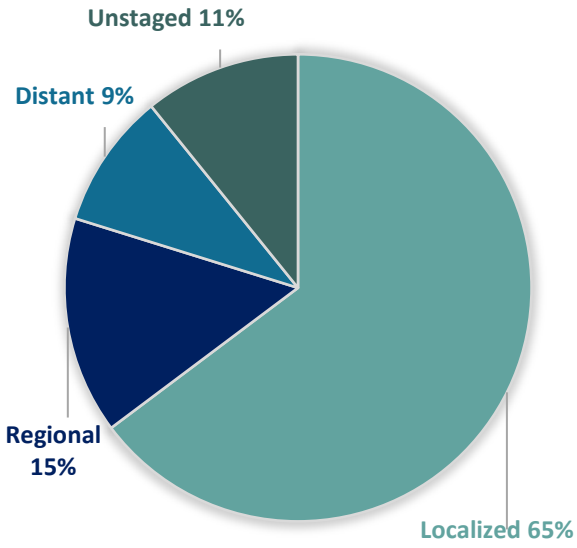
E. FEMALE BREAST



F. CERVICAL CANCER



G. PROSTATE CANCER



The proportion of screen detectable cancers diagnosed late stage (regional or distant stages) varied by neighborhood socioeconomic status (SES), sex, race/ethnicity, and rural/urban residence (Figure 21). Melanoma showed the greatest variability in late-stage diagnoses by demographic characteristics. Compared to non-Hispanic White patients, two to three times the proportion of Black/African American, Asian/Pacific Islander and Hispanic patients were diagnosed late-stage. Male patients and those residing in lower SES neighborhoods had higher proportions of late-stage melanoma diagnoses. Women residing in low SES neighborhoods or of Black/African American, Hispanic, or American Indian race/ethnicity had higher proportions of late-stage breast cancer. Women residing in low SES neighborhoods or of Black/African American race/ethnicity had higher proportions of late-stage cervical cancer. More men and those residing in low SES neighborhoods were diagnosed late-stage for lung and oral cancers. For lung cancer, more Black/African American, Hispanic, and Asian/Pacific Islander patients were diagnosed late-stage while for oral cancer, more Black/African American and American Indian patients were diagnosed late-stage. Rural/urban residence showed nearly identical proportions of late-stage diagnoses for most cancer sites, except for lung and cervical cancers where slightly more rural patients were diagnosed late-stage.

FIGURE 21. PERCENT OF SCREEN DETECTABLE CANCERS DIAGNOSED LATE STAGE BY SOCIOECONOMIC (SES) TERTILE, SEX, RACE/ETHNICITY, AND RURAL/URBAN RESIDENCE, CALIFORNIA, 2015-2019, N=485,809

SES Tertile	Oral	Colorectal	Lung	Melanoma	Breast	Cervical	Prostate
Lowest SES Tertile	64.9	57.0	69.6	17.1	36.9	53.1	24.9
Middle SES Tertile	63.0	56.2	67.8	13.5	33.0	52.3	24.4
Highest SES Tertile	61.9	55.5	66.2	10.2	28.7	46.2	24.2
Sex							
Men	68.1	56.7	70.2	13.6			24.4
Women	51.0	55.7	65.4	10.4	32.6	51.1	
Race/Ethnicity							
NH White	63.8	56.6	66.2	12.5	30.0	51.7	26.2
Black/African American	70.9	56.4	71.6	33.1	38.9	59.9	25.6
Hispanic	63.0	57.4	70.4	24.5	38.1	50.7	25.3
Asian/Pacific Islander	62.3	57.0	72.0	34.6	32.9	51.7	26.3
American Indian	70.1	56.9	68.2	18.8	37.1	49.2	24.3
Rural/Urban Residence							
Urban	63.1	56.1	67.5	12.3	32.6	50.7	24.3
Rural	63.2	56.8	69.4	12.7	32.7	53.8	25.0

LATE STAGE INCLUDES REGIONAL AND DISTANT STAGES.

CONCLUSION

Findings from this report indicate that cancer incidence and mortality vary by sex, race/ethnicity, age group, and county. In addition, although incidence and mortality rates are decreasing overall in California, they are not decreasing for all groups.

- While men have experienced significant decreases in incidence and mortality, women have only experienced decreases in mortality with incidence remaining unchanged. This may be driven by significant increases in breast cancer incidence. Also, for women, incidence and mortality of cervical cancer, a screen detectable cancer for which a vaccine exists, have remained unchanged.
- American Indians did not experience the same improvements in cancer incidence and mortality as other racial/ethnic groups. In particular, overall cancer incidence increased, overall cancer mortality did not decrease, and lung and prostate cancer incidence did not decrease.
- Racial/ethnic differences in cancer incidence trends existed for specific cancer types. Uterine cancer incidence increased among all racial/ethnic groups, except non-Hispanic Whites, and breast cancer incidence increased among Asian/Pacific Islanders and Hispanics.
- By age group, children and AYAs were the only age groups where cancer incidence increased.
- Colorectal cancer incidence increased among AYAs and those 40 to 64 years, breast cancer incidence increased among those 40 to 64 years and uterine cancer increased among those ages 15 to 74 years.
- Counties in the northern part of the state had the highest cancer incidence and mortality rates.
- Californians residing in low SES neighborhoods had greater proportions of late-stage diagnoses for screen detectable cancers, including oral, lung, melanoma, breast, and cervical cancers.

This report identified various groups where incidence, mortality, or both were increasing. Why they are increasing in certain groups is beyond the scope of this report, but these findings indicate that more research needs to be done in the groups identified to better understand these trends. The following important strategies can potentially reduce the burden of cancer in California:

- Reducing modifiable risk factors for cancer[1,2] (See Box)
- Increase HPV and hepatitis B vaccine use
- Increasing adherence to cancer screening guidelines
- Ensuring that all populations receive timely and guideline concordant care after a cancer diagnosis

MODIFIABLE RISK FACTORS FOR CANCER


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


INFECTION WITH SOME PATHOGENS

HUMAN PAPILLOMAVIRUS (HPV)
HUMAN IMMUNODEFICIENCY VIRUS (HIV)
HEPATITIS B AND C
HELICOBACTER PYLORI

Some programs that help low-income individuals obtain cancer screening include the following:

- Every Woman Counts provides free breast and cervical cancer screening to California's underserved populations. https://www.dhcs.ca.gov/services/Cancer/ewc/Pages/default.aspx
- The Colorectal Cancer Alliance provided financial assistance for colorectal cancer screening. https://www.ccalliance.org/patient-family-support/financial-assistance-programs
- Federally Qualified Health Centers are safety net providers in rural areas that help those needing financial assistance with their health and preventive care. https://www.ruralhealthinfo.org/topics/federally-qualified-health-centers
- Local health departments provide free or low-cost cancer screenings to individuals with limited income. https://www.cdc.gov/publichealthgateway/healthdirectories/index.html

Additional cancer rate information for individual counties and regions can be found at the following: 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, 2019 reported to CCR as of December 2021. 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. 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.

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.[3]

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.[4]

STATISTICAL SIGNIFICANCE

The statistical significance of AAPCs was determined using Joinpoint software. AAPCs were considered significantly different from 0 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.[5]

FIGURES

Figures were created using Excel, SAS 9.4, and ArcGIS version 10.7.1.

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4. Joinpoint Regression Program, Version 4.9.1.0 – March 2021; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute.
5. North American Association of Central Cancer Registries. NAACCR Hispanic and Asian/Pacific Islander Identification Algorithm (NHAPIIA). https://www.naaccr.org/analysis-and-data-improvement-tools/#NHAPIIA Published 2019. Accessed June 2, 2022.