University of California
San Francisco

Greater Bay Area
CANCER REGISTRY

The Greater Bay Area Cancer Registry
Incidence and Mortality Annual Review, 1988-2016

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Version 6/21/2019

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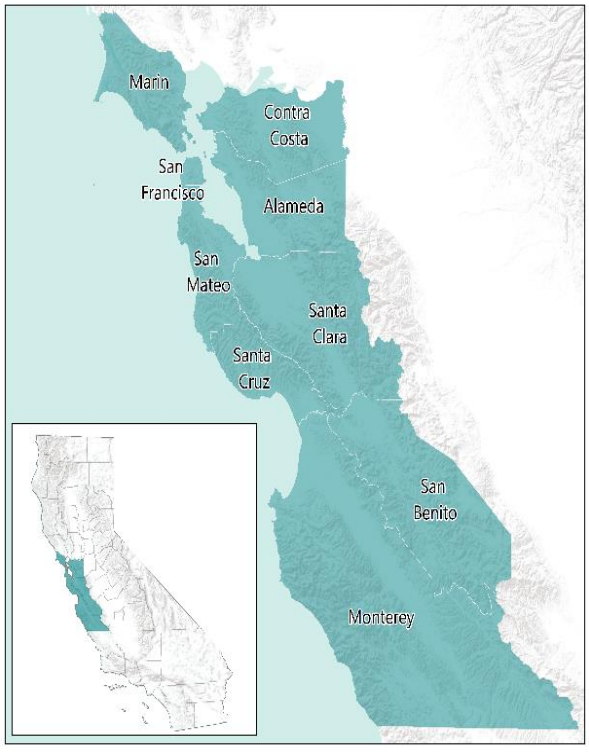
This report highlights the most current cancer statistics for the Greater Bay Area in California and includes data on new cases of cancer and cancer deaths for the 29-year period from 1988 through 2016. The report focuses on the incidence and mortality of invasive cancers[1] and examines trends, highlighting the latest available data from 2012-2016 for the nine Greater Bay Area counties and racial/ethnic groups. For cancer sites of the breast, skin, and colon/rectum, incidence rates are also provided for *in situ* tumors[2]. Because cancers vary considerably by age, all incidence and mortality rates have been age-adjusted to the 2000 U.S. Standard Population to allow for the comparison of rates across groups, without the confounding effects of age. Please refer to the **Appendix** at the end of this report for definitions of the technical terms used throughout this report.

As part of the California Cancer Registry, the Greater Bay Area Cancer Registry, operated by the University of California at San Francisco (UCSF), collects information on all newly diagnosed cancers occurring in residents of nine Greater Bay Area counties: Alameda, Contra Costa, Marin, Monterey, San Benito, San Francisco, San Mateo, Santa Clara, and Santa Cruz. Statewide cancer reporting in California began in 1988. At present, the most recent year of complete case ascertainment and follow-up for deaths is 2016 [1, 2]. Cancer rates from the entire state (including the Greater Bay Area) are also included for comparison of rates in the Greater Bay Area. California mortality rates are calculated from vital status data obtained from the California Department of Public Health, Center for Health Statistics (www.cdph.ca.gov).

More information about the Greater Bay Area Cancer Registry can be found on our website at www.cancerregistry.ucsf.edu. Furthermore, cancer statistics for the Greater Bay Area region are also available upon request by emailing GBACR@ucsf.edu. Customizable cancer statistics for all counties in California are available from the California Cancer Registry's interactive cancer incidence and mortality mapping tool www.cancer-rates.info/ca/. This website allows users to create and view custom tables and maps of the most current cancer incidence and mortality data by cancer site, year of diagnosis, sex, race/ethnicity, and county.

Nine Counties included in the Greater Bay Area Cancer Registry



[1] Tumors that have invaded surrounding tissue or other parts of the body.

[2] Tumors that stay in the site of origin and do not invade neighboring tissues or other parts of the body.

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I. TRENDS IN INVASIVE CANCER INCIDENCE AND MORTALITY IN THE GREATER BAY AREA

Cancer incidence and mortality have decreased significantly during the 29-year period from 1988 through 2016 in the Greater Bay Area. For each cancer site, there are notable differences by sex and race/ethnicity, but overall, there are promising patterns of decreasing incidence and mortality for most sites. The remainder of this report focuses on sex- and race/ethnicity-specific cancer rates and trends, although some of the most compelling trends are evident when looking at the combined population. Since 1988, the incidence and mortality rates of cancer (calculated as number of new cases and deaths per 100,000 individuals, respectively) have greatly decreased in the Greater Bay Area, with distinct declines seen in the latest 10-year period of available data from 2007 through 2016 **(Figures 1-4)**.

Incidence

Decreasing incidence of many cancers, as evident from the average annual percent changes provided for males and females, is due in part to changes in cancer screening and the reduction in smoking prevalence. For all invasive cancers combined, the average annual percent change in males from 1988 through 2016 was -1.2%, and for females was -0.4%.

In the past 10 years alone (2007-2016), cancer incidence rates declined for several cancers including colorectal (males: -3.4% per year, females: -3.9% per year), lung (males: -3.2%, females: -2.6%), bladder (males: -2.2%, females: -2.4%), and stomach cancers (males: -1.6%, -1.9%). Additionally, males experienced significant average annual decreases in the incidence of prostate cancer (-7.6%), which may be attributable to changes in prostate cancer screening guidelines that increasingly limit the ages of males recommended for routine screening by prostate-specific antigen or PSA. Only thyroid cancer (4.3%) and malignant melanoma (3.2%) increased significantly on an annual basis during this period among males **(Figure 1)**. For females, annual incidence rates increased significantly for thyroid (2.1%), malignant melanoma (2.7%), and uterine cancers (1.6%) **(Figure 2)**.

Mortality

Cancer mortality rates for the Greater Bay Area have also declined since 1988, by an average annual percent of -2% for males, and -1.6% for females. During the most recent 10-year period, mortality declined by an average of -2.0% per year in males, and -2.1% in females. More specifically, cancer mortality rates declined for several of the most common cancers such as lung cancer (males: -4.0% per year, females: -3.4% per year), colorectal cancer (males: -3.6%, females: -3.3%), and Non-Hodgkin lymphoma (males: -3.8%, females: -3.7%) **(Figures 3, 4)**. Males experienced significant declines in mortality rates of prostate cancer (-2.0%), while females experienced significant declines in mortality rates of melanoma (-6.8%), oral cavity/ pharynx cancer (-2.8%), bladder cancer (-2.7%), and breast cancer (-2.5%). The only mortality rate with a significant increase for females was uterine cancer (3.3%), and there were no significantly increased mortality rates for males for any cancer from 2007 through 2016.

Note: In Figures 1-4, solid bars indicate a statistically significant increase or decrease in Average Annual Percent Change (AAPC) from 2007 to 2016. Hatched bars indicate a non-statistically significant increase or decrease.

Figure 1: Average Annual Percent Change of Invasive Cancer Incidence Rates among Males in the Greater Bay Area, 2007-2016

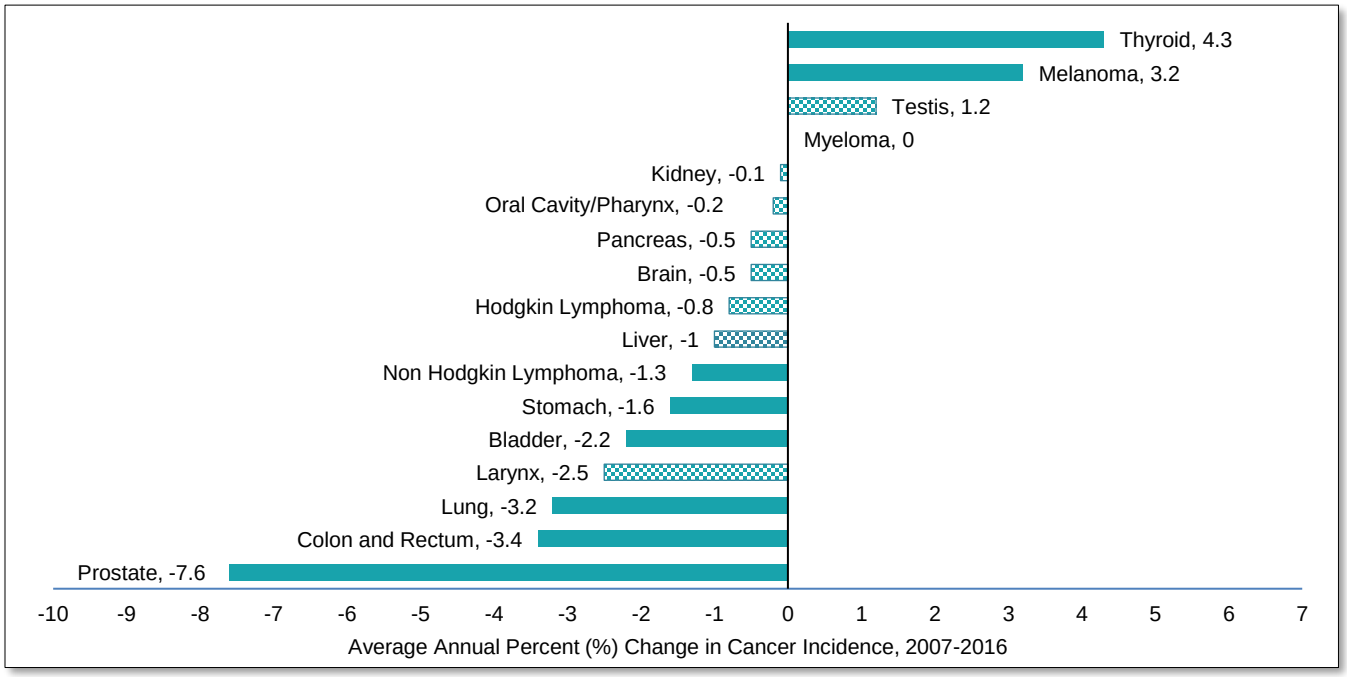


Figure 2: Average Annual Percent Change of Invasive Cancer Incidence Rates among Females in the Greater Bay Area, 2007-2016

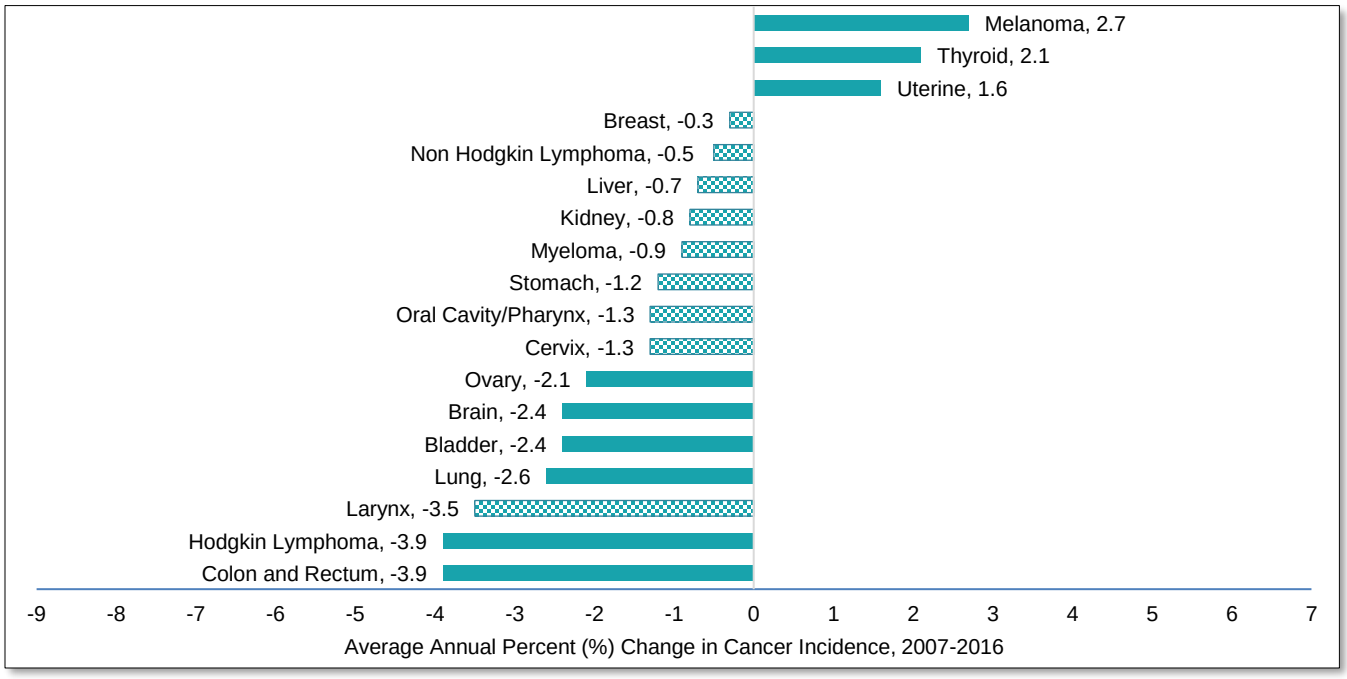


Figure 3: Average Annual Percent Change of Cancer Mortality Rates among Males in the Greater Bay Area, 2007-2016

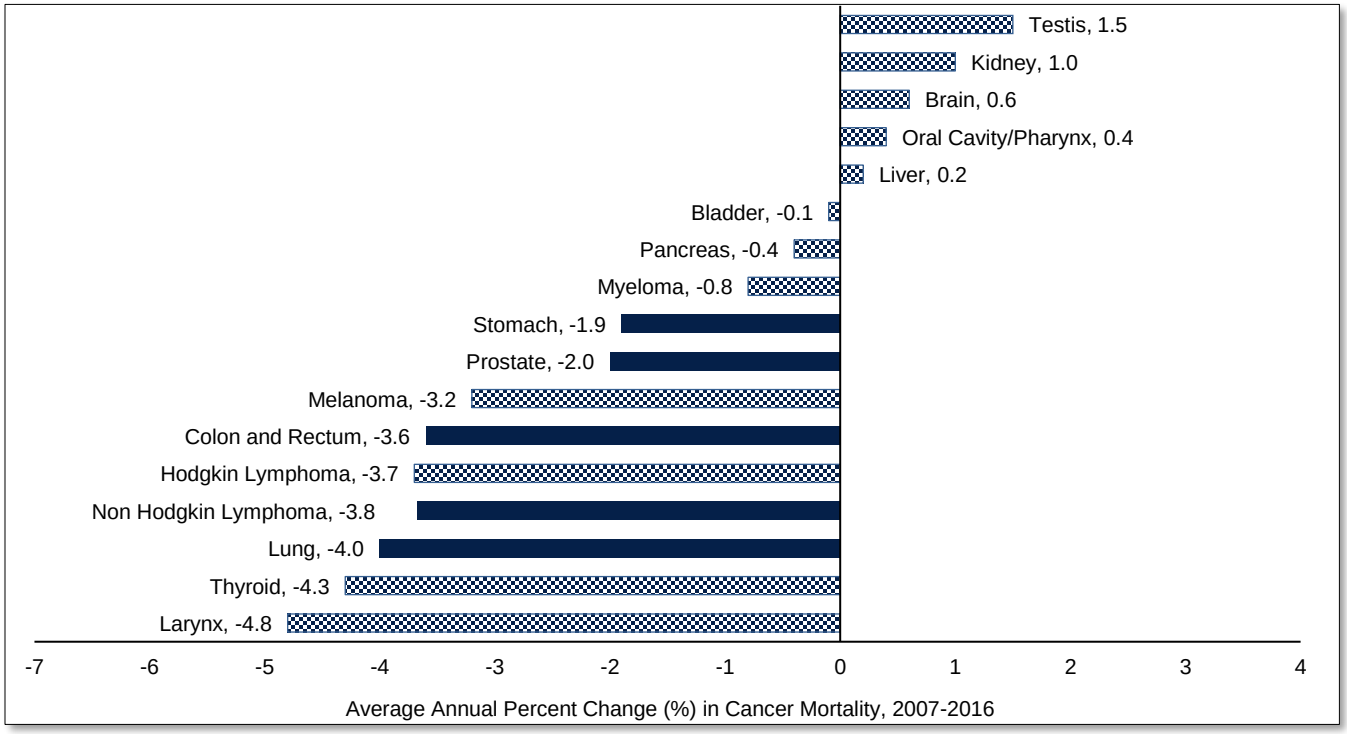
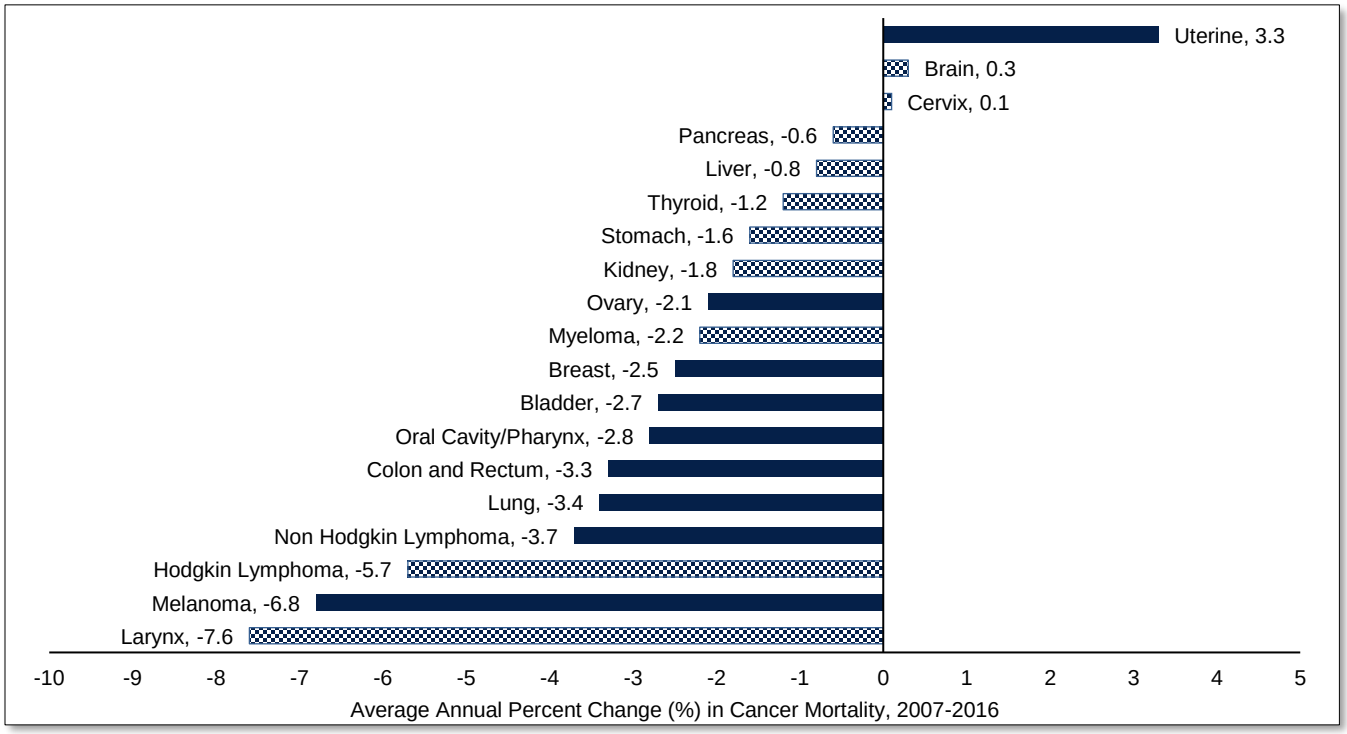


Figure 4: Average Annual Percent Change of Cancer Mortality Rates among Females in the Greater Bay Area, 2007-2016



II. ALL INVASIVE CANCERS IN THE GREATER BAY AREA, 1988-2016

Overall Invasive Cancer Incidence Rates

From 1988 through 2016, incidence rates of all invasive cancers (i.e., rate of newly diagnosed cancers of any site) declined substantially in the Greater Bay Area **(Figure 5)**. Invasive cancers are those determined by a pathologist to have spread beyond the tissue of origin and invaded the surrounding tissue (i.e., not *in situ* or benign cancers). The annual percent decrease in incidence rates from 2012 through 2016 was substantially greater for males than females (-1.2% vs. -0.4% per year, respectively), driven largely by declines in the incidence rates of smoking-related cancers and prostate cancer in males. During the recent 5-year period of 2012-2016, 159,715 new cases of invasive cancer were diagnosed in the Greater Bay Area. In 2016 alone, 32,254 new cases of cancer were diagnosed.

The five most common invasive cancers—breast, prostate, lung and bronchus, colorectal, and melanoma—accounted for over half (53.1%) of all newly diagnosed cancers. The incidence rate of all invasive cancers from 2012-2016 was higher in males (432.2 per 100,000) than in females (383.8 per 100,000) **(Table 1)**. Among males in the Greater Bay Area, non-Hispanic (NH) Blacks (517.4 per 100,000) had the highest incidence rate while Asians/Pacific Islanders (312.7 per 100,000) had the lowest incidence rate. Among females, NH Whites had the highest incidence rate (431.0 per 100,000) and Asians/Pacific Islanders had the lowest rate (305.8 per 100,000). Incidence rates of all invasive cancers among males and females in the Greater Bay Area were almost identical to the rates in California. However, rates for NH Black and Asian/Pacific Islander males and females were slightly higher in the Greater Bay Area.

Figure 5: Age-Adjusted Incidence Rates and Trends for All Invasive Cancers in the Greater Bay Area by Race/Ethnicity, 1988-2016

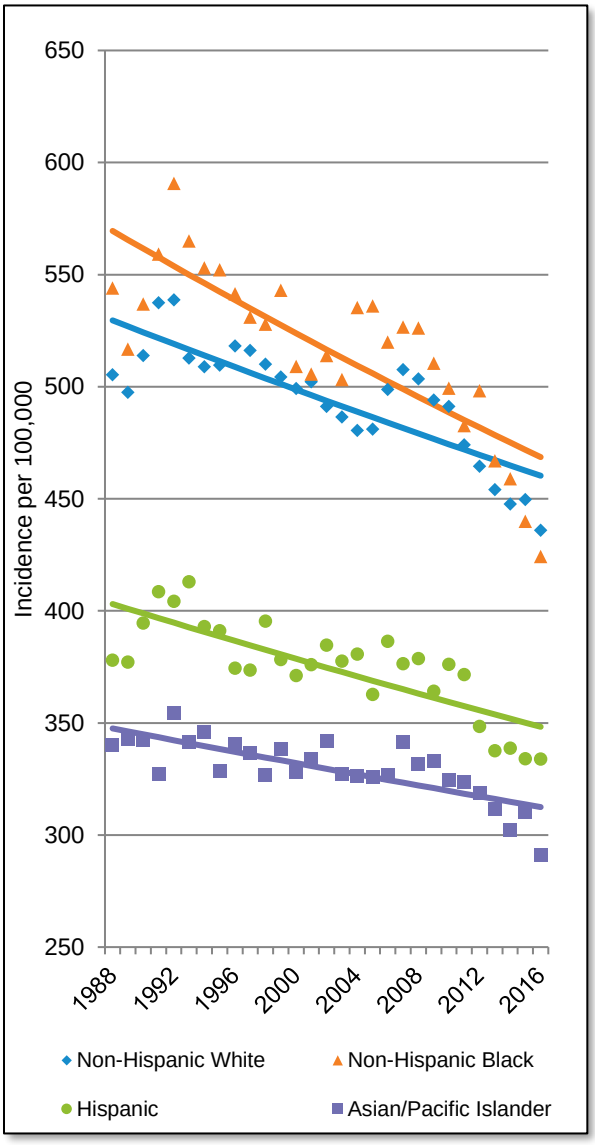


Table 1: Age-Adjusted Incidence Rates for All Invasive Cancers per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	432.2	383.8	427.9	381.5
Non-Hispanic White	481.8	431.0	472.5	427.1
Non-Hispanic Black	517.4	413.2	480.3	390.2
Hispanic	362.2	328.5	343.0	313.7
Asian/Pacific Islander	312.7	305.8	295.0	301.2

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

Overall Cancer Mortality Rates

As with overall cancer incidence, deaths due to cancer also declined dramatically from 1988 through 2016 in the Greater Bay Area **(Figure 6)**. In general, a more substantial decline in cancer mortality occurred for males than females over the 29 year period. Among males, the cancer mortality rate declined by 42% during this time period, falling from 259.9 to 152.0 deaths per 100,000. Among females, cancer mortality declined by 36% from 1988 to 2016, falling from 176.4 to 112.6 deaths per 100,000. During this 29 year period, cancer mortality declined across all racial/ethnic groups, particularly among NH Blacks. Deaths due to cancer declined more than -2% per year among NH Black males, and -1% for NH Black females, with similar patterns observed in California [3]. From 2012 through 2016, the overall cancer mortality rate in the Greater Bay Area was significantly lower than the mortality rate for California. This was driven by the lower NH White mortality rate among males and females, compared to the statewide rate for these groups **(Table 2)**. Overall, males had a substantially higher mortality rate than females (160.5 vs 119.6 per 100,000, respectively), with the highest mortality rate observed in NH Black males (236.2 per 100,000) and lowest mortality rate observed in Asian/Pacific Islander females (92.1 per 100,000). Breast, prostate, lung, colorectal, and melanoma were the most common cancer sites, and lung, breast, prostate, colorectal, and pancreatic cancer were the most common cause of cancer deaths, collectively accounts for half of all cancer deaths in the Greater Bay Area **(Figure 7)**.

Figure 6: Age-Adjusted Mortality Rates and Trends for All Invasive Cancers in the Greater Bay Area by Race/Ethnicity, 1988-2016

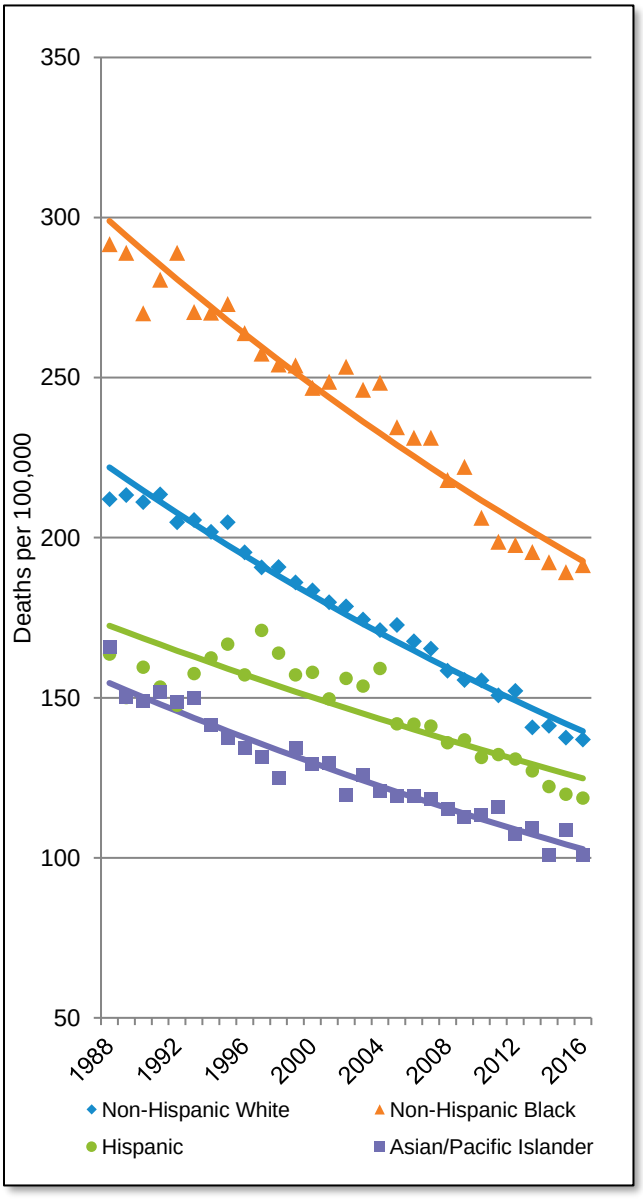
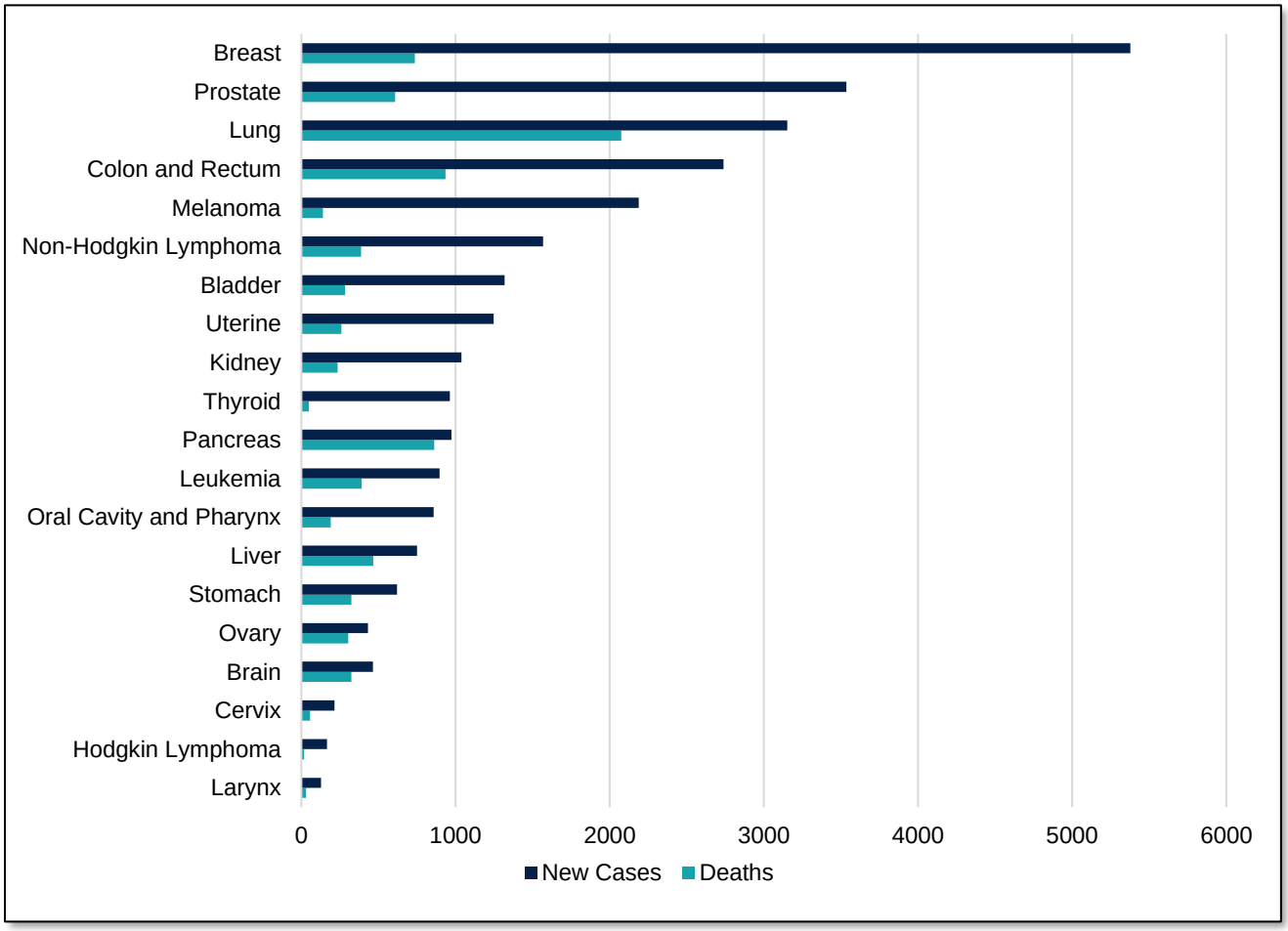


Table 2: Age-Adjusted Mortality Rates for All Invasive Cancers per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	157.4	117.1	170.4	126.1
Non-Hispanic White	165.6	124.7	181.9	135.6
Non-Hispanic Black	232.3	168.0	223.9	164.7
Hispanic	142.8	110.5	145.9	108.9
Asian/Pacific Islander	125.9	90.4	131.5	94.8

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

Figure 7: Number of New Invasive Cancer Cases and Deaths from Cancer in the Greater Bay Area by Cancer Site, 2016



III. BREAST CANCER

Invasive breast cancer is the most common cancer in females, accounting for approximately a third of all invasive cancers diagnosed annually in the Greater Bay Area and in the state. From 2012 through 2016, there were 26,407 new invasive breast cancers diagnosed in females in the Greater Bay Area, and 130,621 in all of California. About one in eight females in the U.S. will develop invasive breast cancer within their lifetime. Risk factors include older age, family history of breast cancer, inherited genetic mutations (BRCA1 and BRCA2), early age of menarche, late age of menopause, no pregnancies or pregnancies later in life (i.e., first after age 30), postmenopausal hormone therapy use, obesity and excessive weight gain, physical inactivity, alcohol consumption, and dense breast tissue (as on a mammogram). However, risk factors differ across the different subtypes of breast cancer. An estimated 30% of postmenopausal breast cancers could potentially be prevented through lifestyle changes, such as maintaining a healthy weight, being physically active, and limiting alcohol intake [4-7].

Incidence trends of invasive breast cancer in the Greater Bay Area have generally paralleled those in California with overall general decline from 1988 to 2016. The well-documented decline since the turn of the century, especially among NH Whites, follows the broad cessation of hormone therapy use [8, 9] in response to the seminal report by the Women's Health Initiative of increased breast cancer risk associated with certain formulations of hormone therapy [10]. Yet, there have been striking racial/ethnic differences in breast cancer incidence rates **(Figure 8)**. For NH Black females, the annual incidence rate of invasive breast cancer has increased steadily by 0.3% per year during the time period of 1988-2016. For both NH White and Hispanic females, there was an overall annual decrease in the incidence rate of invasive breast cancer by 0.3% per year. While for Asians/Pacific Islanders the rates have steadily increased since 1988, by 1.1% per year. The underlying reasons for these increasing rates in Asians/Pacific Islanders are unclear. Recent analyses have suggested incidence patterns may differ within the various ethnicities represented by the heterogeneous group of Asians/Pacific Islanders, population groups that are well represented in the Bay Area. The increase in incidence in Asians/Pacific Islanders may be attributable to the changing immigration patterns and/or acculturation experiences of specific Asian American ethnic groups [11-13].

For the most recent time period (2012-2016), the incidence rate of breast cancer in the Greater Bay Area (126.4 per 100,000 females) was slightly higher than that for California (121.2 per 100,000) **(Table 3)**. Rates varied across counties in the Greater Bay Area (www.cancer-rates.info/ca/). Marin County has long been recognized for having high breast cancer rates, particularly in NH Whites. For NH White females, the rate in San Mateo County (160.4 per 100,000) exceeded that in Marin (146.2 per 100,000), San Francisco (148.8 per 100,000) and Santa Cruz (155.0 per 100,000) Counties during the recent 5-year period (2012-2016). Perhaps the most striking regional differences in rates were for Asians/Pacific Islanders, for whom the rate in San Mateo County (128.3 per 100,000) was significantly higher than that for Asians/Pacific Islanders in the entire Greater Bay Area (106.9 per 100,000) and California (101.9 per 100,000) **(Figure 9)**.

Figure 8: Age-Adjusted Incidence Rates and Trends for Female Invasive and *In Situ* Breast Cancer in the Greater Bay Area by Race/Ethnicity, 1988-2016

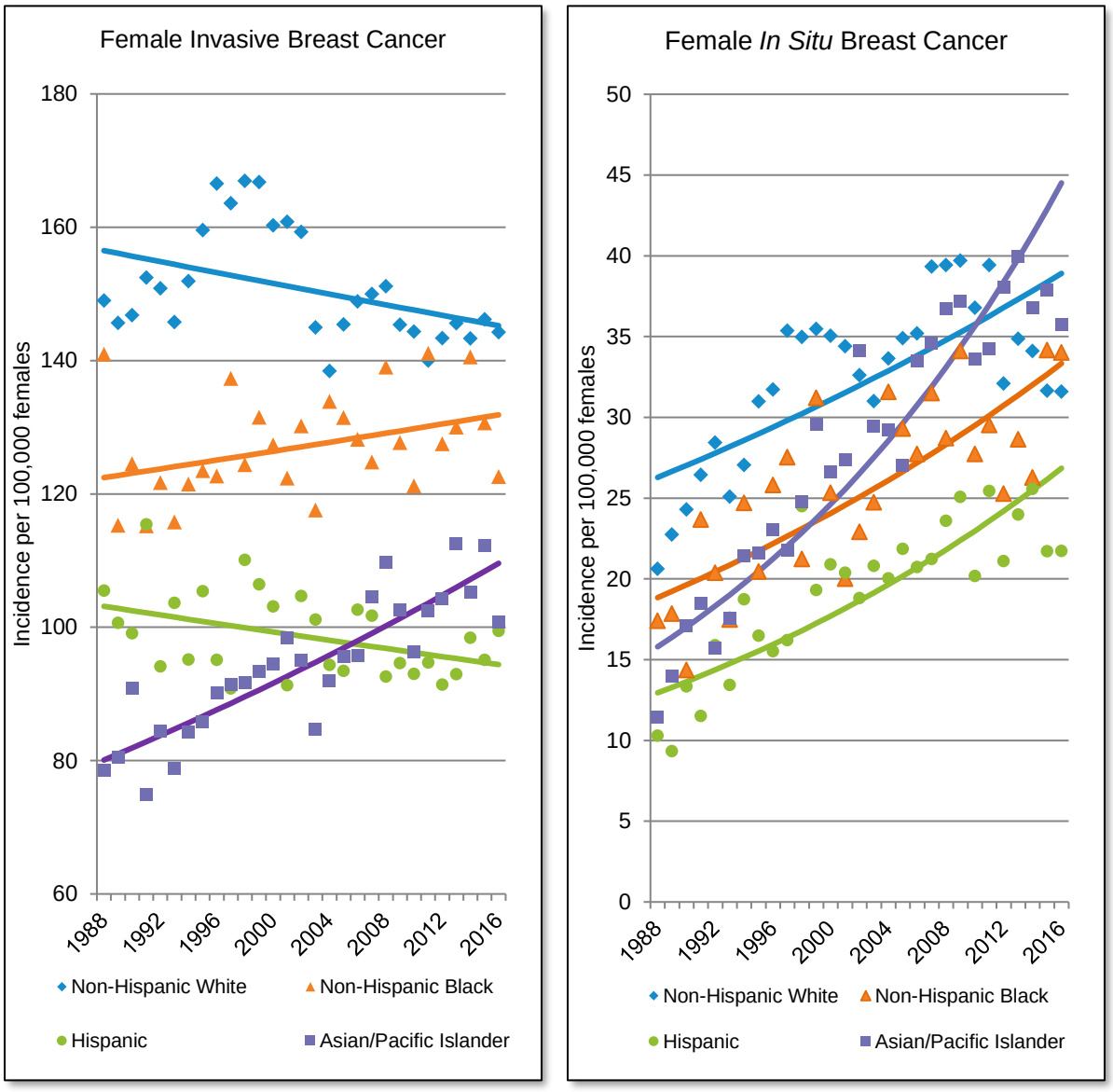
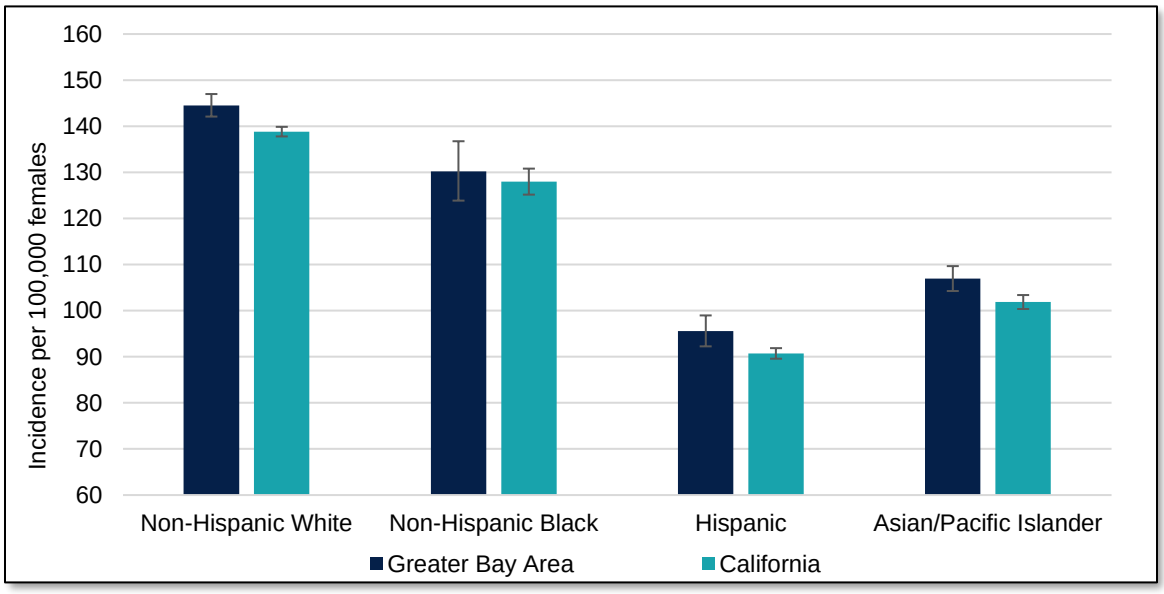


Figure 9: Female Invasive Breast Cancer Age-Adjusted Incidence Rates [1] by Racial/Ethnic Group and Region[2], 2012-2016



[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals for the corresponding incidence rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

Table 3. Female Invasive Breast Cancer Age-Adjusted Incidence Rates (per 100,000 females) by Racial/Ethnic Group and County/Region, 2012-2016

Geographic Location	Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian/ Pacific Islander
California	138.8	128.0	90.7	101.9
Greater Bay Area	144.5	130.2	95.6	106.9
Alameda County	140.9	128.5	88.2	102.9
Contra Costa County	138.0	132.1	97.4	113.4
Marin County	146.2	139.6	107.9	127.0
San Francisco County	148.1	137.5	99.2	108.9
San Mateo County	160.4	132.9	88.5	128.3
Santa Clara County	145.2	130.4	106.4	97.3
Monterey County	131.3	111.4	79.3	126.9
San Benito County	104.0	^	117.0	122.5
Santa Cruz County	155.0	92.0	93.5	99.0

^ Statistic not displayed due to fewer than 5 cases.

In situ carcinomas of the breast, specifically ductal carcinoma *in situ* (DCIS) and lobular carcinoma *in situ* (LCIS), reflect cancer cells of the milk ducts or milk-making glands, respectively, that do not spread to surrounding healthy breast tissue. DCIS, the most common, is thought to have the potential to progress to invasive breast cancer [14] and is captured by cancer registries as a reportable cancer. Incidence rates of *in situ* breast carcinomas in the Greater Bay Area increased significantly from 1988 through 2016 by an average of 1.8% per year. Incidence rates for *in situ* breast cancer have increased significantly from 1988 to 2016 for all racial/ethnic groups with the largest average increase per year seen in Asians/Pacific Islanders (3.8%), followed by Hispanics (2.6%), NH Blacks (2.1%), and NH Whites (1.4%; **Figure 8)**. The incidence rate of *in situ* carcinomas for the Greater Bay Area (32.6 per 100,000) was significantly higher than the rate for California (28.1 per 100,000).

Mortality rates for invasive breast cancer declined significantly in all racial/ethnic groups from 1988 through 2016, with the largest average declines per year seen in NH Whites (-2.3% per year), followed by Hispanics (-1.8%), NH Blacks (-1.4%), and Asians/Pacific Islanders (-1.1%; **Figure 10)**. From 2012 through 2016, breast cancer mortality rates varied by race/ethnicity, with the highest rates in NH Blacks (28.9 per 100,000) followed by NH Whites (20.0 per 100,000), Hispanics (14.9 per 100,000) and Asians/Pacific Islanders (12.0 per 100,000) in the Greater Bay Area **(Figure 11)**. The breast cancer mortality rate for all racial/ethnic groups together was significantly lower in the Greater Bay Area (17.8 per 100,000) than California (19.8 per 100,000).

Figure 10: Age-Adjusted Mortality Rates and Trends for Female Invasive Breast Cancer in the Greater Bay Area by Race/Ethnicity, 1988-2016

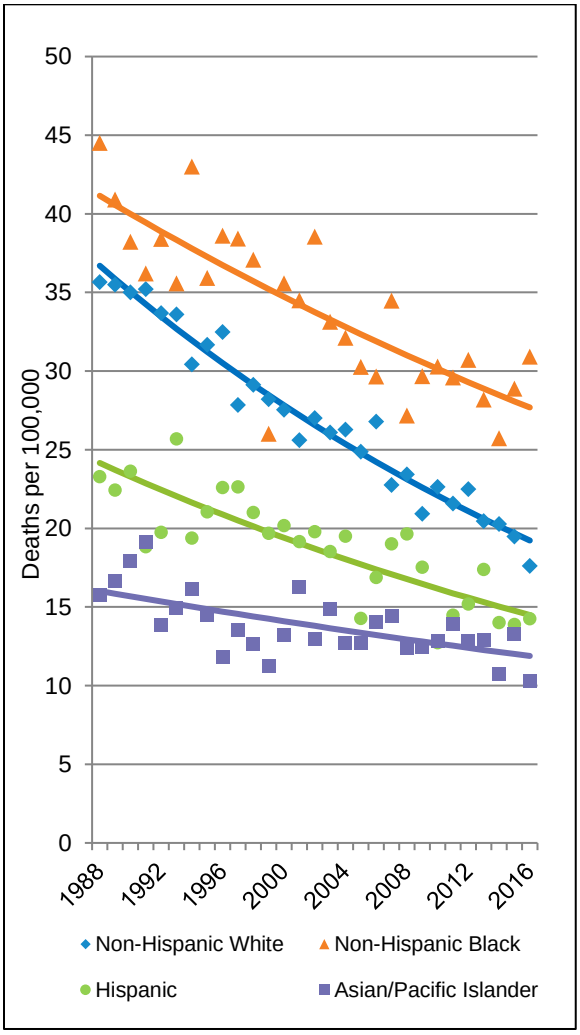
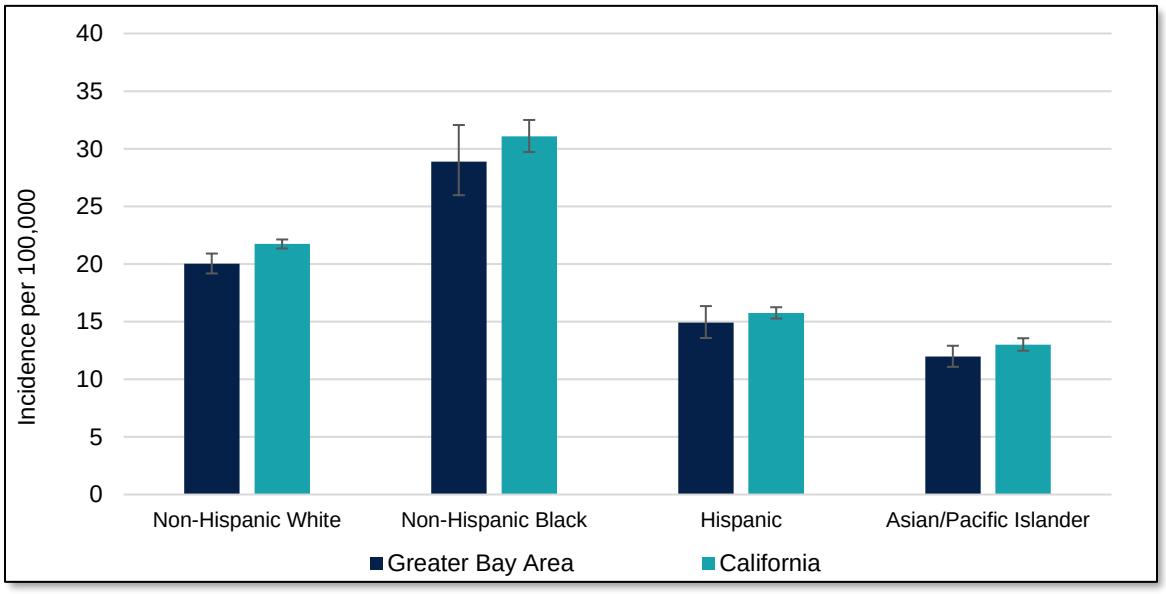


Figure 11: Female Invasive Breast Cancer Age-Adjusted Mortality Rates [1] by Racial/Ethnic Group and Region[2], 2012-2016



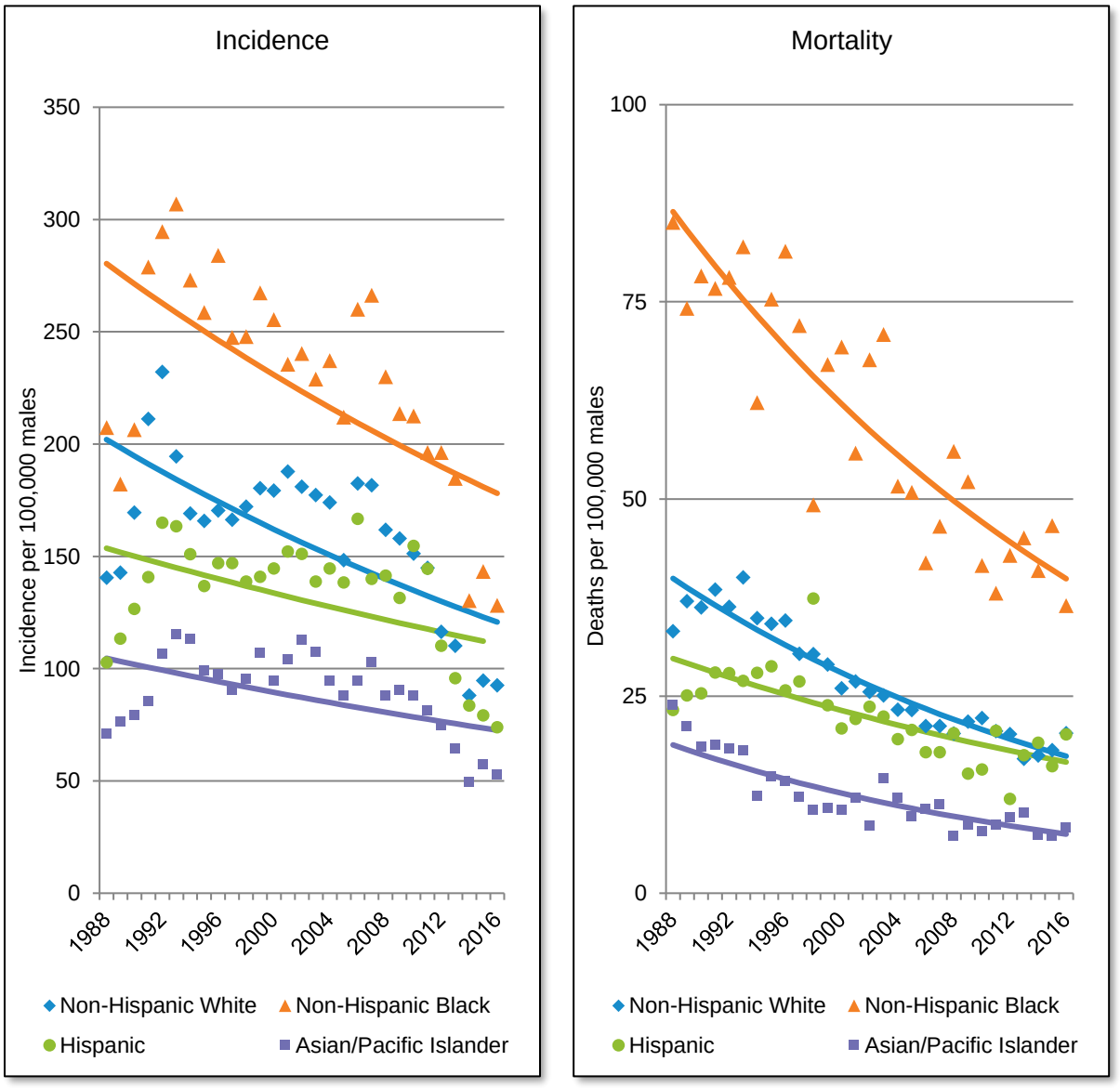
[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals for the corresponding mortality rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

IV. PROSTATE CANCER

Prostate cancer was the most commonly diagnosed cancer in Greater Bay Area males in the years 1988 through 2016. From 2012 through 2016, NH Blacks had the highest incidence rate (155.9 per 100,000 males) followed by NH Whites (100.2 per 100,000), Hispanics (87.7 per 100,000), and Asians/Pacific Islanders (59.4 per 100,000). Prostate cancer incidence rates spiked in 1992, which has been attributed to the widespread adoption of prostate-specific antigen (PSA) screening. Incidence rates then declined, which is attributed to the drop in the detection of prostate cancers after the introduction of PSA screening **(Figure 12)** [15, 16]. However, as evidence that widespread screening did not improve survival among males older than 75 years of age, the U.S. Preventive Services Task Force recommended against PSA-screening in this age group in 2008 [17]. Furthermore, in 2012, the Task Force recommended against screening at all ages due to evidence that treatment for screening-detected prostate cancer resulted in more harm than benefit [18]. This recommendation and the associated decrease in screening, likely contributed to the national declines in prostate cancer diagnoses in recent years. In fact, in the Greater Bay Area, a significant decline in incidence occurred among males in all races/ethnicities between 2007 and 2016, at an average of -7.6% per year. However, it has recently been noted that after the decline of PSA screening, there has been an increase in late-stage disease at the national level [19]. The *most recent* screening recommendation (May 2018) states that for men aged 55 to 69 years, the decision to undergo periodic PSA screening for prostate cancer should be an individual one, made with each patient's clinician, including a discussion of the potential harms and benefits of such screening [20]. Furthermore, clinical practice has shifted towards more conservative management for low risk prostate cancer through active surveillance or watchful waiting [21]. The implications of this shift in clinical practice on prostate cancer mortality is unclear; the GBACR will closely monitor the trends in prostate cancer mortality.

Prostate cancer mortality rates have steadily declined in males by an average of -3.2% per year from 1988 through 2016, and declines were seen across all racial/ethnic groups **(Figure 12)**. Because most prostate cancers have a good prognosis even without treatment, the lifetime risk for dying of prostate cancer is very low (2.8%) [18]. From 2012 through 2016, the mortality rate was highest among NH Blacks (42.3 per 100,000), whose rate was more than double the rate in NH Whites (18.6 per 100,000), nearly triple the rate in Hispanics (17.1 per 100,000), and almost five times the rate in Asians/Pacific Islanders (8.5 per 100,000). These rates were relatively similar or slightly lower than the mortality rates in California from 2011 through 2016.

Figure 12: Prostate Cancer Age-Adjusted Annual Incidence and Mortality Rates and Trends in the Greater Bay Area by Racial/Ethnic Group, 1988-2016



V. LUNG AND BRONCHUS CANCER

Due to aggressive anti-smoking policies and subsequent reductions in the prevalence of smoking over many years, lung and bronchus cancer incidence and mortality in the Greater Bay Area have continued to decrease through 2016 (**Figure 13**). In the most recent 10 year period (2007-2016), incidence has decreased by an average of -2.8% per year. From 1988 through 2016, the declines in incidence rates were significant across all racial/ethnic groups, with the largest decline seen among NH Whites (-2.0% per year) and the smallest decline seen among Asians/Pacific Islanders (-0.8%). However, lung and bronchus cancer continues to be the second most common cancer diagnosis for males and females in the Greater Bay Area. From 2012 through 2016, approximately 16,000 new lung and bronchus cancers were diagnosed. The highest incidence rates of lung and bronchus cancer were observed among NH Black males and females (73.5 and 51.6 per 100,000, respectively) followed by Asian/Pacific Islander males (49.5 per 100,000) **(Table 4a)**. Hispanic females had the lowest rate (23.0 per 100,000). From 2012 through 2016, the Greater Bay Area incidence rates of lung and bronchus cancer for NH Whites were lower than rates in California. In contrast, incidence rates for NH Blacks, Hispanics and Asians/Pacific Islanders in the Greater Bay Area were higher than those in California.

Despite the overall decline in incidence and mortality, from 1988 through 2016, lung and bronchus cancer continues to be the top contributor to causes of cancer deaths, representing 18.2% (1,043 deaths) of all cancer deaths among females and 19.1% (1,032 deaths) of all cancer deaths among males in the Greater Bay Area in 2016. The mortality rate of lung and bronchus cancer declined by an average of -2.5% per year in the Greater Bay Area from 1988 through 2016, with a larger decline seen in NH Blacks (-3.3%). From 2012 through 2016, Greater Bay Area NH Black males and females had the highest lung and bronchus cancer mortality rates (53.6 and 34.9 per 100,000, respectively), while the lowest mortality rates were observed in Hispanic and Asian/Pacific Islander females (15.1 and 18.1 per 100,000 respectively; **Table 4b**). The rates in the Greater Bay Area were substantially lower for NH White males and females in comparison to rates in California. In contrast, higher mortality rates were seen for NH Black females and males, Hispanic males and females, and Asian/Pacific Islander females in the Greater Bay Area than California.

In 2013, the U.S. Preventive Services Task Force recommended annual lung cancer screening by low-dose computed tomography (LDCT) for high risk populations (adults aged 55 to 80 years, who have a 30 pack-year smoking history and currently smoke or have quit within the past 15 years); starting in 2015, Medicare approved coverage for this screening [22, 23]. It is unknown how the introduction of this screening program will affect population-wide lung and bronchus cancer incidence and mortality; the Greater Bay Area Cancer Registry will be tracking future data closely for any changes.

Table 4a and 4b: Lung and Bronchus Cancer Age-Adjusted Incidence and Mortality Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

4a: Incidence

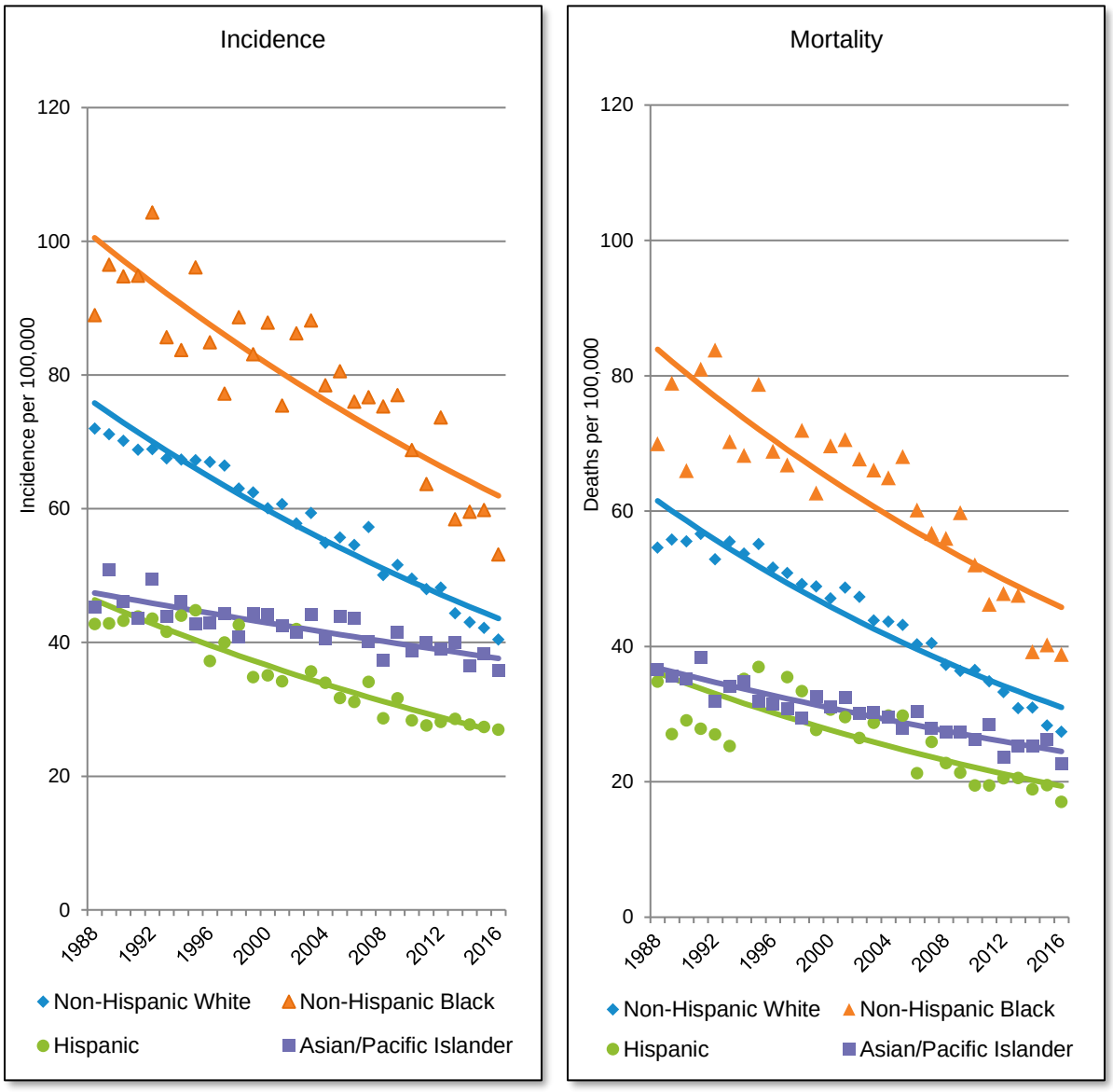
Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	46.7	37.2	47.6	38.1
Non-Hispanic White	45.1	42.6	52.2	46.4
Non-Hispanic Black	73.5	51.6	65.7	46.7
Hispanic	35.0	23.0	29.6	20.6
Asian/Pacific Islander	49.5	29.3	45.9	27.6

4b: Mortality

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	33.1	24.4	36.3	26.4
Non-Hispanic White	32.4	28.5	39.8	32.2
Non-Hispanic Black	53.6	34.9	51.9	33.8
Hispanic	25.4	15.1	23.0	14.1
Asian/Pacific Islander	33.6	18.1	33.9	17.9

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

Figure 13: Lung and Bronchus Cancer Age-Adjusted Annual Incidence and Mortality Rates and Trends in the Greater Bay Area by Racial/Ethnic Group, 1988-2016



VI. SMOKING-RELATED CANCERS

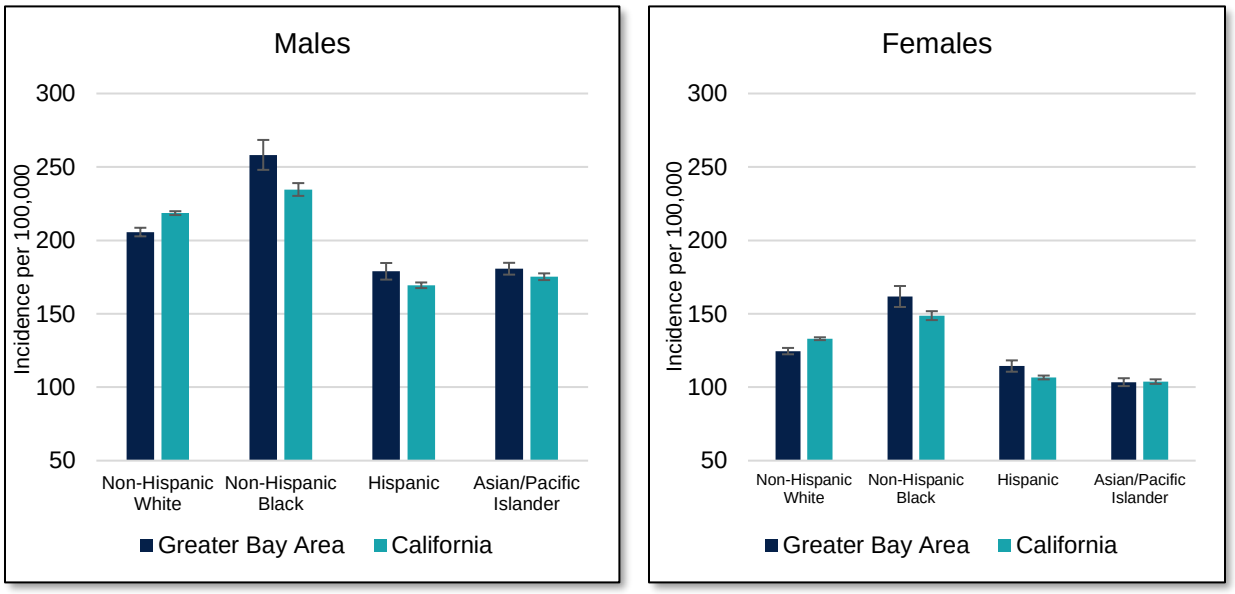
As defined by the U.S. Surgeon General, cancers known to be smoking-related include cancers of the lung, oral cavity and pharynx, esophagus, stomach, colon/rectum, liver, pancreas, larynx, bladder, kidney, and acute myeloid leukemia [24, 25]. Following national declines in smoking prevalence, incidence rates of these smoking-related cancers (combined) declined significantly from 1988 through 2016 among males and females in all racial/ethnic groups. In the Greater Bay Area, from 1988 through 2016, the most substantial annual declines in incidence rates were observed for NH White (-1.3%) and Black males (-1.4%). Among females, incidence in NH Whites had the steepest annual decline (-1.1%), while rates among NH Blacks, Hispanics, and Asians/Pacific Islanders declined at roughly -0.7% per year. Historically, declines in both incidence and mortality of smoking-related cancers in the Greater Bay Area have been among the steepest in the nation, likely due to the success of California's stringent tobacco-control programs. For all smoking-related cancers combined, the incidence rates for NH Blacks were higher than all other racial/ethnic groups, both in the GBACR and in California. GBACR rates were higher than California rates for NH Black and Hispanic males and females **(Table 5, Figure 14)**.

Table 5. Smoking-Related Cancers[1] Age-Adjusted Incidence Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[2], 2012-2016

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	200.7	121.2	204.6	125.1
Non-Hispanic White	205.7	124.6	218.5	133.0
Non-Hispanic Black	258.0	161.7	234.6	148.7
Hispanic	178.9	114.4	169.4	106.6
Asian/Pacific Islander	180.7	103.4	175.2	103.8

[1] Smoking-related cancer incidence is the combined incidence of lung, oral cavity and pharynx, esophagus, stomach, colorectal, liver, pancreas, larynx, bladder, kidney cancers, and acute myeloid leukemia, as defined by the U.S. Surgeon General [24, 25].
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

Figure 14: Smoking-related Cancers Age-Adjusted Incidence Rates[1] by Sex, Racial/Ethnic Group, and Region[2], 2012-2016



[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county region of the Greater Bay Area).

Highlights of trends in specific smoking-related cancers:

Cancer of the oral cavity and pharynx (oropharyngeal cancer) was more common in males than females and in NH Whites and Blacks [23, 26, 27]. Risk factors include tobacco and heavy alcohol use, as well as infection with certain cancer-causing strains of human papillomavirus (HPV) [28]. The number of oropharyngeal cancers linked to HPV infection has increased dramatically over recent decades, with approximately 70% now caused by HPV infection [29, 30]. Efforts are underway to monitor HPV-related forms of oropharyngeal cancer.

The incidence of oropharyngeal cancer in males has steadily declined by -0.8% per year from 1988-2016. In females, there has been a greater decline in incidence of -1.4% per year from 1988-2016. In 2012-2016, the incidence rate in males (all races/ethnicities) was 15.3 per 100,000, and 6.0 per 100,000 in females. During this time, incidence was almost twice as high in NH White males (18.5 per 100,000) than in Hispanic males (9.3 per 100,000). There is less racial/ethnic variation in incidence among females. Asian/Pacific Islander and NH White females have the highest rates (6.6 and 6.6 per 100,000, respectively) and Hispanic females have the lowest rate (3.9 per 100,000). In 2012-2016, the incidence of oropharyngeal cancer for the Greater Bay Area was comparable to California for all racial/ethnic groups.

There has been a consistent decline in mortality from oropharyngeal cancer since 1988 for both sexes: -2.2% per year for males, and -2.8% per year for females. This trend may be due to changes in the underlying cause of oropharyngeal cancers. As the prevalence of smoking in the U.S. has declined, so has

the incidence of smoking-related oropharyngeal cancers. At the same time, the incidence of HPV-positive oropharyngeal cancer has increased, and these tumors are associated with significantly improved survival [31]. For 2012-2016, the mortality rate for NH Black males (5.5 per 100,000) was the highest of all racial/ethnic groups, followed by NH Whites (3.7 per 100,000), Asians/Pacific Islanders (3.3 per 100,000) and Hispanics (2.7 per 100,000). The mortality rates of oropharyngeal cancer in females were very low, ranging from 1.3 per 100,000 in NH Whites to 0.6 per 100,000 in NH Blacks. The mortality rate for Greater Bay Area NH White males (3.7 per 100,000) was slightly lower than California (4.4 per 100,000), but rates were comparable for NH Black, Hispanic, and Asian/Pacific Islander males and across all racial/ethnic groups for females.

Bladder cancer, both invasive and in situ, was the 8th most commonly diagnosed cancer in the Greater Bay Area from 2012 through 2016, and was about four times more common in males (29.3 per 100,000) than females (7.1 per 100,000). Age-adjusted incidence rates were highest in NH Whites (37.0 per 100,000 males; 8.8 per 100,000 females) and lowest in Asians/Pacific Islanders (15.9 per 100,000 males; 3.8 per 100,000 females). Incidence of bladder cancer increases sharply with age; approximately 90% of bladder cancers were diagnosed in people aged 60 and older. Smoking increases the risk of bladder cancer two- to four-fold and approximately half of urothelial bladder cancers (the most common kind of bladder cancer) are attributed to smoking [32-35]. Other risk factors for bladder cancer include exposures to various chemicals in the dye, rubber, metal, textile, and leather industries [34]. Incidence rates of bladder cancer have been declining over time. Over the past 10 years, the rates for men have decreased by -2.7% per year and for women by -0.9% per year. One notable exception to this trend is the rates for NH Black men, which have been increasing by 1% per year. For all racial/ethnic groups combined, from 1988 through 2016 mortality rates have been decreasing at a rate of 0.5% per year in males and 1.6% per year in females. Bladder cancer incidence rates were similar in the Greater Bay Area compared to California. In males, bladder cancer mortality rates were lower in the Greater Bay Area than in California (6.1 per 100,000 vs 6.9 per 100,000).

VII. MELANOMA

Melanoma, a cancer of the skin's pigment cells, is substantially more common among populations with fair complexions, which generally includes NH Whites and some Hispanics. In the Greater Bay Area, among NH White males, melanoma was the second most common newly diagnosed invasive cancer, behind prostate cancer, and accounting for 12% (5,515 cases) of all new cancers from 2012-2016. Melanoma risk factors include fair skin complexion and exposure to sunlight over long periods of time [36]. From 2012 through 2016, the incidence rate of invasive melanoma for NH Whites (57.5 per 100,000) was more than eight times higher than that for Hispanics (6.9 per 100,000). Rates were extremely low in Asians/Pacific Islanders (1.4 per 100,000) and NH Blacks (1.2 per 100,000) **(Table 6)**. From 1988 through 2016, invasive melanoma incidence for NH Whites rose rapidly in the Greater Bay Area, at an average of 3.5% per year. During this same time period, rates increased for Asians/Pacific Islanders by 2.4% per year, and for Hispanics by 1.3% per year. Incidence rates for NH Blacks have remained stable.

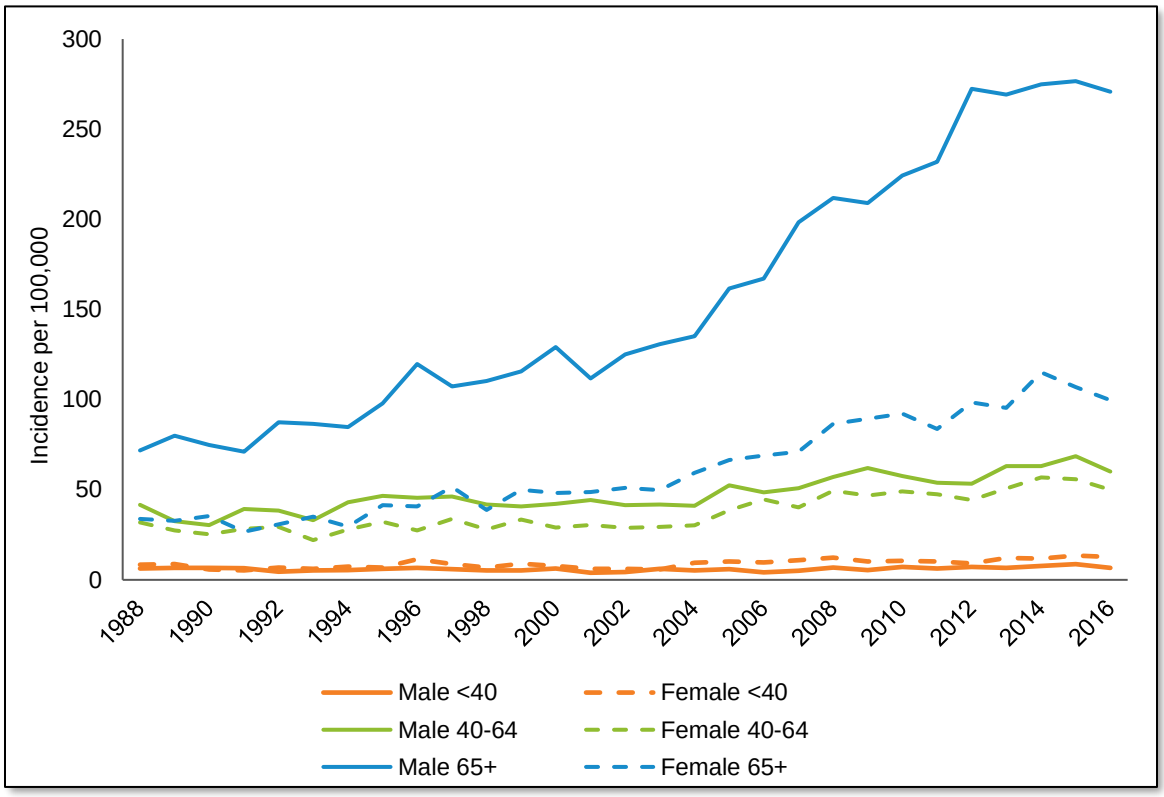
Melanoma incidence rates among NH Whites increased substantially over time for males age 65 years and older in comparison to males or females less than 40 years of age **(Figure 15)**. Overall, in the past decade, invasive melanoma incidence rates among NH White males and females have been significantly higher and increased more rapidly in the Greater Bay Area than in California. Among NH Whites during the recent 5-year period (2012-2016), the incidence rate for both males and females in the Greater Bay Area were significantly higher than rates for all of California **(Table 6)**.

Table 6: Invasive Melanoma Age-Adjusted Incidence Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	34.2	19.7	30.1	16.8
Non-Hispanic White	57.5	35.5	47.5	28.3
Non-Hispanic Black	1.2	0.5	1.5	0.8
Hispanic	6.9	7.0	5.0	4.8
Asian/Pacific Islander	1.4	1.5	1.4	1.2

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

Figure 15: Invasive Melanoma Incidence Rates per 100,000 for NH Whites in the Greater Bay Area by Sex and Age Group, 1988-2016



In situ melanoma is contained in the outer layer of skin and has not spread to deeper layers of the skin or surrounding tissues. It is likely that *in situ* melanoma is diagnosed exclusively through physician skin examination; as such, its occurrence may be associated with access to health care. Incidence rates of *in situ* melanoma in the Greater Bay Area for NH Whites (males: 53.7 per 100,000; females: 34.0 per 100,000) were markedly higher than rates for California.

Mortality rates due to invasive melanoma in the Greater Bay Area have decreased slightly since 1988 for all races/ethnicities and both sexes combined, by an average of -1.0% per year. For NH White females, a substantial decrease in mortality rates, with a -7.9% average decline per year, was observed for recent years (2009 through 2016), yet in NH White males, mortality rates remained stable from 1988 through 2016. Melanoma mortality rates were three times as high for NH White males as NH White females (5.1 vs. 1.7 per 100,000, respectively) for 2012-2016, a poorly understood difference. For NH Whites, the 2012-2016 mortality rate in the Greater Bay Area (3.1 per 100,000) was slightly lower than the mortality rate in California (3.5 per 100,000).

VIII. COLORECTAL CANCER

Invasive colorectal cancer (cancer of the colon or rectum) is the 4th most commonly diagnosed cancer among males and females in the Greater Bay Area. Obesity, smoking, history of colorectal polyps, and a diet high in red meat are associated with increased risk of this cancer [37, 38]. Among males, incidence rates of invasive colorectal cancer have been declining over time; significant annual declines have occurred from 1988 through 2016 in all racial/ethnic groups: NH Whites (-2.6%), NH Blacks (-1.9%), Hispanics (-1.7%) and Asians/Pacific Islanders (-1.7%). Among females, there were also significant annual declines in colorectal cancer incidence rates: NH Whites (-1.9%), Asians/Pacific Islanders (-1.6%), NH Blacks (-1.3%), and Hispanics (-1.2%). These declines have been attributed to greater uptake of colorectal cancer screening [39]. Colorectal cancer screening is important clinically because it can identify polyps that could lead to *in situ* or invasive cancer, allowing for intervention (removal of the polyp) before the diagnosis of cancer. The 2012-2016 incidence rates were higher among males (38.9 per 100,000) than females (30.2 per 100,000). Incidence rates in NH Blacks were higher than those for other racial/ethnic groups for both males (48.0 per 100,000) and females (42.5 per 100,000). For 2012-2016, colorectal cancer incidence rates for NH White males in the Greater Bay Area were lower than in California, whereas incidence rates for NH Black, Asian/Pacific Islander and Hispanic males were comparable. For females from 2012-2016, colorectal cancer incidence rates for all racial/ethnic groups were comparable to rates for California **(Figure 16)**.

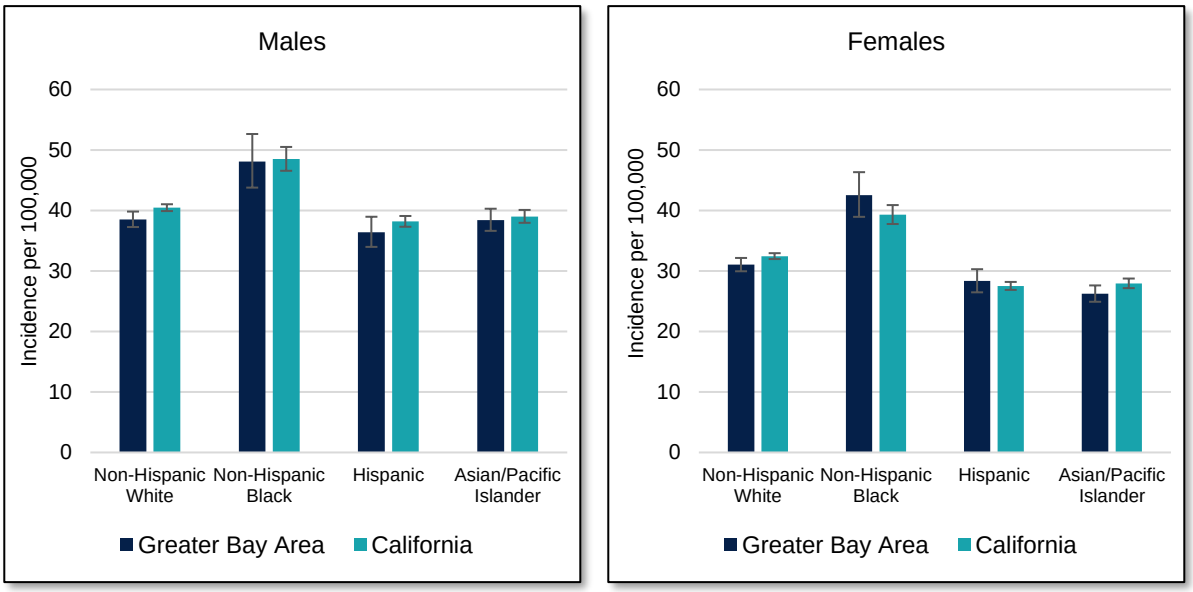
Mortality due to colorectal cancer for both males and females declined substantially from 1988 through 2016 for all racial/ethnic groups **(Figure 17)**. This is likely due to early detection as the result of effective cancer screening strategies. The greatest annual declines in mortality were observed in NH White males (-3.2% per year since 1988) and NH White females (-2.8% per year since 1988). For the period 2012-2016, the mortality rate in males was highest among NH Blacks (17.6 per 100,000) and lowest among Asians/Pacific Islanders (11.9 per 100,000). Similarly, in females, mortality rate of colorectal cancer was highest in NH Blacks (17.1 per 100,000) and lowest in Asians/Pacific Islanders (8.6 per 100,000). Mortality rates of male colorectal cancer in the Greater Bay Area were lower than rates in California for NH Whites, NH Blacks and Hispanics, but comparable for Asians/Pacific Islanders. Female colorectal cancer mortality rates were lower for NH White females in the Greater Bay Area than in California, but comparable for all other racial/ethnic groups.

In situ colorectal cancer is detected before it has spread beyond the inner layer of the colon or rectum [38]. The declines in both *in situ* and invasive colorectal cancer incidence and mortality in the Greater Bay Area likely reflect the success from wide implementation of colorectal cancer screening across the population [37-39]. Declines in incidence of *in situ* colorectal cancer from 1988 through 2016 were observed for both males (-5.0% per year) and females (-4.6% per year). Significant average annual declines in incidence were observed since 1988 for males in all racial/ethnic groups (NH Whites [-5.4%], Hispanics [-4.6%], and Asians/Pacific Islanders [-4.0%] per year). Similarly in females, significant average annual declines in incidence were observed since 1988 in all racial/ethnic groups (NH Blacks [-5.5%], NH Whites [-4.9%], Asians/Pacific Islanders

[-2.8%], and Hispanics [-2.7%] per year). For 2012-2016, colorectal cancer (*in situ*) incidence rates for NH White, NH Black, Hispanic, and Asian/Pacific Islander males in the Greater Bay Area were lower than in California.

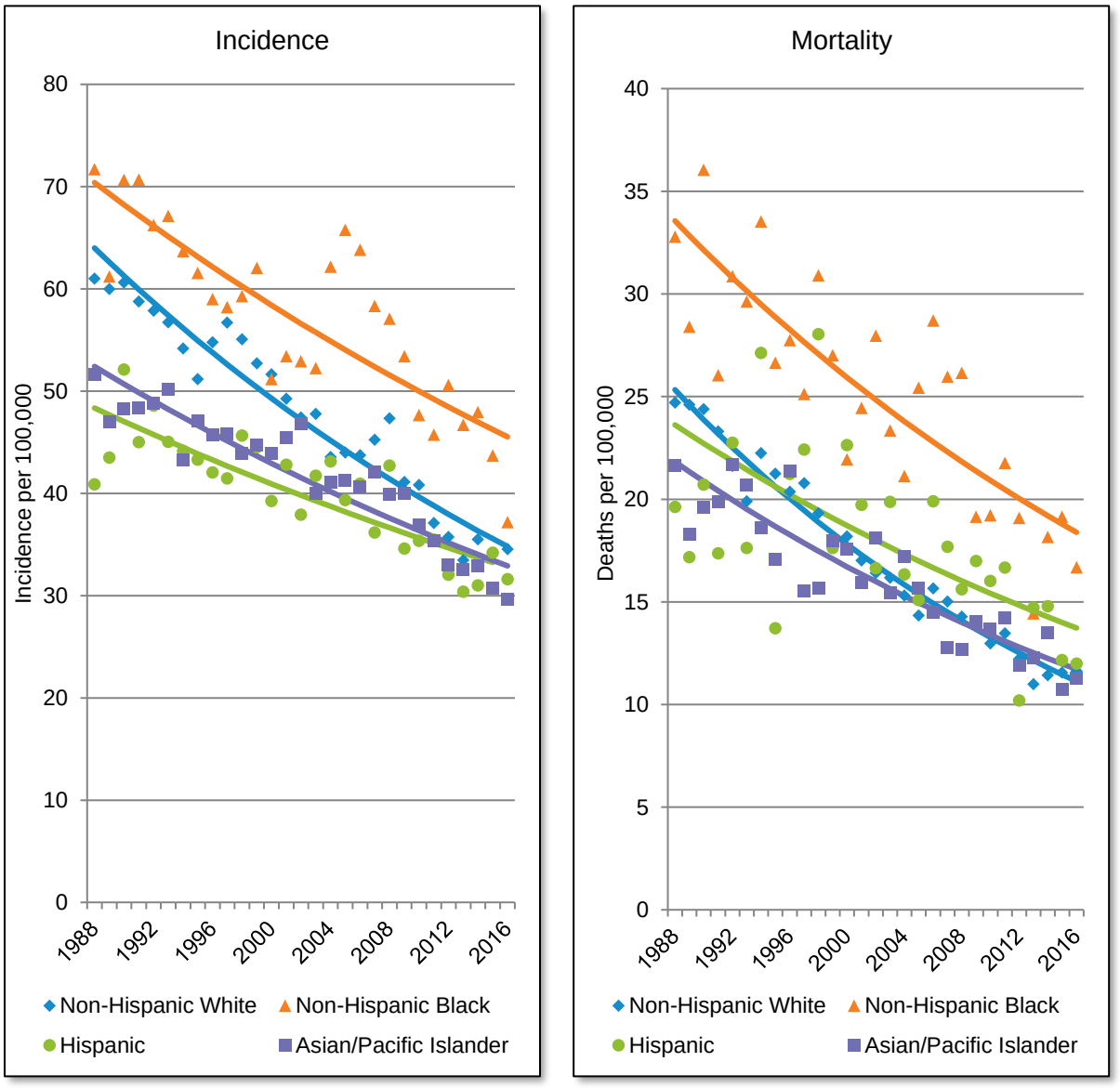
Similarly for females from 2012-2016, colorectal cancer (*in situ*) incidence rates for NH White, NH Black, Hispanic, and Asian/Pacific Islander females in the Greater Bay Area were lower than in California.

Figure 16: Invasive Colorectal Cancer Age-Adjusted Incidence Rates[1] by Sex, Racial/Ethnic Group, and Region[2], 2012-2016



[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county region of the Greater Bay Area)

Figure 17: Invasive Colorectal Cancer Age-Adjusted Annual Incidence and Mortality Rates and Trends in the Greater Bay Area by Racial/Ethnic Group, 1988-2016



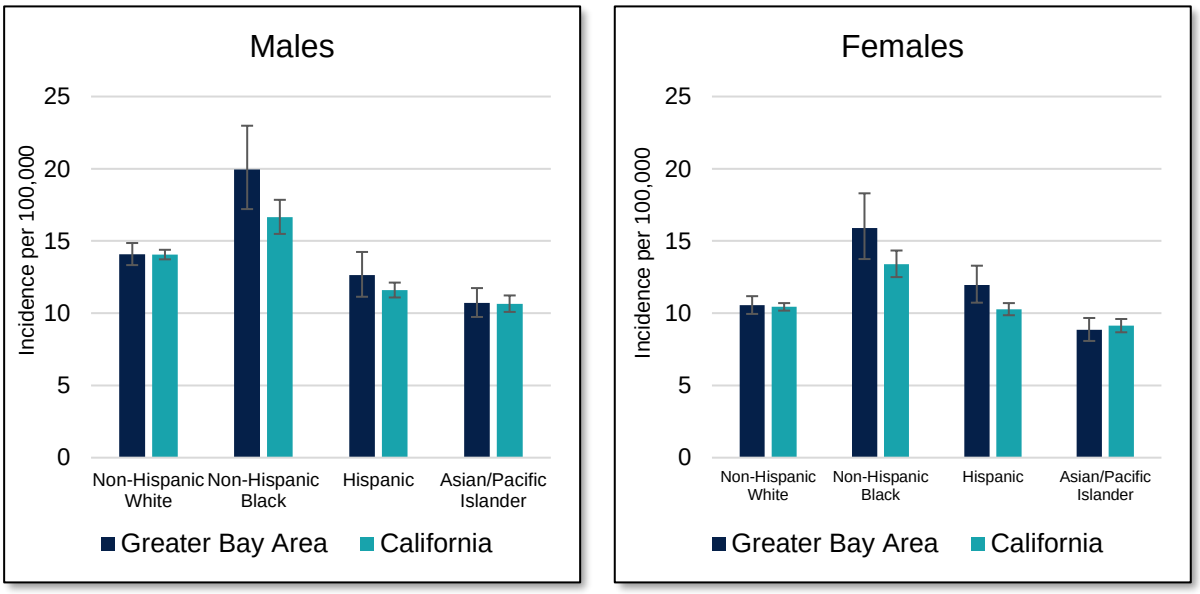
IX. PANCREATIC CANCER

Pancreatic cancer has been associated with smoking, obesity, personal history of diabetes or pancreatitis, family history of pancreatitis or pancreatic cancer, and certain hereditary conditions [40]. In the U.S., pancreatic cancer is rare, but survival is poor [41]. Since 2000, national incidence rates of pancreatic cancer have increased slightly while mortality rates have stabilized; however, racial/ethnic disparities persist with NH Blacks having disproportionately higher incidence and mortality rates than any other major racial/ethnic group [41], although more recent evidence suggests similarly high rates among Native Hawaiians and Japanese Americans [42].

In the Greater Bay Area, since 1988, incidence rates of pancreatic cancer have remained relatively stable with significant increases of 0.6% per year for NH White males. From 2012 through 2016, NH Black males and females experienced the highest incidence rates of pancreatic cancer (19.9 and 15.9 per 100,000, respectively) followed by NH White males (14.1 per 100,000), Hispanic males (12.6 per 100,000), and Hispanic females (12.0 per 100,000). Asian/Pacific Islander males and females and NH White females had the lowest rates (10.7, 8.9 and 10.6 per 100,000, respectively). Incidence rates in the Greater Bay Area were comparable to California rates for all racial/ethnic groups except for Hispanic females, for which the incidence rate in the Greater Bay Area was significantly higher than the rate in California **(Figure 18)**.

Similar to incidence rates, mortality rates of pancreatic cancer have remained stable from 1988 through 2016. Asian/Pacific Islander females experienced a slight increase of 0.8% per year in mortality since 1988. For the period 2012 through 2016, mortality was highest for NH Black males and females (16.5 and 13.1 per 100,000, respectively) and Asian/Pacific Islander males and females had the lowest mortality rates (8.5 and 7.3 per 100,000, respectively). The 2012-2016 mortality rates for all racial/ethnic groups in the Greater Bay Area were comparable to the rates in California.

Figure 18: Pancreatic Cancer Age-Adjusted Incidence Rates[1] by Sex, Racial/Ethnic Group and Region[2], 2012-2016



[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county region of the Greater Bay Area).

X. LIVER CANCER

Among all racial/ethnic groups and both sexes combined, the incidence of liver cancer in the Greater Bay Area increased substantially from 1988 through 2016. Liver cancer is more than three times more common in males than females. From 1988-2016, among all racial/ethnic groups, incidence increased yearly by 3.3% for males and 3.7% for females. Among males, for NH Whites, NH Blacks and Hispanics, incidence increased yearly by 4.1%, 3.9%, and 3.7%, respectively. Among females, for NH Whites, NH Blacks and Hispanics, incidence increased yearly by 3.6%, 3.2%, and 4.5%, respectively **(Figure 19)**. No statistically significant change was observed among Asian/Pacific Islander males nor females. Among males of all racial/ethnic groups, incidence increased yearly by 4.4% from 1988-2009, and has since stabilized. Among females of all racial/ethnic groups, incidence increased by 4.4% per year from 1990-2010, and has since stabilized.

The increasing trends in NH Whites, NH Blacks, and Hispanics of both sexes that have been noted nationwide may reflect an increasing prevalence of risk factors such as hepatitis infection, cirrhosis, alcohol abuse, and obesity in these populations [43, 44]. While these national patterns are observed among NH Black males, and NH White, NH Black and Hispanic females, recent data for the Greater Bay Area suggest that for NH White and Hispanic males, the increasing trends in liver cancer incidence rates may be slowing down. In contrast, incidence among Asian/Pacific Islander females was stable, and among males, declined in recent years.

Asians/Pacific Islanders historically have had the highest liver cancer incidence rates of all racial/ethnic groups due to higher prevalence of hepatitis B infection [45], although incidence differences across Asian/Pacific Islander groups have been noted [11, 46-48]. In the Greater Bay Area, the 2012-2016 incidence rate was 14.7 per 100,000 in males and 4.6 per 100,000 in females **(Table 7a)**. For males, rates were highest among NH Blacks (22.9 per 100,000), followed by Asians/Pacific Islanders (20.2 per 100,000), Hispanics (18.7 per 100,000) and NH Whites (9.9 per 100,000). For females, rates were highest among Hispanics (7.6 per 100,000), followed by Asians/Pacific Islanders (6.6 per 100,000), NH Blacks (5.7 per 100,000) and NH Whites (2.7 per 100,000). Compared to rates in California, liver cancer incidence rates from 2012 through 2016 were higher for NH Black males in the Greater Bay Area, while all other racial/ethnic and sex groups had incidence rates in the Greater Bay Area that were comparable to the rates in California **(Table 7a)**.

Liver cancer mortality rates increased overall by 1.6% per year for males and 1.1% for females from 1988 through 2016 in the Greater Bay Area. There were similar increases for NH White, NH Black, and Hispanic males (~2% per year). Rates were stable for NH White and NH Black females. The mortality rate in Hispanic females increased by 1.8% per year from 1988 through 2016. A decrease in mortality by an average of -1.8% per year occurred from 1988 through 2016 among Asians/Pacific Islanders. For 2012-2016, mortality rates were more than three times higher for males than for females in the Greater Bay Area (males: 9.2 per 100,000; females: 2.9 per 100,000; **Table 7b**). During this time, NH Black (15.4 per 100,000), Hispanic (12.4 per 100,000) and Asian/Pacific Islander (12.3 per 100,000) males experienced markedly higher rates of mortality due to liver cancer than NH White

males (6.1 per 100,000). Females experienced much lower mortality rates, ranging from 1.7 per 100,000 in NH Whites to 5.1 per 100,000 in Hispanics. For 2012-2016, liver cancer mortality rates for NH Black males (15.4 per 100,000) were notably higher in the Greater Bay Area compared to California **(Table 7b)**, while for all other racial/ethnic groups, Greater Bay Area mortality rates were similar to those in California.

Figure 19: Liver Cancer Incidence Trends in the Greater Bay Area by Sex and Racial/Ethnic Group, 1988-2016

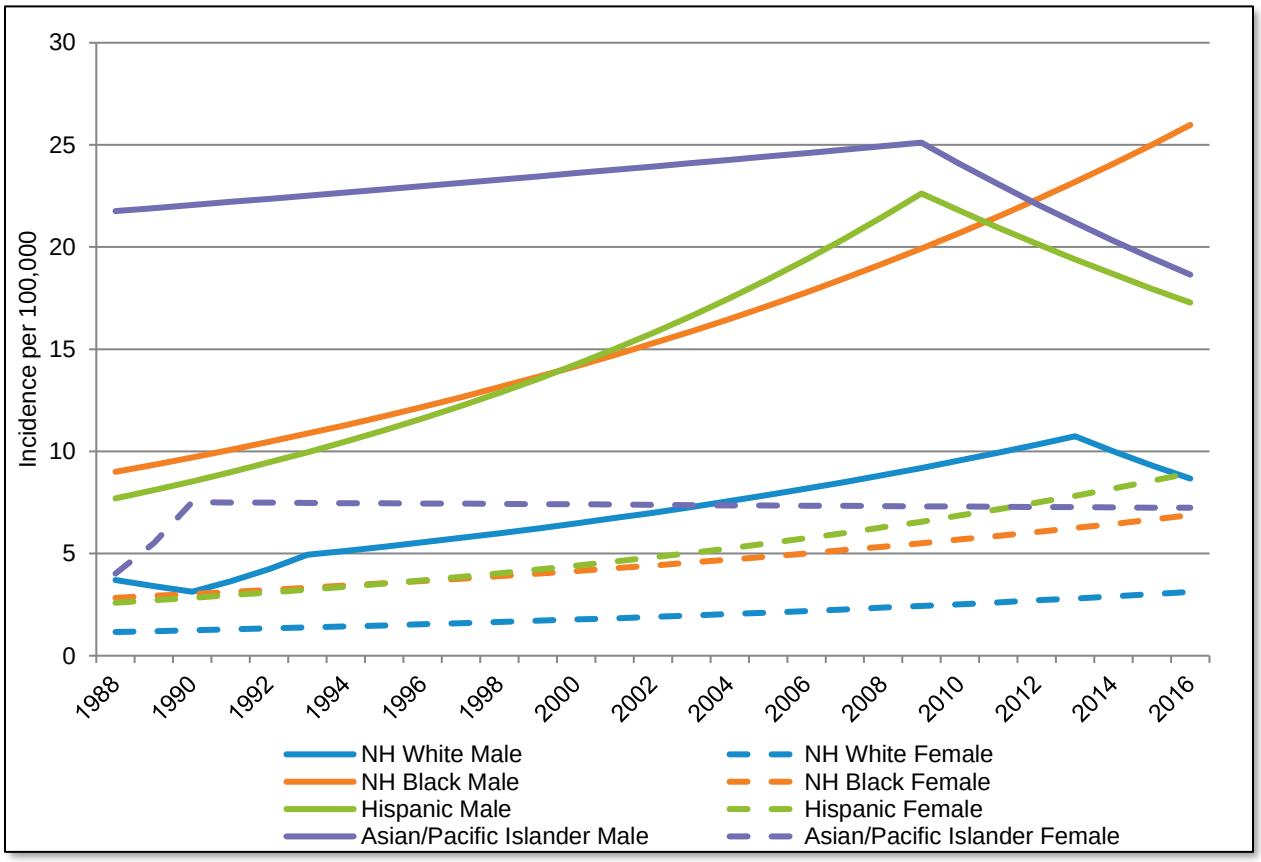


Table 7a and 7b: Liver Cancer Age-Adjusted Incidence and Mortality Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

7a: Incidence

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Female
All Races/Ethnicities	14.7	4.6	13.5	4.4
Non-Hispanic White	9.9	2.7	9.5	2.9
Non-Hispanic Black	22.9	5.7	17.6	5.1
Hispanic	18.6	7.6	18.3	6.7
Asian/Pacific Islander	20.2	6.6	19.1	6.5

7b: Mortality

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Female
All Races/Ethnicities	9.2	2.9	9.2	3.2
Non-Hispanic White	6.1	1.7	6.6	2.2
Non-Hispanic Black	15.4	3.8	12.2	4.0
Hispanic	12.4	5.1	12.8	4.9
Asian/Pacific Islander	12.3	3.9	12.9	4.3

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

XI. THYROID CANCER

Thyroid cancer incidence increased dramatically in the Greater Bay Area for males and females starting in the early 2000s, but while the rate has stabilized since 2010 for females of all races/ethnicities combined, it has continued to increase for males **(Figure 20)**. Among female NH Whites, thyroid cancer incidence increased on average 7.6% per year from 2002 through 2010, then stabilized through 2016. Whereas for males, incidence increased 6.1% annually from 2003 through 2016 for NH whites and 6.9% from 2004 through 2016 for Asian/Pacific Islanders. The overall increase in thyroid cancer during the 29-year period from 1988-2016 may be due to improved imaging technology and thus increased detection of thyroid cancers, as well as to the increased prevalence of suspected risk factors (e.g., prior radiation exposure, obesity, insulin resistance due to obesity or type 2 diabetes) [49-51]. There has been substantial scientific discourse as to whether or not the increase in papillary thyroid cancer diagnoses represents "overdiagnosis" of a harmless condition [52], and questions about potential over-treatment of otherwise indolent cancers.

From 2012 through 2016, thyroid cancer incidence rates were strikingly higher among females than males in all racial/ethnic groups, and NH Blacks had significantly lower rates than the other racial/ethnic groups in both males and females, while Hispanic males had significantly lower rates than NH White and Asian/Pacific Islander males: NH White females (18.2 per 100,000), males (7.3 per 100,000); NH Black females (8.0 per 100,000), males (2.4 per 100,000); Hispanic females (16.6 per 100,000), males (4.7 per 100,000); Asian/Pacific Islander females (18.1 per 100,000), males (6.8 per 100,000). In the Greater Bay Area, incidence rates of thyroid cancer in females were significantly lower than rates in California for all races/ethnicities, whereas in males rates were similar between the Greater Bay Area and all of California **(Figure 21)**.

Mortality due to thyroid cancer remained very low among all racial/ethnic groups and both sexes (0.5 per 100,000 in males; 0.6 per 100,000 in females for 2012-2016) and was stable from 1988 through 2016 in the Greater Bay Area. The mortality rates of thyroid cancer in 2012-2016 were highest in Hispanic females (1.2 per 100,000), a rate which was significantly higher than the mortality rate in NH White females (0.5 per 100,000) and males (0.4 per 100,000). Mortality rates in California were similar to those in the Greater Bay Area for both sexes and all racial/ethnic groups.

Figure 20: Thyroid Cancer Age-Adjusted Incidence Rates in the Greater Bay Area by Sex, 1988-2016

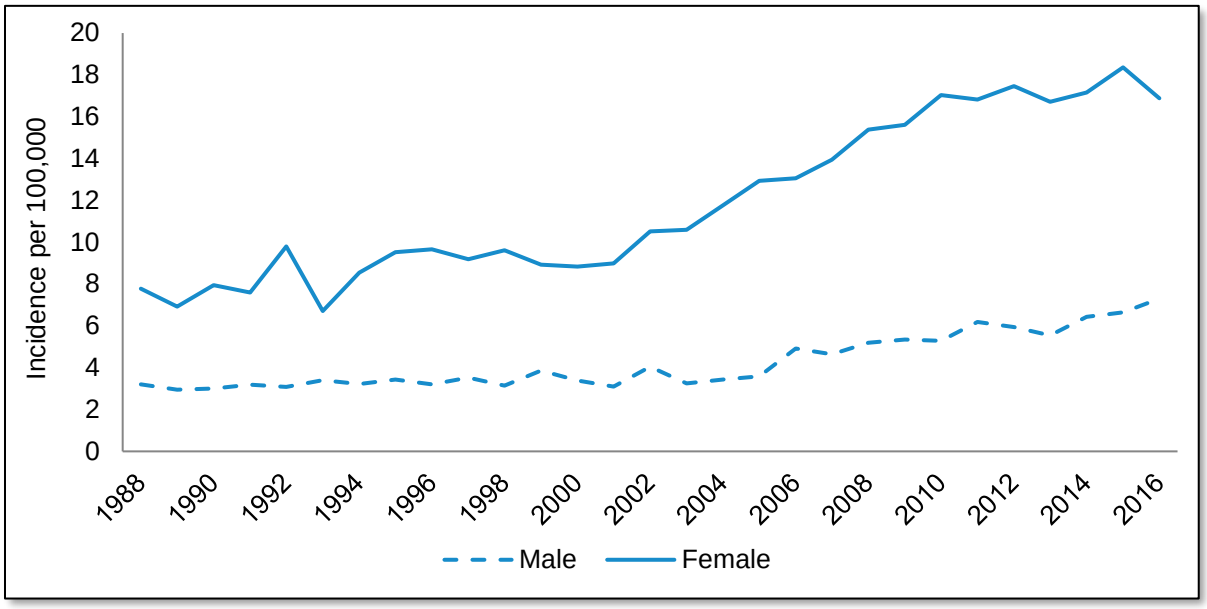
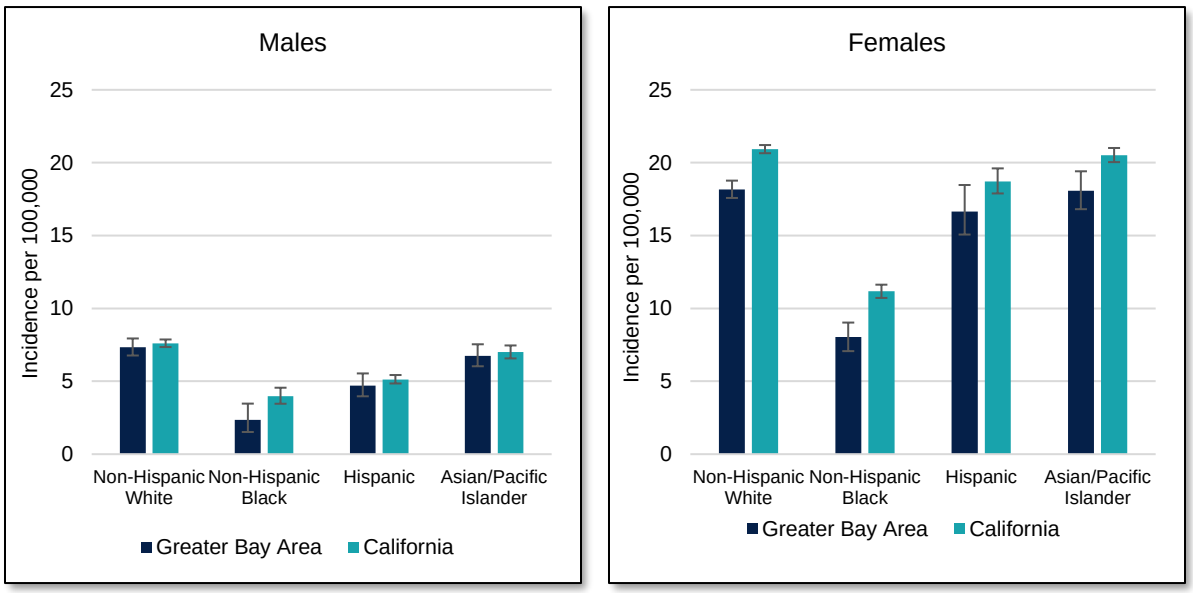


Figure 21: Thyroid Cancer Age-Adjusted Incidence Rates[1] by Sex, Racial/Ethnic Group, and Region[2], 2012-2016



[1] Error bars (in Black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region), and (2) all of California (including the nine-county Greater Bay Area region).

XII. CERVICAL CANCER

Incidence rates of cervical cancer have declined substantially since 1988 in all racial/ethnic groups in the Greater Bay Area **(Figure 22)**. From 1988 through 2016, the steepest declines were seen among Asians/Pacific Islanders and NH Blacks, both by -4.7% per year; in addition, significant declines were also observed among Hispanics and NH Whites, -4.0% and -1.6% per year, respectively. Cervical cancer screening ("Pap" testing), which detects precancerous cells and early cervical cancers, has contributed significantly to the decline in cervical cancer incidence [53, 54].

The most common risk factor for cervical cancer is human papillomavirus (HPV) infection; HPV types 16 and 18 are responsible for approximately 70% of all cervical cancers [53-55]. In 2006, three highly effective vaccines against these strains of HPV were approved by the Food and Drug Administration (FDA) for the prevention of HPV-caused cancers [56]. In combination with continued cervical cancer screening, these vaccines are likely to result in further declines in cervical cancer incidence in future years.

In the Greater Bay Area, 2012-2016 incidence rates of cervical cancer were higher among Hispanics (8.2 per 100,000) than NH Whites and Asians/Pacific Islanders (both 5.3 per 100,000). The disproportionate burden of cervical cancer in Hispanic females can, in part, be attributable to low uptake of cervical cancer screening [57]. From 2012-2016, cervical cancer incidence rates were lower in the Greater Bay Area than in California among NH Whites and Asians/Pacific Islanders, whereas rates were similar between the regions for NH Blacks and Hispanics **(Figure 23)**.

From 1988 through 2016, mortality rates due to cervical cancer decreased significantly in all racial/ethnic groups, with the largest decline seen among Asians/Pacific Islanders (-4.2% per year) followed by NH Blacks (-4.4% per year). The decrease in mortality rates in the Greater Bay Area was similar to that seen nationwide, with declines likely as a result of continuing increases in prevention and early detection due to wide-spread screening [58]. From 2012-2016, cervical cancer mortality rates in the Greater Bay Area were highest in Hispanics (2.2 per 100,000), and this rate was significantly higher than the rate in NH Whites (1.1 per 100,000). In the Greater Bay Area, cervical cancer mortality rates for NH Whites, NH Blacks and Asians/Pacific Islanders were significantly lower than in all of California, but rates were similar for Hispanics **(Figure 23).**

Although a vaccine against HPV has been available and recommended in the U.S. since 2006, its direct impact on cancer incidence and mortality rates remains unclear, in part, due to the targeting of vaccinations to primarily young populations, slow uptake in the U.S., and ~20 year latency between HPV infection and presentation of a pre-cancerous lesion. However, a recent study in the U.S. supports the conclusion that HPV vaccination is effective in reducing cervical cancer [59]. In addition, promising declines in HPV prevalence and related anogenital diseases have been recently documented in U.S. populations [60]. Additional ongoing surveillance and research will be able to determine the direct impact of HPV vaccination on population-level cervical cancer incidence and mortality over the next several years [61].

Figure 22: Cervical Cancer Incidence Rates and Trends in the Greater Bay Area by Racial/ Ethnic Group, 1988-2016

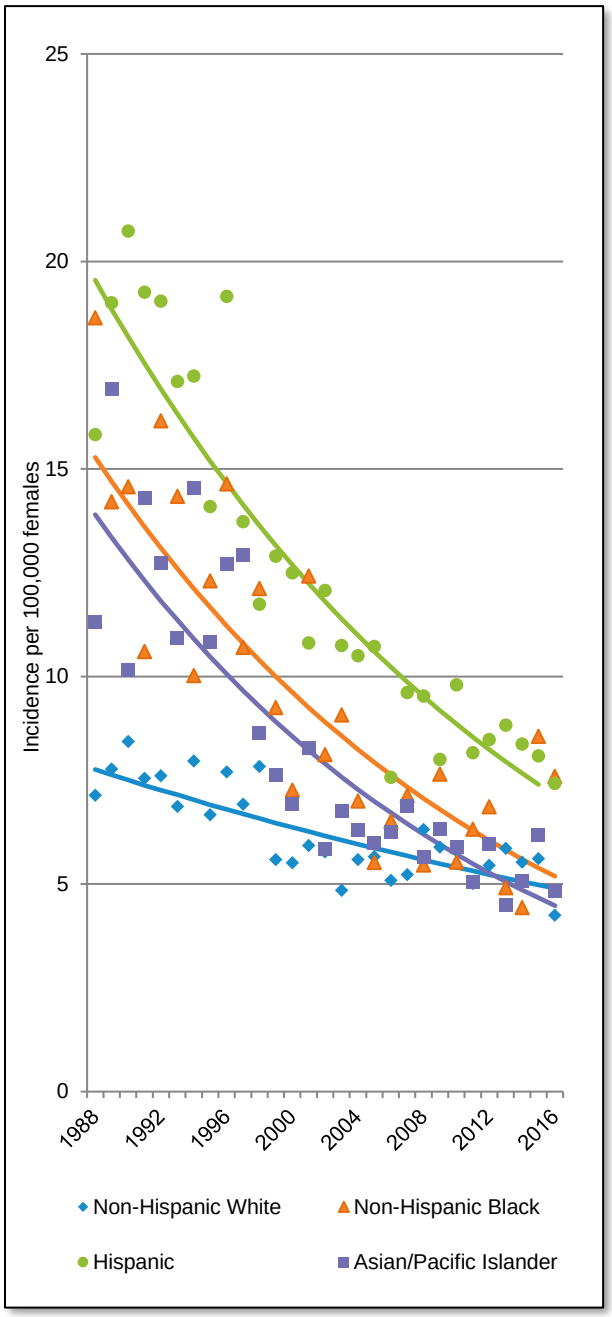
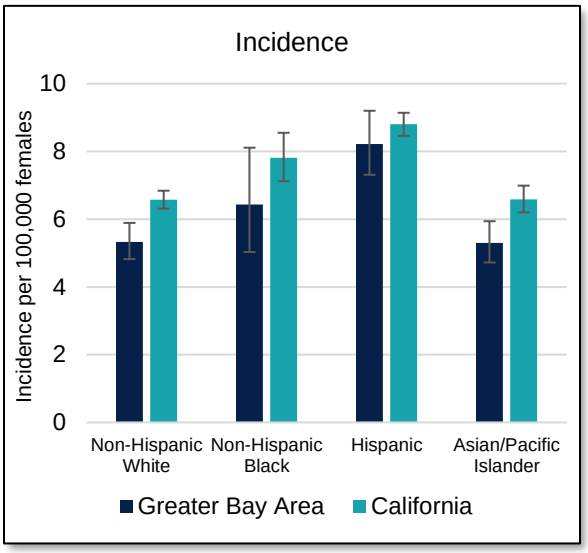
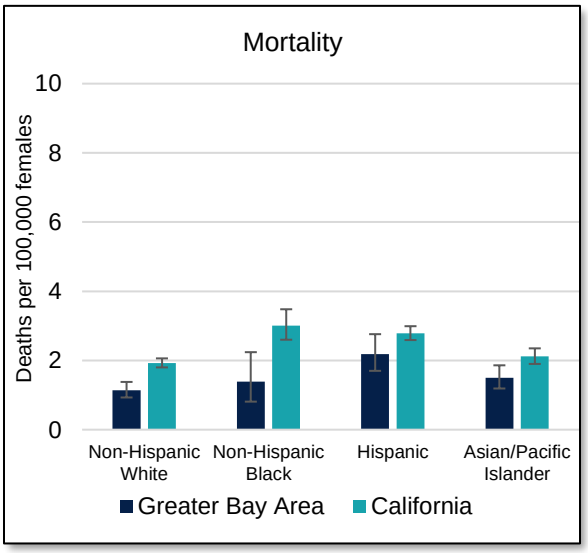


Figure 23: Cervical Cancer Age-Adjusted Incidence and Mortality Rates[1] by Racial/Ethnic Group and Region[2], 2012-2016





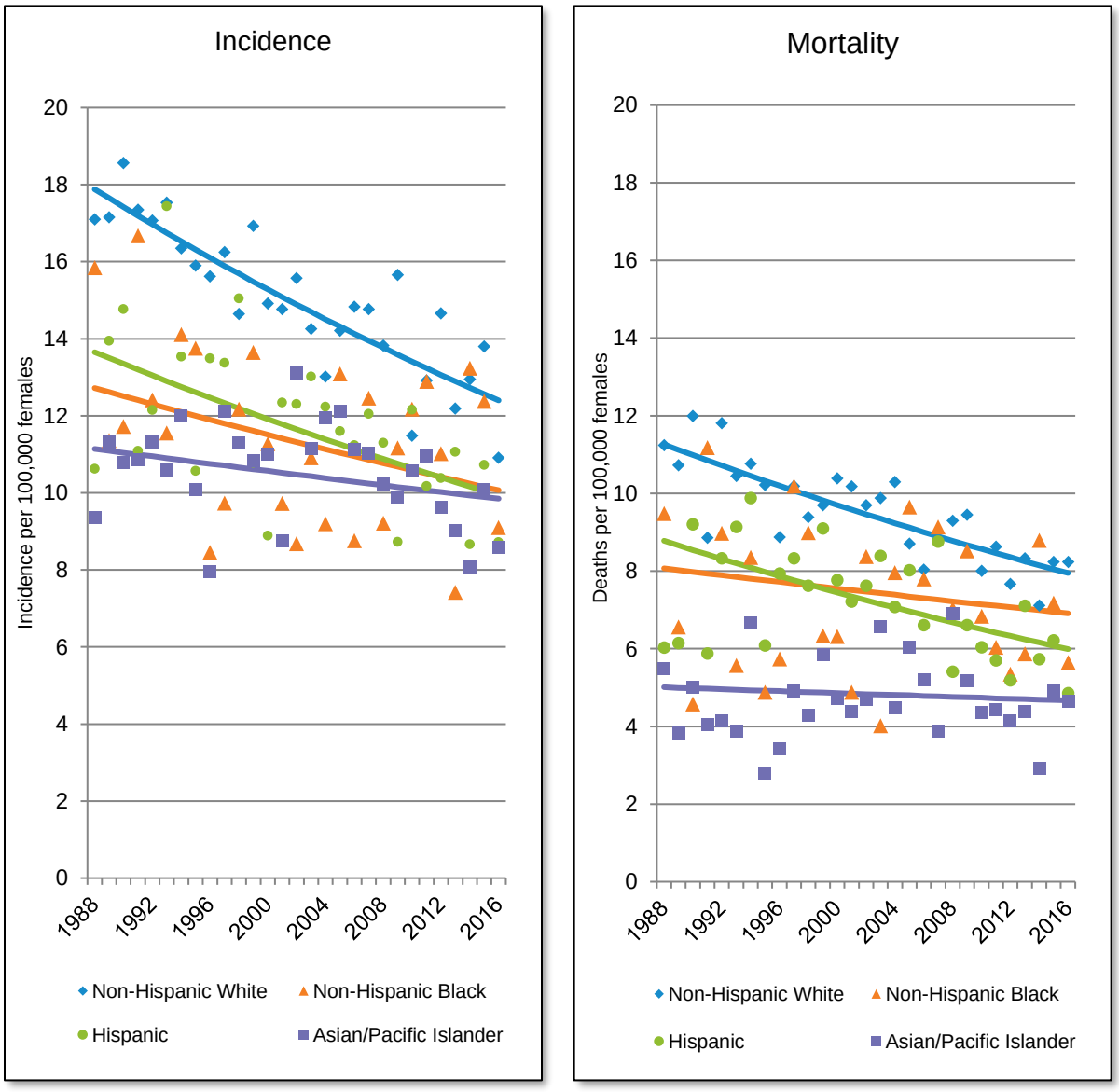
[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence and mortality rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region), and (2) all of California (including the nine-county region of the Greater Bay Area).

XIII. OVARIAN CANCER

In the Greater Bay Area, ovarian cancer was the 8th most common cancer diagnosed in females from 2012-2016, and the 6th leading cause of death resulting from cancer. Ovarian cancer accounts for approximately 3% of all cancers among females in the U.S.. Most ovarian cancers start from cells that cover the outer surface of the ovaries, and are often not diagnosed until late stage [62]. Risk factors include a family history of ovarian cancer, obesity and excessive weight gain, no pregnancies, use of postmenopausal hormone therapy, fertility drugs, and perineal use of talcum powder [63]. Incidence rates of ovarian cancer have decreased in the Greater Bay Area for all racial/ethnic groups from 1988 through 2016: significantly for NH Whites (-1.3% per year) and Hispanics (-1.1% per year), and non-significantly for NH Blacks (-0.8% per year) and Asians/Pacific Islanders (-0.4% per year; **Figure 24)**. In the Greater Bay Area from 2012 through 2016, NH White females had a slightly higher incidence rate of ovarian cancer (12.9 per 100,000) than females of other races/ethnicities (~10 per 100,000). For all racial/ethnic groups, Greater Bay Area incidence rates were comparable to those in California.

Mortality rates from ovarian cancer also decreased significantly over the period 1988-2016 among NH Whites (-1.2% per year) and Hispanics (-1.4% per year), and were stable in NH Blacks and Asians/Pacific Islanders **(Figure 24)**. From 2012 through 2016, NH White females had slightly higher mortality rates from ovarian cancer (7.9 per 100,000) than other racial/ethnic groups (NH Blacks: 6.6 per 100,000; Hispanics: 5.8 per 100,000; Asians/Pacific Islanders: 4.2 per 100,000). Mortality rates in the Greater Bay Area were comparable to those in California for all racial/ethnic groups.

Figure 24: Ovarian Cancer Incidence and Mortality Rates and Trends in the Greater Bay Area by Racial/Ethnic Group, 1988-2016



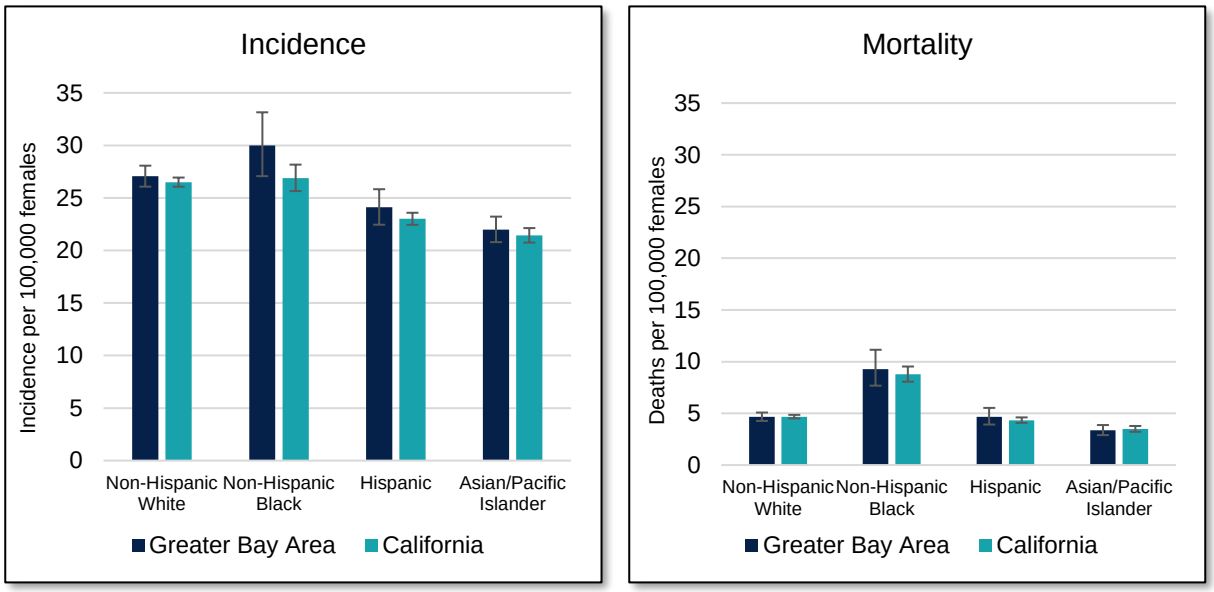
XIV. UTERINE CANCER

Uterine cancer is the most common gynecologic cancer and is primarily diagnosed in post-menopausal women, with incidence peaking in the sixth decade of life. Almost all uterine cancers occur in the endometrium (lining of the uterus) [64]. Over the past decade (from 2007 through 2016), incidence rates of uterine cancer in the Greater Bay Area have increased on average by 1.7% per year with Hispanic women experiencing the largest increase in incidence rates (3.0% per year), and the smallest increase in NH White women (0.9% per year). Increasing incidence rates may be related to the increasing prevalence of obesity [64, 65], especially in postmenopausal women for whom body fat is the primary source of estrogens. Other risk factors for endometrial cancer related to estrogen exposure include early age of menarche, late age of menopause, no pregnancies, and menopausal hormone use of unopposed estrogen [64].

During the period 2012-2016, incidence rates in the Greater Bay Area were highest in NH Blacks (30.0 per 100,000) and NH Whites (27.1 per 100,000), and lowest in Hispanics (24.1 per 100,000) and Asians/Pacific Islanders (22.0 per 100,000; **Figure 25)**. The incidence rates in the Greater Bay Area were similar to those in California across racial/ethnic groups. Because women who have had their uterus removed (hysterectomy) are no longer at risk for uterine cancer, the actual incidence rates are likely higher than reported. This is because the population counts used in calculating the rates do not account for the true at-risk population (i.e., women who have not had a hysterectomy) [65, 66]. The prevalence of hysterectomy in the population varies by race/ethnicity, and one report suggests that correcting incidence rates by the prevalence of hysterectomy in the population would increase incidence rates by 55% for NH Whites, 80% for NH Blacks, and 44% for Hispanics in California [66]. Additionally, as the prevalence of hysterectomy has changed differentially over time across racial/ethnic groups, observed incidence trends may in part be reflecting changes in the prevalence of hysterectomy rather than true changes in incidence rates, and caution must be taken when comparing incidence rate trends by race/ethnicity [65].

Uterine cancer mortality rates in the Greater Bay Area have been increasing by 1-2% per year over the past 2 decades for all racial/ethnic groups except for Hispanic women, whose mortality rate has remained stable since 1988. From 2012-2016, the mortality rate was highest among NH Blacks (9.3 per 100,000) and lowest among Asians/Pacific Islanders (3.4 per 100,000). NH Whites and Hispanics had similar mortality rates (4.7 per 100,000). The disproportionately higher mortality rates in NH Blacks, which has been noted nationwide, is likely due to many factors, including a higher proportion of more aggressive subtypes of uterine cancer and more advanced stage at diagnosis in this group of women [66]. Overall, uterine cancer mortality rates for the Greater Bay Area were similar to those for California **(Figure 25)**.

Figure 25. Uterine Cancer Age-Adjusted Incidence and Mortality Rates[1] by Racial/Ethnic Group and Region[2], 2012-2016



[1] Error bars (in black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence and mortality rates.
[2] The two regions represented include: (1) the Greater Bay Area (nine-county region), and (2) all of California (including the nine-county Greater Bay Area region).

XV. KIDNEY CANCER

Kidney cancer is about twice as common in males as females. In addition to family history and genetic mutations, risk factors for kidney cancer include smoking, obesity, and high blood pressure [67-69]. In the Greater Bay Area, incidence rates of kidney cancer were highest in NH Blacks (males: 25.7 per 100,000; females: 13.2 per 100,000) and lowest in Asians/Pacific Islanders (males: 12.0 per 100,000; females: 5.7 per 100,000) during 2012-2016. Kidney cancer rates have been increasing since 1988 at a rate of 2-3% per year for most groups in the Greater Bay Area, except for NH Whites for whom rates appear to have levelled off. In NH White males, rates levelled off in 2008 following a sharp increase of 4.7% per year from 2002-2008. In NH White females, rates levelled off in 2011 after increasing at a rate of 1.8% per year prior to that **(Figure 26)**. The observed increasing rates mainly reflect increases in the rates of localized stage disease, which can in part be attributed to the greater use of medical imaging procedures and the incidental detection of early kidney cancers. Increasing rates may also reflect changes in the prevalence of kidney cancer risk factors, such as obesity and hypertension, in the population [68, 70]. Incidence rates for regional and distant stage disease have remained relatively stable over time. For 2012 through 2016, kidney cancer incidence rates overall in the Greater Bay Area were lower than rates in California (18.3 per 100,000 vs. 19.9 per 100,000 for males and 8.6 per 100,000 vs. 9.7 per 100,000 for females, respectively) **(Table 8)**.

Mortality due to kidney cancer has declined by -0.8% per year for NH White males and -1.4% per year for NH White females from 1988 through 2016, but mortality rates have remained fairly constant for most other racial/ethnic groups. Yet, for Asian/Pacific Islander males, the mortality rate has steadily increased by 5.6% per year since 2002. Mortality is highest among NH Black males (6.1 per 100,000) and females (2.5 per 100,000), followed by Hispanic males (5.0 per 100,000) and females (2.4 per 100,000). Greater use of sophisticated imaging procedures, resulting in diagnosis of early stage tumors, has led to improved survival, thus reducing mortality rates nationwide [67]. Mortality rates in the Greater Bay Area were comparable to California rates for all racial/ethnic groups.

Figure 26: Kidney Cancer Incidence and Mortality Rates and Trends in the Greater Bay Area by Racial/Ethnic Group, 1988-2016

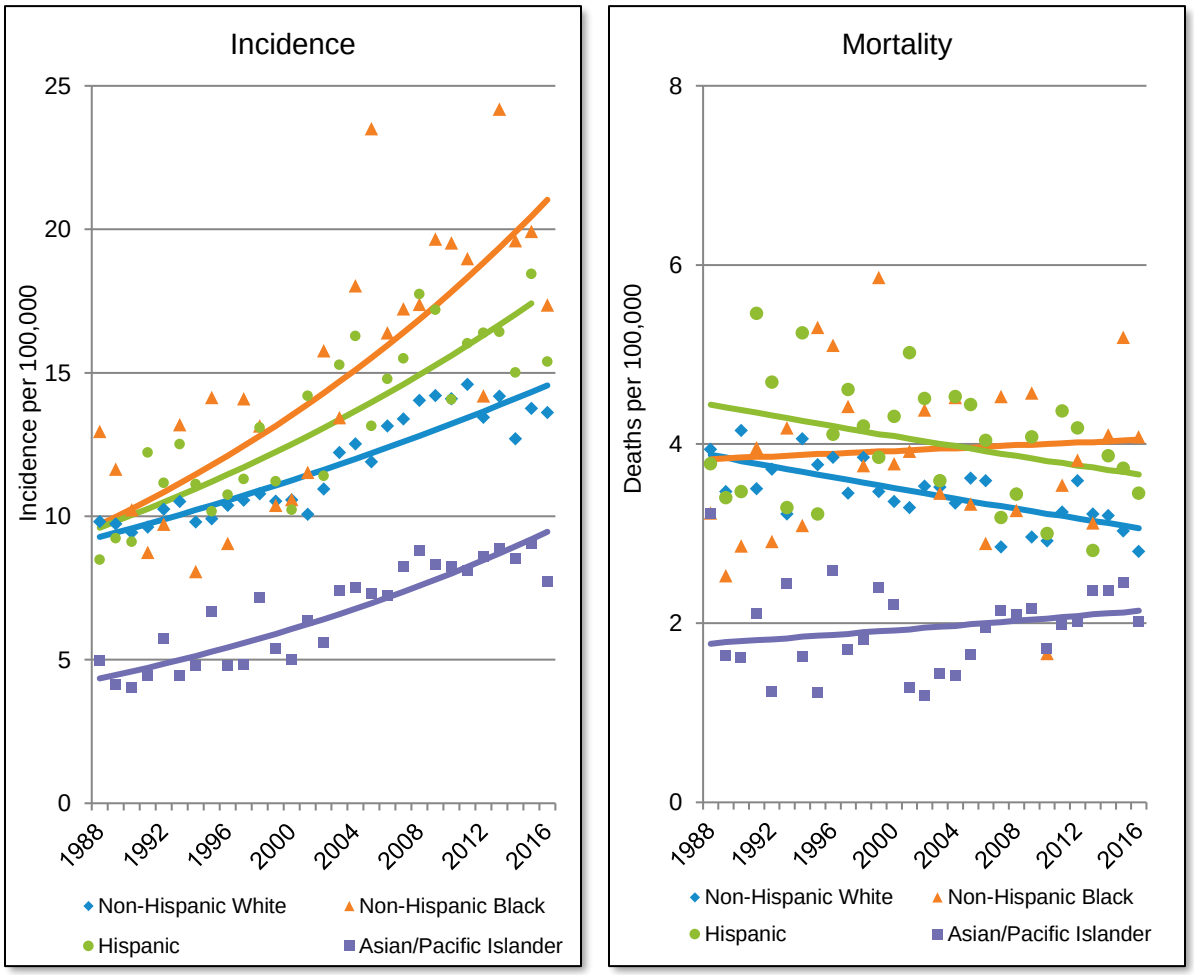


Table 8: Kidney Cancer Age-Adjusted Incidence Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	18.3	8.6	19.9	9.7
Non-Hispanic White	19.4	8.2	20.5	9.3
Non-Hispanic Black	25.7	13.2	24.3	12.3
Hispanic	21.3	12.2	21.9	12.1
Asian/Pacific Islander	12.0	5.7	11.9	5.4

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region), and (2) all of California (including the nine-county region of the Greater Bay Area).

XVI. BRAIN AND OTHER NERVOUS SYSTEM CANCERS

Brain and other nervous system cancers is the 18th most commonly diagnosed cancer among males and females in the Greater Bay Area. There are many different types of brain and other nervous system tumors included in this classification: astrocytic tumors, oligodendroglial tumors, mixed gliomas, etc. [71]. Risk factors for these tumors are generally unknown; however, having specific genetic syndromes may increase the risk of a central nervous system tumor. Among males, incidence rates of brain and other nervous system cancer have been declining over time (-0.4% per year since 1988); no significant decreases have occurred in most racial/ethnic groups, but a significant increase has occurred in Asians/Pacific Islanders (1.3% per year since 1988). Among females, there were also no significant decreases or increases in brain and other nervous system cancer incidence rates since 1988. The 2012-2016 incidence rates were higher among males (7.4 per 100,000) than females (4.9 per 100,000). Incidence rates in NH White males and females were approximately twice the rates for other racial/ethnic groups. For 2012-2016, the incidence rate for Asian/Pacific Islander males in the Greater Bay Area was higher compared to California; for other racial/ethnic groups, both males and females, the incidence rates were comparable to the California rates **(Table 9a)**.

Similar to incidence rates, mortality rates were twice as high for NH Whites than for other racial/ethnic groups. Mortality rates for all racial/ethnic groups in the GBACR were comparable to those of California **(Table 9b)**.

Glioblastoma

While glioblastoma multiforme (GBM) is relatively rare, its poor prognosis and resulting rates of mortality make it an important public health issue. These tumors arise in glial cells, a specific type of cell in the brain that surrounds neurons and provides support and insulation between them. Glial cells are the most abundant cell type in the central nervous system [72].

GBM is more common in males than in females. In the Greater Bay Area, 5-year incidence rates were highest in NH Whites (males: 5.1 per 100,000; females: 3.2 per 100,000) and lowest in NH Blacks (males: 2.4 per 100,000; females: 1.2 per 100,000). Incidence rates have generally been stable over the past three decades in the Greater Bay Area population as a whole, but GBM has been increasing significantly in specific racial/ethnic groups: NH White males (0.6% per year) and females (1.0% per year), and Asian/Pacific-Islander males (1.7% per year). Incidence rates in Hispanic females have been decreasing since 1988 (-1.6%).

GBM incidence rates in the Greater Bay Area were higher than rates in California (4.2 per 100,000 vs. 3.8 per 100,000 for males and 2.5 per 100,000 vs. 2.4 per 100,000 for females, respectively). Incidence rates in the Greater Bay Area were higher than rates in California for Asian/Pacific Islander males and for NH White males. Among all females, incidence rates were comparable between the Greater Bay Area and California **(Figure 27)**.

Table 9a and 9b: Brain and Other Nervous System Cancer Age-Adjusted Incidence and Mortality Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

9a: Incidence

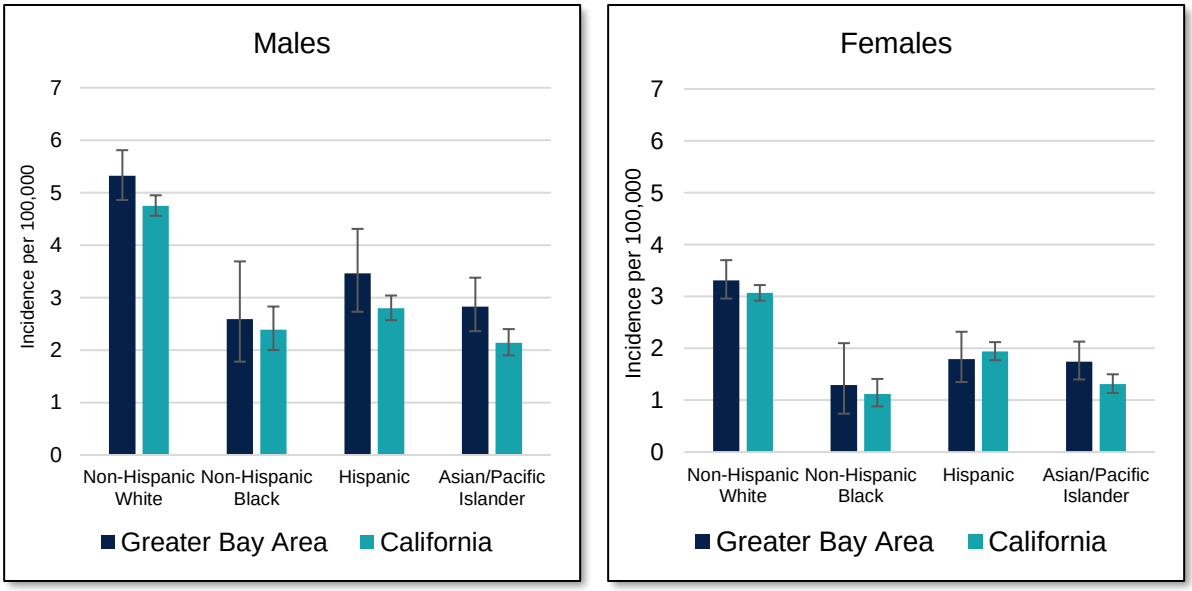
Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	7.4	4.9	7.0	5.0
Non-Hispanic White	9.7	6.4	9.1	6.3
Non-Hispanic Black	4.8	3.1	5.1	3.0
Hispanic	5.8	4.2	5.4	4.3
Asian/Pacific Islander	5.4	3.6	4.6	3.1

9b: Mortality

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	5.1	3.3	5.4	3.5
Non-Hispanic White	6.6	4.2	6.7	4.3
Non-Hispanic Black	3.8	1.7	4.1	2.2
Hispanic	3.7	2.7	4.0	3.0
Asian/Pacific Islander	3.4	2.3	3.1	2.2

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region), and (2) all of California (including the nine-county region of the Greater Bay Area).

Figure 27: Glioblastoma Age-Adjusted Incidence Rates[1] by Sex, Racial/Ethnic Group, and Region[2], 2012-2016



[1] Error bars (in Black at the top of the bars) indicate 95% confidence intervals surrounding the corresponding incidence rates.

[2] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county region of the Greater Bay Area).

XVII. LEUKEMIA

Acute lymphocytic leukemia

Acute lymphocytic leukemia (ALL) is the most frequent malignancy in children (aged 0-14 years) and the leading cause of cancer death in this age group in the U.S. [73, 74]. From 1988 through 2016, the incidence rates of childhood ALL in the Greater Bay Area remained stable for all racial/ethnic groups. For the period 2012–2016, the highest incidence rates of childhood ALL were in Hispanic males (5.5 per 100,000) and Asian/Pacific Islander females (5.0 per 100,000); **Table 10a**). For males and females of all racial/ethnic groups, the incidence rates were 4.8 and 4.2 per 100,000, respectively, in the Greater Bay Area, which were slightly less than overall California rates for males and females (5.2 and 4.4 per 100,000, respectively).

Childhood ALL is a highly curable disease, with five-year survival up to 80%–90% [73, 74]. Survival has improved dramatically in the last few decades due to advances in treatment and supportive care. The mortality rates in the Greater Bay Area from 2012-2016 for males and females of all racial/ethnic groups (0.5 and 0.2 per 100,000, respectively) were similar to California rates for males but lower for females (0.4 and 0.3 per 100,000, respectively; **Table 10b**).

Table 10a and 10b: Childhood ALL Incidence and Mortality Rates per 100,000 by Sex, Racial/Ethnic Group, and Region[1], 2012-2016

10a: Incidence

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	4.8	4.2	5.2	4.4
Non-Hispanic White	4.8	3.2	4.7	4.1
Non-Hispanic Black	^	^	2.7	2.2
Hispanic	5.5	4.5	6.0	5.0
Asian/Pacific Islander	4.3	5.0	4.0	3.6

10b: Mortality

Race/Ethnicity	Greater Bay Area		California	
	Males	Females	Males	Females
All Races/Ethnicities	0.5	0.2	0.4	0.3
Non-Hispanic White	0.5	^	0.2	0.2
Non-Hispanic Black	^	^	^	^
Hispanic	0.7	^	0.5	0.4
Asian/Pacific Islander	^	^	0.3	0.3

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region), and (2) all of California (including the nine-county region of the Greater Bay Area).
^ Statistic not displayed due to fewer than 5 cases.

Acute myeloid leukemia (AML)
Acute myeloid leukemia is the most common type of leukemia and its incidence increases substantially with advancing age, particularly among males. Incidence rates of AML increased significantly from 1988 through 2016 for NH Black males (by 1.9% per year), Hispanic males (by 1.6% per year), and NH White males and females (by 0.7% and 0.6% per year, respectively). The 2012-2016 incidence rates of AML (both sexes combined) were highest for NH Whites (4.3 per 100,000), followed by Hispanics (4.0 per 100,000), NH Blacks (3.8 per 100,000) and lowest for Asians/Pacific Islanders (3.4 per 100,000). For all racial/ethnic groups, AML incidence rates for males and females in the Greater Bay Area (5.2 and 3.2 per 100,000, respectively) and California (4.9 and 3.3 per 100,000, respectively) were similar.

From 1988 through 2016, AML mortality rates increased for NH White males (1.2% per year) and females (0.9% per year). For all races/ethnicities and both sexes, AML mortality rates in the Greater Bay Area were similar to those in California **(Table 11)**.

Chronic lymphocytic leukemia (CLL)
The incidence of chronic lymphocytic leukemia increases with age, with more than 70% of patients older than 65 years at diagnosis [75]. Among all racial/ethnic groups, incidence is almost twice as high in males as in females. In the Greater Bay Area, the incidence of CLL among NH Whites increased by 1.4% per year over the period 1988-2016. The 2012–2016 incidence rate for both sexes was highest in NH Whites (5.7 per 100,000), followed by NH Blacks (3.9 per 100,000), Hispanics (2.1 per 100,000), and Asians/Pacific Islanders (1.2 per 100,000). Incidence for Hispanic males and Asian/Pacific Islander females was about 30% higher in the Greater Bay Area (3.1 and 0.9 per 100,000, respectively) than California (2.3 and 0.6 per 100,000, respectively).

From 1988 through 2016, mortality rates for CLL decreased by -1.3% per year for males and by -1.4% for females, mainly due to a decline in mortality among NH Whites. Mortality rates for CLL in the Greater Bay Area were 30% lower than rates in California for NH Black males and NH White females.

Chronic myeloid leukemia (CML)
Chronic myeloid leukemia is more common in adults than children, and is characterized by the presence of the Philadelphia chromosome [76-79]. Incidence rates of CML in males declined from 1988 through 2016 by an average of -0.8% per year, mainly due to the decreasing incidence among Asian/Pacific Islander males (by -1.8% per year). In females, incidence also declined by -1.0% per year. Incidence rates from 2012-2016 for both sexes combined were similar for NH Whites, NH Blacks, and Hispanics (approximately 1.6-1.7 per 100,000) but lower for Asians/Pacific Islanders (1.2 per 100,000). CML incidence rates for all sexes and racial/ethnic groups in the Greater Bay Area were similar to California **(Table 11)**.

Mortality rates for CML declined by -6.4% per year from 1988-2016 for all sexes and races/ethnicities. This overall decline was mainly due to the reduced mortality among NH Whites. In the last 15 years, the introduction of tyrosine kinase inhibitors as the first line treatment for CML has dramatically improved survival from this disease [80]. Mortality rates for all racial/ethnic groups in the Greater Bay Area (0.3 per 100,000 for males and 0.2 per 100,000 for females) were similar to those in California (0.4 per 100,000 for males and 0.2 per 100,000 for females).

Table 11. Leukemia Incidence and Mortality Rates for Both Sexes and All Racial/Ethnic Groups Combined, by Histology Type and Region[1], 2012-2016

Histology Type	Incidence per 100,000		Deaths per 100,000	
	Greater Bay Area	California	Greater Bay Area	California
Childhood Acute Lymphocytic Leukemia (ALL)[2]	4.5	6.0	0.6	0.7
Acute Myeloid Leukemia (AML)	4.0	4.0	2.8	2.7
Chronic Lymphocytic Leukemia (CLL)	4.0	3.7	1.0	1.1
Chronic Myeloid Leukemia (CML)	1.5	1.6	0.2	0.3

[1] The two regions represented include: (1) the Greater Bay Area (nine-county region) and (2) all of California (including the nine-county Greater Bay Area region).

[2] Childhood ALL includes cases diagnosed at 0-14 years of age; all other leukemia rates include all cases regardless of age at diagnosis.

XVIII. ACKNOWLEDGMENT

The collection of cancer incidence data used in this study was supported by the California Department of Public Health pursuant to California Health and Safety Code Section 103885; Centers for Disease Control and Prevention's (CDC) National Program of Cancer Registries, under cooperative agreement 5NU58DP006344; the National Cancer Institute's Surveillance, Epidemiology and End Results Program under contract HHSN261201800032I awarded to the University of California, San Francisco, contract HHSN261201800015I awarded to the University of Southern California, and contract HHSN261201800009I awarded to the Public Health Institute, Cancer Registry of Greater California. The ideas and opinions expressed herein are those of the author(s) and do not necessarily reflect the opinions of the State of California, Department of Public Health, the National Cancer Institute, and the Centers for Disease Control and Prevention or their Contractors and Subcontractors.

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XX. APPENDIX

Glossary of Technical Terms

I. Analytic terms

Incidence: The number of new cases of cancer diagnosed in a certain period of time. In this report, incidence data are based on the number of new cases of cancer diagnosed each year in residents of the Greater Bay Area over the period January 1, 1988 through December 31, 2016.

Mortality: The number of deaths due to cancer in a certain period of time. In this report, mortality data are based on the number of deaths from cancer each year in residents of the Greater Bay Area over the period January 1, 1988 through December 31, 2016.

Incidence/mortality rate: The number of new cancer cases (*incidence*) or deaths (*mortality*) in a certain period of time in a specific population, divided by the size of that population. Incidence and mortality rates are expressed per 100,000 population. In this report, annual and cumulative (or average) 5-year incidence and mortality rates are presented.

Confidence interval: A statistical measure of the precision of the observed incidence or mortality rate. The observed rate is an estimate of the true rate based on counts of cancer cases (or deaths) and of the population, and is subject to variation from the true value of the rate. The confidence interval for the observed rate is a range of values within which the true rate is thought to lie, with a specified level of confidence, e.g., 95%. Rates based on larger numbers are subject to less variation.

Age-adjusted incidence/mortality rate: Age-adjustment is a statistical method that allows comparisons of incidence and mortality to be made between populations with different age distributions. An age-adjusted cancer incidence (or mortality) rate is defined as the number of new cancers (or deaths) per 100,000 population that would occur in a certain period of time if that population had a 'standard' age distribution. In this report, incidence and mortality rates are age-adjusted using the U.S. 2000 Standard Population.

Trend: Used to describe the change in the incidence or mortality rate over time. The Annual Percent Change (APC) is used to measure trends. For example, incidence rates may rise gradually over a period of several years, then drop sharply for several years. Statistical criteria are used to quantify the magnitude of change over a period of time.

Race/ethnicity: In this report, race/ethnicity is categorized as: All races/ethnicities, Non-Hispanic (NH) White, NH Black, Asian/Pacific Islander, or Hispanic. "All races" includes all of the above, as well as other/unknown race/ethnicity and American Indian/Alaska Native. The latter two groups are not reported separately due to small numbers for many cancer sites (<5 cases).

II. Cancer terms

Carcinoma: Cancer that begins in the skin or in tissues that line or cover internal organs.

Histology: The study of tissues and cells under a microscope. Cancers are identified and diagnosed primarily on the basis of histology. They often are classified further by histologic subtype.

In situ*:* Meaning 'in its original place'. For example, in carcinoma in situ, abnormal cells are found only in the place where they first formed. They have not spread.

Invasive: Cancer that has spread beyond the layer of tissue in which it developed and is growing into surrounding, healthy tissues. Also called infiltrating cancer. Invasive tumors are classified according to how far the cancer has spread at the time of diagnosis.

Malignant: Cancerous. Malignant cells can invade and destroy nearby tissue and spread to other parts of the body.

Stage: The extent of the cancer in the body, such as how large the tumor is, and if it has spread. In this report, four categories of stage are used: (1) In situ (see above), (2) localized – cancer is limited to the place where it started with no sign that it has spread, (3) regional – cancer has spread to nearby lymph nodes, tissues or organs, (4) distant – cancer has spread to distant parts of the body.

SEER: The Surveillance Epidemiology and End Results Program of the National Cancer Institute (NCI), which provides cancer statistics for the US population. U.S. SEER 20 is comprised of 20 cancer registries from around the U.S., including all regions in California (San Francisco-Oakland, San Jose-Monterey, Greater California, and Los Angeles), Connecticut, Georgia, Hawaii, Idaho, Iowa, Kentucky, Louisiana, Massachusetts, New Jersey, New York, New Mexico, Utah, Wisconsin, the metropolitan areas of Detroit and Seattle-Puget Sound; the Alaska Native Tumor Registry, Arizona Indians, and the Cherokee Nation. .