

UC San Diego

UC San Diego Previously Published Works

Title

Racial/Ethnic Disparities Across Indicators of Cigarette Smoking in the Era of Increased Tobacco Control, 1992–2019

Permalink

<https://escholarship.org/uc/item/1j42m24j>

Journal

Nicotine & Tobacco Research, 23(6)

ISSN

1462-2203

Authors

Sakuma, Kari-Lyn K

Pierce, John P

Fagan, Pebbles

et al.

Publication Date

2021-05-24

DOI

10.1093/ntr/ntaa231

Peer reviewed

Racial/Ethnic Disparities Across Indicators of Cigarette Smoking in the Era of Increased Tobacco Control, 1992- 2019

Nicotine Tob Res. 2020 Nov 16:ntaa231. doi: 10.1093/ntr/ntaa231. Epub ahead of print. PMID: 33196799.

AUTHORS:

Kari-Lyn K. Sakuma, PhD MPH¹

John P Pierce, PhD²

Pebbles Fagan, PhD MPH³

France T. Nguyen-Grozavu, PhD MPH MA²

Eric C. Leas, PhD MPH⁴

Karen Messer, PhD²

Martha M White, MS²

Amanda S Tieu²

Dennis R Trinidad, PhD MPH²

AFFILIATIONS:

1. School of Social and Behavioral Health Sciences, College of Public Health and Human Sciences, Oregon State University, Corvallis, Oregon
2. Moores Cancer Center, Department of Family Medicine and Public Health, University of California San Diego, La Jolla, California
3. Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences, Little Rock, AR
4. Division of Health Policy, Department of Family Medicine and Public Health, University of California San Diego, La Jolla, California
- 5.

CORRESPONDING AUTHOR: All correspondence and reprint requests should be directed to: Kari-Lyn Kobayakawa Sakuma, Ph.D., M.P.H., College of Public Health and Human Sciences, School of Social and Behavioral Health Sciences, Oregon State University, 412 Waldo Hall, Corvallis, Oregon 97331-6406. Email: karilyn.sakuma@oregonstate.edu

Abstract

Introduction: This study compared tobacco use and cessation for African Americans (AA), Asians/Pacific Islanders (API), Hispanics/Latinos (H/L), American Indian/Alaskan Natives (AI/AN), and non-Hispanic Whites (NHW) in the United States (US) to California (CA), the state with the longest continually funded tobacco control program. The purpose of this study was to identify tobacco use disparities across racial/ethnic groups across time.

Methods: Cigarette use prevalence (uptake and current use), consumption (mean number of cigarettes smoked per day [CPD]), and quit ratios were calculated across survey years and trends were examined within each race/ethnic group and comparing between CA and the US utilizing the 1992-2019 Tobacco Use Supplements to the Current Population Survey.

Results: Prevalence decreased for all race/ethnic groups. Current use among CA NHW showed significant decline compared to US counterparts, while US H/L showed greater decline than CA counterparts. CPD decreased by approximately 30% across race/ethnic groups, with CA groups having lower numbers. The greatest decrease occurred among AA in CA (average 10.3 CPD (95% CI: 10.3,12.6) in 1992/93 to 3 CPD (95% CI: 2.4,3.7) in 2018/19). Quit ratios increased from 1992/93 to 2018/19 for CA H/L 52.4% (95% CI: 49.8,53.0) to 59.3 (95% CI: 55.8, 62.5), and CA NHWs 61.5% (95% CI: 60.7, 61.9) to 63.8% (95% CI:63.9, 66.9).

Conclusions. Although overall prevalence decreased over time for each racial/ethnic group, declines in CA outpaced the US only for NHWs. Reductions in CPD were encouraging but the quit ratio points to the need to increase tobacco control efforts toward cessation.

IMPLICATIONS [50-100 words]

The successes in reduced cigarette use uptake and prevalence across time for both California and the rest of the US were observed largely among non-Hispanic White populations. While reductions in the number of cigarettes smoked per day are a

notable success, particularly among the Californian African Americans, efforts to support quitting across racial/ethnic groups, especially marginalized groups, need to be prioritized.

INTRODUCTION

Since the 1990s, the tobacco control landscape in the United States (US) has become increasingly restrictive and overall cigarette smoking prevalence rates have decreased.^{1,2} Over this same period, California has been the only state in the nation to have a continuously-funded, comprehensive Tobacco Control Program, which has cultivated a strong anti-tobacco climate.^{3,4} California restricted sales, increased taxes, utilized the Clean Air Act to restrict smoking indoors and in public locations, launched comprehensive education and media campaigns to prevent tobacco use initiation, and created quitlines.³⁻⁵ This level of investment has contributed to California, tied with Utah, as having the lowest current cigarette use prevalence in the nation at just 8% between 2014-2015.⁶

California is currently the most populous state in the US with an estimated 39.5 million individuals,⁷ and is home to the largest Latino population in the US.⁸ As of 2018, no race or ethnic group constitutes the majority of California's population.⁹ The demographic makeup of the US is also showing increasing racial/ethnic diversity. As the population ages and the proportion of White residents decline across the US, younger cohorts are demonstrating steady or increasing proportions of more racial/ethnic groups.¹⁰ Population-level cigarette smoking rates and tobacco-related morbidity and mortality may shift alongside these demographic changes in the US.

Racial/ethnic minority populations suffer disproportionately from tobacco-related diseases compared to non-Hispanic White populations.^{1,11,12} African Americans and Hispanic/Latinos smoke fewer cigarettes¹³⁻¹⁵ and are more likely to be non-daily smokers,^{14,16} yet have greater risk of lung cancer morbidity and mortality.^{1,17-20} American Indian/Alaskan Native populations have the highest

cigarette use prevalence ²¹ and are more likely to suffer disproportionate rates of tobacco-related death.²² Some Asian subgroups, Native Hawaiians, and other Pacific Islanders also suffer from disproportionate rates of tobacco-related mortality.^{11,17,18} Collectively, the disparities in tobacco-related diseases observed among racial/ethnic populations require closer study. Comparing California to the rest of the US affords an opportunity to examine how different cigarette use behaviors change over time within each racial/ethnic group. These differences may give public health and policy makers insight on how to best address tobacco-related health disparities.

Previous studies have shown marked differences in smoking behaviors between California and the rest of the US, suggesting a positive impact of the state's efforts on reducing prevalence,²³⁻²⁶ tobacco consumption ²⁷ and tobacco-related diseases.^{23,28,29} For example, changes in smoking behaviors in the 1970s-80s were more rapid in California compared to the rest of the US as a result of early and aggressive tobacco control; these changes were reflected in reduced lung cancer rates nearly 20 years later.^{26,29} However, relatively few studies have specifically examined differences between California and the US in reducing racial/ethnic disparities in smoking,^{30,31} and none have detailed trends over time in cigarette uptake, prevalence, consumption, and quitting among race/ethnic minority groups in the US. While California boasted the lowest current cigarette use prevalence in the nation,⁶ American Indian/ Alaska Natives and African Americans in the state had the highest smoking prevalence followed by California Whites, Asians, and Hispanic/Latinos.^{32,33} These data suggest that disproportionate levels of cigarette use remain. A prior study that examined smoking behaviors in California and compared it with the rest of the US found that Whites, Hispanic/Latino, and Asian/Pacific Islanders in

California were more likely to smoke fewer cigarettes per day or be non-daily smokers than the rest of the US.³⁰ However, this prior study was limited by pooling data and aggregating across decades of data, from 1992-2011, in order to have the power to examine racial/ethnic groups. The current study will expand prior work by examining trends of multiple smoking behaviors at each time point across nearly three decades of data, from 1992 to 2019, and within all racial/ethnic groups.

In studying the population-level impact of a changing tobacco control landscape, tracking trends in smoking behaviors can provide an overview of progress at various stages of the smoking continuum, from initiation to quitting. With the nation's increasing racial/ethnic diversity, and California being one of the most racially/ethnically diverse states,³⁴ examining these cigarette use indicators over time and within race/ethnic groups can provide a valuable population-level assessment of progress made, while identifying areas for improvement that can ultimately lead to progress in reducing morbidity and mortality disparities.

METHODS

Data Source

The US Census Bureau's Current Population Survey (CPS) assesses labor force characteristics among the civilian, non-institutionalized US population ages 15 and older.³⁵ The CPS is a stratified two stage probability sample design in which primary sampling units are first selected and then a sampling of housing units are identified.³⁵ Approximately 54,000 households are interviewed each month.³⁵ Detailed methodology of the CPS are published elsewhere.³⁵ Since the 1990s, Tobacco Use Supplements (TUS) sponsored by the National Cancer Institute and the Food and Drug Administration have been included with the CPS approximately

every 3 years. Each TUS consists of 3 monthly samples spaced approximately 4 months apart. The current study analyzed data from the 1992/93, 1995/96, 1998/99, 2001/02, 2003, 2006/07, 2010/11, 2014/15, and 2018/19 TUS-CPS.³⁶⁻⁴¹ The response rates ranged from 62% (2006/07) to 75% (2018/19).^{39,42} The analytical sample for this study was limited to self-responders, age 18 or older, who completed in-person interviews. Person-level TUS supplement weights adjust for non-response, in addition to maintaining national demographic information.⁴² These are publicly available data and are exempt from IRB review.

Measures

Demographic Characteristics

Demographic measures of interest included age, self-identified gender (women, men), level of education (less than high school, high school graduate, some college and college graduate), and race/ethnicity. Hispanic or Latino origin or descent was first determined by the question “Are you Hispanic?” Those who answered “Yes” were categorized as Hispanic/Latino, regardless of race. The remaining respondents were then categorized by race. Race was initially reported as one of five categories (Black [hence African American]; American Indian/Alaska Native; Asian or Pacific Islander; White; or Other). The ‘Other’ category was discontinued in 1996 and was excluded from this analysis. Starting in 2000, the Census allowed respondents to report more than one race, which was implemented in the TUS starting in 2003. Other or multiple races comprised at maximum only 1.4% of the data, and were excluded from this analysis. Prior to 2003, participants could only select Asian/Pacific Islander as a single response group. Participants were able to identify with each individual group (i.e., Asian Americans only or Pacific

Islander only) starting in 2003. For consistency with data prior to 2003, Asians/Pacific Islanders were analyzed together after 2003.

Cigarette Use Behaviors

Ever smokers were those who responded “Yes” to the question, “Have you smoked at least 100 cigarettes in your entire life?” We defined the *cigarette use uptake* as the proportion of ever smokers in the population between the age of 18-35.⁴³ While 99% of cigarette use uptake occurs by the age of 26,^{1,44} we extended the age range in order to capture late initiators who are likely to belong to a marginalized racial/ethnic group and smaller population groups,^{45,46} and in accordance with prior studies.^{26,43,47}

Ever smokers who reported smoking cigarettes “every day” or “some days” at the time of data collection were categorized as *current smokers* (see PhenX ID: Adult Tobacco Use 30-Day Quantity and Frequency #030804).^{48,49} Current smoking prevalence is an indicator of how widespread the behavior is among adults in the nation.⁵⁰

The number of cigarettes smoked per day (CPD) is a widely used measure of cigarette consumption or intensity of cigarette use.^{45,49,50} Cigarette consumption levels were measured by asking every day smokers “On the average, about how many cigarettes do you now smoke each day?” For those who indicated that they smoked “some days,” they were asked “On how many of the past 30 days did you smoke cigarettes?” and “On the average, on those days, how many cigarettes did you usually smoke each day?” For some day smokers, the number of days smoked in the last 30 days was multiplied by number of CPD then divided by thirty days to obtain the average number of CPD in the past month. Cigarette consumption levels were calculated and reported among adult (18 years and above) current smokers²⁵.

Ever smokers who responded “not at all” to the question, “Do you now smoke every day, some days or not at all?” were categorized as quitters. As a population-level measure of smoking cessation, the *quit ratio* was calculated as the proportion of ever smokers who had quit.^{49,50} Nearly all smoking initiation occurs by age 25 and experimentation is unlikely to occur after this age.⁴⁴ Aligned with published studies,^{26,29} we limit the quit ratio estimates to those aged 25 and older to capture those beyond experimentation.

Statistical analysis

Statistical analyses were conducted using SAS software version 9.4.⁵¹ All analyses were stratified by 2 categories of state residence (California alone and the US without California) and were conducted for each racial/ethnic group. Prevalence estimates were weighted using respondents’ person-level TUS-CPS survey weights. Variance estimates used replicate weights with Fay’s balanced repeated replication.⁵²

In order to remove additional complications due to changes in US demographics over the 27 years examined in this paper, within race/ethnicity categories data were standardized to the 2010 U.S. population.⁵³ Data were standardized to 48 cells (2 sex X 4 education X 6 ages: 18-24, 25-35, 36-45, 46-55, 56-65, 66+, as appropriate). Standardization was done by calculating the statistic of interest for each cell, multiplying that by the proportion each cell represented of the US population, and summing over all cells. Variance estimates were made using the replicate weights to calculate replicate estimates. Non-overlapping 95% confidence intervals are considered a conservative indication of statistical significance over time or between California and the rest of the US. We also estimated a linear trend and calculated differences in slope across time within California and US with the null

hypothesis that the slope is not different from zero. We also calculated slope differences between CA and US with the null hypothesis that slopes were equal.

RESULTS

Demographic Characteristics/ Sample

Sample sizes, mean age of respondents, and weighted percentages for gender and education level for California and the US for the last three data collection periods (2010/11, 2014/15, and 2018/19) of the TUS-CPS by race/ethnicity are presented in Table 1. The remaining demographic data for 1992-99 are in Supplementary Table 1s and 2001-07 are in Supplemental Table 2s. Over the entire period, the mean age of respondents in the US and California was highest among Whites (45.3 – 49.7 years), and lowest among Hispanics/Latinos (35.8 – 40.9 years). Compared to men over time, there were larger proportions of women among American Indians/Alaska Natives and African Americans in both the US and California, while there were larger proportions of White women compared to men in the US. Across all years in both the US and California, there were larger proportions of Asian/Pacific Islander college graduates relative to other race/ethnic groups.

Smoking Uptake: Ever Smoking among 18 – 35 Year Olds

See Table 2 for population-level cigarette use data by race/ethnicity for all survey years. For African Americans, there were no significant differences in smoking uptake slopes between California and the US ($p=.08$; see Supplemental Figure 1s). For African Americans in California, the prevalence for smoking uptake in 1992/93 was $30.1\% \pm 18.2$ which decreased to $10.9\% \pm 36.4$ in 2018/19. Smoking uptake rates for African Americans in the rest of the US went from $26.7\% \pm 4.3$ in

1992/93 to $17.7\% \pm 21.9$ in 2018/19. The estimated slopes for CA ($p=.0009$) and US ($p<.0001$) were significantly different from zero.

Among California Asian/Pacific Islanders, the rate of smoking uptake was at $19\% \pm 13.0$ in 1992/93 and decreased to $7.5\% \pm 22.4$ in 2018/19. Among those in the US, the rate of smoking uptake was $22.2\% \pm 6.7$ in 1992/93 and decreased to $12.5\% \pm 23.7$ in 2018/19. Asian/Pacific Islander smoking uptake in California represented a relative 60% decrease since 1992/93 ($p=.0047$) and in the rest of the US represented a relative 43.6% decrease ($p<.0001$), but these slopes were not statistically significant different from each other ($p=.987$).

American Indian/Alaska Natives and Hispanics/Latinos had consistently lower rates of smoking uptake in California compared to their US counterparts. For American Indian/Alaska Natives in California, smoking uptake was $38.5\% \pm 27.1$ in 1992/93 and declined to 9.1% in 2018/19, though the confidence intervals could not be estimated due to the small sample size. For those in the rest of the US, smoking uptake rates were higher at $53.9\% \pm 20.0$ in 1992/93 and declined to $41.2\% \pm 53.6$ in 2018/19. The confidence intervals overlap across time points and between California and US observed data; therefore conclusions on changes over time or between samples cannot be made.

Among Hispanics/Latinos in California, smoking uptake was $23.2\% \pm 6.3$ in 1992/93 that declined to $11.8\% \pm 24.7$ in 2018/19, representing a significant decline across time ($p<.0001$). For those in the US, smoking uptake was slightly higher at $29.3\% \pm 5.6$ in 1992/93 which declined to $15.2\% \pm 12.6$ in 2018/19, representing a significant decline across time ($p<.0001$). The patterns of decline were similar for both California and US and slopes were not statistically different from one another ($p=.46$).

Among Whites in California, smoking uptake prevalence was $36.8\% \pm 7.9$ in 1992/93 and remained relatively steady until 2001/2002 when it decreased to $19.4\% \pm 27.4$ in 2018/19, a significant decrease in slope ($p=.03$). In comparison, the smoking uptake rate among Whites in the US was $40.4\% \pm 1.6$ and remained relatively steady until 2001/02 when it decreased to $26.0\% \pm 8.3$ in 2018/19, also a significant decrease in slope ($p<.0001$). There was no statistically significant difference between California and US slopes ($p=.39$).

Current Cigarette Smoking Prevalence

For African Americans, Asians/Pacific Islanders, and American Indian/Alaskan Natives ($p=.33$) there were no significant differences in decline between California and the US in current smoking (see Supplemental Figure 2s). For African Americans in California, the current smoking rate was $25.3\% \pm 11.5$ in 1992/93 declined to $12.2\% \pm 22.0$ in 2018/19, representing a significant decrease across time ($p<.0001$). For those in the US, the current smoking rate was comparable at $24.7\% \pm 3.1$ in 1992/93 and declined to $14.8\% \pm 10.4$ in 2018/19, also representing a significant decrease across time ($P<.0001$). The rate of change between California and US African Americans were not statistically different from each other ($p=.27$).

Asians/Pacific Islanders in California had a current smoking rate of $13.8\% \pm 5.6$ in 1992/93 and declined to $6.6\% \pm 12.0$ in 2018/19, a significant decline over time ($p<.0001$). Those in the rest of the US had comparable rates in 1992/93 at $14.0\% \pm 3.9$ and declined about 6 percentage points to $8.1\% \pm 10.4$ in 2018/19, also a significant decline over time ($p<.0001$). The difference in slope between California and US Asian/Pacific Islanders were not statistically different from one another ($p=.81$).

Among American Indians/Alaska Natives in California, the current smoking rate was $26.3\% \pm 19.3$ in 1992/93 declined to $5.9\% \pm 23.4$ in 2018/19. This represents a significant decrease over time ($p < .0001$), however overlapping 95% confidence intervals of the observed data for each time point suggest caution in interpreting these results. For those in the rest of the US, current smoking rates were higher at $39.5\% \pm 12.0$ in 1992/93 and declined to $29.3\% \pm 31.9$ by 2018/19. This represented a significant decrease over time ($p = .0005$), but the wide and overlapping confidence intervals of the observed data suggest caution in interpreting these results. The rate of change between CA and US American Indian/Alaska Natives were not significantly different from one another ($p = .33$).

The current smoking rates for Hispanics/Latinos, and Whites all displayed lower prevalence in 1992/93 and later in 2018/19 in California compared to their US counterparts. California consistently held lower rates of use than their US counterparts. Among Hispanics/Latinos, the current smoking rate in California was $14.7\% \pm 4.7$ in 1992/93 and declined to $7.6\% \pm 11.4$ by 2018/19, representing a significant decrease over time ($p < .0001$). For Hispanic/Latinos in the rest of the US current smoking was $21.0\% \pm 3.7$ in 1992/93 and declined to $9.2\% \pm 6.6$ by 2018/19, representing a significant decrease over time ($p < .0001$). The estimated rates of change between California and US Hispanic/Latinos were significantly different from one another ($p = .02$), with the US showing a slightly steeper rate of decline.

For Whites in California, current smoking fell from $21.0\% \pm 2.4$ in 1992/93 to $11.9\% \pm 13.8$ by 2018/19, representing a significant decrease across time ($p < .0001$). Among Whites in the US, the current smoking rate was $22.5\% \pm 0.9$ in 1992/93 and declined to $15.8\% \pm 3.4$ by 2018/19, representing a significant decrease across time ($p < .0001$). The estimated rates of change between Whites in California and US were

significantly different from one another ($p < .03$), with California showing a steeper rate of decline overtime.

Cigarette Consumption: Cigarettes Per Day

Patterns in cigarette consumption varied by race/ethnicity across time (see Supplemental Figure 3s). For African Americans in California, the average number of CPD was 10.3 ± 3.7 in 1992/93, increased in 1998/99 to match the CPD of those in the rest of the US, then declined sharply to $3.0 \text{ CPD} \pm 1.6$ in 2018/19. The estimated slope indicate a significant decline across time ($p < .0001$). For those in rest of the US, the average CPD decreased steadily from $11.6 \text{ CPD} \pm 1.3$ in 1992/93 to about $8.0 \text{ CPD} \pm 4.0$ by 2018/19. The estimated slope indicate a significant decline across time ($p < .0001$). The decrease in average number of CPD observed in California was significantly different of that of the US ($p < .0001$), indicating a much steeper decline in California.

Asians/ Pacific Islanders in California smoked an average of $9.9 \text{ CPD} \pm 3.6$ in 1992/93 and decreased to $2.4 \text{ CPD} \pm 5.6$ in 2018/19, with the estimated slope representing a significant decrease over time ($p < .0001$). In comparison, those in the rest of the US smoked on average $13.1 \text{ CPD} \pm 3.7$ in 1992/93 and decreased to $5.2 \text{ CPD} \pm 4.1$ in 2018/19, with the estimated slope also significant ($p < .0001$). The rate of decline between California and the US was similar in average CPD reductions with no statistically significant difference between the two slopes ($p < .77$).

American Indian/Alaskan Natives in California smoked an average of $10.4 \text{ CPD} \pm 4.5$ in 1992/93 and sharp and rapid decrease to 0.8 CPD , however the sample was too small to estimate the 95% confidence interval for 2018/19. American Indian/ Alaskan Native current smokers in the rest of the US also showed a decrease from $15.8 \text{ CPD} \pm 3.4$ in 1992/93 to $9.4 \text{ CPD} \pm 5.0$ in 2018/19. Due to the small

sample, there was insufficient data for a valid test of slopes for California, US, and to test differences between the groups. However, using a more conservative approach, the 95% confidence intervals do not overlap between California and US samples in years post-1999, indicating lower number of CPD among California American Indian/Alaskan Natives compared to their US counterparts.

Among California Hispanic/Latino current smokers, a decrease from 8.4 CPD \pm 2.6 in 1992/93 to 4.4 CPD \pm 4.3 in 2018/19 was observed. The estimated slope indicated a significant decline ($p < .0001$). Among Hispanics/Latinos in the US, the average CPD decreased from 11.1 CPD \pm 1.7 in 1992/93 to 7.1 CPD \pm 4.5 in 2018/19. The estimated slope indicated a significant rate of decline ($p < .0001$). While the average number of CPD is higher in the US, the rate of change between California and US Hispanics/Latinos were similar and there was no statistically significant difference in the estimated slopes ($p = .11$).

White current smokers in California smoked an average of 16.8 CPD \pm 2.1 in 1992/93 and decreased to 10.2 CPD \pm 8.0 in 2018/19. The estimated slope indicated a significant decline ($p < .0001$). Whites in the rest of the US smoked on average 18.0 CPD \pm 0.6 in 1992/93 and decreased to 12.1 CPD \pm 2.2 in 2018/19. The estimated slope indicated a significant rate of decline ($p < .0001$). The estimated slopes among Whites in California were similar to that of those in the rest of the US, showing no statistically significant difference in the decline ($p = .06$).

Cessation/Quit Ratio

The quit ratio (for those who quit, over all ever-smokers age 25 years or older), represented as a percentage for each race/ethnic group is presented in Supplemental Figure 4s. The quit ratio for African Americans in California remained relatively stable across time from 44.2% \pm 15.5 in 1992/93 to 38.8% \pm 24.8 in

2018/19. The estimated slope indicated there was no significant difference between the slope and zero ($p=.08$). The quit ratio and stability across time was similar for African Americans in the rest of the US, from $41.6\% \pm 5.5$ in 1992/93 to $42.7\% \pm 25.0$ in 2018/19. The estimated slope is no different from zero ($p=.87$). There was no significant difference in slopes for African Americans in California versus those in the US ($p=.12$).

Among Asians/PIs in California, the quit ratio was $45.9\% \pm 17.6$ in 1992/93, increased to $61.8\% \pm 27.2$ by 2003 and fluctuated over time such that by 2018/19 the quit ratio was $46.7\% \pm 58.7$. The estimated slope showed a significant increase across time ($p=.04$). In the rest of the US, the quit ratio among Asians/PIs was $54.2\% \pm 11.9$ in 1992/93, fluctuated between 49.5% to 53.3% over the years, with the latest quit ratio at $52.2\% \pm 43.2$ in 2018/19. The estimated slope was not different from zero ($p=.6$). The slopes between Asians/PIs in California was significantly different from those in the rest of the US ($p=.04$), with California showing a slight increase over time compared to a steady line for the US.

Among American Indians/Alaska Natives in California, the quit ratio was $31.2\% \pm 17.4$ in 1992/93 and decreased to about 20% in 2003 before increasing to $32.3\% \pm 13.7$ by 2014/15 and decreasing to $13.1\% \pm 19.4$ in 2018/19. Despite fluctuations over time, the quit ratio in California in 2014/15 was similar to the level in 1992/93 and declined further in 2018/19. The estimated slope across time was not statistically different from zero ($p=.16$). For the rest of the US, the quit ratio was $34.6\% \pm 12.2$ in 1992/93 and fluctuated between 34% to 44% across the years and ending at $38.1\% \pm 48.4$ in 2018/19. The estimated slope for the US was also not statistically different from zero ($p=.54$). Change across time comparing California and US was not statistically different from one another ($p=.16$).

The quit ratio among Hispanics/Latinos and Whites both showed increases across time with California holding generally higher ratios than the rest of the US. Hispanics/Latinos in California demonstrated an increase in quit ratios from 52.4% ± 11.5 in 1992/93 to 59.3% ± 43.5 by 2018/19. The estimated slope showed a significant increase over time ($p=.05$). Hispanics/ Latinos in the rest of the US went from 44.0% ± 6.8 in 1992/93 to 52.3% ± 31.2 in 2018/19. The estimated slope was not statistically different from zero ($p=.14$). Comparison in slopes between California Hispanics/Latinos to their US counterparts show no statistically significant difference ($p=.27$).

Among Whites in California, the quit ratio increased from 61.5% ± 4.6 in 1992/93 to 63.8% ± 31.1 by 2018/19, though the estimated slope was not significantly different from zero ($p=.08$). In comparison, the quit ratio for Whites in the rest of the US increased slightly from 58.9% ± 1.4 in 1992/93 to 60.6% ± 6.7 in 2018/19, with the estimated slope significantly different from zero ($p=.02$). By 2018/19 the quit ratio among Whites was higher in California compared to US counterparts, the test of the estimated slopes show no significant difference ($p=.23$).

DISCUSSION

California funded the nation's first state-wide tobacco control program in 1988 through a cigarette excise tax passed by voters.^{4,54} A decade later the Tobacco Master Settlement Agreement led to several other statewide tobacco control programs.⁵⁵ California's program was comprehensive in its coordinated efforts to reduce initiation, reduce consumption levels, and increase smoking cessation.^{5,56} In addition to taxation, the program also included changing social norms around the

acceptability of smoking, organized communities to influence local ordinances to restrict public and workplace smoking areas, and restrict tobacco advertising particularly near schools and selling products to minors.⁴ During this time period, California was in a vanguard position for the nation with its efforts to de-normalize cigarette smoking.⁴ Indeed, these efforts have been reflected in changes in smoking behaviors²⁴ and associated with reductions in lung cancer rates in California compared to the rest of the US.²⁹ In the current study, we also see these reductions in cigarette smoking uptake, reflected across all racial/ethnic groups in California and the US. The changes in young adult uptake from 1992 to 2019 indicate significant reductions across the nation within each racial/ethnic group and trends indicating California starting at a lower baseline and maintaining lower incidence of smoking uptake. Considering that most cigarette users initiate by the age of 26,⁴⁴ tobacco control efforts to prevent or delay the uptake of smoking is the most effective strategy to prevent tobacco-related morbidity and mortality.^{1,44} While California may have been at the forefront of state-wide tobacco control efforts, other states followed suit and later surpassed California in terms of resource allocation toward tobacco control.^{57,58} In 2009, the Family Smoking Prevention and Tobacco Control Act was signed into law giving the Food and Drug Administration authority to regulate the manufacture, distribution, and marketing of tobacco products nationwide.⁵⁹ Collectively, state and federal tobacco control efforts in the past decade may be seen as “catching up” with California in terms of smoking uptake, resulting in non-significant differences in changes across time or in comparing recent time points.

The measure of current smoking provides a more robust snapshot of the proportion of smokers across each time point. For all racial/ethnic groups in

California and the US, we see significant declines in current smoking prevalence across the decades. Of note, we see a greater decline among California Whites compared to their US counterparts. While the prevalence for both groups started at about the same level in the early 1990s, the collective influence of California's tobacco control programs and shifting of social norms surrounding cigarette use may have had its most profound impact and continuing impact on this group. Other studies using different datasets have shown rapid declines in smoking initiation and use among young adult Californians compared to US counterparts.^{6,43} Our study confirms those findings, but only among White populations. In contrast, while both California and US Hispanic/Latino groups demonstrated significant reductions in current use across the decades, US Hispanic/Latino groups showed a steeper decline compared to their California counterparts. Hispanic/Latino ethnicity encompasses several subgroups that differ in their smoking behaviors. California's Hispanic/Latino populations are largely Mexican in origin or ancestry³¹ and the current use prevalence of this group is similar to White populations.⁶⁰ Other Hispanic/Latino subpopulations, such as Puerto Rican and Cuban ancestry tend to have higher prevalence and smoke at greater intensity.^{31,61,62} The impact of tobacco control at the federal level and states in which a larger proportion of these subpopulations reside, may have had stronger impact in demonstrating reduction in current smoking in the rest of the US. Future studies need to disaggregate Hispanic/Latino subpopulations and take into account nativity and length of time in the US or acculturation,^{31,62} as these are important factors to better address tobacco use disparities observed among these groups. Much of the successes that California has had in reducing lung cancer compared to the rest of the US⁴³ may be largely attributed to the reductions in cigarette use prevalence documented among the

non-Hispanic White population and perhaps the collective reductions in cigarette consumption levels across all race/ethnic groups.

National reductions in cigarette consumption levels across race/ethnic groups have been substantial, with all groups experiencing at least a 30% reduction in the number of CPD. Compared to the US, reductions in CPD over time were even more pronounced in California, though only significantly different among African Americans. African Americans are typically lighter consumers of cigarettes^{13,16,45,63} and are more likely to be non-daily smokers.^{11,13,45} A strong tobacco control environment such as California may influence both the reduction in consumption and also quitting.⁶⁴ Despite the positive population level shift toward lighter consumption for African Americans, we do not see progression in terms of quitting. African Americans want to quit at higher rates than other racial/ethnic groups^{65,66} and they make more quit attempts but are less successful than White and Hispanic/Latino counterparts.⁶⁷ Studies suggest that continued targeted tobacco marketing in communities with higher proportion of African Americans,⁶⁸⁻⁷² and continued sale of mentholated products,^{65,69,73} contribute to the group's lower quit success rates. More work is needed to address the transition from light consumption to quitting, specifically for African American populations. Other studies have also documented lack of significant changes in the quit ratio among African Americans contrasted with significant increases among Hispanic/Latino and White US populations,^{74,75} further demonstrating the need to better target and address the needs of these priority groups.

The magnitude of cigarette consumption reductions among Asians/Pacific Islanders, Hispanics/Latinos, and Whites in California were similar to those in the US. These reductions in CPD are encouraging but further improvements are needed as

light and intermittent smokers are still at increased risk for tobacco-related morbidity and mortality.^{76,77} It is possible that federal, state, and local taxation of cigarettes may have helped to reduce the overall number of CPD over time for all groups^{69,78,79} and contributed to the diminished differences in CPD between California and US among some race/ethnic groups. However, the stark difference seen between California and US American Indian/Alaskan Native and African American reductions in CPD may be due to California's investment in tobacco control efforts tailored specifically for those groups⁸⁰ and by extension similar targeted efforts may hasten reductions in the consumption of cigarettes for other racial/ethnic groups and vulnerable populations.

The quit ratio among California and US Whites, and among California Hispanic/Latinos show both a significant increase overtime and are at rates substantially higher than other groups throughout the decades. The quit ratio for California Hispanic/Latino population appear to have increased to similar levels of California non-Hispanic Whites, indicating major success in reaching parity. A number of studies have shown that rates of successful smoking cessation among African American smokers are lower than they are among Whites, despite reports citing lower cigarette consumption.^{16,65,67} Similarly, generally Hispanics/Latinos do not experience higher rates of successful quitting than Whites, despite lower consumption patterns.^{15,75,81} While our results show quit ratios are similar between Hispanic/Latinos and Whites in California, efforts to increase quit attempts and successful long-term quitting remain a priority. There is little evidence indicating that American Indians/Alaska Natives and Asian Americans quit at higher rates than Whites.^{81,82} While we see tremendous success in the decline of overall tobacco use prevalence and particularly reductions in cigarettes per day for American

Indians/Alaska Natives, these quit ratios demonstrate an important and striking need to focus efforts on quitting success. Our findings point to a specific need for tobacco control efforts to move beyond reductions in consumption and focus on successful quitting among racial/ethnic minority populations.

Limitations and Future Directions

Several limitations must be considered when interpreting the results of this study. The data are from independent cross-sectional samples and based on self-reported data, which may introduce bias. The TUS-CPS data are limited to non-institutionalized, civilian populations and collected from in-person interviews among US households. In-person survey administration mode was shown to produce accurate responses over telephone interviews,⁸³ but factors that limit representation based on availability of those willing to do in-person interviews can only be statistically adjusted. These data were analyzed to be representative of the US population, however our results may be underestimating smoking prevalence due to our study population being limited to non-institutionalized, civilian populations. For example, some of the populations that are excluded include the overrepresentation of African American young adult smokers who are incarcerated,⁸⁴ high prevalence of current smoking among chronic homeless adults,⁸⁵⁻⁸⁷ and high use prevalence among military populations.⁸⁸

Another consideration is that the quit ratio is a limited measure and cannot assess how long a person has quit or if they are successful in quitting long term. The quit ratio serves as a snapshot of the proportion of the population who were established smokers and are not currently smoking. Future studies should investigate different measures and factors that lead to successful quitting, as our results indicate that more effort is needed to increase that quit ratio for all

racial/ethnic groups. Furthermore, we must do more to understand how best to address these tobacco use disparities by investing more in disaggregating data, namely Asian, Native Hawaiian, Pacific Islanders, and Hispanic/Latino subpopulations. To do so, we can better address the cessation needs of those at greatest risk. American Indian/Alaskan Native populations are especially important given some of the high tobacco use trends observed but the small sample size does not allow for valid interpretation of the data. More efforts are needed to address the disparities we see among these groups.

This study compares California to the rest of the US because of California's strong and consistent tobacco control efforts and its diverse population. Other states such as Massachusetts, New Jersey, and New York,⁵⁷ among others, have also developed strong tobacco regulation and have relatively diverse populations. When these progressive tobacco control states are combined with the rest of the US, it may diminish the differences observed between California and the US. Given that California's progressive statewide tobacco control efforts were followed by others along with federal tobacco control efforts, we should expect some lag and closing of the gap between California and US smoking indicators. Yet, we still see continued disparities among some racial/ethnic minority groups. The results of this study point specifically to successes in reducing uptake and CPD but current use and quitting are areas that need to be targeted for improvement. These patterns across these cigarette use indicators for different racial/ethnic groups hold valuable lessons in how we should continue to invest in future tobacco control efforts.

CONCLUSION

Over the past 25 years, in the era of increased tobacco control, there have been noteworthy reductions in cigarette smoking prevalence and consumption rates across all race/ethnic groups in the US and in California. As the US diversifies further, these lessons will continue to aid policy makers in how to best invest in tobacco control efforts. Investments in disaggregating Asian, Native Hawaiian, Pacific Islander, and Hispanic/Latino subpopulations in surveillance studies and prioritizing tailored interventions will help to further reduce consumption and support cessation. Similarly, American Indian/Alaskan Native and African American populations are potentially at the lowest levels of consumption but future studies and investments are needed to transition these groups to successful cessation. Future efforts to increase cigarette cessation rates, particularly among race/ethnic minority groups, should continue to be a major priority for tobacco control.

ACKNOWLEDGEMENTS

The authors would like to thank Ruby Ling for her contributions to the literature review and development of this manuscript.

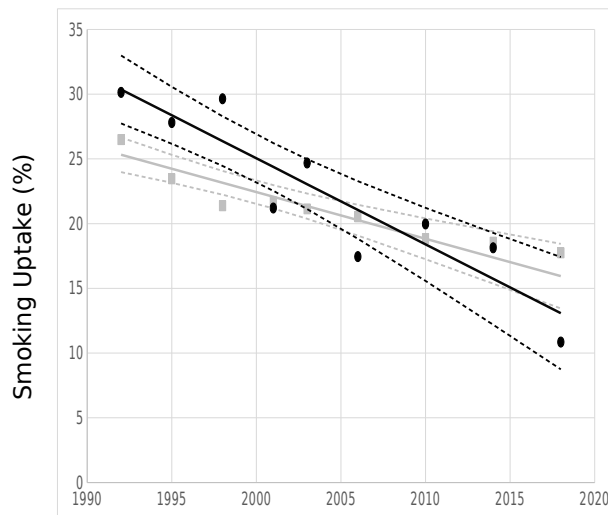
FUNDING

Research reported in this publication was supported by the Tobacco-Related Disease Research Program (TRDRP) of the University of California, Office of the President (grant #28IR-0066; PI: Trinidad) and the National Institutes of Health (NIH; grant #1R01CA234539; PI: Pierce). The content is solely the responsibility of the authors and does not necessarily represent the official views of TRDRP or the NIH.

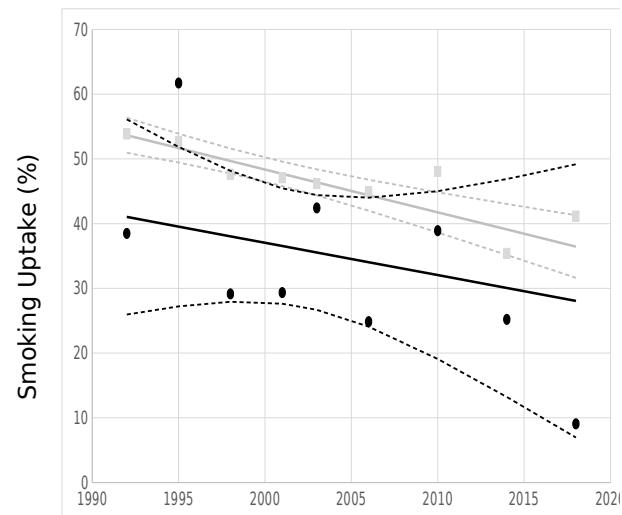
DECLARATION OF INTERESTS

All authors have no conflicts of interest to declare.

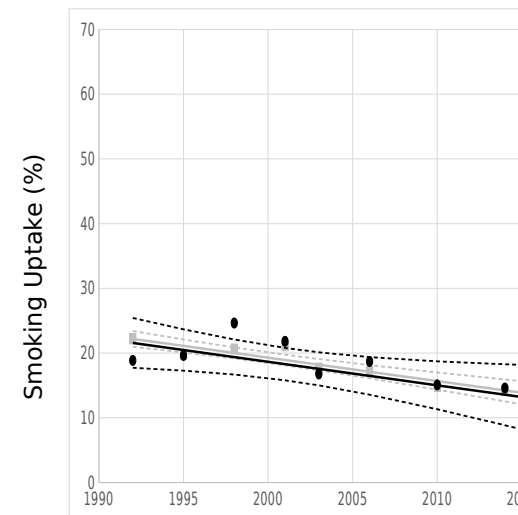
A African American



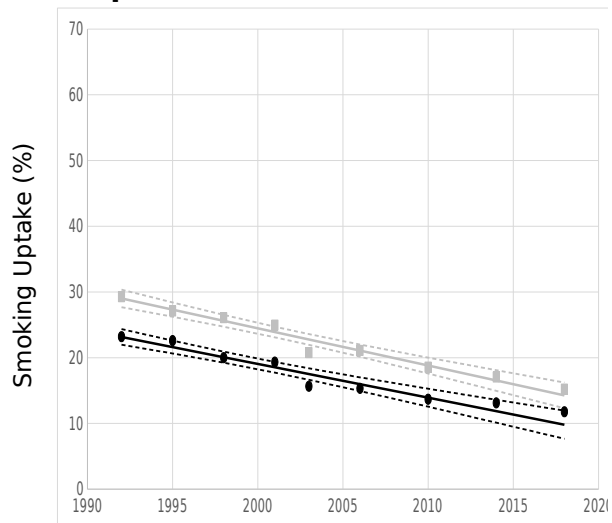
B American Indian and Alaskan Native



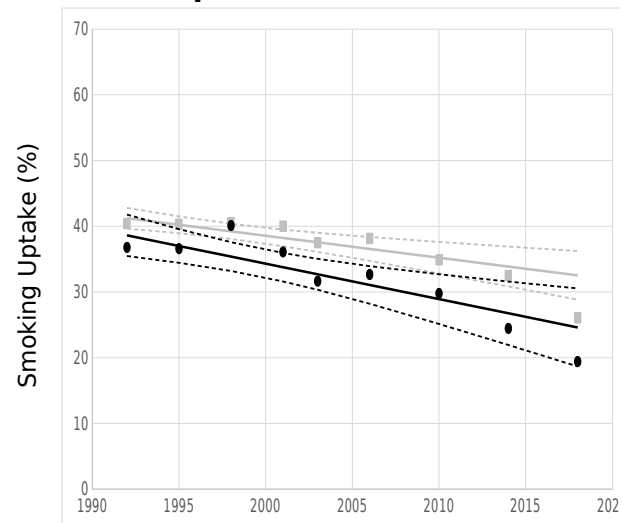
C Asian and Pacific Islander



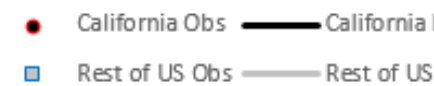
D Hispanic/Latino



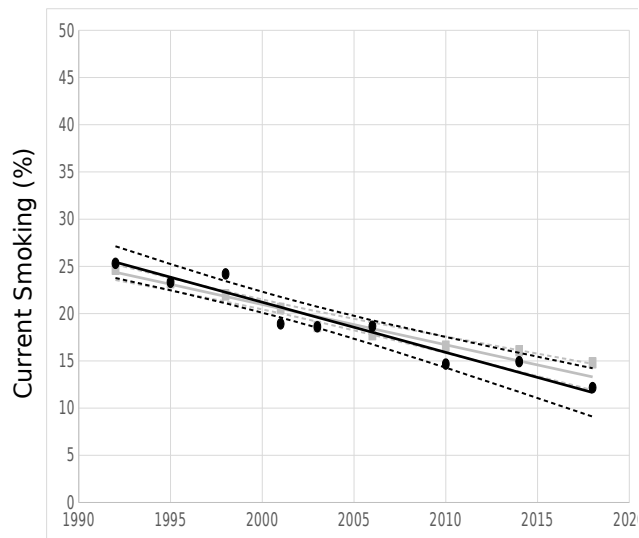
E Non-Hispanic White



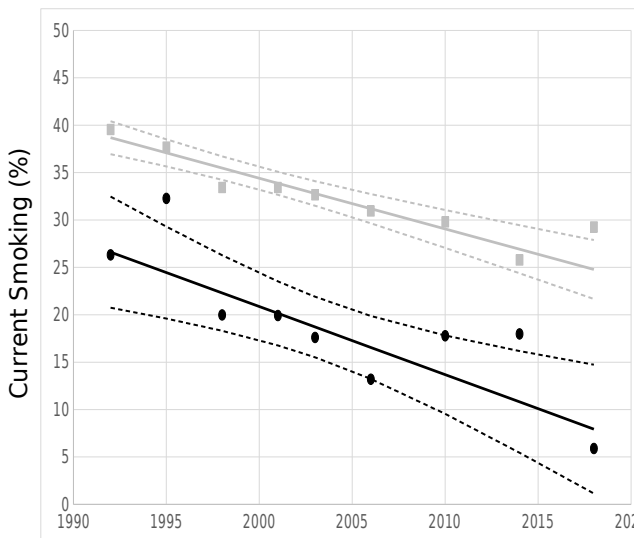
Legend



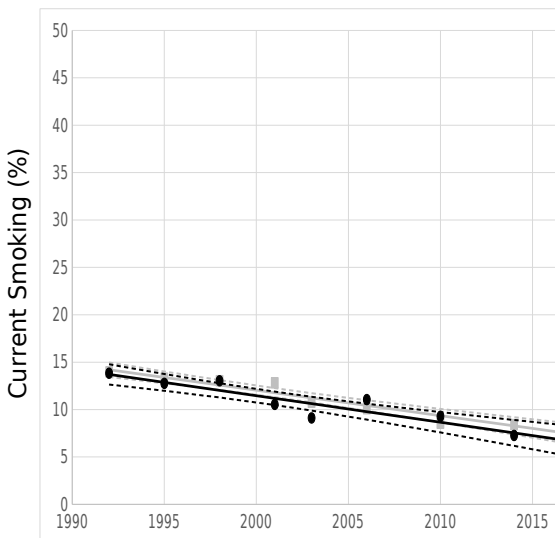
A African American



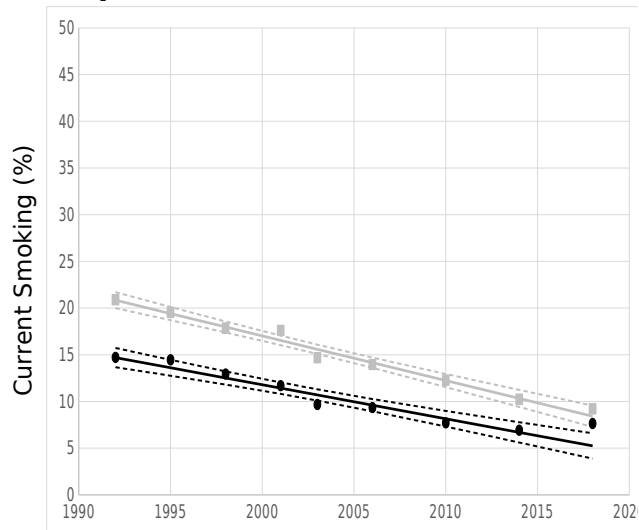
B American Indian and Alaskan Native



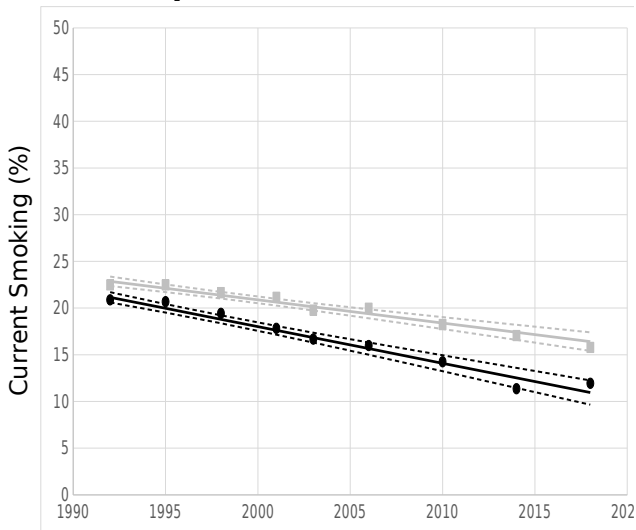
C Asian and Pacific Islander



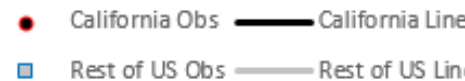
D Hispanic/Latino



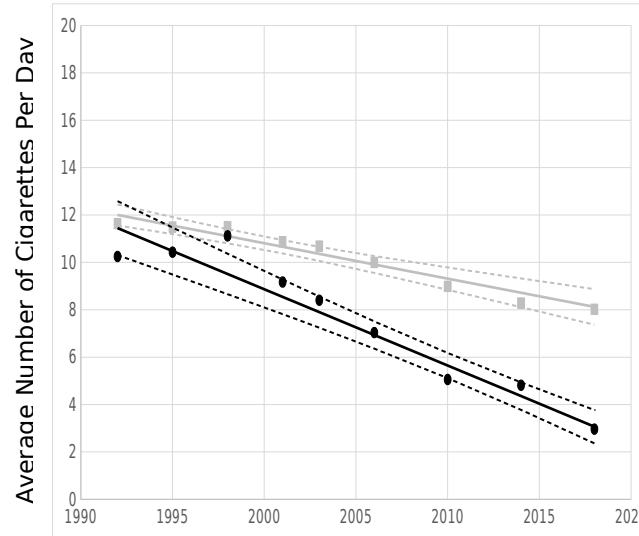
E Non-Hispanic White



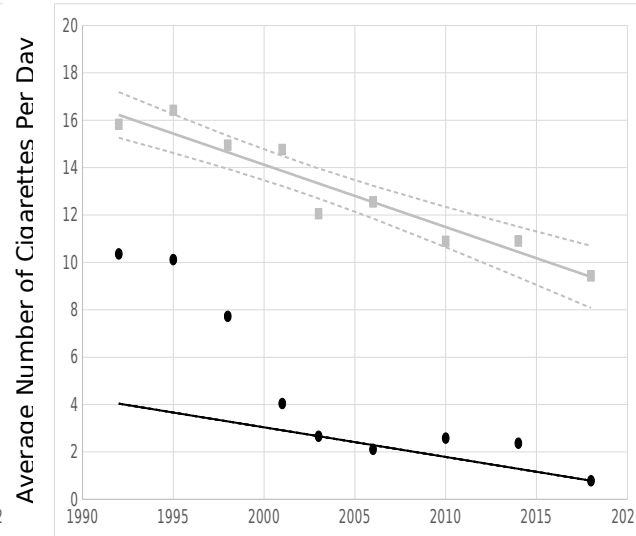
Legend



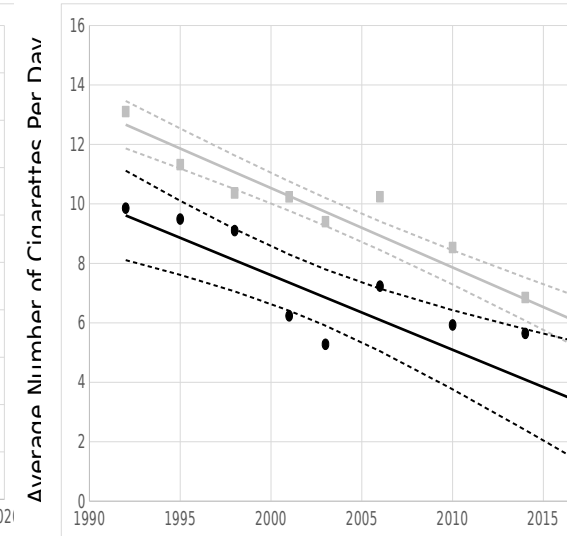
A Black and African American



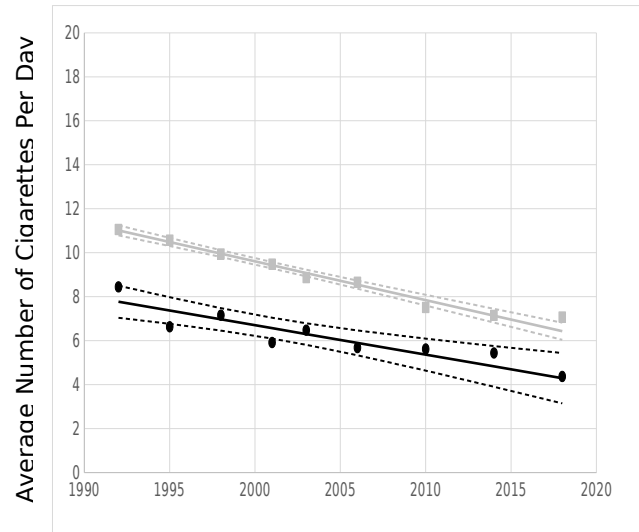
B American Indian and Alaskan Native



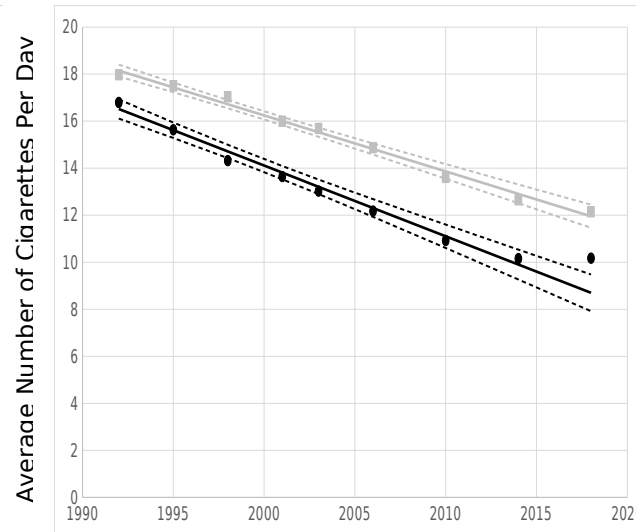
C Asian and Pacific Islander



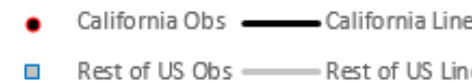
D Hispanic/Latino



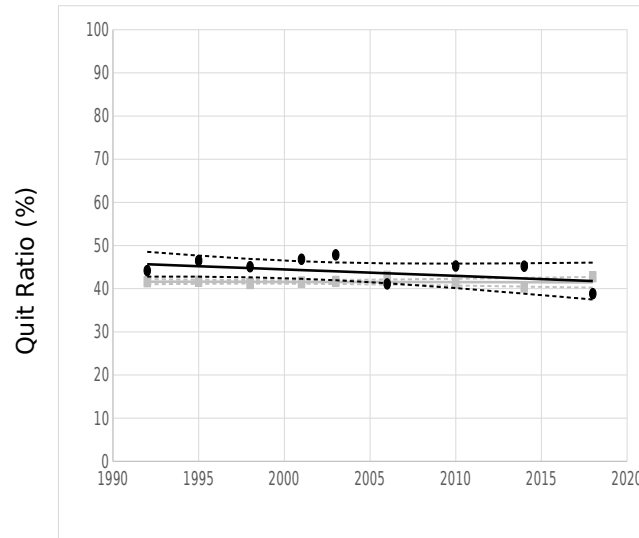
E Non-Hispanic White



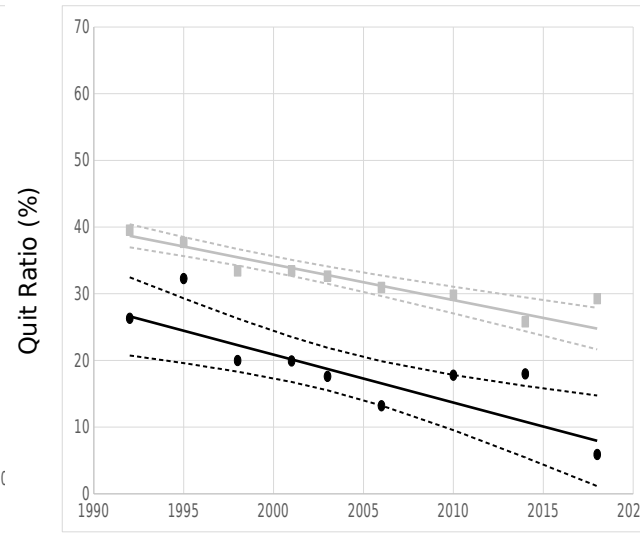
Legend



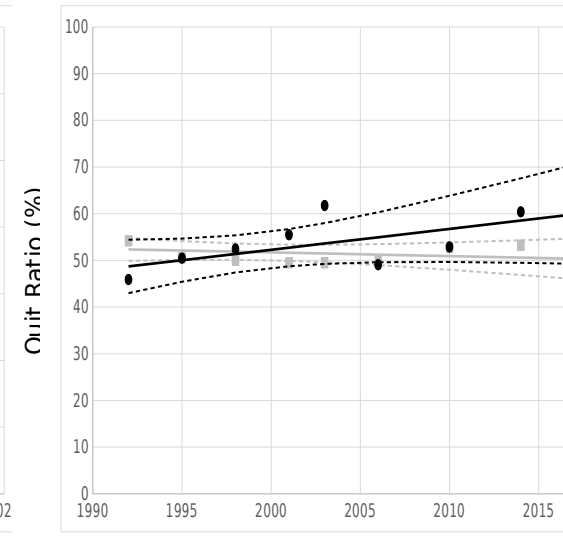
A African American



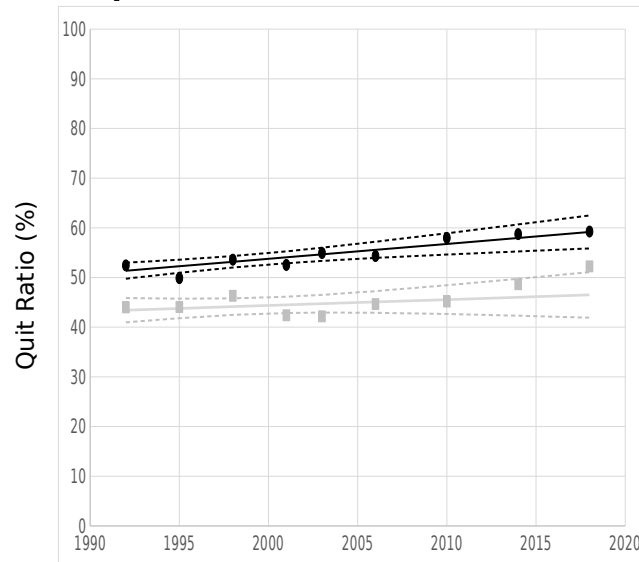
B American Indian and Alaskan Native



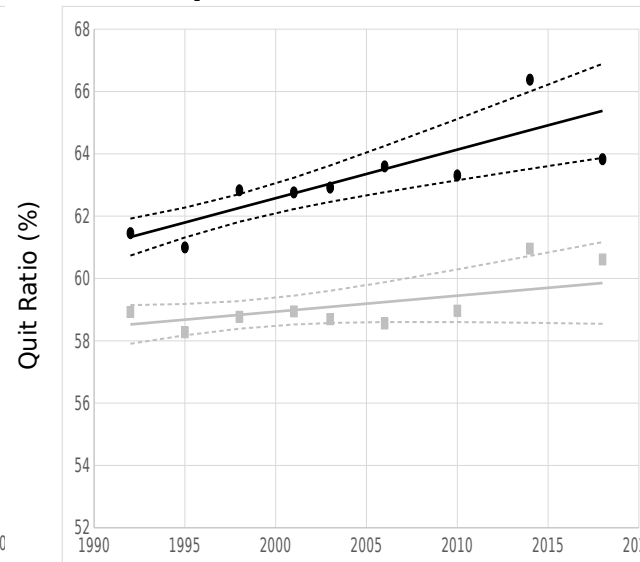
C Asian and Pacific Islander



C Hispanic/Latino



D Non-Hispanic White



Legend

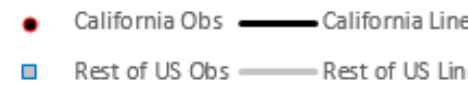


Table 1. Demographic Characteristics by Race/Ethnicity, 2010-2011, 2014-2015, and 2018

		2010-2011						2014-2015						2018-2019			
		Black or African American															
		California			Rest of US			California			Rest of US			California			Rest
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N
Age (mean years)		730	44.4	0.7	15,487	43.4	0.1	654	44.4	0.9	15,739	44.3	0.1	168	51.2	2.0	4,318
Men		304	46.5	1.2	6,086	44.8	0.2	273	48.1	1.4	6,223	44.7	0.2	81	48.2	2.2	1,745
Women		426	53.5	1.2	9,401	55.2	0.2	381	51.9	1.4	9,516	55.3	0.2	87	51.8	2.2	2,573
	Less than High School	73	10.0	1.7	2,667	16.9	0.5	48	8.1	1.8	2,337	13.8	0.5	17	9.1	3.6	502
	High School Graduate	198	27.1	2.0	5,120	33.4	0.6	171	27.3	2.8	5,211	33.2	0.7	42	24.7	4.2	1,399
	Some College	404	55.4	2.6	6,630	43.6	0.7	355	53.3	3.1	6,882	45.4	0.7	57	35.1	5.3	1,349
	College Graduate	55	7.5	1.3	1,070	6.2	0.3	80	11.3	1.8	1,309	7.6	0.3	52	31.2	5.2	1,068
		Hispanic/Latino															
		California			Rest of US			California			Rest of US			California			Rest
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N
Age (mean years)		4,276	39.7	0.3	13,554	40.2	0.1	3,557	40.2	0.3	13,685	40.9	0.1	1,024	40.8	0.6	3,959
Men		1,890	50.9	0.6	6,015	51.4	0.3	1,592	49.6	0.9	6,094	49.8	0.3	434	49.1	1.4	1,747
Women		2,386	49.1	0.6	7,539	48.6	0.3	1,965	50.4	0.9	7,591	50.2	0.3	590	50.9	1.4	2,212
	Less than High School	1,618	36.5	1.4	4,395	32.5	0.8	1,162	31.0	1.5	3,901	28.1	0.6	256	23.6	2.0	980
	High School Graduate	1,171	28.6	1.1	4,030	30.4	0.6	1,008	29.1	1.2	4,190	31.0	0.6	314	31.0	2.3	1,229
	Some College	1,358	32.0	1.3	4,544	33.1	0.8	1,241	36.2	1.4	4,896	36.5	0.7	302	31.5	2.2	976
	College Graduate	129	2.9	0.4	585	4.0	0.3	146	3.7	0.4	698	4.5	0.3	152	13.9	1.6	774
		Asian, Native Hawaiian, Pacific Islander															
		California			Rest of US			California			Rest of US			California			Rest
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N
Age (mean years)		1,588	45.9	0.6	5,458	42.8	0.3	1,455	46.0	0.6	5,457	43.4	0.3	529	45.2	1.0	1,601
Men		735	45.4	1.3	2,580	48.1	0.6	707	45.7	1.3	2,618	47.1	0.7	256	46.2	2.1	780
Women		853	54.6	1.3	2,878	51.9	0.6	748	54.3	1.3	2,839	52.9	0.7	273	53.8	2.1	821
	Less than High School	132	8.3	1.2	499	10.1	1.2	114	7.7	1.0	475	8.9	0.7	25	4.7	1.3	115
	High School Graduate	265	16.3	1.4	1,152	19.0	1.1	198	13.7	1.4	1,073	17.4	0.8	72	14.7	2.5	258
	Some College	931	59.0	1.9	2,657	48.8	1.3	832	58.8	1.9	2,636	49.1	1.1	99	21.8	2.6	308
	College Graduate	260	16.3	1.5	1,150	22.2	1.0	311	19.8	1.7	1,273	24.6	1.0	333	58.8	3.1	920
		American Indian/Alaskan Native															
		California			Rest of US			California			Rest of US			California			Rest
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N
Age (mean years)		60	45.9	2.7	1,403	43.0	0.7	61	44.6	3.7	1,522	43.1	0.7	22	53.6	4.0	407
Men		27	49.4	7.8	578	44.0	2.2	23	38.4	10.4	621	45.9	1.9	10	45.1	16.5	187

Table 2a. Demographic Characteristics Over Time for Black or African American, Hispanic/Latino, and Asian, Native Hawaiian, and Pacific Islanders, 2003-2015

Black or African American																									
		2003						2006-2007						2010-2011						2014-2015					
		California			Rest of US			California			Rest of US			California			Rest of US			California			Rest of US		
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI
Age (mean, years)		771	43.3	0.6	14,948	42.6	0.1	698	44.3	0.6	14,094	42.8	0.1	730	44.4	0.7	15,487	43.4	0.1	654	44.4	0.9	15,739	44.9	0.1
Gender	Men	318	45.9	0.9	5,589	44.1	0.1	276	46.3	1.1	5,294	44.5	0.1	304	46.5	1.2	6,086	44.8	0.2	273	48.1	1.4	6,223	48.1	0.1
	Women	453	54.1	0.9	9,359	55.9	0.1	422	53.7	1.1	8,800	55.5	0.1	426	53.5	1.2	9,401	55.2	0.2	381	51.9	1.4	9,516	51.9	0.5
Education																									
Less than High School		105	11.5	1.7	3,252	20.9	0.6	100	13.9	2.2	2,893	19.5	0.6	73	10.0	1.7	2,667	16.9	0.5	48	8.1	1.8	2,337	11.8	1.1
High School Graduate		195	25.8	2.4	5,199	35.0	0.7	170	25.0	2.5	4,784	34.5	0.6	198	27.1	2.0	5,120	33.4	0.6	171	27.3	2.8	5,211	27.3	0.3
Some College		406	55.0	2.5	5,707	39.4	0.8	378	54.3	3.2	5,572	40.7	0.6	404	55.4	2.6	6,630	43.6	0.7	355	53.3	3.1	6,882	53.3	0.4
College Graduate		65	7.8	1.4	790	4.6	0.3	50	6.8	1.4	845	5.4	0.3	55	7.5	1.3	1,070	6.2	0.3	80	11.3	1.8	1,309	11.3	0.7
Hispanic/Latino																									
		2003						2006-2007						2010-2011						2014-2015					
		California			Rest of US			California			Rest of US			California			Rest of US			California			Rest of US		
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI
Age (mean, years)		3,401	38.2	0.3	12,705	39.0	0.1	3,728	39.0	0.4	12,491	39.5	0.1	4,276	39.7	0.3	13,554	40.2	0.1	3,557	40.2	0.3	13,685	40.2	0.4
Gender	Men	1,523	50.3	0.8	5,793	51.5	0.3	1,612	50.6	0.8	5,685	51.9	0.3	1,890	50.9	0.6	6,015	51.4	0.3	1,592	49.6	0.9	6,094	49.6	0.4
	Women	1,878	49.7	0.8	6,912	48.5	0.3	2,116	49.4	0.8	6,806	48.1	0.3	2,386	49.1	0.6	7,539	48.6	0.3	1,965	50.4	0.9	7,591	50.4	0.5
Education																									
Less than High School		1,478	41.5	1.5	4,984	40.8	0.9	1,580	41.4	1.5	4,785	38.8	0.9	1,618	36.5	1.4	4,395	32.5	0.8	1,162	31.0	1.5	3,901	31.0	0.2
High School Graduate		865	26.4	1.2	3,777	28.8	0.7	910	24.9	1.0	3,566	28.5	0.6	1,171	28.6	1.1	4,030	30.4	0.6	1,008	29.1	1.2	4,190	29.1	0.3
Some College		992	30.1	1.2	3,514	27.2	0.9	1,141	31.2	1.5	3,682	29.1	0.7	1,358	32.0	1.3	4,544	33.1	0.8	1,241	36.2	1.4	4,896	36.2	0.3
College Graduate		66	2.0	0.3	430	3.2	0.3	97	2.6	0.4	458	3.5	0.3	129	2.9	0.4	585	4.0	0.3	146	3.7	0.4	698	3.7	0.4
Asian, Native Hawaiian, and Pacific Islanders																									
		2003						2006-2007						2010-2011						2014-2015					
		California			Rest of US			California			Rest of US			California			Rest of US			California			Rest of US		
		Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI	Unwt N	%	CI

Table 2 (continued). Population-level Cigarette Use Behaviors by Race/Ethnicity, Tobacco Use Supplement to the Current Population Survey, 1992-2019

Hispanic/ Latino															
	Uptake				Current Use				Consumption (CPD)				Quit Ratio		
	California		Rest of US		California		Rest of US		California		Rest of US		California		Rest o
Year	%	CI	%	CI	%	CI	%	CI	Mean	CI	Mean	CI	%	CI	%
1992-1993	23.2	6.3	29.3	5.6	14.7	4.7	20.9	3.7	8.4	2.6	11.1	1.7	52.4	11.5	44.0
1995-1996	22.6	10.1	27.1	6.3	14.5	7.4	19.6	4.0	6.6	3.1	10.6	2.2	49.9	16.6	44.1
1998-1999	20.0	9.6	26.1	6.9	12.9	5.8	17.9	4.0	7.2	3.8	9.9	1.7	53.6	16.1	46.3
2001-2002	19.3	10.7	25.0	6.0	11.7	7.3	17.6	3.9	5.9	2.8	9.5	2.1	52.5	22.1	42.4
2003	15.7	9.6	20.8	6.1	9.7	5.4	14.7	3.4	6.5	3.1	8.9	2.1	54.9	19.5	42.2
2006-2007	15.3	11.7	21.1	7.4	9.3	6.0	14.0	4.8	5.7	4.7	8.7	3.0	54.3	28.8	44.7
2010-2011	13.7	11.1	18.6	7.1	7.7	5.2	12.3	4.8	5.6	6.2	7.5	3.1	58.0	24.2	45.2
2014-2015	13.1	13.6	17.1	7.8	6.9	6.3	10.2	3.9	5.4	4.7	7.1	2.8	58.7	29.6	48.6
2018-2019	11.8	24.7	15.2	12.6	7.6	11.4	9.2	6.6	4.4	4.3	7.1	4.5	59.3	43.5	52.3
Non-Hispanic White															
	Uptake				Current Use				Consumption (CPD)				Quit Ratio		
	California		Rest of US		California		Rest of US		California		Rest of US		California		Rest o
Year	%	CI	%	CI	%	CI	%	CI	Mean	CI	Mean	CI	%	CI	%
1992-1993	36.8	7.9	40.4	1.6	20.9	2.4	22.5	0.9	16.8	2.1	18.0	0.6	61.5	4.6	58.9
1995-1996	36.6	11.7	40.3	2.8	20.7	4.6	22.5	1.2	15.6	2.8	17.5	0.9	61.0	8.2	58.3
1998-1999	40.1	11.4	40.6	2.7	19.4	5.6	21.6	1.1	14.3	2.9	17.0	0.7	62.8	9.0	58.8
2001-2002	36.1	13.5	40.0	2.9	17.8	5.7	21.2	1.4	13.6	2.8	16.0	0.8	62.8	8.8	58.9
2003	31.6	9.9	37.5	3.1	16.7	5.1	19.8	1.4	13.0	3.9	15.7	0.9	62.9	8.6	58.7
2006-2007	32.7	17.3	38.2	5.0	16.0	6.9	20.0	1.9	12.2	3.9	14.9	1.2	63.6	12.8	58.6
2010-2011	29.8	16.1	34.9	4.7	14.3	8.0	18.2	2.0	10.9	4.4	13.6	1.1	63.3	14.7	59.0
2014-2015	24.5	17.7	32.5	4.9	11.4	7.2	17.1	1.7	10.2	4.3	12.7	1.2	66.4	17.9	61.0
2018-2019	19.4	27.4	26.0	8.3	11.9	13.8	15.8	3.4	10.2	8.0	12.1	2.2	63.8	31.1	60.6

References

1. United States Surgeon General. The Health Consequences of Smoking -- 50 Years of progress: A Report of the Surgeon General: (510072014-001). Published online 2014. doi:10.1037/e510072014-001
2. Wang TW. Tobacco Product Use Among Adults — United States, 2017. *MMWR Morb Mortal Wkly Rep*. 2018;67. doi:10.15585/mmwr.mm6744a2
3. California Department of Health Services. *A Model for Change: The California Experience in Tobacco Control*. California Department of Health Services, Tobacco Control Section; 1998.
4. Roeseler A, Burns D. The quarter that changed the world. *Tob Control*. 2010;19(Suppl 1):i3-i15. doi:10.1136/tc.2009.030809
5. Rogers T. The California Tobacco Control Program: introduction to the 20-year retrospective. *Tob Control*. 2010;19(Suppl_1):i1-i2. doi:10.1136/tc.2010.036293
6. Odani S, Armour BS, Graffunder CM, Willis G, Hartman AM, Agaku IT. State-Specific Prevalence of Tobacco Product Use Among Adults - United States, 2014-2015. *MMWR Morb Mortal Wkly Rep*. 2018;67(3):97-102. doi:10.15585/mmwr.mm6703a3
7. Bureau UC. Population Estimates Continue to Show the Nation's Growth Is Slowing. The United States Census Bureau. Accessed August 28, 2020. <https://www.census.gov/newsroom/press-releases/2019/popest-nation.html>
8. Flores A. *How the US Hispanic Population Is Changing*. Pew Research Center; 2017.
9. US Census Bureau. 2018: ACS 5-Year Estimates Data Profiles. ACS Demographic and Housing Estimates for California. Accessed August 28, 2020. <https://data.census.gov/cedsci/table?g=0400000US06&d=ACS%205-Year%20Estimates%20Data%20Profiles&tid=ACSDP5Y2018.DP05>
10. US Census Bureau. 2017 National Population Projections Tables: Main Series. The United States Census Bureau. Accessed August 28, 2020. <https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html>
11. U.S. Department of Health and Human Services. *Tobacco Use Among U.S. Racial/Ethnic Minority Groups ---African Americans, American Indians and Alaska Natives, Asian Americans and Pacific Islanders, and Hispanics: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1998.
12. U.S. Department of Health and Human Services. *The Health Consequences of Smoking: A Report of the Surgeon General*. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004.
13. Trinidad DR, Pérez-Stable EJ, Emery SL, White MM, Grana RA, Messer KS. Intermittent and light daily smoking across racial/ethnic groups in the United States. *Nicotine Tob Res*. 2009;11(2):203-210. doi:10.1093/ntr/ntn018

14. Pulvers K, Romero DR, Blanco L, Sakuma K-LK, Ahluwalia JS, Trinidad DR. Light and Intermittent Smoking Among California Black, Hispanic/Latino, and Non-Hispanic White Men and Women. *Nicotine Tob Res Off J Soc Res Nicotine Tob*. Published online October 21, 2014. doi:10.1093/ntr/ntu221
15. Trinidad DR, Pérez-Stable EJ, White MM, Emery SL, Messer K. A Nationwide Analysis of US Racial/Ethnic Disparities in Smoking Behaviors, Smoking Cessation, and Cessation-Related Factors. *Am J Public Health*. 2011;101(4):699-706. doi:10.2105/AJPH.2010.191668
16. Trinidad DR, Xie B, Fagan P, et al. Disparities in the Population Distribution of African American and Non-Hispanic White Smokers Along the Quitting Continuum. *Health Educ Behav Off Publ Soc Public Health Educ*. Published online March 20, 2015. doi:10.1177/1090198115577376
17. Haiman CA, Stram DO, Wilkens LR, et al. Ethnic and racial differences in the smoking-related risk of lung cancer. *N Engl J Med*. 2006;354(4):333-342. doi:10.1056/NEJMoa033250
18. Ellis L, Canchola AJ, Spiegel D, Ladabaum U, Haile R, Gomez SL. Racial and Ethnic Disparities in Cancer Survival: The Contribution of Tumor, Sociodemographic, Institutional, and Neighborhood Characteristics. *J Clin Oncol Off J Am Soc Clin Oncol*. 2018;36(1):25-33. doi:10.1200/JCO.2017.74.2049
19. Fagan P, Moolchan ET, Lawrence D, Fernander A, Ponder PK. Identifying health disparities across the tobacco continuum. *Addiction*. 2007;102:5-29. doi:10.1111/j.1360-0443.2007.01952.x
20. Howe HL, Lake A, Schymura MJ, Edwards BK. Indirect method to estimate specific Hispanic group cancer rates. *Cancer Causes Control*. 2009;20(7):1215-1226. doi:10.1007/s10552-009-9398-8
21. Odani S, Armour BS, Graffunder CM, Garrett BE, Agaku IT. Prevalence and Disparities in Tobacco Product Use Among American Indians/Alaska Natives - United States, 2010-2015. *MMWR Morb Mortal Wkly Rep*. 2017;66(50):1374-1378. doi:10.15585/mmwr.mm6650a2
22. Centers for Disease Control and Prevention (CDC). Cancer mortality among American Indians and Alaska Natives--United States, 1994-1998. *MMWR Morb Mortal Wkly Rep*. 2003;52(30):704-707.
23. Fichtenberg CM, Glantz SA. Association of the California Tobacco Control Program with Declines in Cigarette Consumption and Mortality from Heart Disease. *N Engl J Med*. 2000;343(24):1772-1777. doi:10.1056/NEJM200012143432406
24. Gilpin EA, Messer K, White MM, Pierce JP. What contributed to the major decline in per capita cigarette consumption during California's comprehensive tobacco control programme? *Tob Control*. 2006;15(4):308-316. doi:10.1136/tc.2005.015370
25. Pierce JP, Messer K, White MM, Cowling DW, Thomas DP. Prevalence of heavy smoking in California and the United States, 1965-2007. *JAMA*. 2011;305(11):1106-1112. doi:10.1001/jama.2011.334
26. Pierce JP, Shi Y, Hendrickson EM, et al. Tobacco control in California compared with the rest of the USA: trends in adult per capita cigarette consumption. *Tob Control*. 2018;27(e2):e112-e117. doi:10.1136/tobaccocontrol-2017-053895
27. Al-Delaimy WK, Pierce JP, Messer K, White MM, Trinidad DR, Gilpin EA. The California Tobacco Control Program's effect on adult smokers: (2) Daily cigarette consumption levels. *Tob Control*. 2007;16(2):91-95. doi:10.1136/tc.2006.017061

28. Jemal A, Thun MJ, Ries LAG, et al. Annual Report to the Nation on the Status of Cancer, 1975–2005, Featuring Trends in Lung Cancer, Tobacco Use, and Tobacco Control. *JNCI J Natl Cancer Inst.* 2008;100(23):1672-1694. doi:10.1093/jnci/djn389
29. Pierce JP, Messer K, White MM, Kealey S, Cowling DW. Forty Years of Faster Decline in Cigarette Smoking in California Explains Current Lower Lung Cancer Rates. *Cancer Epidemiol Biomarkers Prev.* 2010;19(11):2801-2810. doi:10.1158/1055-9965.EPI-10-0563
30. Sakuma K-LK, Felicitas-Perkins JQ, Blanco L, et al. Tobacco use disparities by racial/ethnic groups: California compared to the United States. *Prev Med.* 2016;91:224-232. doi:10.1016/j.ypmed.2016.08.035
31. Felicitas-Perkins JQ, Sakuma K-LK, Blanco L, et al. Smoking Among Hispanic/Latino Nationality Groups and Whites, Comparisons Between California and the United States. *Nicotine Tob Res Off J Soc Res Nicotine Tob.* 2018;20(9):1085-1094. doi:10.1093/ntr/ntx191
32. Kulik MC, Glantz SA. Similar softening across different racial and ethnic groups of smokers in California as smoking prevalence declined. *Prev Med.* 2019;120:144-149. doi:10.1016/j.ypmed.2019.01.020
33. Vuong T, Zhang X, Roeseler A. *California Tobacco Facts and Figures 2019.* California Department of Public Health; 2019. Accessed August 31, 2020. <https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/CTCB/Pages/Data.aspx>
34. Colby S, Ortman JM. *Projections of the Size and Composition of the U.S. Population: 2014 to 2060.* U.S. Census Bureau; 2014:13.
35. US Census Bureau. Current Population Survey Design and Methodology. Published online October 2019. Accessed February 14, 2020. <https://www.census.gov/programs-surveys/cps.html>
36. US Department of Commerce, Census Bureau. National Cancer Institute Sponsored Tobacco Use Supplement to the Current Population Survey (1995-96). Published online 1998.
37. US Department of Commerce, Census Bureau. National Cancer Institute Sponsored Tobacco Use Supplement to the Current Population Survey (1998-99). Published online 2001.
38. US Department of Commerce, Census Bureau. National Cancer Institute and Centers for Disease Control and Prevention co-sponsored Tobacco Use Supplement to the Current Population Survey (2001-02). Published online 2003. <http://riskfactor.cancer.gov/studies/tus-cps/> and <https://cancercontrol.cancer.gov/brp/tcrb/tus-cps/questionnaires.html>
39. US Department of Commerce, Census Bureau. National Cancer Institute and Centers for Disease Control and Prevention co-sponsored Tobacco Use Special Cessation Supplement to the Current Population Survey 2003. Published online 2006. <http://riskfactor.cancer.gov/studies/tus-cps>
40. US Department of Commerce, Census Bureau. National Cancer Institute sponsored Tobacco Use Supplement to the Current Population Survey May 2010. Published online 2012. <http://riskfactor.cancer.gov/studies/tus-cps/> and <http://www.census.gov/cps/methodology/techdocs.html>
41. US Department of Commerce, Census Bureau. National Cancer Institute and Food and Drug Administration co-sponsored Tobacco Use Supplement to the Current Population Survey July 2014. http://thedataweb.rm.census.gov/ftp/cps_ftp.html#cpssupps. Published online 2016. <https://cancercontrol.cancer.gov/brp/tcrb/tus-cps/>

42. US Department of Commerce, Census Bureau. National Cancer Institute and Food and Drug Administration co-sponsored Tobacco Use Supplement to the Current Population Survey May 2019. Published online 2020.
<https://cancercontrol.cancer.gov/brp/tcrb/tus-cps/questionnaires.html>.
43. Pierce JP, Shi Y, McMenamin SB, et al. Trends in Lung Cancer and Cigarette Smoking: California Compared to the Rest of the United States. *Cancer Prev Res (Phila Pa)*. 2019;12(1):3-12. doi:10.1158/1940-6207.CAPR-18-0341
44. U.S. Department of Health and Human Services. *Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General*. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2012. <http://www.ncbi.nlm.nih.gov/books/NBK99237/>
45. US National Cancer Institute. *Monograph 22: A Socioecological Approach to Addressing Tobacco-Related Health Disparities*. US Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 2017. Accessed August 31, 2020.
<https://cancercontrol.cancer.gov/brp/tcrb/monographs/22/>
46. Trinidad DR, Gilpin EA, Lee L, Pierce JP. Do the majority of Asian-American and African-American smokers start as adults? *Am J Prev Med*. 2004;26(2):156-158.
doi:10.1016/j.amepre.2003.10.008
47. Trinidad DR, Gilpin EA, Lee L, Pierce JP. Has there been a delay in the age of regular smoking onset among African Americans? *Ann Behav Med Publ Soc Behav Med*. 2004;28(3):152-157.
doi:10.1207/s15324796abm2803_2
48. Piper ME, Brown DC, Hendershot TP, Swan GE. PhenX: Host: Social/Cognitive measures for tobacco regulatory research. *Tob Control*. 2020;29(Suppl 1):s5-s12.
doi:10.1136/tobaccocontrol-2018-054467
49. Jamal A, Phillips E, Gentzke AS, et al. Current Cigarette Smoking Among Adults — United States, 2016. *Morb Mortal Wkly Rep*. 2018;67(2):53-59. doi:10.15585/mmwr.mm6702a1
50. Creamer MR, Wang TW, Babb S, et al. Tobacco Product Use and Cessation Indicators Among Adults - United States, 2018. *MMWR Morb Mortal Wkly Rep*. 2019;68(45):1013-1019.
doi:10.15585/mmwr.mm6845a2
51. SAS. SAS Institute Inc; 2014.
52. Judkins DR. Fay's Method for Variance Estimation. *J Off Stat*. 1990;6(3):223-239.
53. Ruggles S, Flood S, Goeken R, et al. IPUMS; 2019. <https://doi.org/10.18128/D010.V9.0>
54. Bal DG. Designing an effective statewide tobacco control program--California. *Cancer*. 1998;83(12 Suppl Robert):2717-2721. doi:10.1002/(sici)1097-0142(19981215)83:12a+<2717::aid-cnrcr11>3.3.co;2-4
55. Niemeyer D, Miner KR, Carlson LM, Baer K, Shorty L. The 1998 Master Settlement Agreement: A Public Health Opportunity Realized—Or Lost? *Health Promot Pract*. 2004;5(3_suppl):21S-32S. doi:10.1177/1524839904264588
56. Hu TW, Sung HY, Keeler TE. Reducing cigarette consumption in California: tobacco taxes vs an anti-smoking media campaign. *Am J Public Health*. 1995;85(9):1218-1222.
57. Campaign for Tobacco-Free Kids, American Heart Association, American Cancer Society Cancer Action Network, American Lung Association, Americans for Nonsmokers' Rights,

Truth Initiative. *Broken Promises to Our Children: A State-by-State Look at the 1998 Tobacco Settlement 20 Years Later*. Campaign for Tobacco Free Kids; 2018. Accessed February 14, 2020. https://www.tobaccofreekids.org/assets/content/what_we_do/state_local_issues/settlement/FY2019/2018_State_Report.pdf

58. Farrelly MC, Chaloupka FJ, Berg CJ, et al. Taking Stock of Tobacco Control Program and Policy Science and Impact in the United States. *J Addict Behav Ther*. 2017;1(2). Accessed August 31, 2020. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6124688/>
59. Carvajal R, Clissold D, Shapiro J. The Family Smoking Prevention and Tobacco Control Act: An Overview. *Food Drug Law J*. 2009;64(4):717-732.
60. Martell BN. Disparities in Adult Cigarette Smoking — United States, 2002–2005 and 2010–2013. *MMWR Morb Mortal Wkly Rep*. 2016;65. doi:10.15585/mmwr.mm6530a1
61. Pérez-Stable EJ, Ramirez A, Villareal R, et al. Cigarette smoking behavior among US Latino men and women from different countries of origin. *Am J Public Health*. 2001;91(9):1424-1430. doi:10.2105/ajph.91.9.1424
62. Rodriguez EJ, Fernández A, Livaudais-Toman JC, Pérez-Stable EJ. How Does Acculturation Influence Smoking Behavior Among Latinos? The Role of Education and National Background. *Ethn Dis*. 29(2):227-238. doi:10.18865/ed.29.2.227
63. Sakuma K-LK, Felicitas J, Fagan P, et al. Smoking Trends and Disparities Among Black and Non-Hispanic Whites in California. *Nicotine Tob Res Off J Soc Res Nicotine Tob*. Published online February 8, 2015. doi:10.1093/ntr/ntv032
64. Zhu S-H, Gardiner P, Cummins S, et al. Quitline utilization rates of African-American and white smokers: the California experience. *Am J Health Promot AJHP*. 2011;25(5 Suppl):S51-58. doi:10.4278/ajhp.100611-QUAN-185
65. Keeler C, Max W, Yerger V, Yao T, Ong MK, Sung H-Y. The Association of Menthol Cigarette Use With Quit Attempts, Successful Cessation, and Intention to Quit Across Racial/Ethnic Groups in the United States. *Nicotine Tob Res*. 2017;19(12):1450-1464. doi:10.1093/ntr/ntw215
66. Trinidad DR, Pérez-Stable EJ, Messer K, White MM, Pierce JP. Menthol cigarettes and smoking cessation among racial/ethnic groups in the United States. *Addict Abingdon Engl*. 2010;105(0 1):84-94. doi:10.1111/j.1360-0443.2010.03187.x
67. Babb S. Quitting Smoking Among Adults — United States, 2000–2015. *MMWR Morb Mortal Wkly Rep*. 2017;65. doi:10.15585/mmwr.mm6552a1
68. Primack BA, Bost JE, Land SR, Fine MJ. Volume of tobacco advertising in African American markets: systematic review and meta-analysis. *Public Health Rep Wash DC 1974*. 2007;122(5):607-615.
69. Yao T, Ong MK, Max W, et al. Responsiveness to cigarette prices by different racial/ethnic groups of US adults. *Tob Control*. 2018;27(3):301-309. doi:10.1136/tobaccocontrol-2016-053434
70. Henriksen L, Schleicher NC, Dauphinee AL, Fortmann SP. Targeted advertising, promotion, and price for menthol cigarettes in California high school neighborhoods. *Nicotine Tob Res Off J Soc Res Nicotine Tob*. 2012;14(1):116-121. doi:10.1093/ntr/ntr122

71. Mills SD, Henriksen L, Golden SD, et al. Disparities in Retail Marketing for Menthol Cigarettes in the United States, 2015. *Health Place*. 2018;53:62-70. doi:10.1016/j.healthplace.2018.06.011
72. Ribisl KM, D'Angelo H, Feld AL, et al. Disparities in tobacco marketing and product availability at the point of sale: Results of a national study. *Prev Med*. 2017;105:381-388. doi:10.1016/j.ypmed.2017.04.010
73. Alexander LA, Trinidad DR, Sakuma K-LK, et al. Why We Must Continue to Investigate Menthol's Role in the African American Smoking Paradox. *Nicotine Tob Res*. 2016;18(suppl_1):S91-S101. doi:10.1093/ntr/ntv209
74. Webb Hooper M, Rogers BG, Okuyemi K. Smoking Cessation Among Racial/Ethnic Minorities, 2010-2014. *Curr Addict Rep*. 2015;2(1):24-32. doi:10.1007/s40429-015-0041-3
75. Weinberger AH, Giovenco DP, Zhu J, Lee J, Kashan RS, Goodwin RD. Racial/ethnic differences in daily, nondaily, and menthol cigarette use and smoking quit ratios in the United States: 2002 to 2016. *Prev Med*. 2019;125:32-39. doi:10.1016/j.ypmed.2019.04.009
76. Schane RE, Ling PM, Glantz SA. Health Effects of Light and Intermittent Smoking: A Review. *Circulation*. 2010;121(13):1518-1522. doi:10.1161/CIRCULATIONAHA.109.904235
77. Inoue-Choi M, Hartge P, Park Y, Abnet CC, Freedman ND. Association Between Reductions of Number of Cigarettes Smoked per Day and Mortality Among Older Adults in the United States. *Am J Epidemiol*. 2019;188(2):363-371. doi:10.1093/aje/kwy227
78. Sharbaugh MS, Althouse AD, Thoma FW, Lee JS, Figueredo VM, Mulukutla SR. Impact of cigarette taxes on smoking prevalence from 2001-2015: A report using the Behavioral and Risk Factor Surveillance Survey (BRFSS). *PLOS ONE*. 2018;13(9):e0204416. doi:10.1371/journal.pone.0204416
79. van Hasselt M, Kruger J, Han B, et al. The relation between tobacco taxes and youth and young adult smoking: what happened following the 2009 U.S. federal tax increase on cigarettes? *Addict Behav*. 2015;45:104-109. doi:10.1016/j.addbeh.2015.01.023
80. Satter DE, Roby DH, Smith LM, Avendano KK, Kaslow J, Wallace SP. Costs of smoking and policy strategies for California American Indian communities. *J Cancer Educ Off J Am Assoc Cancer Educ*. 2012;27(1 Suppl):S91-105. doi:10.1007/s13187-012-0340-5
81. Kahende JW, Malarcher AM, Teplinskaya A, Asman KJ. Quit Attempt Correlates among Smokers by Race/Ethnicity. *Int J Environ Res Public Health*. 2011;8(10):3871-3888. doi:10.3390/ijerph8103871
82. Lienemann BA, Cummins SE, Tedeschi GJ, Wong S, Zhu S-H. American Indian/Alaska Native Smokers' Utilization of a Statewide Tobacco Quitline: Engagement and Quitting Behaviors From 2008 to 2018. *Nicotine Tob Res*. 2019;(ntz205). doi:10.1093/ntr/ntz205
83. Soulakova J, Davis WW, Hartman A, Gibson J. The Impact of Survey and Response Modes on Current Smoking Prevalence Estimates Using TUS-CPS: 1992-2003. *Surv Res Methods*. 2009;3(3):123-137.
84. Kennedy SM, Sharapova SR, Beasley DD, Hsia J. Cigarette Smoking Among Inmates by Race/Ethnicity: Impact of Excluding African American Young Adult Men From National Prevalence Estimates. *Nicotine Tob Res Off J Soc Res Nicotine Tob*. 2016;18 Suppl 1:S73-78. doi:10.1093/ntr/ntv157

85. Tsai J, Rosenheck RA. Smoking Among Chronically Homeless Adults: Prevalence and Correlates. *Psychiatr Serv*. 2012;63(6):569-576. doi:10.1176/appi.ps.201100398
86. Baggett TP, Lebrun-Harris LA, Rigotti NA. Homelessness, Cigarette Smoking, and Desire to Quit: Results from a U.S. National Study. *Addict Abingdon Engl*. 2013;108(11):2009-2018. doi:10.1111/add.12292
87. Baggett TP, Rigotti NA. Cigarette smoking and advice to quit in a national sample of homeless adults. *Am J Prev Med*. 2010;39(2):164-172. doi:10.1016/j.amepre.2010.03.024
88. Nelson JP, Pederson LL. Military Tobacco Use: A Synthesis of the Literature on Prevalence, Factors Related to Use, and Cessation Interventions. *Nicotine Tob Res*. 2008;10(5):775-790. doi:10.1080/14622200802027123