San Francisco Sugary Drinks Distributor Tax Advisory Committee

August 2019 Data Report

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Table of Contents

Executive Summary

Sugar-Sweetened Beverages Contribute to Diet-sensitive Chronic Diseases in San Francisco and the Sugary Drinks Distributor Tax Seeks to Mitigate the Effects

A large body of evidence exists indicating that sugar-sweetened beverage (SSB) consumption increases risk for diet-sensitive chronic diseases, particularly cavities, overweight/obesity, type 2 diabetes, hypertension, and heart disease.[1–7] SSB consumption in San Francisco is greatest among the very populations most impacted by diet-sensitive chronic diseases. Pacific Islander, Black/African American, Latinx and Filipinx students are 0.66 to 3 times higher than White or Asian students to report daily consumption of SSBs.

Excise taxes on sugary sweetened beverages are an effective public health intervention meant to decrease SSB consumption and the downstream health consequences of SSB consumption. In this vein, it is one of the few financial policy tools community and public health advocates have to level the playing field with an industry that receives financial subsidies to make their products cheaper and to advertise to youth.[8] Currently we know the following on the state of SSB prices, sales and consumption in San Francisco:

- **Sugar-sweetened Beverage Prices:** Between April-June 2017 (before tax collection began) and April-June 2018 (after tax collection began), the prices of SSB, as compared to prices in comparison cities without SSB taxes-- San Jose and Richmond—increased by 0.61 - 1.25 cents per ounce (variable on container size) – essentially what was expected as the excise tax was a 1 cent per ounce tax on distributors bringing SSBs into San Francisco. The greatest increases were seen for sports drinks and coffee drinks. The price of non-sugar-sweetened beverages did not increase except for diet soda which increased by 0.48-0.71 cents per ounce.

- **Sugar-sweetened Beverage Sales:** Regular sodas are the most purchased SSB in San Francisco. Data from 2015 to 2017, before tax collection began, show a small but statistically significant decreasing trend in sales for regular soda.

- **Sugar-sweetened Beverage Consumption:** The SFUSD School Health Survey which is conducted among middle and high school students, found that the daily frequency of sugar-sweetened beverage consumption declined significantly among students from 2015 through 2017 (before tax collection began). In 2017 the average frequency of consumption was 0.8 times per day compared to 1.1 times per day in 2015. The frequency of consumption decreased significantly for all categories of sugar-sweetened beverage. At the same time, consumption of water increased significantly.

The SDDT is also expected to impact health through use of revenue generated by the tax to improve the nutrition and physical activity environments in San Francisco, and to create economic opportunities and provide direct services for heavily impacted populations.

Preventable, Diet-sensitive Diseases are Prevalent, Have Major Health and Economic Impacts, and are Unequally Distributed in San Francisco

In San Francisco, 6 of the 10 leading causes of death are preventable, diet-sensitive chronic diseases—ischemic heart failure, hypertension, stroke, Alzheimer's, diabetes mellitus, and colon cancer. Between 2005 and 2018, death rates due to ischemic heart disease, hypertensive disease, cerebrovascular disease, and colon cancer decreased significantly, while rates due to Alzheimer's increased. Mortality rates due to diabetes have remained stable.

These 6, and other diet sensitive chronic diseases affect San Francisco's residents differentially with residents of color and those with lower incomes most affected.[i]

Overall, Black/African American and Pacific Islander residents are the most impacted, particularly in these ways:

- Mortality rates for 5 of the 6 diseases (excluding ischemic heart failure) are highest among Black/African American residents.[ii]
- Diabetes and hypertension rates among Black/African American residents are 2 and 3 times as high as the next highest group.
- Not only are rates higher, but Black/African American residents typically die younger due to these conditions. In San Francisco, on average, Black/African American males and females who die from diabetes live 3-6 fewer years than men and women of other races/ethnicities who die from diabetes.
- Rates of emergency room visits due to non-traumatic dental conditions are 2-18 times higher among Black/African American, Pacific Islander, and Native American residents as compared to White, Latinx and Asian residents.
- Note: data is often not sufficiently available for Pacific Islander residents but the data we do have suggest Pacific Islanders face similar degrees of health disparities as Black/African American residents

Furthermore:

- Decreases seen for heart disease, hypertension, cerebrovascular disease and colon cancer among the population overall are not seen for all subgroups.
    - Mortality rates due to hypertension and cerebrovascular diseases are stable for Latinx, Black/African American, and White residents.
    - The rate of colon cancer has not decreased among Asians.
    - Rates of Emergency Room Visits due to hypertension, diabetes and heart failure among Black/African American and Pacific Islander residents are 7-10 times as high as those seen for White and Asian residents.
- While the disparities are not as vast as those seen for Black/African American and Pacific Islanders, the following is occurring:
    - diabetes ER visit and hospitalization rates are also elevated among Latinx,
    - the colon cancer incidence rate is elevated among Asians, and
    - the Alzheimer's mortality rate is elevated among White residents.

Those most impacted by diet-sensitive chronic diseases are impacted at younger ages. Black/African American residents experience the health consequences of diabetes, hypertension and heart failure earlier in life than do other residents.[iii] Hospitalization rates for Black/African American residents in their 30s and 40s are comparable to those of other race/ethnicities who are 30 or more years older. ***In fact, for diabetes, hospitalization rates are higher among Black/African American 18-34-year-old residents than they are for others at any age.***

[i] Data are not available for all communities in San Francisco who likely experience health disparities. Data are often collected in a way that does not include certain designations and, when collected, data for smaller populations may be too sparse to calculate stable estimates and/or to protect the identity of affected persons.

[ii] Insufficient data is available to produce mortality rates for specific causes for Pacific Islanders. Comparisons here are made with Asian, Latinx, and White residents.

[iii] Data for Pacific Islanders are sparse but also suggest higher rates at younger ages.

San Francisco's youth are at risk for and experiencing diet-sensitive chronic diseases. In school year 2017-2018, 35% of 5th grade students, 34% of 7th graders, and 29% of 9th graders had a measured body composition outside the healthy fitness zone. That same year, 32% of SFUSD kindergarteners had experienced caries and 17% had untreated caries and rates of experiencing caries were 1.5 to 2.5 times higher for Black/African American, Asian, and Latinx students than for White students. For both healthy body weight and oral health, economically disadvantaged children are at highest risk.

The economic impacts of diet-sensitive chronic diseases are immense. A 2013 report estimated the direct and indirect costs of obesity and diabetes in San Francisco at $748 million. The report found the estimated costs of obesity and diabetes attributed to SSBs was $48.1 to $61.8 million. Hospitalization data for 2016 show that together diabetes, hypertension and ischemic heart failure were the primary causes of 12,448 hospital admissions resulting in more than 29,000 days of hospitalization and a partial reporting of associated medical charges exceeding $350 million in San Francisco.

To address Diet-Sensitive Chronic Diseases in San Francisco, Upstream Causes Must be Targeted

Both the 2016 and 2019 San Francisco Community Health Needs Assessments identified poverty and racial health inequities as foundational issues which must be addressed in order to improve the health of all San Franciscans. Healthy eating and active living are only possible where conditions support them and many, especially Black/African American, Pacific Islanders, and Latinx San Franciscans do not experience those conditions. About one quarter (20-27%) of Black/African American and Latinx pregnant women are food insecure compared to 0 to 7% of White and Asian pregnant women. The percentage of children living in poverty varies by race/ethnicity with almost 50% of Black/African American and 30% of Pacific Islander children living in poverty. Educational attainment and median household income vary drastically by race/ethnicity; the median household income for Black/African American, Pacific Islander, and Native American households in San Francisco is only $28-45K in a city where an estimated 120K is considered a self-sufficient income. Upstream determinants of health –inadequate resources, inadequate education, experiencing an unjust criminal justice system, housing instability, systemic racism, and more, build up in a community and lead to the consistent health disparities that we see.

Background

In November of 2016, the voters of San Francisco approved the passage of Proposition V. Proposition V established a 1 cent per ounce fee on the initial distribution of a bottled sugar-sweetened beverage, syrup, or powder, within the City and County of San Francisco.[9] The legislation defines a sugary drink, or sugary-sweetened beverage (SSB), as follows:

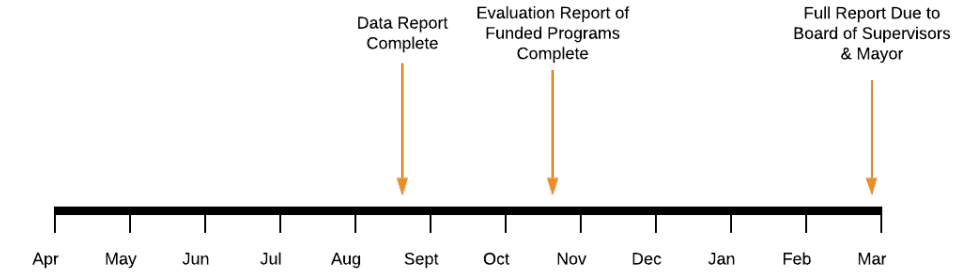
> *A sugar-sweetened beverage (SSB) means any non-alcoholic beverage intended for human consumption that contains caloric sweetener and contains 25 or more calories per 12 fluid ounces of beverage, including but not limited to all drinks and beverages commonly referred to "soda," "pop," "cola,'' soft drinks" "sports drinks," "energy drinks'' "sweetened iced teas" or any other similar names.*

Proposition V established the Sugary Drinks Distributor Tax Advisory Committee (Committee) whose powers and duties are to make recommendations to the Mayor and the Board of Supervisors on the effectiveness of the Sugary Drinks Distributor Tax (SDDT) and to submit a report that evaluates the impact of the SDDT on beverage prices, consumer purchasing behavior, and public health. The Committee also provides recommendations regarding the potential establishment and/or funding of programs to reduce the consumption of sugar-sweetened beverages and to otherwise address diet-sensitive diseases in San Francisco.

Report Requirements and Process

Starting in 2018, by March 1, of each year, the Committee shall submit to the Board of Supervisors and the Mayor a report that evaluates the impact of the SDDT on beverage prices, consumer purchasing behavior, and public health (Figure 1). The Committee in their report shall make recommendations regarding the potential establishment and/or funding of programs to reduce the consumption of sugar-sweetened beverages in San Francisco. This data report fulfils the requirement to evaluate the impact of the Sugary Drinks Distributor Tax.

Figure 1. Annual Report Timeline



Relationship Between Sugar-sweetened Beverage Consumption, Health, and Health Equity

A large body of evidence exists indicating that sugar-sweetened beverage consumption increases risk for cavities, overweight/obesity, type 2 diabetes, hypertension, heart disease and death.[1–7] Although sugar-sweetened beverages can contain hundreds of calories in a serving, they do not signal "fullness" to the brain and thus facilitate overconsumption.[10] sugar-sweetened beverages are the leading source of sugar in the American diet, contributing 36% of the added sugar Americans consume.

Numerous organizations and agencies, including the American Heart Association, American Diabetes Association, American Academy of Pediatrics, Institute of Medicine of the National Academies, American Medical Association, and the Centers for Disease Control, recommend limiting intake of added sugar and sugar-sweetened beverages to improve health. Studies show that sugar-sweetened beverages flood the liver with high amounts of sugar in a short amount of time and that this "sugar rush" over time leads to fat deposits and metabolic disturbances that are associated with the development of type 2 diabetes, cardiovascular disease, and other serious health problems.[3] Of note, every additional

sugar-sweetened beverage consumed daily can increase a child's risk for obesity by 60% and the risk of developing type 2 diabetes by 26%.[4]

Diseases connected to sugar-sweetened beverages are also found to disproportionately impact ethnic minority and low-income communities in San Francisco – the very communities that are found to consume higher amounts of sugar-sweetened beverages. According to OSHPD data, diabetes hospitalizations are approximately three times as high in low-income communities as compared with higher income communities. African American death rates from diabetes are two times higher than San Francisco's overall rate. In San Francisco, approximately 41% of adults are estimated to be obese or overweight, including 63% of Latinx and 61% of Black/African American residents. With respect to oral health, the data indicate that Asian and Pacific Islander children suffer from cavities at a higher rate than other populations; but Latinx and African American children also have a higher prevalence than the average for cavities.

The Sugary Drinks Distributor Tax is intended to discourage the distribution and consumption of sugar-sweetened beverages in San Francisco by taxing their distribution. Mexico, where an average of 163 liters of sugar-sweetened beverages are consumed per person each year, enacted an excise tax on sugar-sweetened beverages in 2014, with the result that the purchase of taxed sugar-sweetened beverages declined by 12% generally and by 17% among low-income Mexicans by December 2014.[11,12] The Mexico data indicate that, when people cut back on sugar-sweetened beverages, to a significant extent they choose lower-caloric or non-caloric alternatives. Studies have projected that a 10% reduction in sugar-sweetened beverage consumption in Mexico would result in about 189,300 fewer incident type 2 diabetes cases, 20,400 fewer incident strokes and myocardial infarctions, and 18,900 fewer deaths occurring from 2013 to 2022. This modeling predicts the sugar-sweetened beverages tax could save Mexico $983 million international dollars.[13] Following the implementation of Berkeley, California's sugar-sweetened beverage tax, the first in the nation, there was a 50% decline in sugar-sweetened beverage consumption among diverse adults over the first 3 years of the tax. [14] Modeling suggests that a national sugar-sweetened beverage tax that reduced consumption by just 20% would avert 101,000 disability-adjusted life-years; gain 871,000 quality-adjusted life-years; and result in $23.6 billion in healthcare cost savings over just 5 years.[15] The tax is further estimated to generate $12.5 billion in annual revenue. This body of research demonstrates that taxation can provide a powerful incentive for individuals to reduce their consumption of sugar-sweetened beverages, which in turn can reduce the burden of chronic disease.

History of Sugar-sweetened Beverage Interventions in San Francisco

In evaluating the impact of the SDDT, it is important to recognize the previous efforts made to curb sugar-sweetened beverage consumption and subsequent health effects as consumption may have been affected and continue to be affected by these efforts. Figure 2 includes a timeline of sugar-sweetened beverage Interventions over the past 10-plus years.

Figure 2. Sugary Drink Interventions in San Francisco, 2009-2019

2009

- SFS in San Francisco: 2009- 2013.
- 25K "Drink Water!" Said the Otter books were distributed to SF pre-k and kindergarten classes.
- American Heart Association releases guidelines on sugar intake.
- CCPHA releases *Bubbling Over* report, scientifically linking soda consumption to overweight /obesity.
- SFDPH releases nexus study examining feasibility of SSB legislation in SF.
- Organizations implementing Soda Free Policies: Boys and Girls Club, Junior Giants, Sunday Streets.

2011

- *Potter the Otter, A Tale About Water* launches for SF childcare centers.

2013

- SFS in San Francisco.
- SUSF convenes Rethink Your Drink Workgroup.
- Senator Monning introduces SB-622 to establish statewide soda tax and create a Children's Health Promotion fund.
- SF PUC convenes Water Hearing.
- Mayor Lee and 17 other mayors urge congressional leaders to ban use of food stamps to buy sugary drinks.
- Organizations implementing Soda Free Policies: YMCA of SF, Bayview Hunters Point Foundation, Children's Council of SF.
- The Bigger Picture (TBP) develops sugary drink PSAs.
- SF Board of Supervisors unanimously pass resolution to support SB-622.
- California hosts its 1st Healthy Beverage Summit.

rethink YOUR DRINK

2015

- Open Truth Campaign launches.
- SF policymakers approve policies to eliminate use of public dollars for sugary drinks purchase and require warning labels on ads for sugary drinks.
- SFGH and UCSF campuses become sugary drinks free.
- SFSU students prevent SFSU from entering into pouring rights contract.
- SFDPH issues policy prohibiting sugary drinks at any event led by DPH or at DPH facility, or to be paid for with DPH funding.
- In partnership with SFHIP, support health equity coalition SSB outreach and education.

open truth

2017

- SFUSD eliminates chocolate milk from school lunch program at **elementary and middle** schools.
- First convening of Sugary Drinks Distributor Tax Advisory Com (SDDTAC): Dec 21, 2017.

2019

- Jan 2019, Ninth Circuit announces en banc decision that SSB warnings on ads may violate 1st Amendment, because 20% size requirement not justified.
- First SDDT funded community based grants programs initiated through DPH.

2008

- SF declares Soda Free Summer (SFS) with the Bay Area Nutrition & Physical Activity Collaborative.
- 40K SFS brochures through SF Unified School District, summer lunch sites, worksites, clinics, and community partners.
- SFDPH implements healthy food policy.
- Mayor Newsom requests nexus study to assess feasibility of local sugary drink fees.

2010

- SFPUC starts tap station installations throughout city
- SFDPH runs NYC's Pouring on the Pounds campaign.
- Mayor Newsom signs Executive Directives: Healthy & Sustainable Foods and Healthy Vending.
- Healthy Meals Ordinance passes.
- Organizations implementing Soda Free Policies: SF Recreation and Parks, Bay Area SCORES, Kai Ming Head Start.

2012

- SFS in San Francisco.
- SUSF supports youth-serving organizations to develop healthy beverage policies.
- *Nature* publishes paper that argues sugar is addictive & linked to diseases associated with metabolic syndrome.
- *Mother Jones* publishes exposé on sugar industry and parallels to big tobacco.
- Canzilla is born

2014

- Choose Healthy Drinks Campaign launched.
- DPH Sugar Science trainings educate about health impacts of sugary drinks and Big Soda tactics.
- TBP launches *Canzilla* campaign.
- 56% of SF voters supported a tax on sugary drink distributors. To win tax needs supermajority.
- Berkeley becomes 1st city in US to pass a voter approved soda tax.
- UCSF launches www.SugarScience.org.

2016

- USDA Guidelines recommend limiting sugar consumption to no more than 12 tsp/day for adults.
- SF defends sugary drinks warning label law against the American Beverage Association.
- Open Truth Campaign materials translated into Spanish and Chinese.
- SF policymakers adopt legislation requiring healthy vending machine standards and prohibit sales of drinks with added sugars.
- SF, Oakland and Albany voters pass soda taxes!

2018

- SF Sugary Drink Distributor Tax (SDDT) takes effect January 1
- SFUSD eliminates chocolate milk from School Lunch Program at **high** schools
- City departments receive SDDT funding for Fiscal Year 2017/18.
- March 2018, SDDTAC submits first funding recommendations to Mayor's office.
- SSB warning label case argued in the Ninth Circuit en banc.

Source: Adapted and updated from Shape Up SF Coalition

A Note on the Social Determinants of Health

According to the World Health Organization, the social determinants of health are "the conditions in which people are born, grow, work, live, and age, and the set of forces and systems shaping the conditions of daily life."[16] While biology, genetics, and access to medical services are largely understood to play an important role in health, social-economic and physical environmental conditions are known to be major, if not primary, drivers of health.[17–19]

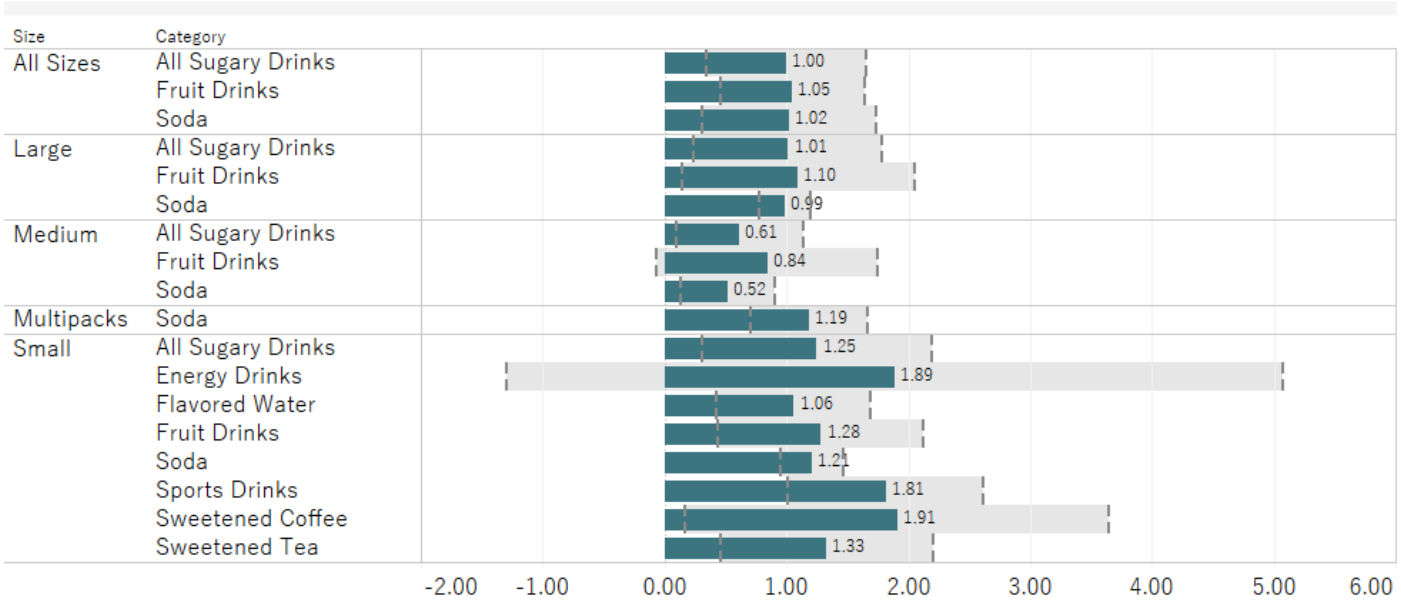
This report only touches on select social determinants of diet-sensitive chronic diseases- the food and beverage environment, food security, and physical activity opportunities and barriers. However, according to the Institute of Medicine, the most important social factors determining health are income, accumulated wealth, education, occupational characteristics, and social inequality based on race and ethnic group membership.[20] These determinants are not equally distributed in San Francisco and contribute to the disparities seen both in the health outcomes as well as the upstream behavioral risk factors presented in this report[21]. Furthermore, the 2019 San Francisco Community Health Needs Assessment identified poverty and racial health inequities as foundational issues which must be addressed in order to improve the health of all San Franciscans. Data on poverty and racial health inequities in San Francisco as well as housing, criminal justice and other upstream social determinants of health are presented in detail in the triannual Community Health Needs Assessment available at www.sfhip.org.

Sugar-sweetened Beverage Price, Sales, and Consumption

Sugar-sweetened Beverage Prices

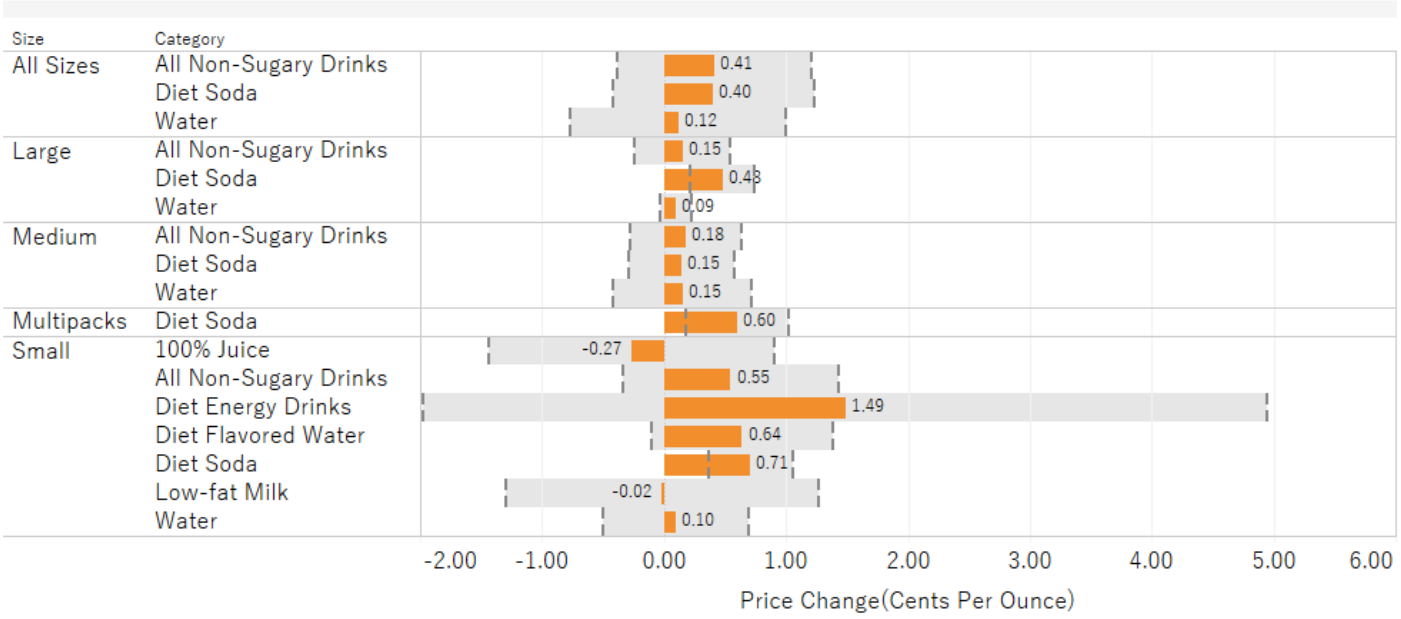
Between April-June 2017 and April-June 2018, and compared to prices in San Jose and Richmond (which do not have a tax), "single serving" (<33.8oz) sugar-sweetened beverages in San Francisco averaged a 1.25 cent per ounce increase (95% confidence interval: 0.30 –2.19), medium sized (between 33.8oz and 46oz) sugar-sweetened beverages averaged a 0.61 cent per ounce increase (95% CI: 0.09, 1.14), and large sized (≥ 46oz) sugar-sweetened beverages averaged a 1.01 cent per ounce increase (95% CI: 0.24– 1.79) (Figure 3). Sports drinks (1.81 cents/oz, 95% CI: 1.01–2.62) and coffee (1.91 cents/oz, 95% CI: 0.17– 3.65) single serving drinks appeared to display the greatest price increase. The price of non-sugar-sweetened beverages did not increase except for diet soda; the price of single serving, large size, and multi packs of diet sodas increased by 0.71 cents/oz (95% CI: 0.36-1.06), 0.48 cents/oz (95% CI: 0.22-0.74), and 0.60 cents/oz (95% CI: 0.18–1.02), respectively (Figure 4).

Figure 3. Price Changes Per Ounce For Sugar-Sweetened Beverages, April-June 2017 to April-June 2018.



Price Changes are relative to those in comparison cities--San Jose and Richmond--which do not have a SSB tax.
Confidence intervals spanning zero indicate that data do not show a change in price.
Source: University of California, Berkeley Madsen Group Pricing Study

Figure 4. Price Changes per Ounce for Non-Sugar-Sweetned Beverages, April-June 2017 to April-June 2018.



Price Changes are relative to those in comparison cities--San Jose and Richmond--which do not have a SSB tax.
Confidence intervals spanning zero indicate that data do not show a change in price.
Source: University of California, Berkeley Madsen Group Pricing Study

Sugar-sweetened Beverage Sales

Beverage sales data are available through IRI market research data. At this time, beverages sales data for San Francisco are only available for 2015 through 2017 and use IRI product categories which may mix taxed and untaxed beverages; analyses presented here are preliminary and baseline regarding the start of tax collection for the SDDT which occurred on January 1, 2018. It must be noted that a true baseline of consumption prior to SDDT influence would be more accurately reflected in data from 2013 from before the initial 2014 sugary beverage tax ballot initiative that raised public awareness about the harms of sugary beverages and the merits of a sugary beverage tax. This 2014 campaign may have influenced decreased consumption which was a trend seen in Berkeley; consumption decreased on the university campus following the local ordinance even before tax collection had begun.[22] See the IRI Methods and Limitations section of this report for more information.

IRI beverage sales data are collected from 108 stores (pharmacies, supermarkets and mass merchandizers) in San Francisco representing about 9% of all retailers selling sugar-sweetened beverages in San Francisco. Of the almost 1,200 retailers in San Francisco which additionally include corner stores, convenience stores, and small groceries and markets, about 85% are independent retailers or part of small, locally owned chains and likely not represented or under-represented in the IRI sample. Other SSB vendors such as restaurants and cafeterias, vending machines, and retail space not subject to local permit requirements (retail of pre-packed, non-potentially hazardous foods occupying less than 300 square feet of space) are not considered at this time.

Sales of regular soda are almost 2 times higher than diet soda and 7 times higher than energy drinks (data for other drink categories not currently available). From 2015 to 2017, there was a small, but statistically significant, decreasing trend in sales for both soda (monthly sales by -.14%) and diet soda (monthly sales by .2%) (Table 1).

Table 1. Beverage Sales Trends, by Beverage Category, 2015-2017

Trends in Total Ounces

	Month trend (standard error)	Constant (standard error)	Mean of Dependent Variable	Number of Observations	R squared
Diet Soda	-7,640.07 (1,883.73)***	3,883,729 (44,317.65)***	3,727,107.37	40	0.302
Energy Drinks	-151.48 (1,613.14)	1,370,851 (37,591.64)***	1,367,745.94	40	0.000
Soda	-14,554.20 (7,103.51)**	10,920,264 (167,121.34)***	10,621,902.52	40	0.099

Trends in Average Over All Zip Codes

Diet Soda	-90.95 (22.43)***	46,234.87 (527.59)***	44,370.33	40	0.302
Energy Drinks	-1.80 (19.20)	16,319.66 (451.80)***	16,282.69	40	0.000
Soda	-173.26 (84.57)**	130,003.14 (1,989.54)***	126,451.22	40	0.099

Statistical significance: * denotes significance at $p < 0.10$, ** at $p < 0.05$, and * at $p < 0.01$.**

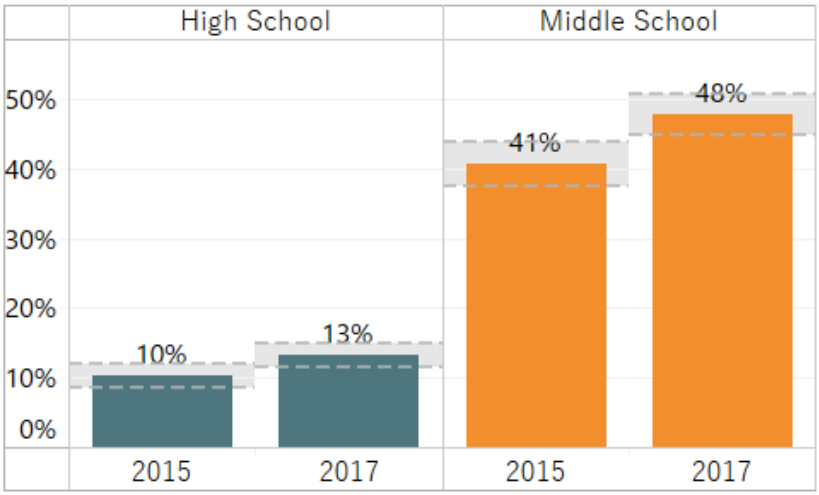
The mean of dependent variable is the mean for total or average ounces sold by month in a beverage category.

Sugar-sweetened Beverage Consumption

Sugar-sweetened beverage Consumption Among SFUSD students

The most recent data available from the Youth Risk Behavioral Surveillance Survey (YRBS), collected prior to Sugary Drink Distributor Tax implementation, shows that nearly half of SFUSD middle school students report consuming any sugar-sweetened beverages the day prior and 13% of high school students report consuming sugar-sweetened beverages daily during the prior week (Figure 5). The percentage of students reporting consumption was 17% (F value 9.79; Pr= 0.002) and 30% (F value 6.32; Pr= 0.013) higher in 2017 than in 2015 for middle and high school students, respectively. The increase was seen among male students but not female students.

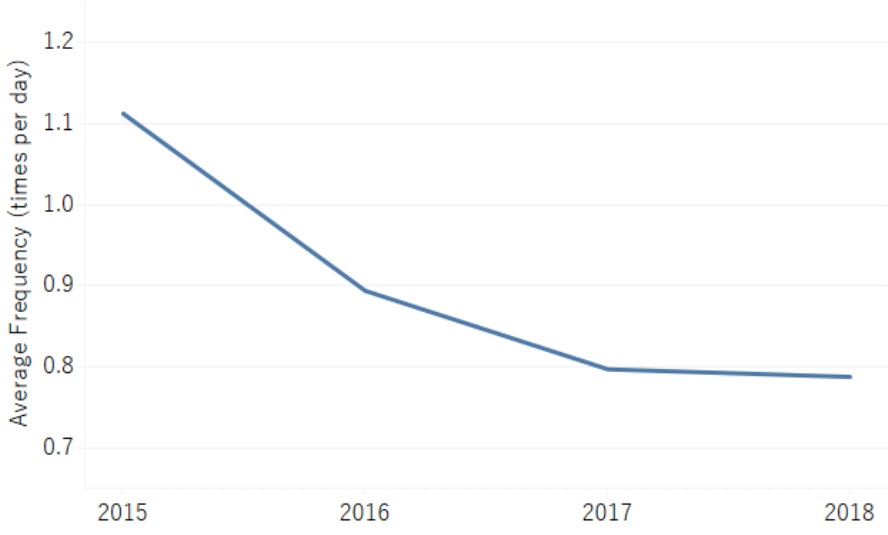
Figure 5. Percentage of SFUSD students consuming sugar sweetened beverages daily



High school students were asked about daily consumption in last 7 days while middle school students were asked about any consumption in previous day.
Source: YRBS

While the YRBS data indicate that many students are drinking sugar-sweetened beverages daily, the School Health Survey which is also conducted among SFUSD middle and high school students, found that the daily frequency of sugar-sweetened beverage consumption declined significantly among students in all grades, of all genders, and of all race/ethnic groups from 2015 through 2017. In 2017 the average frequency of consumption was 0.8 times per day compared to 1.1 times per day in 2015. Consumption remained low in 2018 and was like that of 2017 (Figure 6).

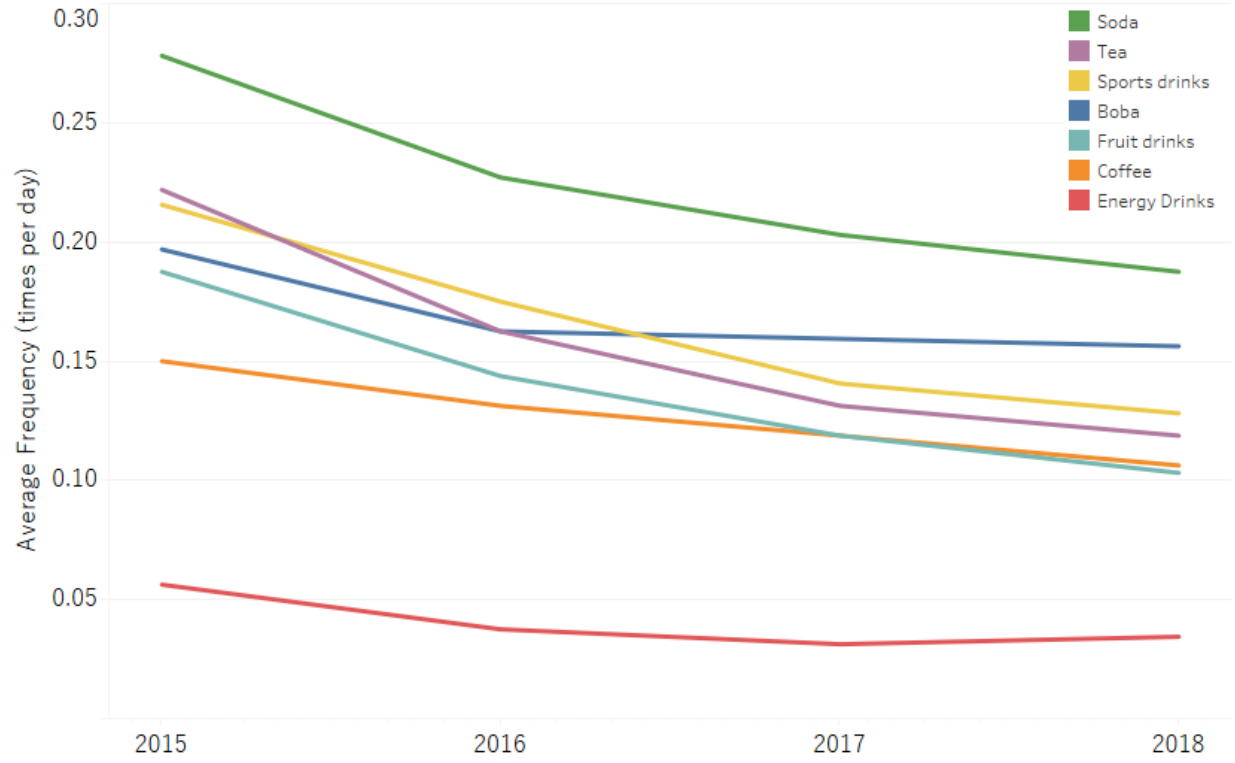
Figure 6. Frequency of Sugar-Sweetened Beverage Consumption by SFUSD students



Source: SFUSD School Health Survey

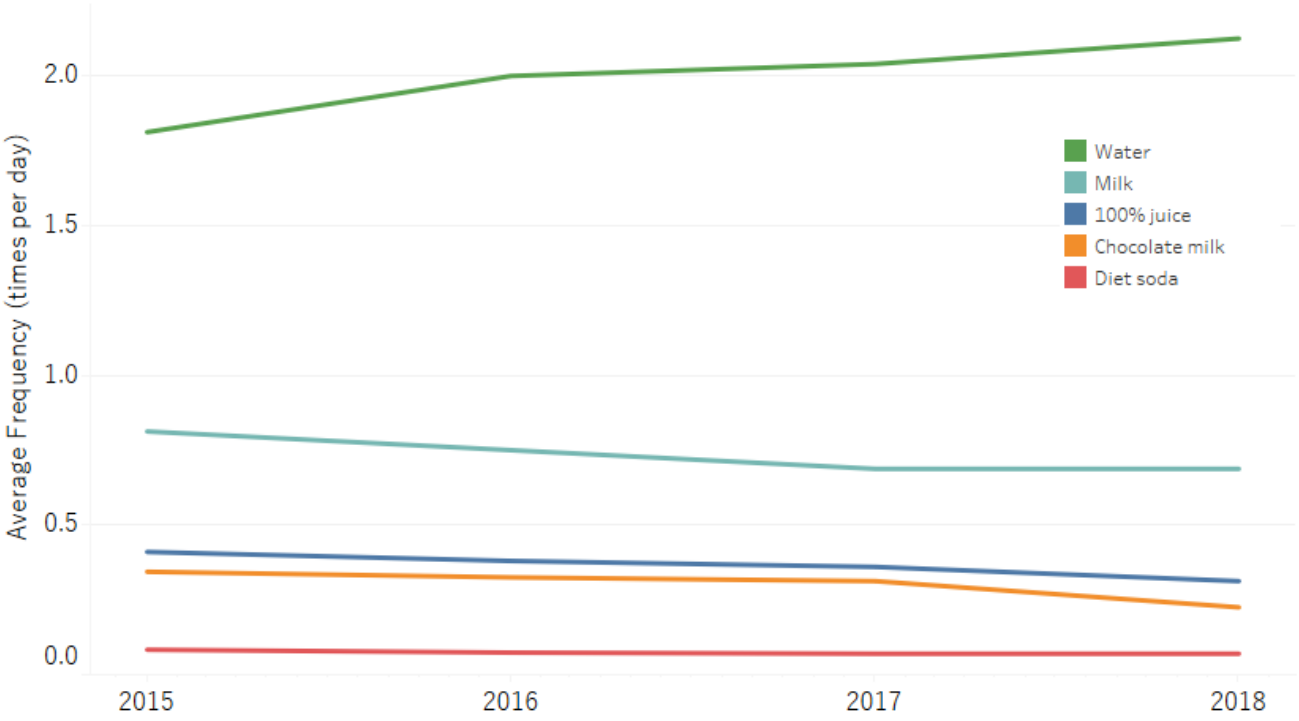
Between 2015 and 2018, the frequency of consumption decreased significantly for all categories of sugar-sweetened beverage with the steepest declines seen for fruit drinks, sports drinks, and sweet teas (Figure 7). At the same time, except for water and unflavored milk, the frequency of consumption of non-sugar-sweetened beverages also declined (Figure 8). A slight decline in unflavored milk consumption appears after 2015, however the difference is statistically significant only in 2017. Consumption of water increased significantly.

Figure 7. Frequency of Sugar-Sweetened Beverage Consumption by SFUSD students, by Beverage Type



Source: SFUSD School Health Survey

Figure 8. Frequency of Consumption of Various Non-Sugar-Sweetened Beverages, by Type



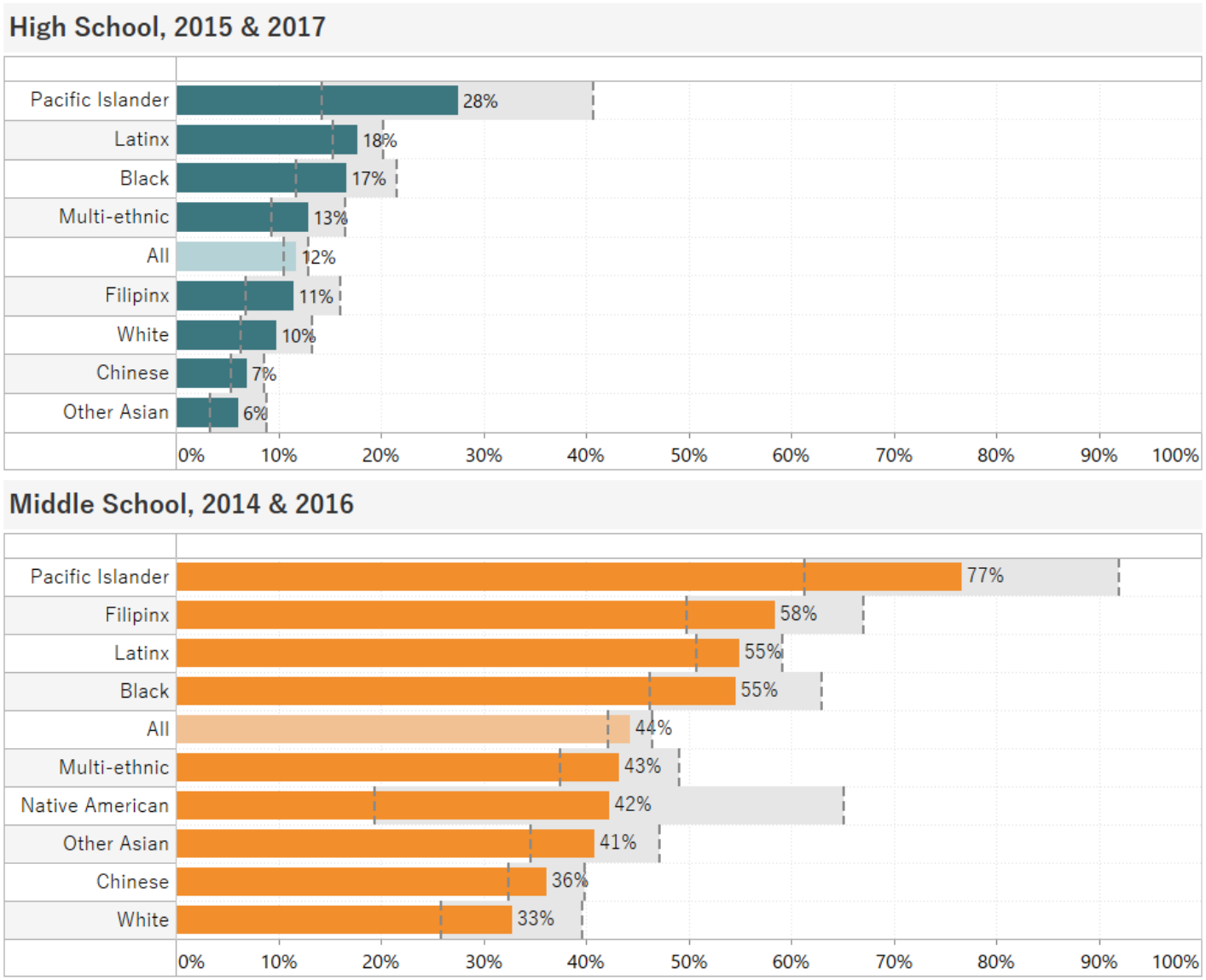
Source: SFUSD School Health Survey

Disparities in sugar-sweetened beverage consumption among SFUSD students

Consistent with national trends, San Francisco SFUSD male students and students of ethnic minority backgrounds are most likely to consume sugar-sweetened beverages[23,24].

Pacific Islander students are the most likely to report consuming sugar-sweetened beverages daily and rates are 3 time higher among high school students and 1.3 times higher among middle school students as compared to Chinese and White classmates who are the least likely to consume[25] (Figure 9). Consumption rates for Black/African American, Latinx, and Filipinx students are 0.66 to 1.6 times higher than Asian or White students[25]. While data were largely insufficient to examine changes overtime for each race/ethnicity, data for Chinese high school students do show a statistically significant increase between 2015 and 2017 (5% to 9% (F value 4.22; Pr= 0.0419))[25].

Figure 9. Percentage of SFUSD Students Consuming Sugar-Sweetened Beverages Daily, by Race/Ethnicity



High school students were asked about daily consumption over last 7 days while middle school students were asked about consumption in previous day.

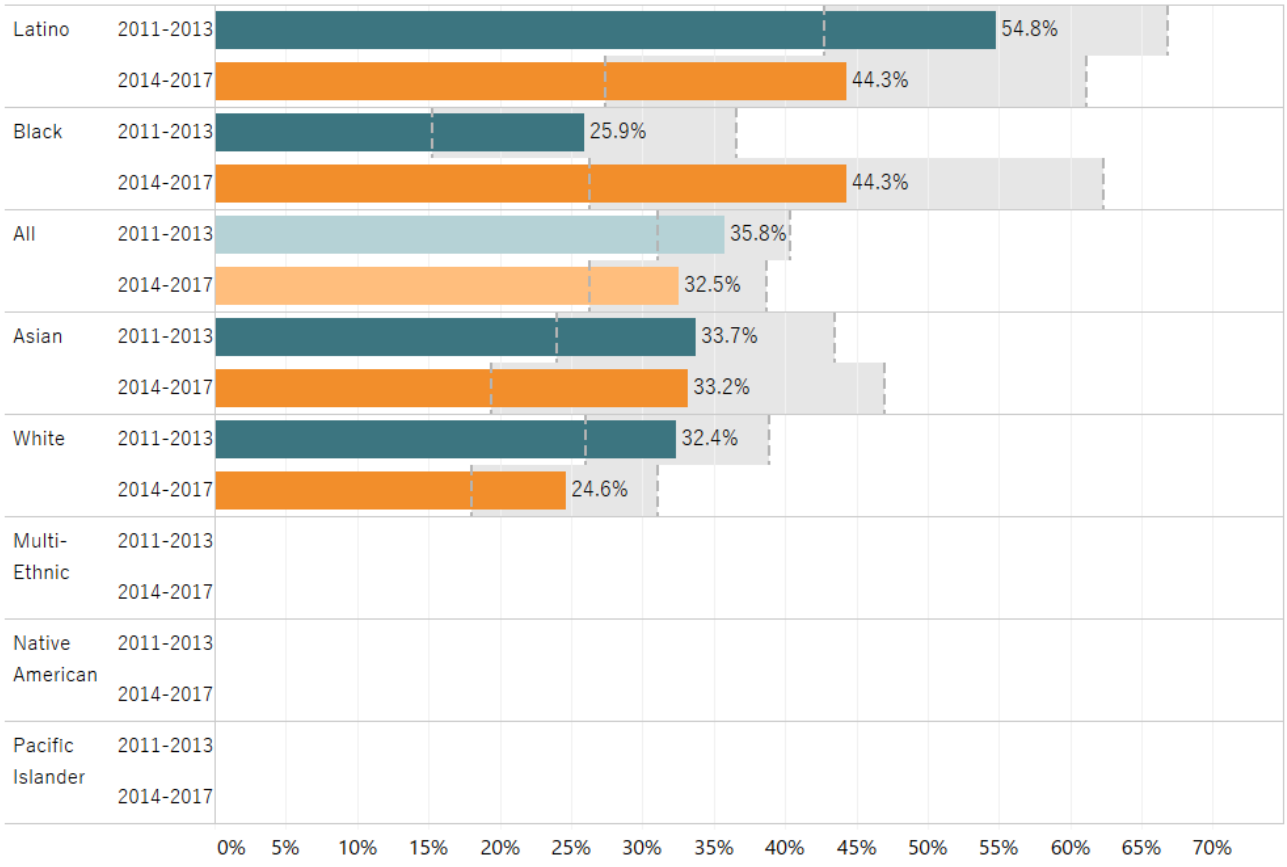
Source: YRBS

Sugar-sweetened beverage Consumption Among Adults

The available data on adult sugary beverage consumption is limited to soda, which is just one type of sugar-sweetened beverage. However, more adults in U.S. report consuming soda that any other category of sugar-sweetened beverage and sodas remain an important source of added sugars in the diet.[26,27]

According to CHIS, among adults in San Francisco, approximately 32% report drinking soda at least once per week. Males are about 50% more likely than women to report consuming any soda (40% vs 26%). Among those for whom data is available, Latinx and Black/African American residents are more likely that White residents to consume any soda (Figure 10). Younger adults are more likely to consume soda; more than 50% of adults 18 to 24 consume any soda at least once per week (Figure 11).

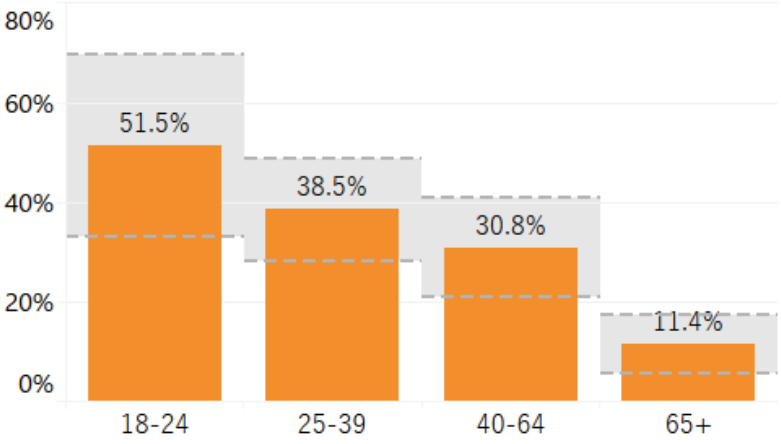
Figure 10. Percentage of Adults Reporting Any Soda Consumption, by Race/Ethnicity



Data for Multi-ethnic, Native American, and Pacific Islander populations are unstable.
Source: CHIS

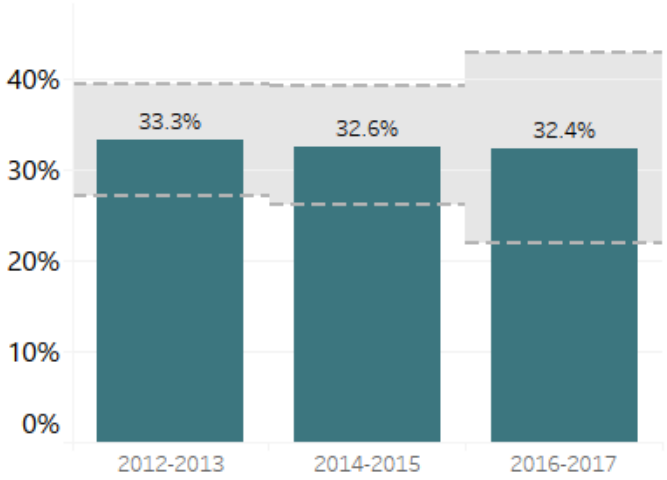
Overall, data ranging from 2012 through 2017 indicate that the percentage of adults drinking any soda has not changed over time (Figure 12). However, rates were not static for all subgroups. From 2011-13 to 2014-17, the percentage of Black/African American residents drinking soda increased from 26% to 44% while the percentage of white residents decreased from 32% to 25% (Figure 10). While residents in households earning less than 300% of the federal poverty level are more likely to consume soda than wealthier ones, 38% vs 29%, the percentage of poorer residents reporting soda consumption decreased from 45% in 2011-13 to 29% in 2014-17 (Figure 13).

Figure 11. Percentage of Adults Reporting Any Soda Consumption, by Age Group



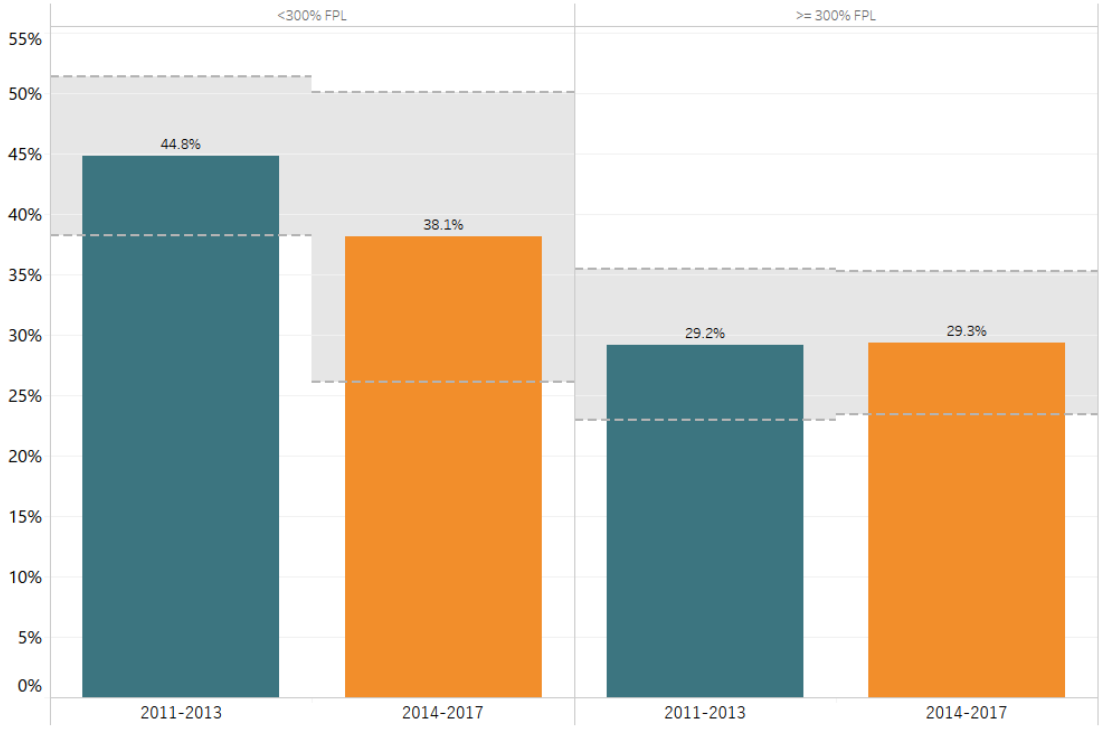
Source: California Health Interview Survey

Figure 12. Percentage of Adults Reporting Any Soda Consumption



Source: California Health Interview Survey

Figure 13. Percentage of Adults Reporting Any Soda Consumption, by Poverty Level



Source: California Health Interview Survey

Current State of Food Security, Food & Beverage Environment, and Nutrition in San Francisco

Food security

Food security is the ability, at all times, to obtain and consume enough nutritious food to support an active, healthy life.[28] Food insecurity exists when the ability to obtain and prepare nutritious food is uncertain or not possible. Food insecurity can have far reaching impact throughout the life course that helps establish and perpetuate health disparities; fetal development in utero is impacted by maternal food security and that impact on early development can increase unborn babies' lifetime risk of obesity and diabetes.[29–31] Children who are food insecure are more likely to have behavioral issues and worse school performance as well as more hospitalizations – all of which can limit socioeconomic advancement and lay the foundations for developing chronic disease as adults.[32,33] In adults, food insecurity increases the risk of multiple chronic conditions including type 2 diabetes, heart disease, and hypertension, and exacerbates existing physical and mental health conditions.[29] The San Francisco Food Security Task Force, frames food security as an issue of:

1. Food Resources: the ability to secure enough financial resources to purchase enough nutritious food to support a healthy diet on a consistent basis
2. Food Access: the ability to obtain affordable, nutritious, and culturally appropriate foods safely and conveniently
3. Food Consumption: the ability to prepare and store healthy meals, and the knowledge of basic nutrition, food safety, and cooking

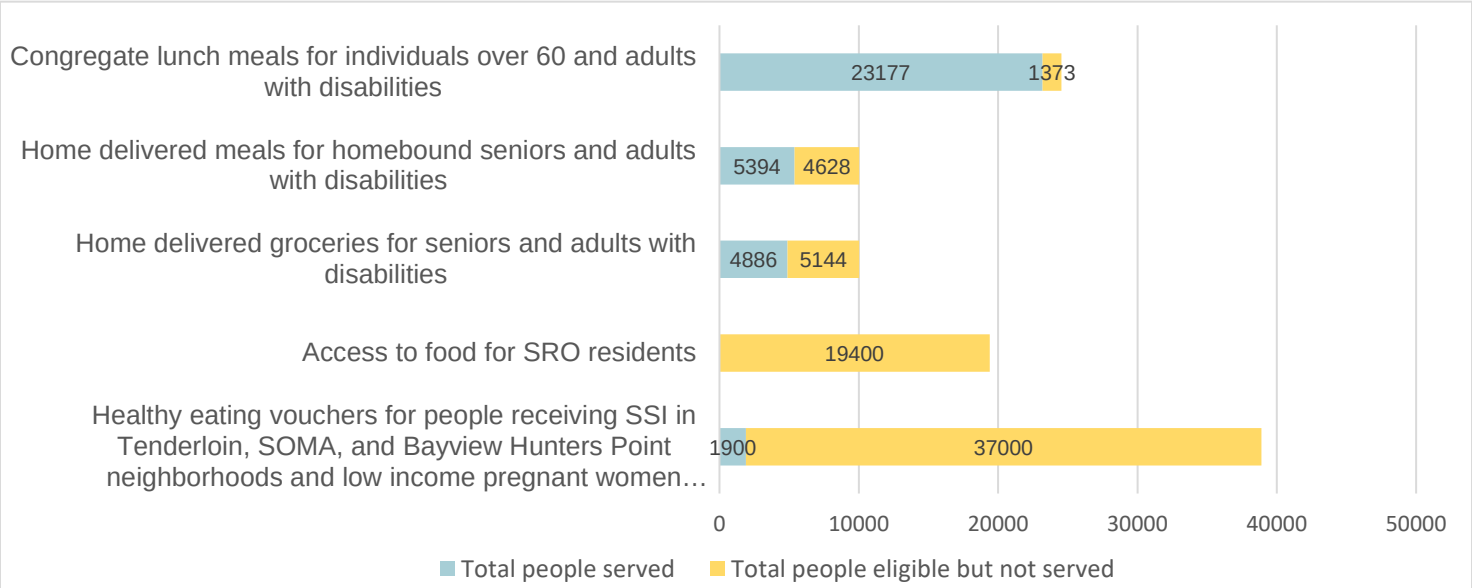
The City does not currently have data infrastructure to fully assess food security in San Francisco. However, we do know that a primary driver of food security is inadequate resources to purchase food. In this regard, data on poverty rates reveal that 54% of Black/African American residents, 36% of Latinx residents, and 30% of Asian residents are living at less than 200% FPL compared to 16% of White residents. Overall, approximately 25%, or 1 in 4 San Franciscans, are living at less than 200% FPL.[34] Data from the 2015-17 California Health Interview Survey revealed that 50% of San Franciscans surveyed who earned less than 200% FPL were food insecure, which increased from 44% in 2013-14. Additionally, we have some data on the food security status of some specific vulnerable groups including:

- Pregnant women: Data from the Maternal and Infant Health Assessment (MIHA) survey indicate that approximately one quarter of all pregnant women in San Francisco are food insecure, including 26.5% Latinx and 19.5% Black/African American women.
- Low income families with young children: Data from a sample of 803 low-income families in San Francisco participating in the Special Supplemental Program for Women, Infants and Children (WIC) program revealed that 53-60% of these families were food insecure.[35]
- Immigrants: National research indicates that the risk for food insecurity among households with immigrants is higher than households with members who are all US born, and immigrant families with young children experience disparities in their ability to afford food.[36,37] Although food insecurity rates among immigrants living in San Francisco are not available, 34% of children in San

Francisco living in households headed by two immigrant parents live below 200% of FPL, compared to only 5% of children living with two US born parents.[38]

- People without homes: During the 2019 San Francisco homeless survey, 59% of respondents indicated that they had experienced a food shortage in the past four weeks.[39] In 2017 52% reported food insecurity. It is estimated that over 8,000 people without homes live in San Francisco.
- Residents of Single Room Occupancy Hotels: Approximately 500 SRO hotels in San Francisco provide housing for over 19,000 people. Most were constructed in the years immediately following the 1906 earthquake and have limited or no cooking facilities. In a study of over 600 adult residents of single-room occupancy (SRO) hotels in San Francisco conducted by the FSTF, 84% reported food insecurity even with high utilization of community food resources.
- Transitional aged youth and college students: There is growing awareness of high rates of food insecurity among youth and young adults in San Francisco. According to the 2016 National College Health Assessment data for San Francisco State University, 35% of students surveyed were food insecure. A recent assessment of 1,088 students at City College of San Francisco found that 41% were food insecure.
- Seniors and people with disabilities: An estimated one-third of low-income seniors in San Francisco are reportedly unable to afford enough food.[40] In San Francisco, program data for 2017-18 from the Department of Aging and Adult Services indicate that 78% of the adults with disabilities (18-59 years) seeking home delivered meal and congregate meals were food insecure.[41]

Despite the high level of need for food support among many communities in San Francisco, the food safety net is both impacted and not fully utilized. In 2016, 65.6% of eligible San Franciscans were enrolled in CalFresh, compared to a national average of 85% eligible enrollment. In contrast, congregate and home-delivered meal programs and many food pantries often have waiting lists of individuals who need food support. **Figure 14. Number of Food Insecure Individuals Who Were Eligible for Meal Programs or Eating Vouchers in San Francisco in 2017—2018 by Whether or Not They Were Served**

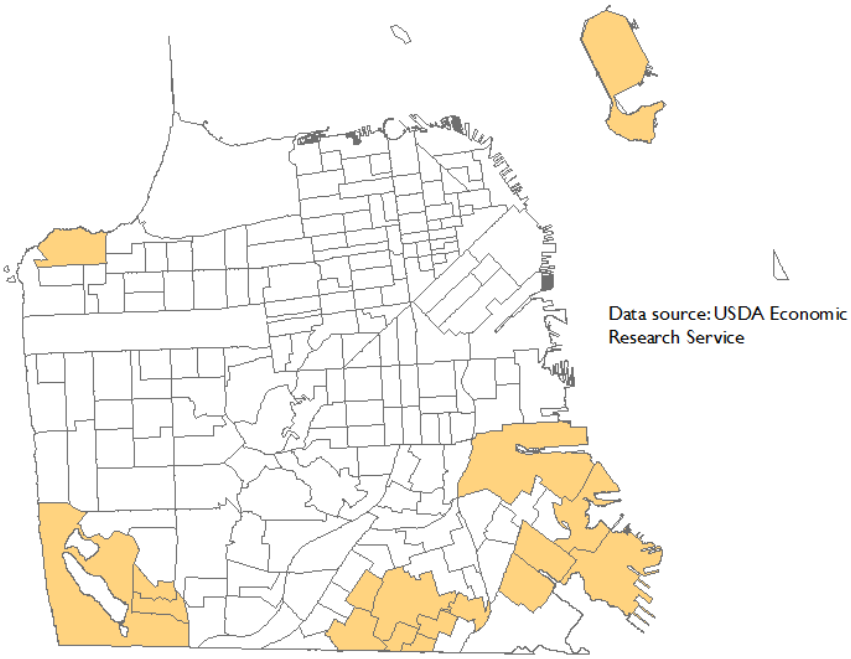


Data Source: San Francisco Food Security Task Force FY 2017-18 & FY 2019-20 Funding Request. https//www.sfdph.org/dph/files/mtgsGrps/FoodSecTaskFrc/docs/FSTE-Budget-Request-FY-18-19.pdf Accessed 8-24-18

Food Environment

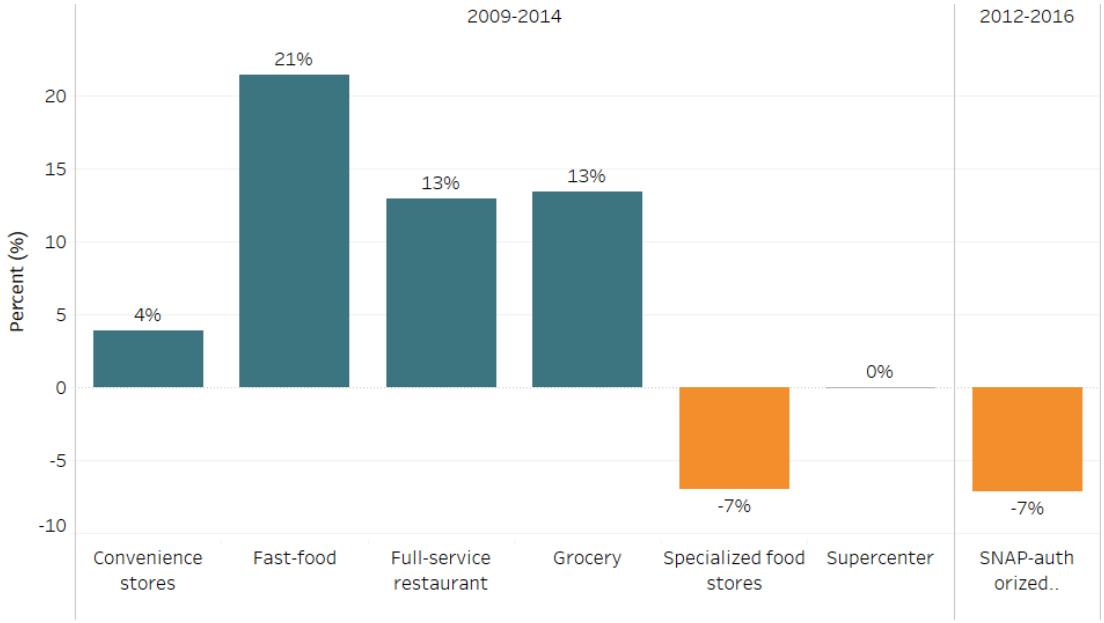
Although research supports the primary role of income in healthy eating, the food retail environment is also an important component of equity and the equitable distribution of resources.[42] In several areas throughout San Francisco, there are concentrations of corner/ convenience stores paired with a paucity of full-service grocery stores, most often found in low-income neighborhoods. The USDA designated several areas in San Francisco as areas of low income and low food access (Figure 15). Fresh produce and a variety of healthier food items can then be more inconvenient for low-income residents to access, requiring increased travel time and expenses. Whether or not a food retail environment facilitates food security and promotes health is dependent on several factors beyond the type of food retail establishments available in a given neighborhood (i.e. corner/convenience store, fast-food restaurant, grocery store, etc.). These include: the convenience, quality, affordability, and cultural acceptability of healthy foods offered within the food retail store; the transportation infrastructure that affects accessibility; the acceptance of federal nutrition programs and local food purchasing supplements; the accessibility of online ordering options; and the food sourcing practices of the food retail establishment (i.e. production, distribution, and procurement of foods from local farms).

Figure 15. USDA-designated areas of low income and low food access



Consistent with nationwide norms to spend less time cooking and eat more meals away from home, access to ready-to-eat meals at fast food stores and full-service restaurants increased in San Francisco between 2009 and 2014 (Figure 16). The number of fast food restaurants increased by 21% from 761 to 924. The number of full-service restaurants increased by 13% from 1676 to 1893. In 2014, there were 1.1 fast food restaurants and 2.2 full-service restaurants for every 1,000 people in San Francisco. Meanwhile, the number of vendors authorized to accept SNAP (Supplemental Nutrition Assistance Program, formerly referred to as food stamps) decreased by 7%. In 2016, 0.55 stores per 1,000 people accepted SNAP.

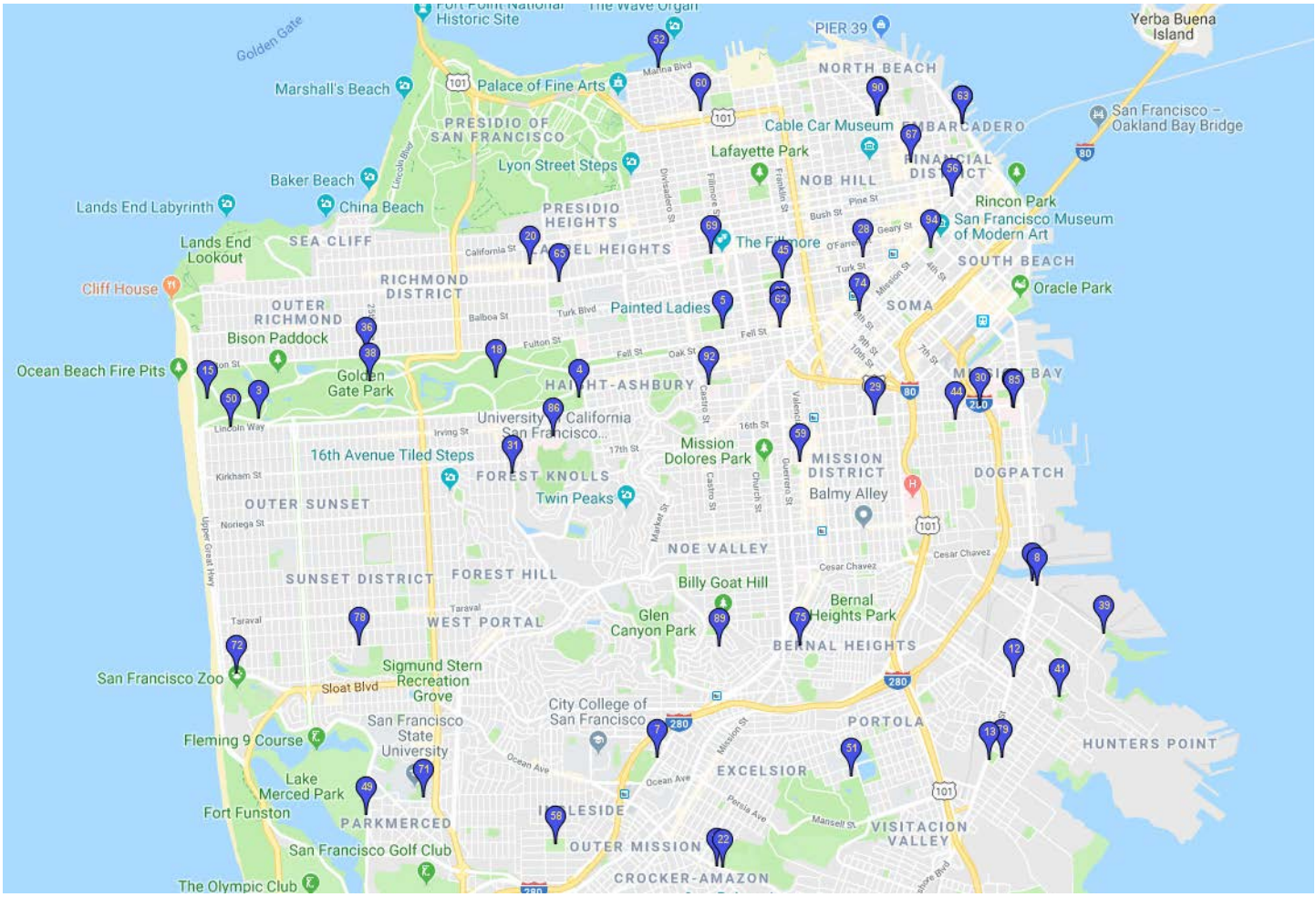
Figure 16. Change in the Types of Food Retail or Stores Available in San Francisco, 2009-2016



Source: 2019 San Francisco Community Health Needs Assessment

As San Francisco communities increasingly recognize the health harms of sugary drinks and the beverage industry tactics to maintain consumption, San Franciscans will increasingly turn to water as the preferred beverage. Infrastructure for water access, including hydration stations, water fountains, and refillable water bottles, must exist to support the community's desire for healthy, accessible drinking options. Hydration stations, distinct from drinking fountains, are stations designed to fill water bottles. Currently, they are not abundantly available nor equitably distributed throughout San Francisco (Figure 17).

Figure 17. Hydration Stations in San Francisco



Source: San Francisco Sugary Drinks Distributor Tax Advisory Committee: March 2019 Report. Map data ©2018 Google.

Nutrition

Breastfeeding

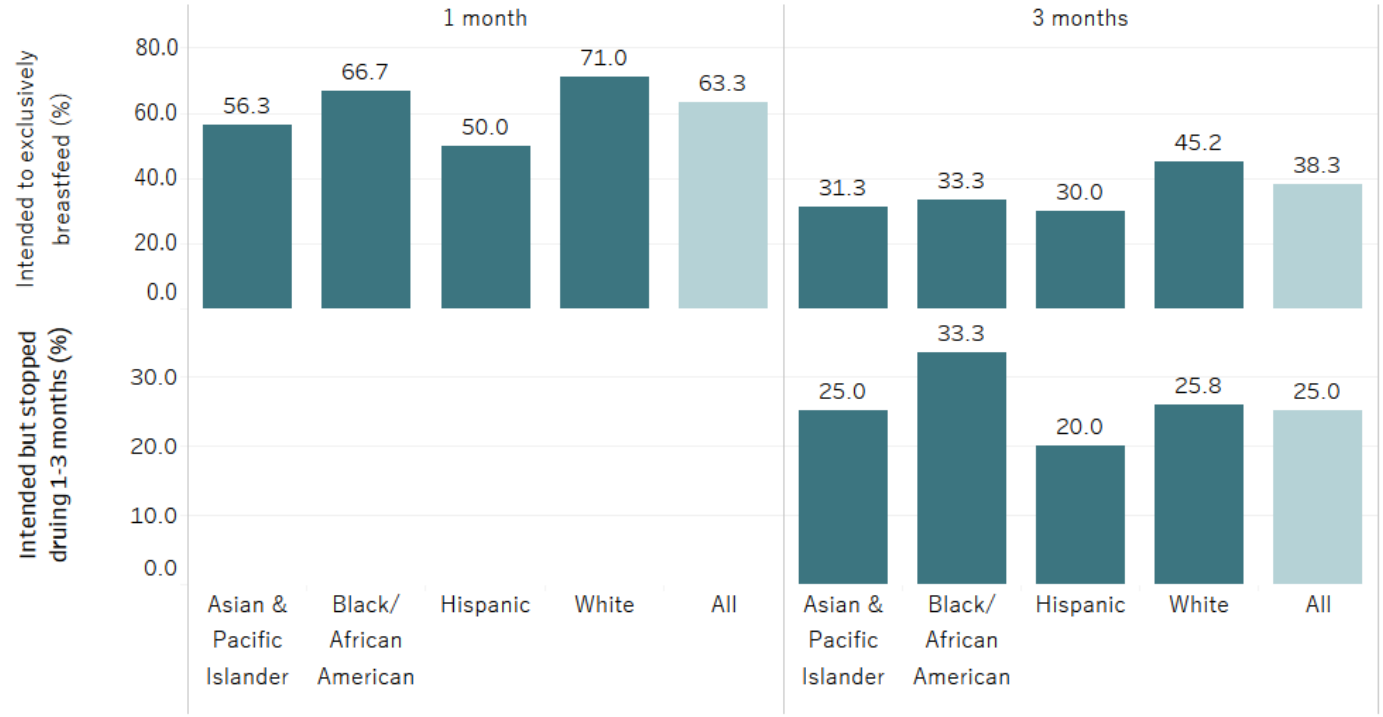
Breast milk is the optimal source of nutrition for most infants and is associated with health benefits for both the mother and infant. Mothers who do not breastfeed are at higher risk of several diet-sensitive chronic diseases such as diabetes mellitus, hyperlipidemia, hypertension, heart disease, and obesity as well as breast and ovarian cancer.[43] Breastfeeding is consistently associated with a modest reduction in the risk of later overweight and obesity in childhood and adulthood.[44] Thus good, optimal nutrition in the early months of life can set the stage for health outcomes in adulthood. Breastfeeding also reduces risk of pediatric infections and death in the first year of life, promotes infant brain development and is associated with improved intelligence by about 2 IQ points.[45]

Breastfeeding has dose-dependent effects, such that both the duration and exclusivity of breastfeeding are associated with positive health benefits.[46] Annually, in the US, billions of dollars could be saved by reducing hypertension and heart attacks, and more than 4,000 infant deaths could be prevented, if 90% of U.S. mothers were able to breastfeed for one year after every birth.[43]

In San Francisco, rates of exclusive breastfeeding at 1 month and 3 months varied by mother's age, race-ethnicity, education, income level, and parity. Less than one in three Asian/Pacific Islander, Black/African American, and Latinx women exclusively breastfed at 3 months, compared to 50% of White women (Figure 18). The proportion of women with a college degree who exclusively breastfed at 3 months was about triple that of women with less than a high school degree and double that of women with some college coursework but no completed degree. Almost half of women with an income over 200% of the Federal Poverty Level exclusively breastfed their infant at 3 months, compared to about 15% of women with lower income (Figure 19).

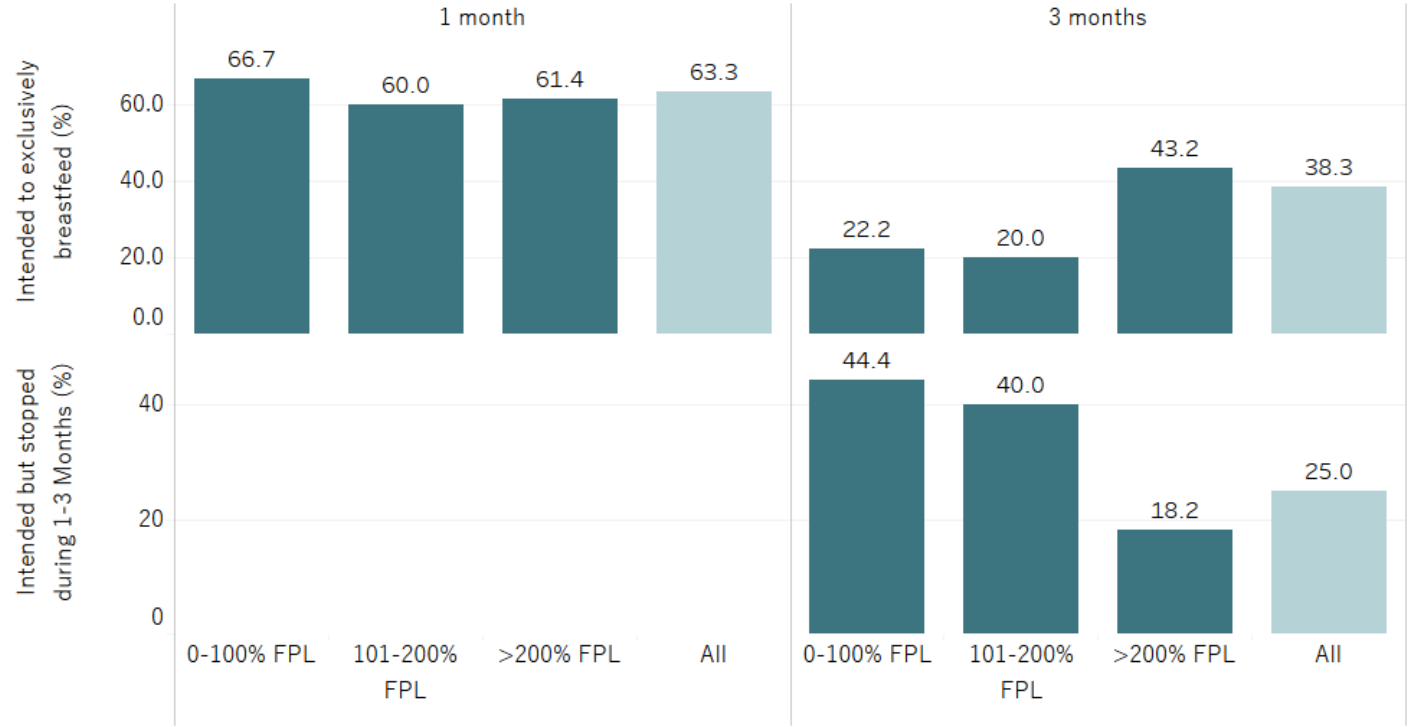
Among women who intended to exclusively breastfeed before birth, the rate of exclusive breastfeeding at 1 month did not differ markedly between groups. Rates were not significantly higher for White vs. Black/African American women, higher income vs lower income, or women with private vs public health insurance. However, after 1 month, rates of exclusive breastfeeding dropped significantly faster for younger, non-White, and lower income groups than for older, White, and higher income groups. The proportion of women with an income below 100% of the Federal Poverty Level, who intended to exclusively breastfeed before birth and did so for the 1st month, decreased by 67% between 1 and 3 months postpartum. The corresponding decrease among women with an income above 200% of the Federal Poverty Level was 30%.

Figure 18. Exclusive Breastfeeding at 1 and 3 Months by Race/Ethnicity, San Francisco, 2013-2015



Source: Maternal and Infant Health Assessment

Figure 19. Exclusive Breastfeeding at 1 and 3 Months by Income Level, San Francisco, 2013-2015



Source: Maternal and Infant Health Assessment

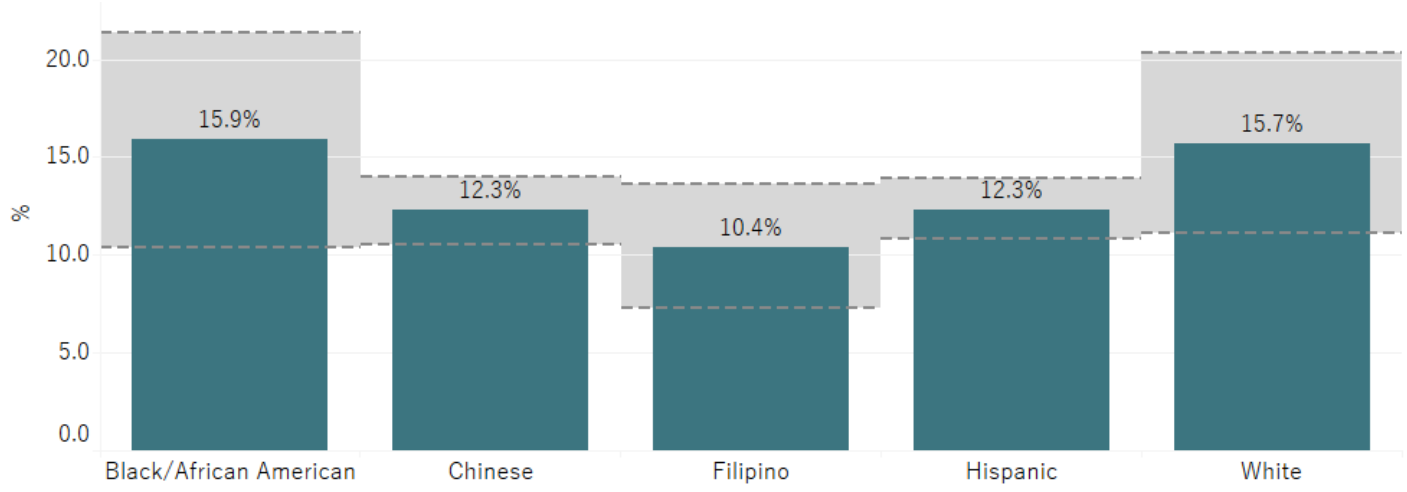
Healthy Food Consumption

Promoting health and reducing chronic disease risk through the consumption of healthful food and drink is a national priority.[47] Good nutrition is critical for growth, development, physical and cognitive function, reproduction, mental health, immunity, and long-term health. An estimated 45% of all heart disease, stroke, and type 2 diabetes deaths are associated with poor nutritional intake of 10 dietary factors (low intake of vegetables, fruits, seafood, whole grains, nuts/seeds, polyunsaturated fats and high intake of sodium, red meats, processed meats, sugary beverages).[48]

Local consumption of fruit and vegetables is below recommendations for the majority of adolescents and adults. Only 13% of SFUSD high school students report eating the recommended 5 or more servings of fruit or vegetables daily. The Behavioral Risk Factor Surveillance System (BRFSS) asks similar questions about adult vegetable consumption which revealed that 14% of residents in the metropolitan statistical area including San Francisco reported not eating any vegetables.[49]

According to YRBS, among high school students, there is not statistically significant difference in the percentage of students reporting 5 or more servings of fruit and vegetables per day by race-ethnicity (Figure 20). In 2013-2017, 16% of Black/African American and White students and 12% of Chinese and Latinx students reported eating 5 or more servings of fruit and vegetables per day.

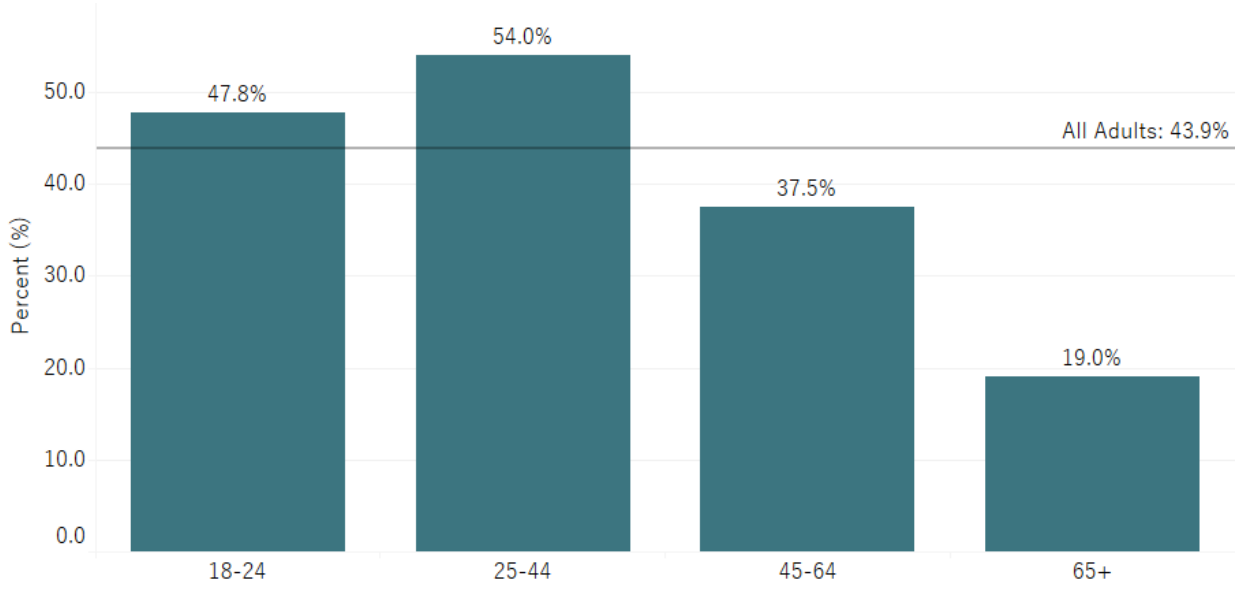
Figure 20. Percent of SFUSD High School Students Reporting 5+ Servings of Fruits or Vegetables per Day, by Race/Ethnicity, 2013-2017



Source: Youth Risk Behavoir Survey

In contrast, consumption of fast food is in excess of recommendations. Data from 2014 to 2016 show that 44% of San Franciscans reported eating fast food at least weekly (Figure 21). Younger adults and males were over two times more likely to report eating a fast food meal in the past 7 days; 54% of adults between the ages 25 to 44 years reported eating fast food at least weekly compared to 19% of adults aged 65 or older. Half of the men who responded to the California Health Interview Survey reported eating fast food weekly compared to 37% of the women surveyed.

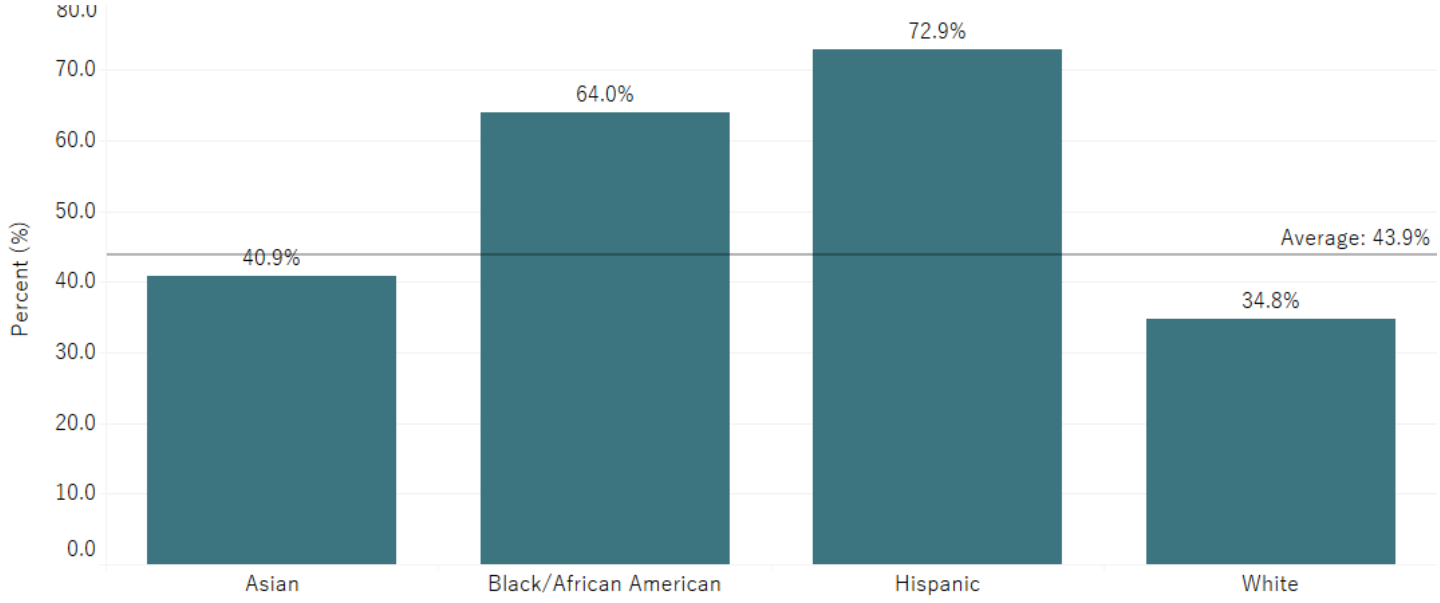
Figure 21. Percent of Adults Reporting Eating Fast Food Weekly, by Age Group, 2014-2016



Data Source: California Health Interview Survey (CHIS), UCLA Center for Health Policy Research, 2014-2016.

Among adults, probability of reporting fast food varies by race-ethnicity (Figure 22). Two times more Latinx adults reported eating fast food at least weekly than White adults.

Figure 22. Percent of Adults Reporting Eating Fast Food Weekly, by Race/Ethnicity, 2014-2016



Data Source: California Health Interview Survey

Current State of Physical Activity and Built Environment in San Francisco

Physical activity is defined as any bodily movement that requires energy expenditure. The Centers for Disease Control and Prevention (CDC) recommends that children and adolescents, age 5 to 17 years, should do at least 60 minutes of moderate -to-vigorous physical activity daily, while adults, age 18 years and above, should do at least 150 minutes of moderate-intensity physical activity, 75 minutes of vigorous-intensity physical activity, or an equivalent combination of moderate and vigorous activity throughout the week.[50] The National Association for Sport and Physical Education set physical activity guidelines for infants to children 5 years old at a minimum of 120 min of daily in the form of 60 min of structured activity and 60 minutes of unstructured activity.[51]

Regular physical activity can help people live longer, healthier lives. According to WHO, physical inactivity has been identified as the fourth-leading risk factor (after hypertension, tobacco use, and high blood sugar) for mortality, causing an estimated 3.2 million deaths globally.[52] Physical activity protects against many chronic health conditions including obesity, cardiovascular disease, type 2 diabetes, metabolic syndrome, and cancer (breast and colon). Through the release of serotonin, exercise can help reduce stress, anxiety, and depression.[53]

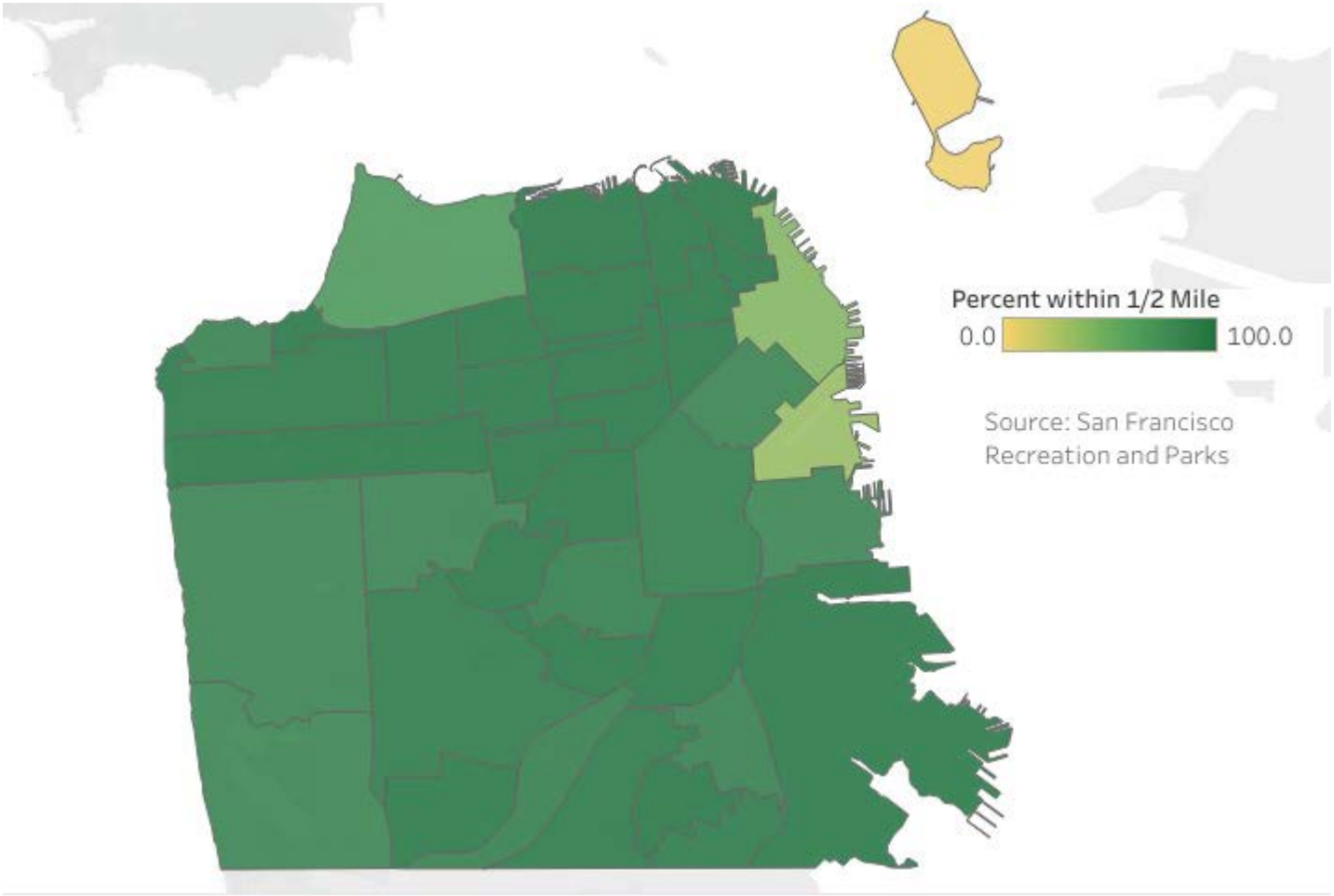
Beyond physical and mental health, physical activity has been found to be important to the success of students. It supports learning by improving concentration and cognitive functioning, and has been shown to have a positive influence on students' academic performance.[54] California uses the FitnessGram® to assess physical fitness of 5th, 7th and 9th graders. On average, California students who achieve more fitness standards perform better on standardized tests.[55]

Despite health advantages of physical activity, few are meeting public health goals. Less than a quarter (24%) of children 6 to 17 years and just 26% of high school students in the U.S. are physically active for at least 60 minutes each day.[56]In 2017 just 54% of adults engaged in regular physical activity.[57]

The environments in which we live can have significant impact on our level of physical activity. Institutional policies and practices, living conditions, especially physical and social environments, and individual factors interact to promote or inhibit physical activity.[58,59] Land use and transportation policies determine the location and design of infrastructure and activities. Neighborhood features such as parks, sidewalks, bicycle trails, recreational facilities, nearby shops, and public transportation stops promote leisurely physical activity, sports, and active transportation.[60,61]

Although 95% of San Francisco's population lives within one half mile of a public recreation facility (defined as athletic fields, meeting spaces/activity centers, performance spaces, and recreational centers/pools run by the San Francisco Recreation and Park Department), Treasure Island currently has no recreation facilities, and only 32% of Mission Bay and 41% of Financial District/South Beach residents are within one half mile of a facility (Figure 23). Potrero Hill and western neighborhoods (including Sunset/Parkside, Inner Sunset, and Lakeshore) also have 10% or more of residents living more than a half mile away from a recreation facility.

Figure 23. Percent of Residents Living Within 1/2 Mile of a Public Recreation Facility, by Analysis Neighborhood, 2017



However, existence of infrastructure alone is insufficient. Barriers to use of facilities and physical activity include costs, poor access to facilities, and perceived unsafe environments.[62–64] Institutional policies, including those in the workplace and school and childcare, also affect health. Policies including transportation vouchers, on-location gyms, safe routes to

school, recess, physical education, and after-hours availability of the school yard for play can boost physical activity among children and adults.[65] Additionally, social support is instrumental in starting and maintaining a physically active lifestyle. Persons who receive encouragement, support or companionship from family and friends are more likely to form positive views of physical activity and to begin and continue being physically active.[60,63,66,67] At the individual level, interest in and ability to do physical activity vary. Individuals may have physical or emotional blocks to doing physical activity. Examples include a lack of skills or confidence; a functional limitation associated with a disability, a chronic disease, or increased age; habits such as cigarette smoking or drinking alcohol; as well as a dislike for physical activity.[67–69] Additional personal barriers which are commonly cited are competing priorities, limited discretionary time and/or money, lack of childcare, and a lack of culturally-appropriate activities.

Walking or biking for utilitarian trips, sometimes referred to as active transportation, is an opportunity to incorporate routine physical activity into daily living. In San Francisco, 55% of adults report walking for transportation, fun or exercise. There is no difference in the percentage of adults walking by race, gender, or poverty status in San Francisco. The percentage of people walking in San Francisco is significantly higher than for California overall (38%).

According to the California State Board of Education's standardized FitnessGram® which tests students in grades 5, 7, and 9 on six measures of fitness, 45-58% of 5th, 7th and 9th grade SFUSD students are not physically fit - defined as being in five or six out of six Healthy Fitness Zones (Figure 24). San Francisco students perform worse than California students [35]. Children from economically disadvantaged households perform worse than students from families who are not economically disadvantaged. While 58-60% of Asian and White 5th grade students score within five or six zones, less than 40% of Black/African American, Latinx, and less than 30% of grade students do the same.

One of the most potent measures of physical fitness from the FitnessGram® test is aerobic capacity because of its relationship to cardiovascular and metabolic health. In San Francisco, about 73% of 5th and 7th graders meet the standard for aerobic capacity (Figure 25). About 67% of 9th graders meet the standard. When examined by income, the percentage of 9th graders identified as not economically disadvantaged who met the aerobic standard was more than 10 percentage points higher than those identified as economically disadvantaged. By ethnicity, around 80% of White and Asian students meet aerobic standards in 5th and 7th grade while only 45-65% of Black/African American and Latinx students do the same. In 9th grade those rates for White students drop to around 75%, while for Black/African American they drop to 37% and for Latinx students to 48%.

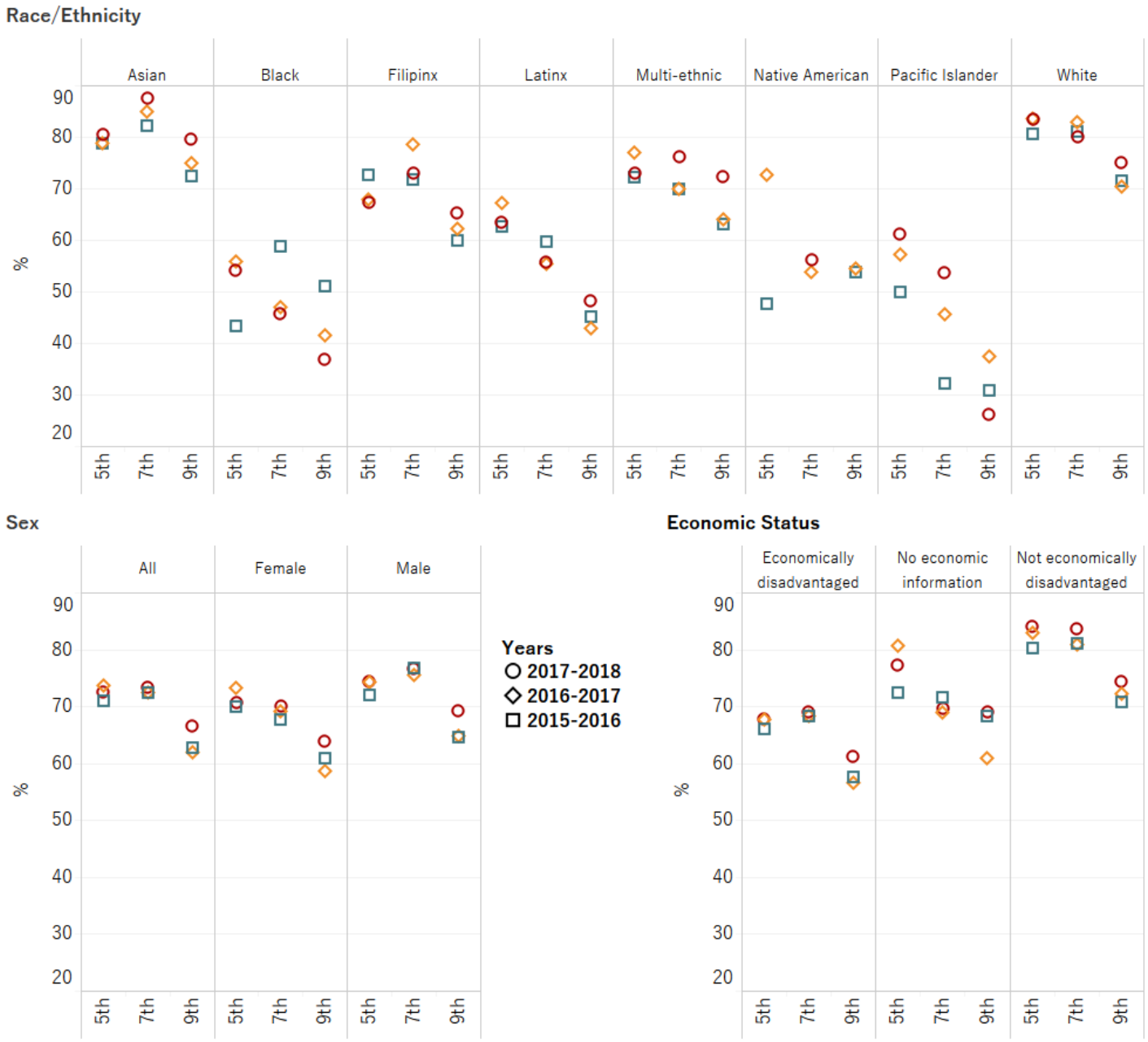
Figure 24. Percentage of SFUSD Students Meeting 5 or 6 out of 6 Fitness Goals

Fitnessgram testing includes six fitness areas-aerobic capacity, body composition, abdominal strength, trunk extension strength, upper body strength, and flexibility.

*Greater data variability from year to year for Native American and Pacific Islander students due to the small number of students.

Source: California Department of Education

Figure 25. Percentage of SFUSD Students with Aerobic Capacity in the Healthy Fitness Zone



*Greater data variability from year to year for Native American and Pacific Islander students due to the small number of students.
Source: California Department of Education

Current State of Diet-sensitive Disease

Oral Health

Oral health is essential to general health and quality of life. It is a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial well-being.[70] Sugar-sweetened beverage consumption is associated with increased tooth decay, cavities and tooth loss.[71–74]

Children's oral health

Tooth decay is the most common chronic disease of childhood and the leading cause for missed school days. Poor oral health can cause pain, dysfunction, school or work absences, difficulty concentrating, and poor appearance—problems that greatly affect quality of life and ability to interact with others. Children who experience dental decay miss more school, have lower academic achievement, and have an increased risk for a lifetime of dental problems.[75,76] California students are estimated to miss 874,000 days of school due to dental problems, costing schools over $29 million in funding based on reductions in the average daily attendance rate.[77] Poor oral health can reflect systemic inflammation, which over time may limit growth and development, as well as increase risk of adverse health outcomes, including hypertension, cardiovascular disease, and cancer.[70]

Routine preventive dental care including daily oral hygiene, fluoride treatments and dental sealants, and reduction of sugars in the diet can prevent tooth decay. Fluoride varnish applications reduce decayed/missing/filled tooth surfaces by 43% in permanent teeth and by 37% in primary teeth.[78] Dental sealants can prevent up to 80% of tooth decay in children and adolescents.[79]

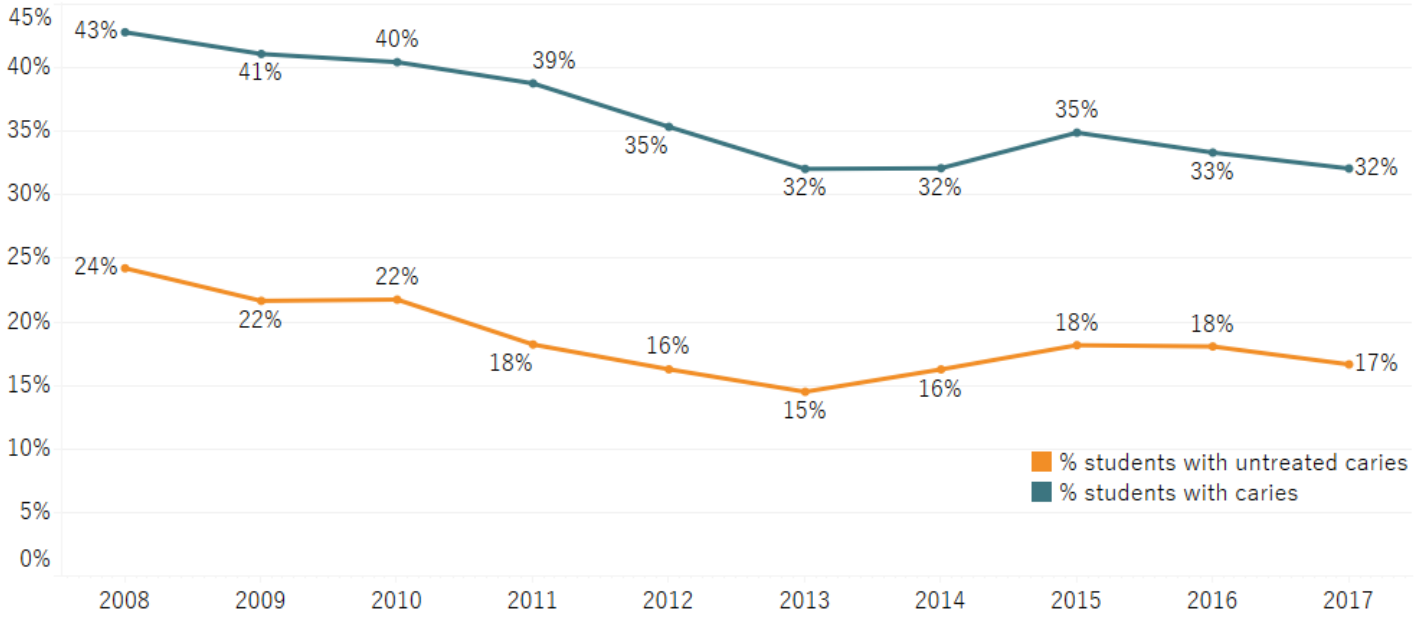
Despite steady decreases in caries (i.e. tooth decay or cavities) prevalence in San Francisco over the past 10 years, tooth decay remains a prevalent local health problem. In 2017-18, 32% of SFUSD kindergarteners had experienced caries and 17% had untreated caries (Figure 26). As treatment of decay is alone insufficient and children who do not receive adequate treatment-- fluoride treatments, dental sealants, ongoing care of cavity fillings—and reduce sugars in the diet are at higher risk for the development of further caries, the initial development of caries signals the beginning of a lifetime of otherwise preventable dental procedures. National and state data show that 52% to 71% of all children 6-9 years have caries. [80,81]

Consistent with nationwide patterns and trends, disparities in oral health persist in San Francisco. Low-income and minority children have higher tooth decay rates. In San Francisco, Black/African American, Latinx, and Asian kindergarteners are two times more likely to experience dental decay as White kindergarteners (Figure 27). Pacific Islander kindergarteners are almost three times more likely than White kindergarteners to have caries (Figure 28). Disparities are similar for *untreated* caries with Black/African American, Latinx, and Asian kindergarteners more likely to experience untreated caries. Rates of dental caries and the untreated dental caries among kindergarteners at the lowest income schools are more than 50% higher than rates at the highest income schools (Figure 29).

Rates of caries experience vary among Asians subpopulations in San Francisco (Figure 30). Asian Indian, Cambodian, Hmong, Japanese, Korean, and Laotian collectively have lower rates of caries prevalence (20%) compared to Chinese, Vietnamese, and Filipinx (37-45%).

Caries experience varies by neighborhood. Children in Chinatown, North Beach, Nob Hill/Russian Hill/Polk, Tenderloin, SOMA, Bayview/Hunters Points, Visitacion Valley, Excelsior, and Portola consistently experience more caries than children in other San Francisco neighborhoods. The most affected neighborhoods coincide with those with high proportions of Latinx, African American, Asian, and low-income residents.[35]

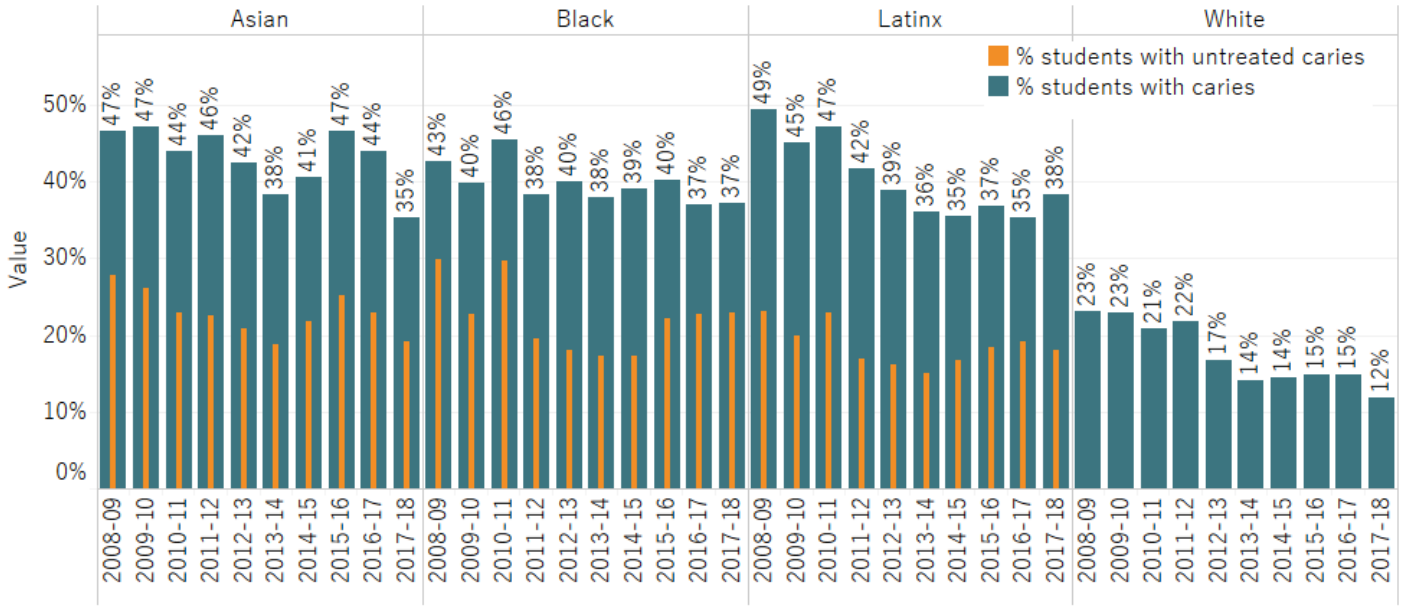
Figure 26. Percentage of SFUSD Kindergartenders with Caries or Untreated Caries



Dates shown indicate the first year of the school year (i.e. 2008 is is the 2008-2009 school year).,

Source: San Francisco Unified School District-San Francisco Department of Public Health Dental Services Kindergarten Oral Health Screening Program

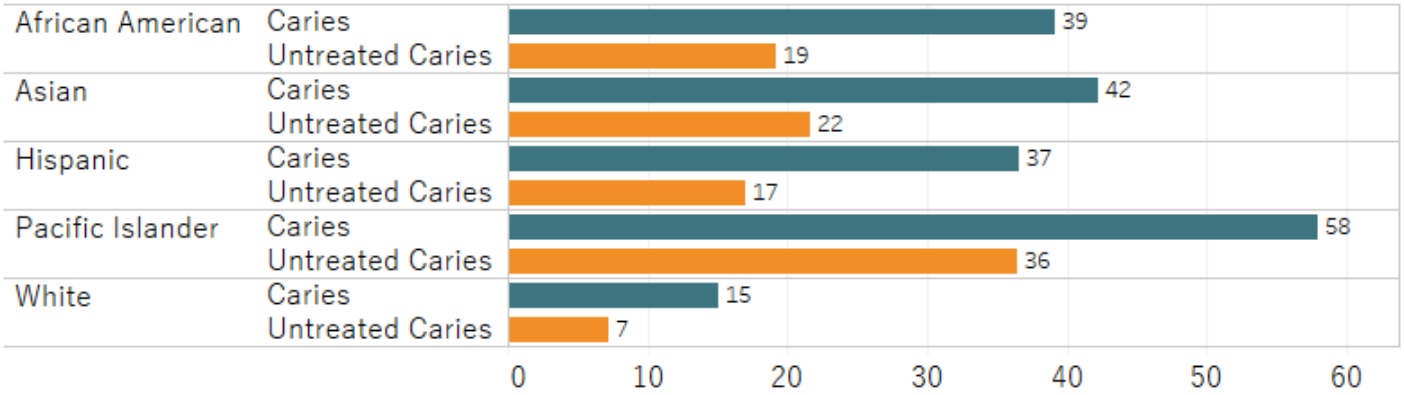
Figure 27. Percentage of SFUSD Kindergartenders with Caries or Untreated Caries, by Race/Ethnicity



Too few white students were found to have untreated caries to report data; however, data for 2013-2017 show that 7% of white students have untreated caries.

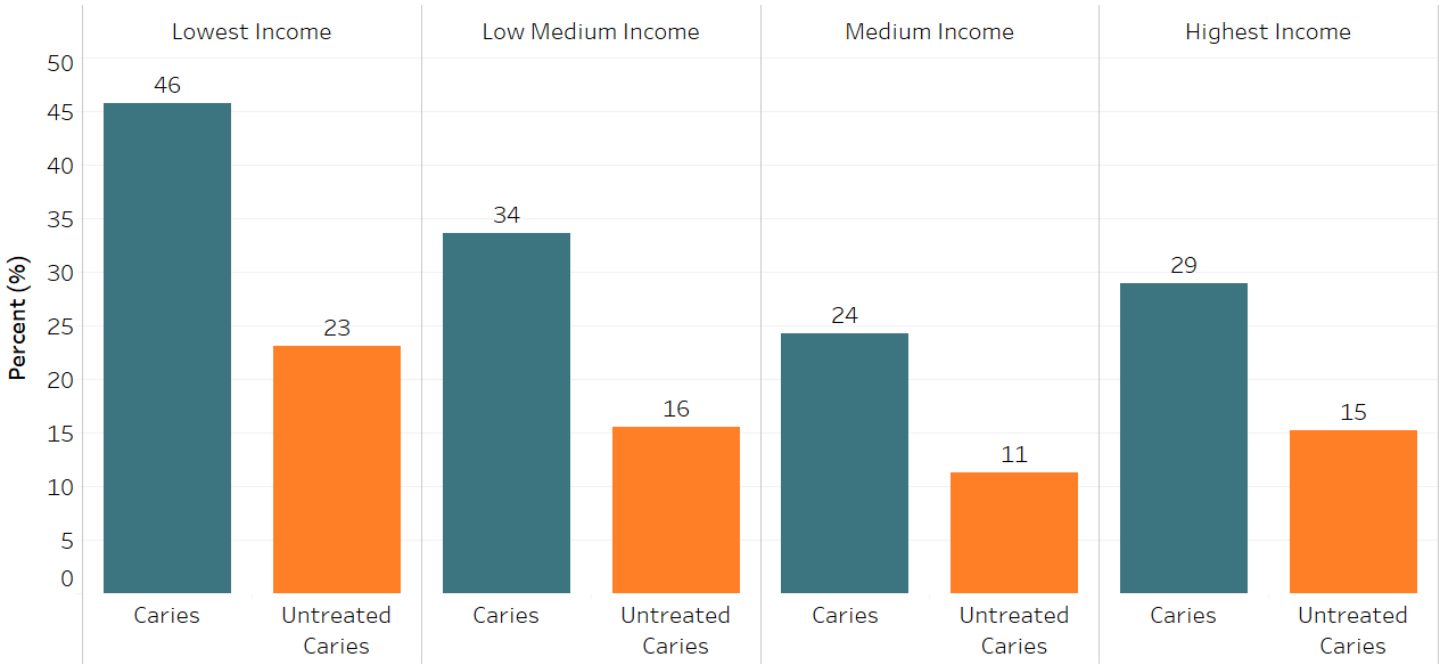
Source: San Francisco Unified School District-San Francisco Department of Public Health Dental Services Kindergarten Oral Healt..

Figure 28. Percent of SFUSD Kindergartener with Untreated Caries Experience by Race/Ethnicity, 2012-2017



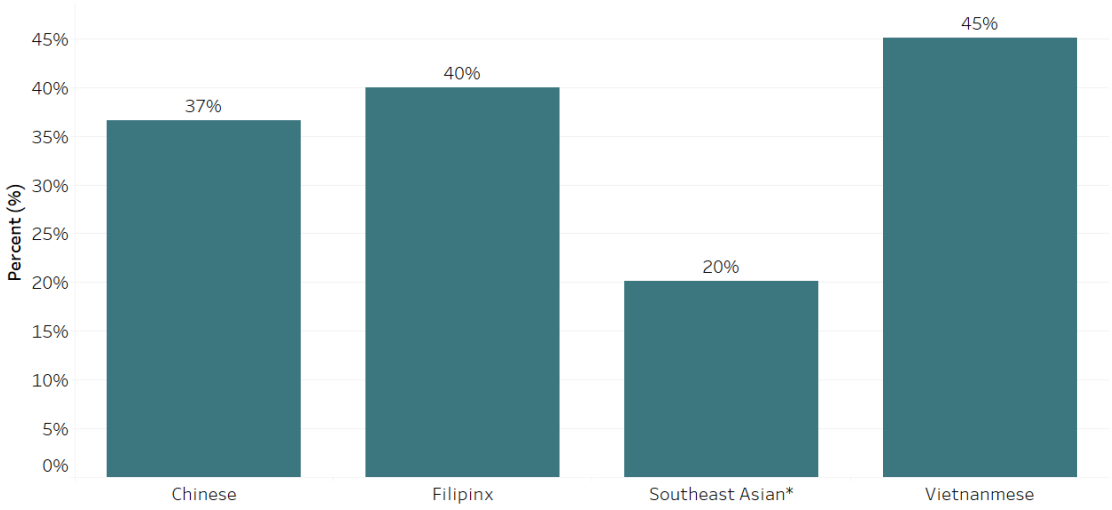
Source: San Francisco Unified School District-San Francisco Department of Public Health Dental Services Kindergarten Oral Health Screening Program

Figure 29. Percent of SFUSD Kindergarteners with Caries or Untreated Caries by School Income Level, 2012-2016



Data Source: Kindergarten Oral Health Screening Program

Figure 30. Percent of SFUSD Kindergarteners with Caries or Untreated Caries by Asian Subgroup, 2017-2019



*Southeast Asian: Asian Indian, Cambodian, Hmong, Japanese, Korean, and Laotian.

Data Source: Kindergarten Oral Health Screening Program

Adult Oral Health

While data on tooth decay and caries experience rates is not available for San Francisco adults, there is statewide, county-level data on the number of emergency department visits for Non-Traumatic Dental Conditions (NTDCs), most of which are a result of tooth decay. According to California Department of Public Health, Office of Oral Health data, during the years 2012-2016 there were 12,025 visits to emergency departments in San Francisco for NTDCs (Table 2). Ninety-two percent of these visits were by individuals aged 18 and over. Black/African American, Native Americans, and Pacific Islanders utilized emergency departments for NTDCs at much higher rates than other groups (Table 3).

Table 2. Emergency Room Visits for Non-Traumatic Dental Conditions by Age Group, San Francisco, 2012-2016

Age Group	Count	Crude Rate (per 100,000)
<1	67	140.3
1-2	193	215.2
3-5	220	191.8
6-9	235	193.5
10-13	135	122
14-17	143	108.4
18-34	4250	357.8
35-64	5790	332.2
65-100	992	164.2

Source: California Department of Public Health Office of Oral Health

Table 3. Emergency Room Visits for Non-Traumatic Dental Conditions by Race/Ethnicity, 2012-2016

Race/Ethnicity	Count	Crude Rate per 100,000
Native American	85	914
Asian	1236	90
Black/African American	3788	1668
Latinx	1890	287
Pacific Islander	160	928
Multi-Racial	621	445
White	4245	246

Source: California Department of Public Health Office of Oral Health

Overweight and Obesity

Sugar-sweetened beverage consumption is associated with overweight and obesity.[82,83] Overweight and obesity reflect excess body weight relative to height. Overweight and obesity are associated with greater risk of chronic disease, pain, disability, anxiety, depression, mental illness, and lower quality of life. Obesity increases risk of chronic conditions, including high blood pressure, high cholesterol, heart disease, type 2 diabetes, osteoarthritis, breast and colon cancers, sleep apnea, and gynecological problems.[84–86] Obesity is associated with all-cause mortality, and is a leading cause of preventable death. Obese men age 20 to 39 have an estimated six years of life lost.[86] That being said, overweight and obesity are not absolutely predictive of negative health outcomes for a given individual whose personal risk of disease can be equivalent or less than that of a normal weight individual depending on their genetics, diet, and level of physical activity.

For adults, overweight is defined as a body mass index (BMI) of 25.0 to 29.9 kg/m2 and obesity as a BMI of $\geq$ 30kg/m2.[87]

For infants and toddlers up to two years of age, excess weight is identified as a weight-for-length greater than or equal to the 98th percentile.[88] For children and adolescents, the CDC defines overweight as a body mass index (BMI) percentile over the 85th percentile for age and sex.[89]

FitnessGram® data for youth in San Francisco describe students as having body compositions either being within or outside the "healthy fitness zone" which is comprised of BMI and a measure of percent body fat.[90] For pregnant women, excess weight gain is defined as a gain of more than 40 pounds if the mother is underweight before pregnancy, more than 35 pounds if she is normal weight before pregnancy, more than 25 pounds if she is overweight before pregnancy, and more than 20 pounds if she is obese before pregnancy.[91]

Risk of overweight and obesity begins during pregnancy and tracks throughout the life course. Excess maternal weight gain during pregnancy programs the unborn fetus for a lifetime of exaggerated response to insulin and stress hormones, and increased susceptibility to weight gain.[92–98] Excess weight gain during pregnancy is associated with excess infant weight at birth, excess weight gain before age five, and childhood and adult obesity. Overweight children are more likely to become overweight adolescents who in turn have a 70% chance of becoming an overweight or obese adult.[99,100] Prevention and early intervention are very important, because obesity is difficult to treat once established.[101]

YOUTH – Overweight and Obesity

Nationally, childhood obesity has more than doubled in children and tripled in adolescents in the past 30 years; in 2010, more than one-third of children and adolescents were overweight or obese.[102]

SFUSD assesses students for body mass index (BMI) and other fitness measures annually in grades 5, 7, and 9 (the Fitness Gram®). In school year 2017-2018, 65% of 5th grade students, 66% of 7th graders, and 71% of 9th graders had a measured body composition inside the healthy fitness zone.

A lower proportion of racial minority, economically disadvantaged, and male students have a body composition inside of the healthy fitness zone (Figure 31). Asian and white students are 73-215% more likely than Pacific Islander students, 65-86% more likely than Black/African American or Latinx students, and 15-37% more likely than Filipinx students to have a healthy body composition. Similarly, economically disadvantaged students (58-67%) are less likely to have a measured body composition outside the healthy fitness zone than not economically disadvantaged students (75-77%). These trends among people of color, and those at an economic disadvantage are mirrored in the adult population; however, unlike among adults, female students (70-73%) appear to be more likely to be within the healthy fitness zone as compared to male students (62-70%).

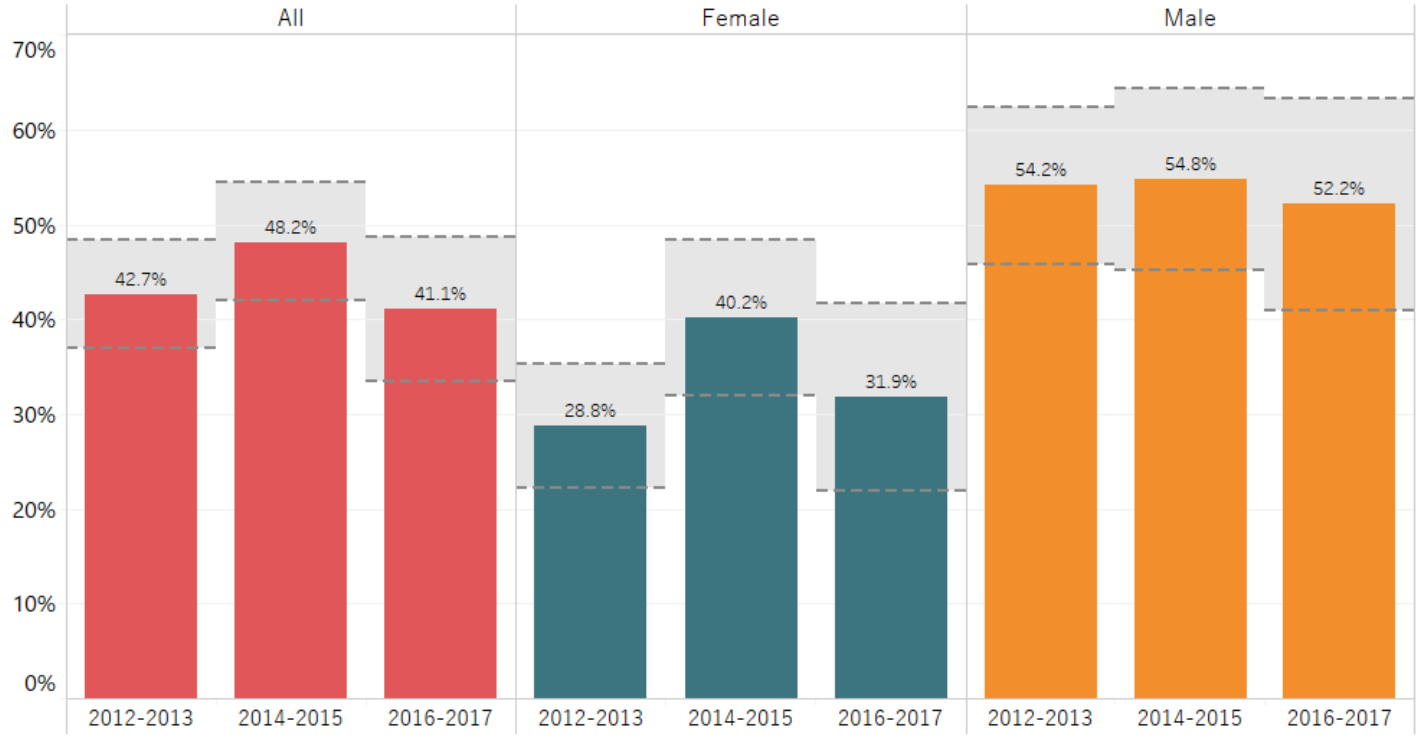
Figure 31. Percentage of SFUSD Students with a Body Composition Inside the Healty Fitness Zone

*Greater data variability from year to year for Native American and Pacific Islander students due to the small number of students.
Source: California Department of Education

ADULTS – Overweight and Obesity

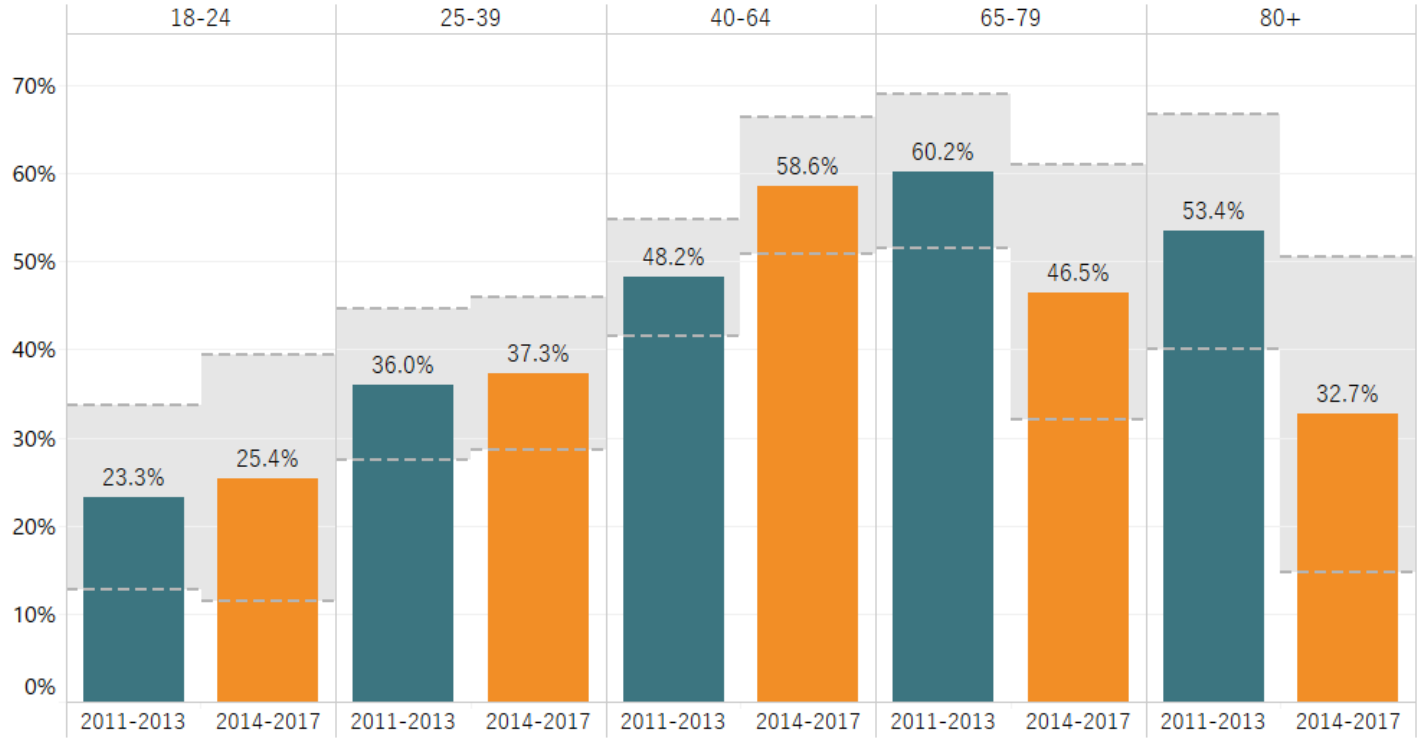
According to CHIS, the percentage of adults reporting weight and height consistent with overweight and obesity (which includes BMI ≥ 25) among adults has remained relatively stable since 2011. In 2016-2017, 41% of San Francisco adults reported a height and weight consistent with being overweight/obese (Figure 32). More men, 52%, and older adults report experiencing overweight or obesity than do women, 40%, and younger adults (Figures 32-35). More than 50% of adults older than 40 years in San Francisco are overweight or obese compared to 25% of adults 18 to 24 years.

Figure 32. Percentage of Adults Reporting Height and Weight Consistent with Overweight or Obesity, by Gender



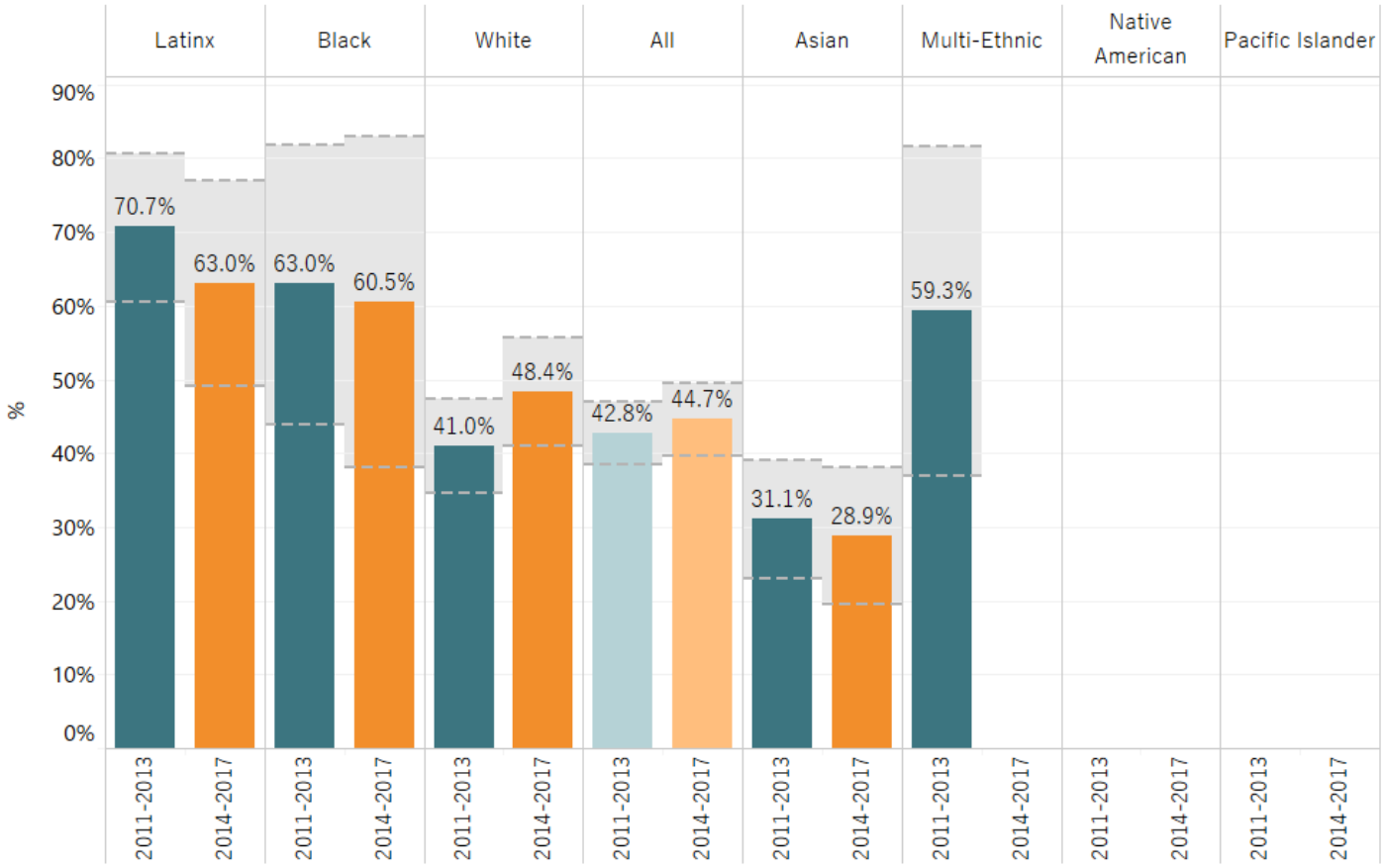
Source: California Health Interview Survey

Figure 33. Percentage of Adults Reporting Height and Weight Consistent with Overweight or Obesity, by Age



Source: California Health Interview Survey

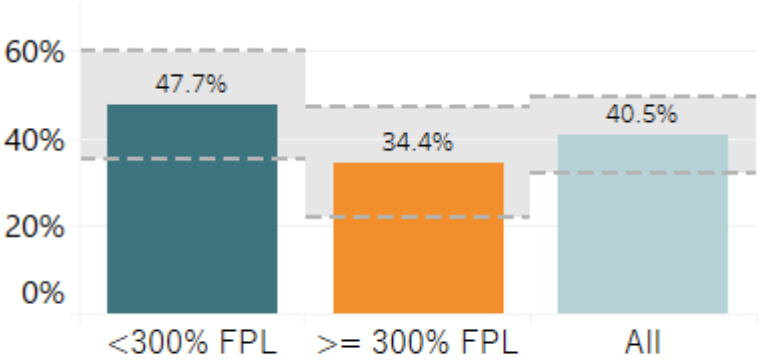
Figure 34. Percentage of Adults Reporting Height and Weight Consistent with Overweight or Obesity, by Race/Ethnicity



Source: California Health Interview Survey

Consistent with national obesity disparities, locally, the rates of overweight and obesity vary by income, race/ethnicity, and zip code. Data from the California Health Interview Survey indicates that Black/African Americans (61%), Latinx (63%), and Whites (48%) have higher prevalence of overweight/obesity than Asians (29%), who have the lowest rate of overweight and obesity in San Francisco (Figure 31).[iv] Residents in households earning less than 300% of the federal poverty level are 38% more likely to experience overweight or obesity as compared to those at 300% or above (Figure 35).

Figure 35. Percentage of Adults Reporting Height and Weight Consistent with Overweight or Obesity, by Poverty Level



Source: California Health Interview Survey

The CDC's modeling of obesity suggests that it is concentrated in parts of Bayview Hunters Point,

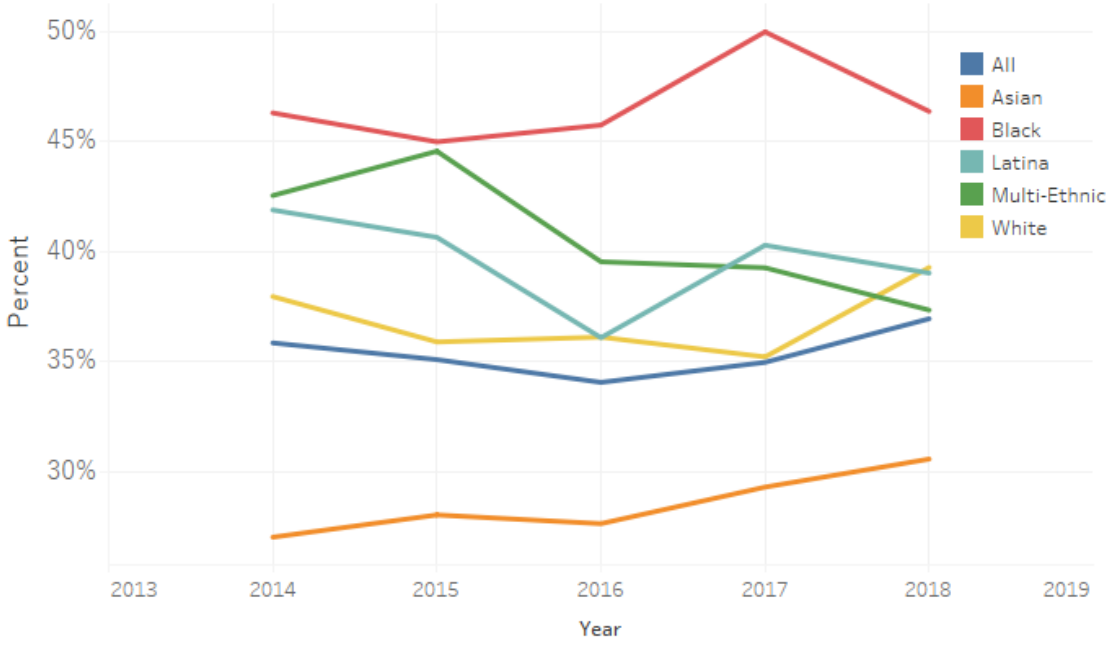
[iv] While data does suggest that Asian people with a high risk of type 2 diabetes and cardiovascular disease is substantial at BMIs lower than the cutoff for overweight (>25 kg/m^2), no clear cut off point has been identified for all Asians for overweight and obesity. For international classification the WHO recommends keeping the standard cut-points. However for many Asian populations public health action points of were defined with as 23 kg/m^2 indicating increased risk and 27.5 kg/m^2 as high risk.[103] At this time Data are not available for the different cut-points and guidance is required to determine which cut off points are useful for San Francisco.

Tenderloin, Western Addition, Hayes Valley, Visitacion Valley, and McLaren Park, coinciding with concentrations of populations at higher risk.[104]

Pregnant Women

More than one third of women (37%) gained excess weight during pregnancy in San Francisco in 2018. Approximately twice as many women who are overweight or obese before pregnancy gain excess weight during pregnancy compared to women who are normal weight before pregnancy (Figure 36). Although, since 2007, there has generally been a decline in excess weight gain during pregnancy, disparities remain.[105] Black/African American are more than 1.5 times as likely as Asian women to gain excess weight during pregnancy compared to Asian women (46% vs. 31%).

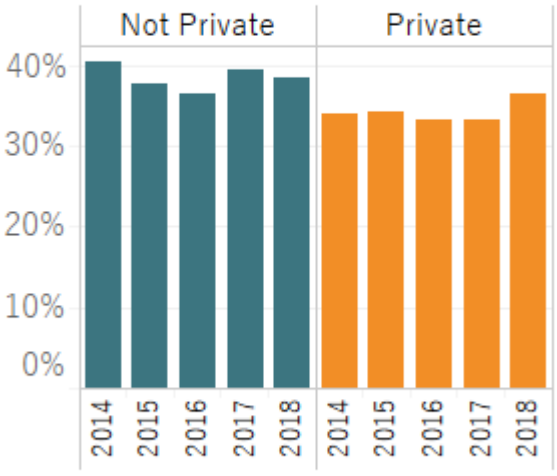
Figure 36. Excess Weight Gain Among Pregnant Women



Source: California Department of Public Health Birth Statistical Master File

The disparity gap in excess weight gain during pregnancy between mothers with private versus other non-private insurance has narrowed in recent years from 2012 when there was a 10-percentage point difference between private and publicly insured women to a 2 percentage gap in 2018 (Figure 37).[105]

Figure 37. Excess Weight Gain Among Pregnant Women, by Insurance Type



Source: California Department of Public Health Birth Statistical Master File

Diabetes

Diabetes is a condition in which the body does not properly process food for use as energy, leading to increased levels of glucose in the blood which can cause damage to tissues and organs throughout the body. The two main types of diabetes are type 1 diabetes and type 2 diabetes. Type 1 diabetes, previously called insulin-dependent diabetes mellitus or juvenile onset diabetes, accounts for 5-10% of all cases of diabetes and is considered primarily a genetic disease whose onset is not particularly influenced by diet or the environment.[106] In contrast, type 2 diabetes, previously called non-insulin-dependent diabetes mellitus or adult-onset diabetes, accounts for about 90 to 95% of all diagnosed cases of diabetes.

Sugar-sweetened beverage consumption is associated with increased risk of developing type 2 diabetes.[107,108] A third type, gestational diabetes, develops only during pregnancy. Babies born to mothers with gestational diabetes may suffer from excessive birth weight, preterm birth, respiratory distress syndrome, low blood sugar, and type 2 diabetes later in life. Women who have gestational diabetes during pregnancy have a 7.5-fold increased risk for the development of type 2 diabetes after delivery. This increased risk persists for their lifetime, even if the diabetes does not develop immediately following pregnancy. Risk factors for type 2 diabetes and gestational diabetes include older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, unhealthy diet, physical inactivity, and race/ethnicity.[109]

Prediabetes, also referred to as impaired glucose tolerance or impaired fasting glucose, is a condition in which blood glucose levels are higher than normal but not high enough for a diagnosis of diabetes. People with prediabetes have a much higher risk of developing type 2 diabetes, as well as an increased risk for cardiovascular disease. Without intervention, up to 30 % of people with prediabetes will develop type 2 diabetes within five years, and up to 70 % will develop diabetes within their lifetime.[110,111] According to modeled prevalence estimates by the UCLA Center for Health Policy Research, approximately 44% of San Franciscans have pre-diabetes.[111]

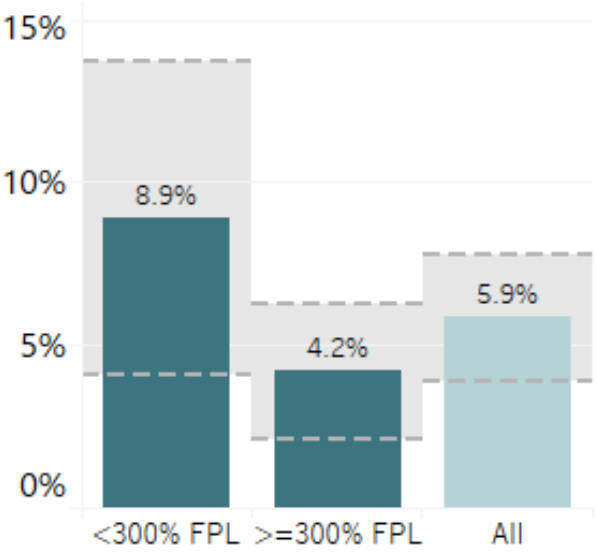
Type 2 Diabetes can be prevented or delayed through moderate weight loss, exercise and improved nutrition, yet, type 2 diabetes impacts health and health spending significantly.[4,112] Diabetes is the eighth leading cause of death in San Francisco which is an underestimate since heart disease, the leading killer, is often worsened by having concurrent diabetes.[113] It is also the leading cause of kidney failure and the need for dialysis and can cause other serious health complications including blindness and lower-extremity amputations.[113,114] Diabetes reduced the lifespan of San Franciscans by approximately eight years and, as estimated by San Francisco's Budget and Legislative Analyst Office, the City and County of San Francisco pays over $87 million for direct and indirect diabetes care costs.[115]

Diabetes Prevalence

Approximately 6% of surveyed San Franciscans reported ever being diagnosed with diabetes on the CHIS survey. However nationally, nearly 1 in 4 people living with diabetes are undiagnosed thus the true prevalence of type 2 diabetes in San Francisco is likely higher. The CDC has modeled diabetes prevalence in San Francisco and estimates the prevalence to be closer to 8.5%.[104,116] Nationally and Locally diabetes affects poorer residents to a greater extent[117]; San Francisco residents living in household which earn less than 300% of the federal poverty level, or about $75,300 for a family of four[118], are more than 2 times as likely to have diabetes (Figure 38).

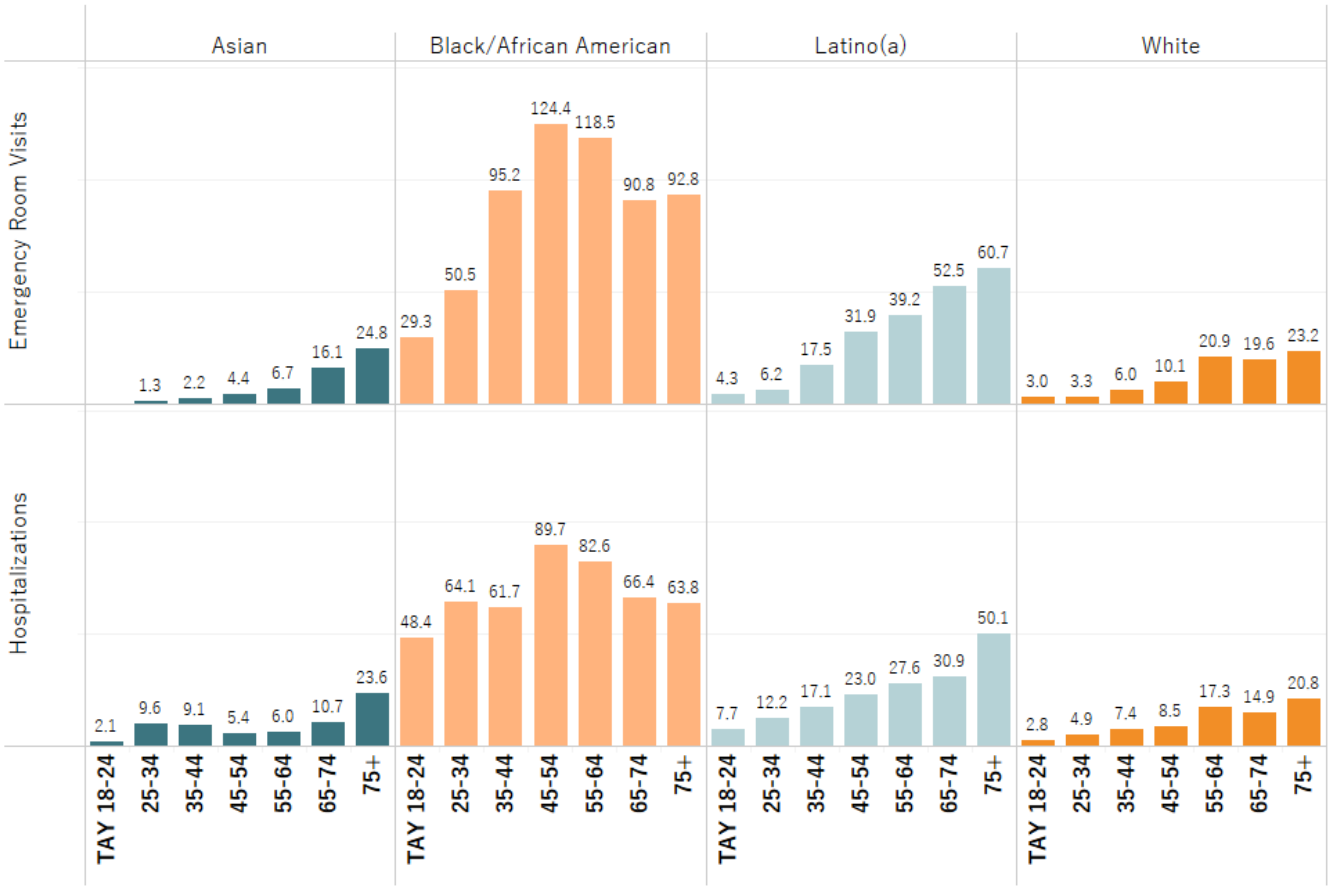
Data examining diabetes prevalence among San Francisco sub populations is not available. However, data are available on hospitalizations and emergency room visits resulting from diabetes. Rates of hospitalizations and emergency room visits are markedly higher for Black/African American and Latinx residents than for White and Asian residents (Figure 39) at all ages. Residents in the eastern zip codes (94102, 94110, 94115, 94124, and 94130) are more likely to be hospitalized due to diabetes than those living elsewhere in San Francisco.[119,120]

Figure 38. Percentage of Adults Reporting Having Diabetes, by Poverty Level, 2013-2017



Source: California Health Interview Survey

Figure 39. Age-Specific Rates of Hospitalization and Emergency Room Visits Due to Diabetes Among Adults, 2012-2016



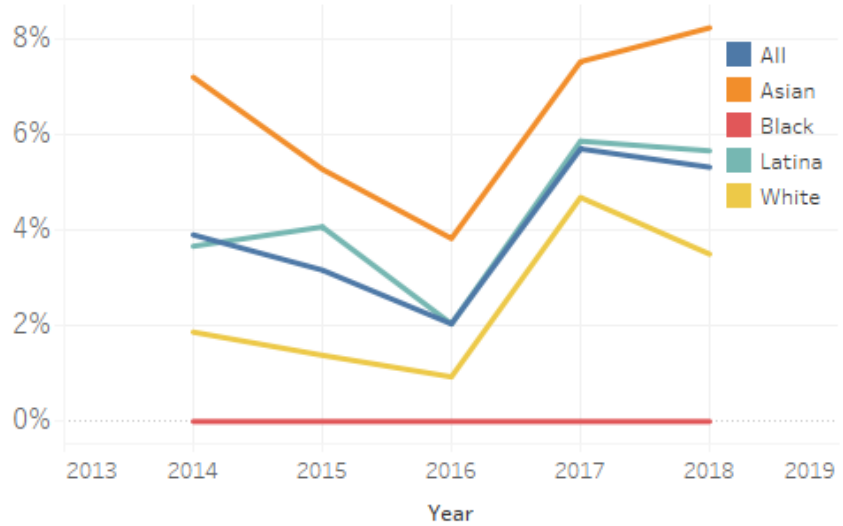
Hospitalization data for Asians includes Pacific Islanders. Emergency Room data for Asians does not include Pacific Islanders.
Source: Office of Statewide Health Planning and Development

Gestational Diabetes

While the incidence rate of gestational diabetes in San Francisco decreased from 2014 to 2016, rates bounced back in 2017 and 2018 (Figure 40). Data from 2018 indicate that Asian women have the highest rate with 8 out of 100 live births affected. This is more than 2 as high as that for White women. The rate for Latina women is also higher than average (6 per 100 live births).

Women who living in the zip codes including North Beach, Chinatown, Sunset/Parkside, Lakeshore, Bayview Hunters Point, Visitation Valley, Excelsior, and Oceanview/Merced. Ingleside neighborhoods are at highest risk of gestational diabetes.[35]

Figure 40. Diabetes Among Pregnant Women



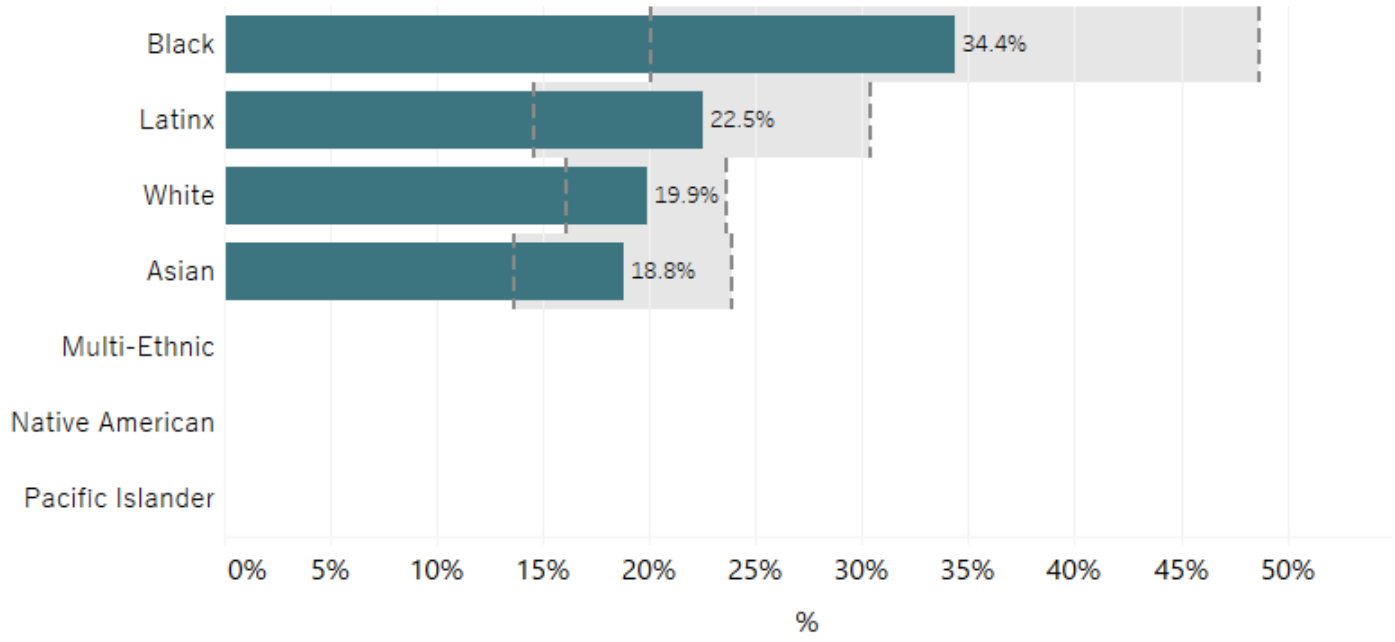
Source: California Department of Public Health Birth Statistical Master File

Hypertension

Hypertension, also called high blood pressure, is a condition in which the force of blood pushing against the vessel walls is higher than normal. This increased pressure damages blood vessel walls and can lead to complications such as cardiovascular disease (including heart attack and stroke), kidney disease, and blindness. Hypertension is the second leading cause of kidney failure. Along with diabetes, hypertension is the major risk factor and contributor to cardiovascular disease which is the leading cause of death in San Francisco and nationally.[121] Diet, physical activity, smoking, stress, family history, and genetics all contribute to the development and management of hypertension.

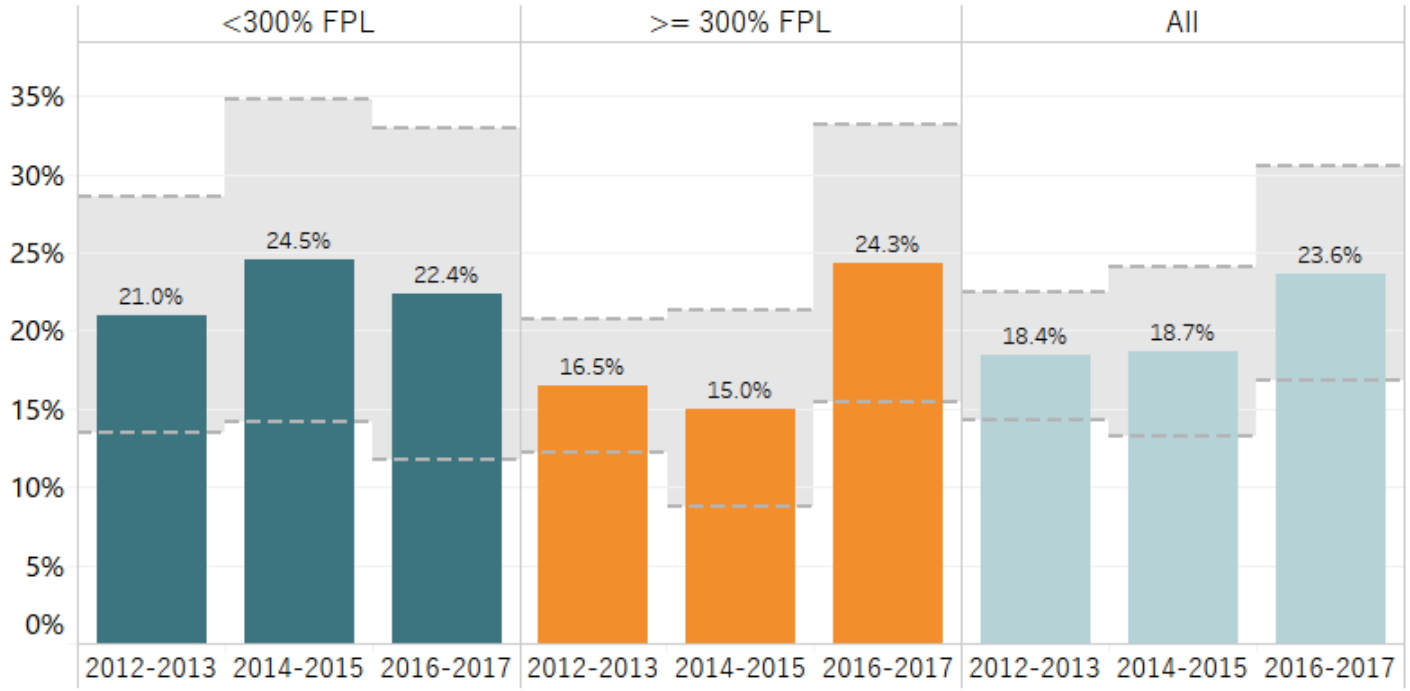
Approximately 24% of surveyed San Franciscans reported ever being diagnosed with hypertension on the CHIS survey. However, nationally, nearly a fifth of people living with hypertension are undiagnosed thus the true prevalence of hypertension in San Francisco is likely higher[122]. As with other chronic disease, disparities are seen across ethnicity and geography[104]. More than a third of Black/African American residents are hypertensive, 50% more than the next highest group: Latinx (23%) (figure). Data additionally suggest increasing percentages of adults 40 to 64 years, men, and persons in households earning more than 300% of the federal poverty level reporting being hypertensive (Figures 41-44).

Figure 41. Percentage of Adults Reporting Having Hypertension, by Race/Ethnicity, 2011-2017



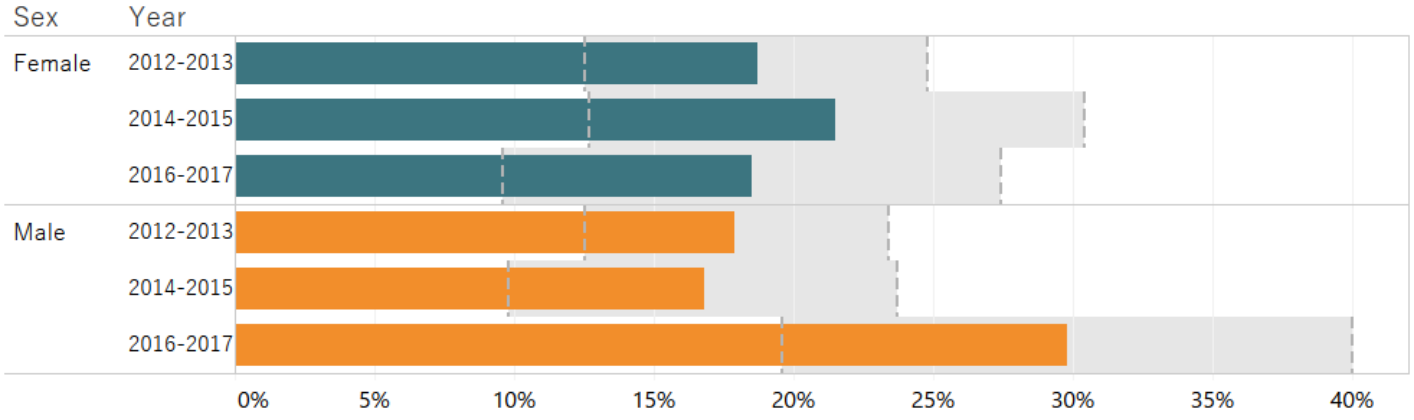
Source: California Health Interview Survey

Figure 42. Percentage of Adults Reporting Having Hypertension, by Poverty Level



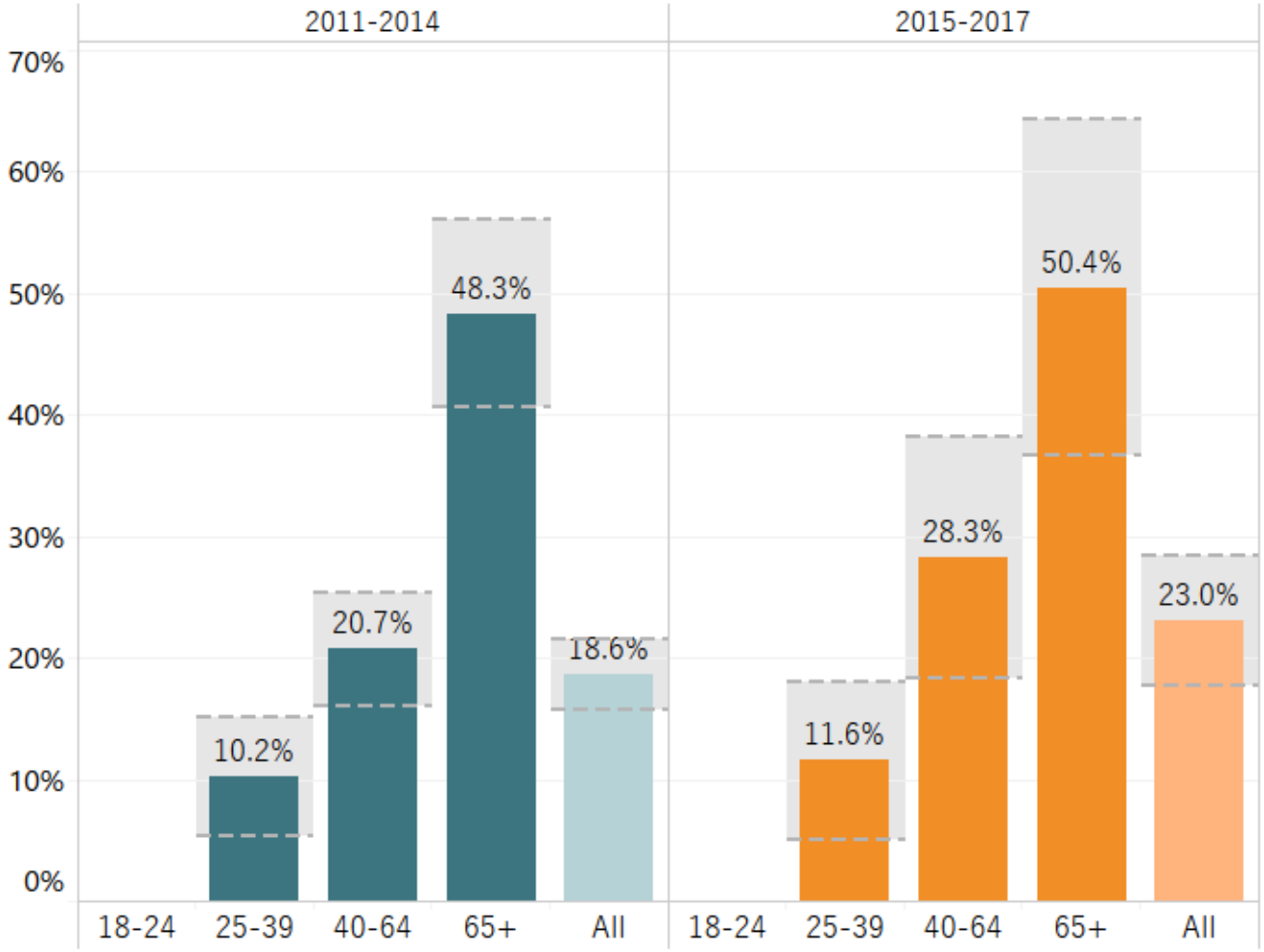
Source: California Health Interview Survey

Figure 43. Percentage of Adults Reporting Having Hypertension, by Gender, 2011-2017



Source: California Health Interview Survey

Figure 44. Percentage of Adults Reporting Having Hypertension, by Age



Source: California Health Interview Survey

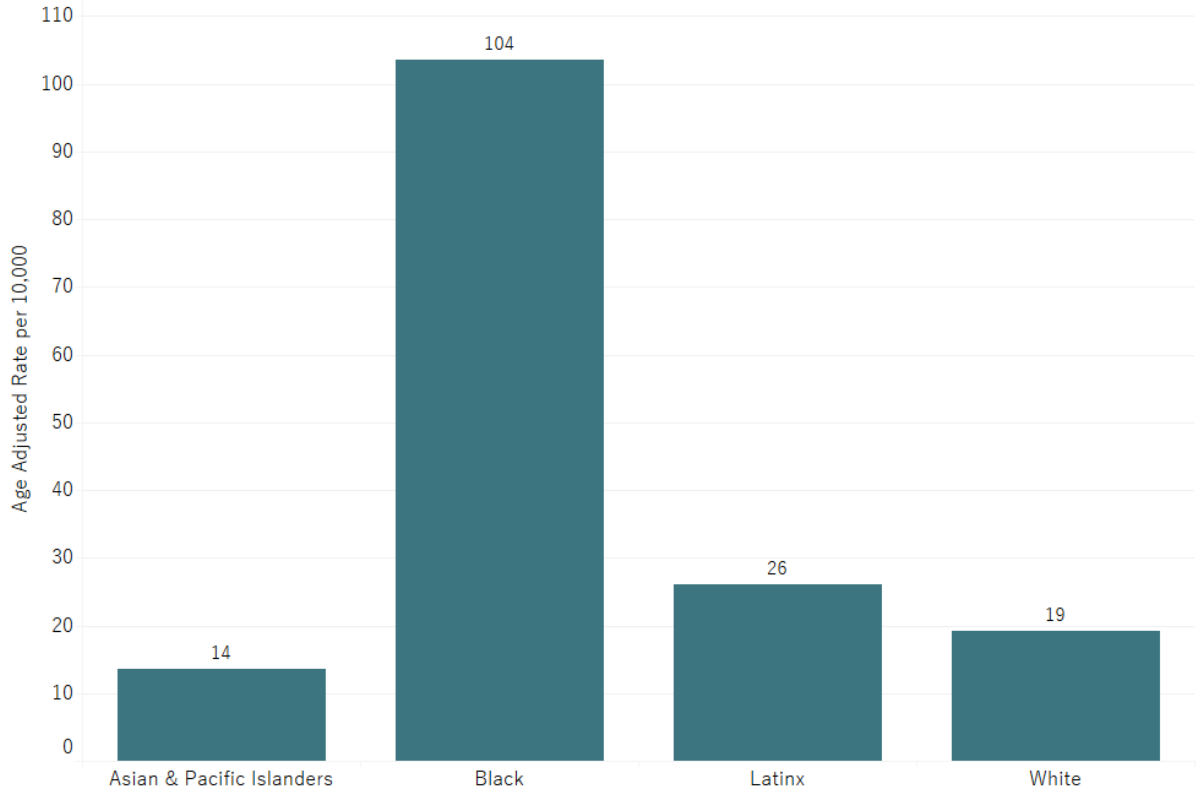
Cardiovascular disease

Cardiovascular disease refers to a class of diseases that involve the heart and blood vessels and is the leading cause of death in San Francisco and nationally. Many of these diseases are attributed to atherosclerosis, a condition where excess plaque builds up in the inner walls of the arteries. This buildup narrows the arteries and constricts blood flow. Diet, physical inactivity, being overweight/obese, cigarette smoking, diabetes, stress, and hypertension all contribute to cardiovascular disease.[123] Common types of cardiovascular diseases include:

- Coronary heart disease which can lead to heart attack (when blood flow to the heart is blocked)
- Heart failure which is when the heart is not functioning at its full potential and the body is not receiving all of the blood and oxygen it requires.
- Stroke which occurs when not enough blood is getting to the brain which can be due to a blocked blood vessel or a burst blood vessel.

In 2014 –2017, 5.2% of adults living in San Francisco reported being told that they had any kind of heart disease. Hospitalization rates due to heart failure are highest among Black/African Americans. In 2016, Black/African American hospitalization rate (104 per 10,000 residents) for heart failure was more than four times higher than White San Franciscans (19 per 10,000 residents) (Figure 45). Hospitalization rates due to heart failure among Latinx (26 per 10,000 residents) was approximately 1.4 times that of White San Franciscans.

Figure 45. Age-Adjusted Rates of Hospitalization Due to Heart Failure among adults, 2012-2016

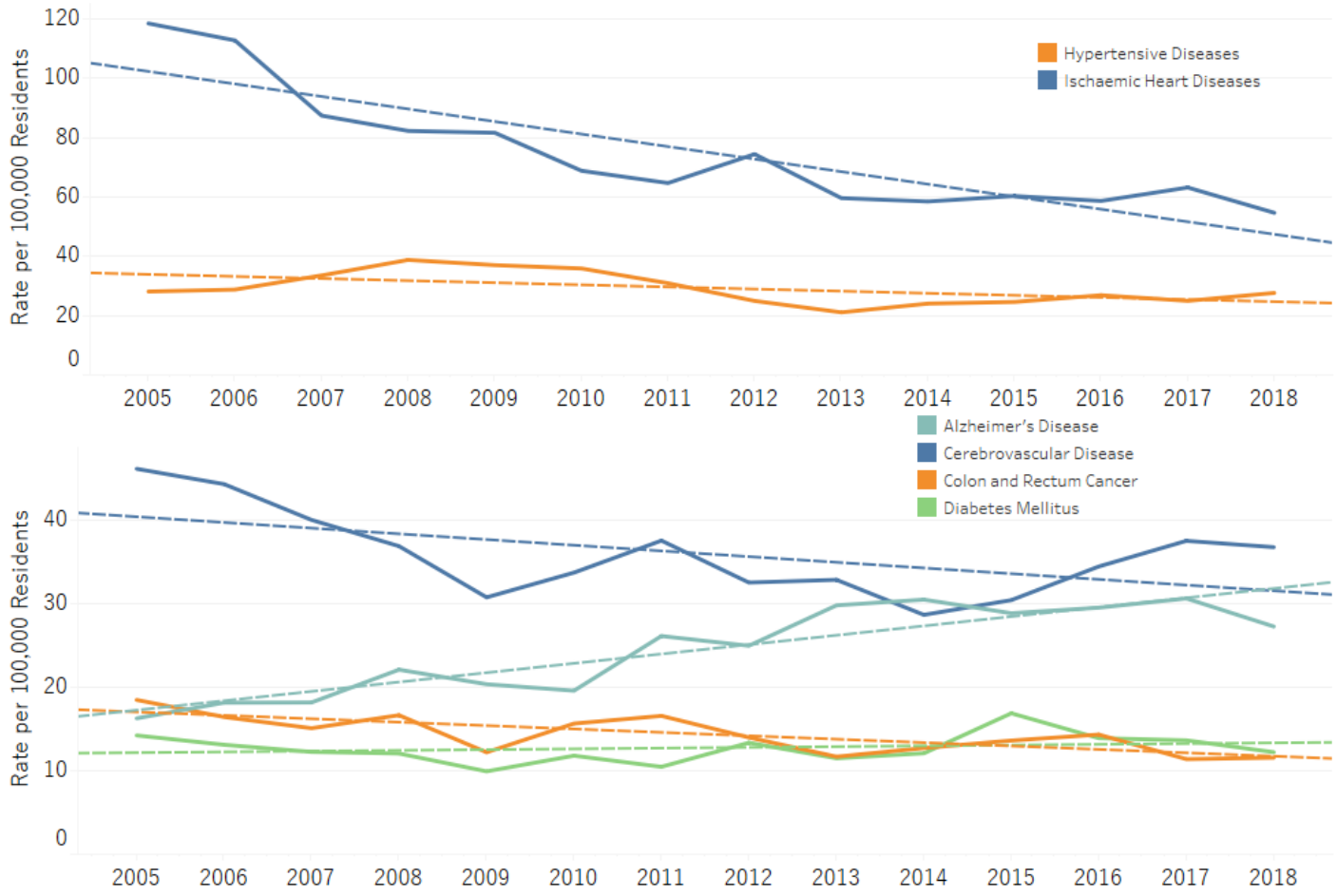


Data for Asian and Pacific Islander residents are received from the source mixed and separate analyses cannot be performed.
Source: Office of Statewide Health Planning and Development

Mortality Due to Diet-sensitive Disease

In San Francisco, the leading 10 causes of death are predominately chronic diseases and the majority of these, 6, are diet-sensitive chronic diseases associated, directly or indirectly, with sugar consumption—Ischemic heart disease, cerebrovascular disease, Alzheimer's, hypertension, diabetes, and colon cancer. Between 2005 and 2018, death rates due to Ischemic heart disease, hypertensive disease, cerebrovascular disease, and colon cancer decreased significantly, while rates due to and Alzheimer's increased (Figure 46). Mortality rates due to Diabetes have remained stable.

Figure 46. Age-adjusted Mortality Rates for the Leading Causes of Death, Diet Sensitive Diseases

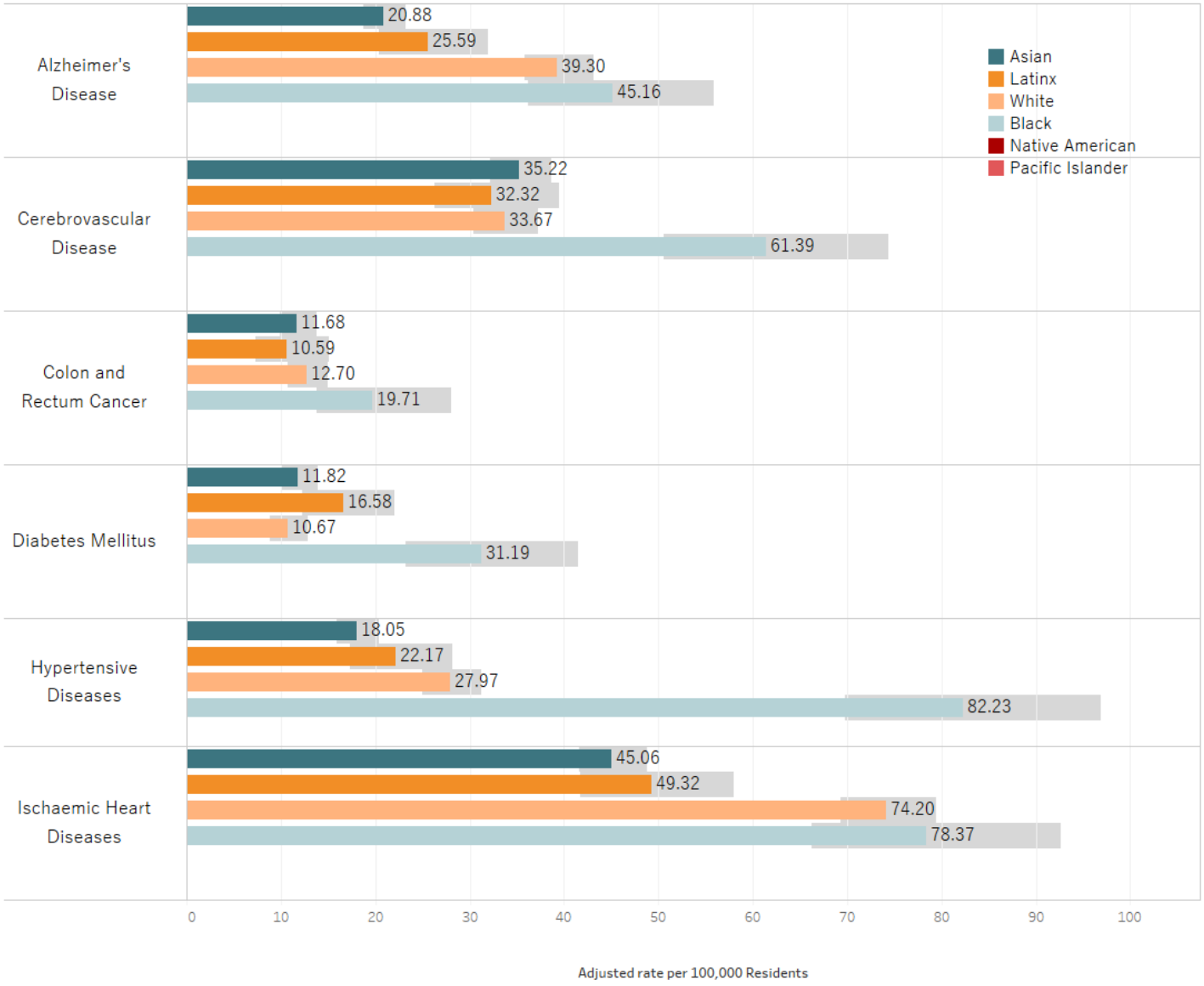


Data split onto two axes due to large differences in rates between causes.

Source: State of California, California Department of Public Health, VRBIS Death Statistical Master File Plus 2006-2018, Created on June 4, 2019.

Mortality rates for diet-sensitive diseases vary by race and ethnicity (Figure 47). Like for mortality overall, Black/African American residents experience the highest rates across all causes. Black/African American death rates due to Diabetes are 2 times as high as that of the next highest group and 3 times as high for Hypertension. Only for Ischemic Heart Disease does another group, White residents, surpass the rate among Black/African American residents. Years of life lost similarly show Black/African American residents experiencing the highest rates of death due to diet-sensitive diseases in San Francisco (Figure 48). Furthermore, decreases seen for the population overall are not seen for all subgroups; mortality rates due to hypertension and cerebrovascular diseases are stable for Latinx, Black/African American, and White residents and population level decreases may be driven by rates among Asians. The rate of colon cancer, however; has not decreased among Asians.

Figure 47. Age-adjusted Mortality Rates for the Leading Causes of Death, Diet Sensitive Diseases, by Race/Ethnicity, 2016-2018

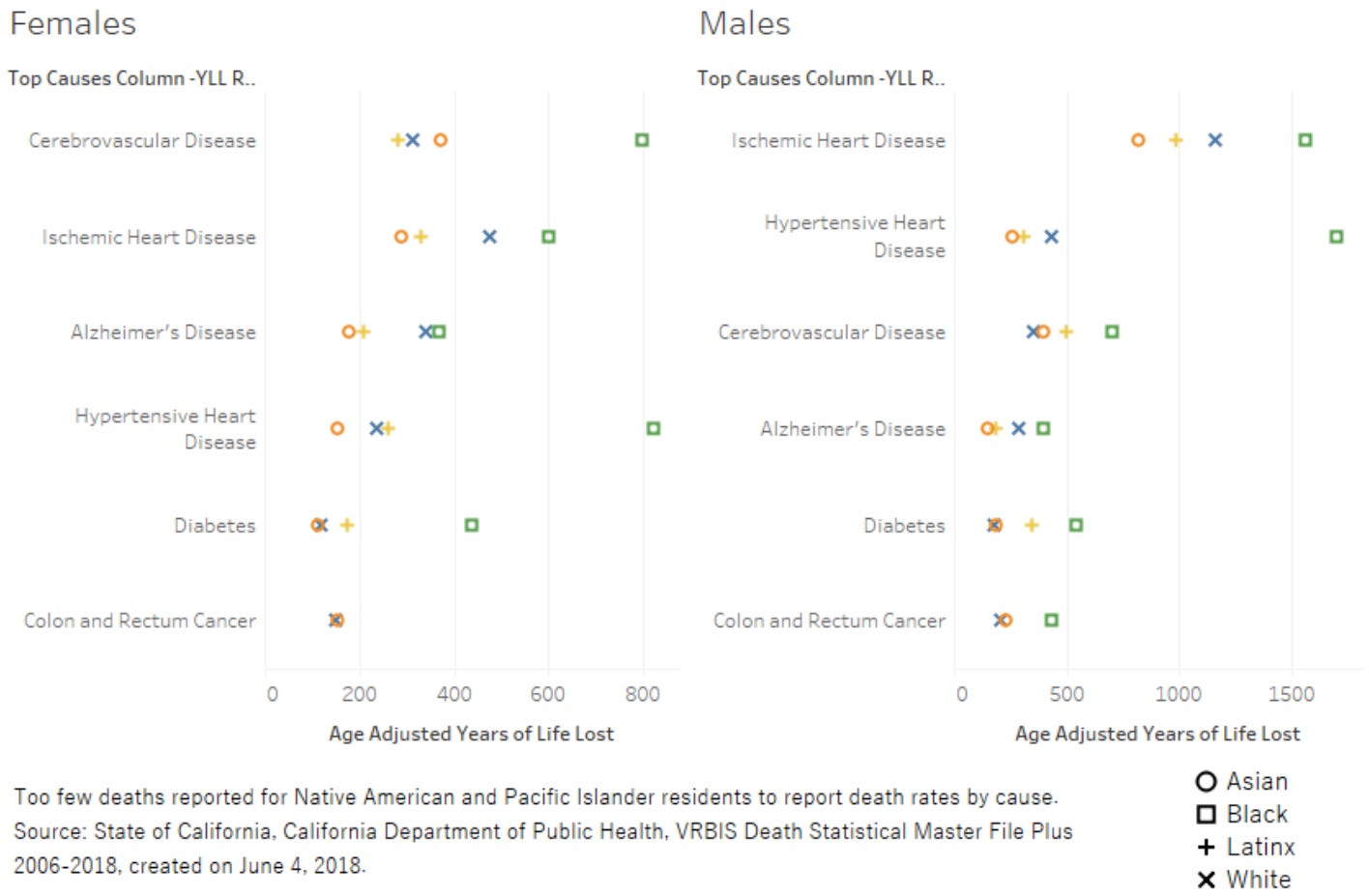


Too few deaths reported for Native American and Pacific Islander residents to report death rates by cause.

95% Confidence intervals shown in grey.

Source: State of California, California Department of Public Health, VRBIS Death Statistical Master File Plus 2006-2018, Created on June 4, 2019.

Figure 48. Years of Life Lost for Leading Diet-Sensitive Causes of Death, by Race/Ethnicity, 2016-2018



Too few deaths reported for Native American and Pacific Islander residents to report death rates by cause.
Source: State of California, California Department of Public Health, VRBIS Death Statistical Master File Plus 2006-2018, created on June 4, 2018.

Given the disparities, seen not only in mortality rates and the most proximate risk factors for these diseases discussed in this report but also the social determinants of health discussed elsewhere, it is both unfortunate and not surprising that Black/African American and Pacific Islander residents have the lowest life expectancies in San Francisco (Figure 42)[21]. Black/African American and Pacific Islander residents, with an average life expectancy of 72 and 76 years, respectively, live 11-15 years less than Asian residents. Despite having the lowest life expectancy of all San Franciscans, Black/African American residents have seen the largest gains in life expectancy since 2005-2007.

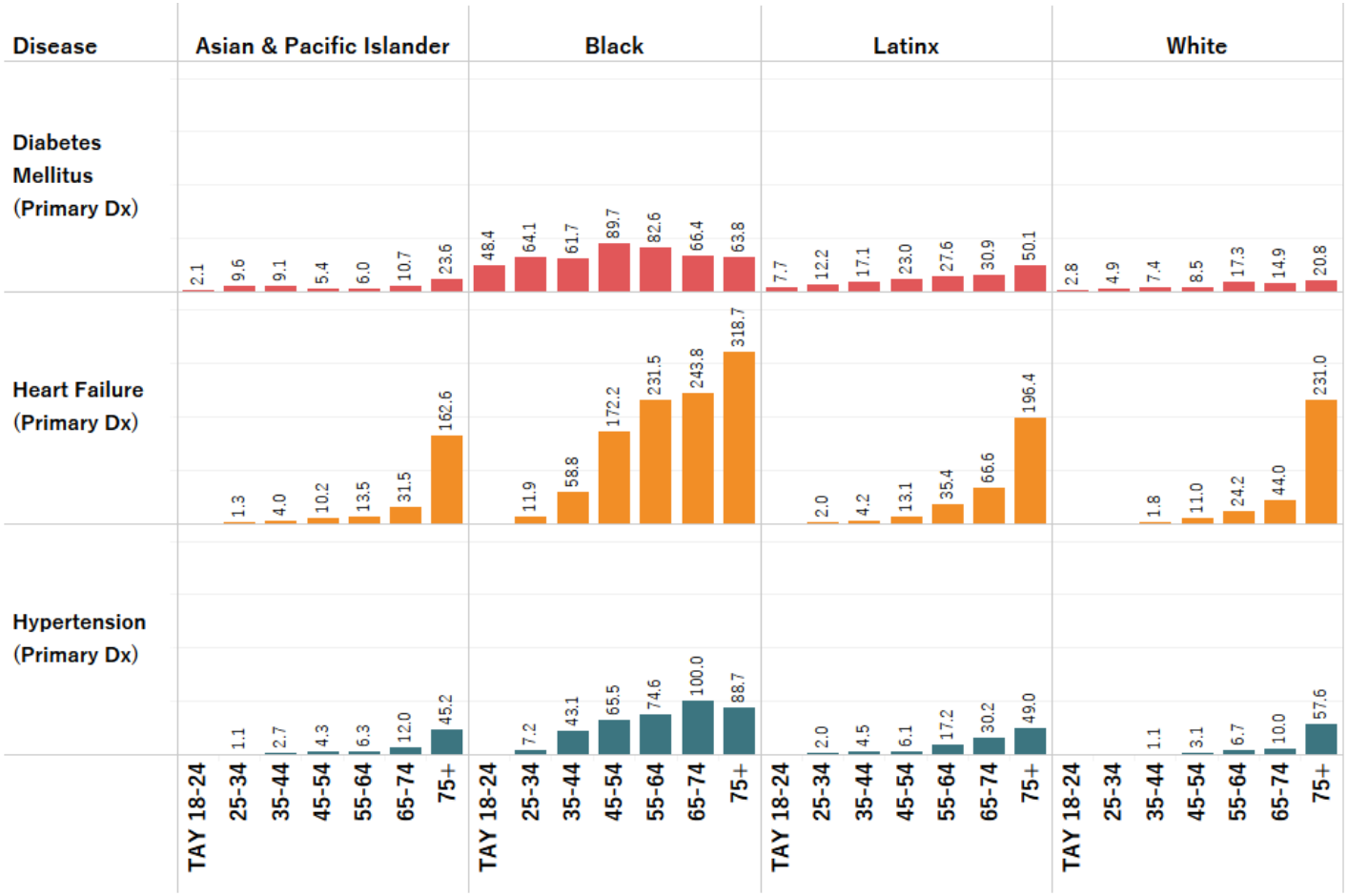
Figure 49. Life Expectancy at Birth

Race and Ethnicity	2006to2008 All	2006to2008 Female	2006to2008 Male	2016to2018 All	2016to2018 Female	2016to2018 Male
All	81.1	84.2	78.1	83.2	86.2	80.4
Asian	85.7	88.1	82.9	87.0	89.4	84.1
Black	68.6	73.2	64.7	72.4	77.0	68.7
Latinx	82.4	85.7	79.0	85.6	88.7	82.7
Pacific Islander	78.1			76.1	77.6	74.6
White	80.1	83.2	77.5	81.8	84.3	79.8

Source: State of California, California Department of Public Health, VRBIS Death Statistical Master File Plus 2006-2017, created on January 31, 2018.

By definition, people are sick with chronic diseases for years to decades. While mortality data cannot tell us for how long affected persons experienced disease before dying, hospitalization data can provide insight into the burden of disease among the living. Hospitalization data for diabetes, heart failure and hypertension by race and age show that while rates for most groups starts to slowly creep up in the early 30s and 40s and only spike among the oldest, rates for Black/African American residents soar early (Figure 43).[119] Rates for Black/African Americans in their 30s and 40s are comparable to those of other race/ethnicities who are 30 or more years older. In fact, for diabetes, rates are higher among young Black/African American residents than they are for others at any age.

Figure 50. Age-Specific Rates of Hospitalization Among Adults, pre 10,000 residents, 2012-2016



Data for Asian and Pacific Islander residents are received from the source mixed and separate analyses cannot be performed.
Source: Office of Statewide Health Planning and Development

Economic Impact of Diet-Sensitive Chronic Diseases

The economic impacts of diet-sensitive chronic diseases are immense.[124] A 2013 report estimated the direct and indirect costs of obesity and diabetes in San Francisco at $748 million.[115] The report found the estimated costs of obesity and diabetes attributed to SSBs was $48.1 to $61.8 million. Hospitalization data for 2016 show that together diabetes, hypertension and ischemic heart failure were the primary causes of 12,448 hospital admissions resulting in more than 29,000 days of hospitalization and a partial reporting of associated medical charges exceeding $350,000,000 in San Francisco.[119]

Methods and Limitations

Birth Statistical Master File, California Department of Public Health (CDPH)

The birth statistical mater file contains birth certificate data for all births. This data provides insights on the health of new mothers and babies born and includes data on gestational diabetes and weight gain during pregnancy.

California Health Interview Survey

The California Health Interview Survey (CHIS) is an annual telephone survey that uses a random-digit-dial technique to landlines and cell-phones and asks respondents to answer health-related questions. In San Francisco, CHIS samples about 400 adults, which provides data for the county, but does not allow annual stratification across different demographic categories for all variables. Data results were obtained either through http://ask.chis.ucla.edu/ or through analysis of the San Francisco-specific dataset. In the latter all weighting was done according to documentation provided by CHIS.

While CHIS asks a number of drink associated questions to children and teens, the sample size is insufficient to get stable estimates in San Francisco. Sample sizes are sufficient among adults to get overall one-year estimates and multiple year pool estimate by poverty, race/ethnicity and gender. Among adults, CHIS asks, “[During the past month,] how often did you drink regular soda or pop that contains sugar? Do not include diet soda." Results are converted to and presented as the soda consumption for an average week.

CHIS also included questions on respondents known chronic diseases. To ascertain diabetes status the question, “Has a doctor ever told you that you have diabetes or sugar diabetes?” is asked. For hypertension the survey asks, “Has a doctor ever told you that you have high blood pressure?”. Additional questions on heart failure, stroke, and prediabetes do not have enough power to produce stable estimates for San Francisco.

To assess food security, CHIS asks persons with incomes less than 200% of the federal poverty level to answer a series of questions. In San Francisco and Alameda Counties these questions are extended to persons earning under 300% of the federal poverty level. Questions asked are 1) "The food that {I/we} bought just didn't last, and {I/we} didn't have money to get more."--Was that often true, sometimes true, or never true for you and your household in the last 12 months?”; 2) "{I/We} couldn't afford to eat balanced meals.-- Was that often true, sometimes true, or never true for you and your household in the last 12 months?”; 3) “Please tell me yes or no. In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? - How often did this happen -- almost every month, some months but not every month, or only in 1 or 2 months?” 4) “In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?”; and 5) “In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?”.

Survey respondents answer two questions on height and weight from which BMI is calculated--“How tall are you without shoes?” and – “{When not pregnant, how/How} much do you weigh without shoes?”. A BMI of 30.0 or higher is labeled as obese, 25.0-29.99 as overweight, 18.5-24.99 as normal, and under 18.5 as underweight.

To determine If an adult walked regularly for transportation, fun or exercises. A series of questions were asked, “During the past 7 days, did you walk to get some place that took you at least 10 minutes?”; “In the past 7 days, how many times did you do that?”, “- {How long did that walk take/On average, how long did those walks take}? “; “Sometimes you may walk for fun, relaxation, exercise, or to walk the dog. During the past 7 days did you walk for at least 10 minutes for any of these reasons? Please do not include walking for transportation.”; “In the past 7 days, how many times did you do that?”; and “{How long did that walk take/On average, how long did those walks take}?”.

California Office of Statewide Health Planning and Development (OSHPD).

Hospitalization and ER rates measure the number of admissions or visits, not the number of residents who are hospitalized. Admissions records may include multiple admissions by the same person.

In October 2015, the diagnosis coding standard for Hospitalizations and Emergency Room visits was changed from ICD-9 to ICD-10. Caution should be used in comparing data using the two different standards.

Diabetes. CD-9 and ICD-10 codes for Diabetes were obtained from the PQI 93: Prevention Quality Diabetes Composite (September 2017) and PQI 16: Lower-Extremity Amputation among Patients with Diabetes Rate (March 2015) technical specifications published by the Agency for Healthcare Research and Quality. A medical visit was determined to be primarily due to Diabetes if the primary diagnosis field contained on the identified ICD-9-CM (discharges prior to October 2015) or ICD-10 (October 2015 and later) codes. To Identify visits where Diabetes was the primary cause, a co-morbidity, or coexisting with another primary cause, all 25 diagnosis fields were searched.

Hypertension: Agency for Healthcare Research and Quality's Clinical Classification Software versions 2015 (ICD-9) and 2017 (ICD-10) were used to identify hospitalizations with a primary diagnosis of hypertension.

Heart Failure: ICD-9 and ICD-10 codes for heart failure were adapted from the PQI 08: Heart Failure Admission Rate (September 2017) and PQI 08: Heart Failure Admission Rate (March 2015) technical specifications published by the Agency for Healthcare Research and Quality. The case definition used here varies from that in the PQI 08 in that records indicating cardiac procedures were not excluded. A medical visit was determined to be primarily due to heart failure if the primary diagnosis field contained the identified ICD-9-CM (discharges prior to October 2015) or ICD-10 (October 2015 and later) codes.

Hospitalization charges: Charges reflect the amount asked for health care services and goods. Charges do not necessarily reflect the expenses incurred by the provider to deliver health care services and goods. Furthermore, the actual amount paid may vary from both charges and costs. Not all hospitals report hospitalization charges to OSHPD.

IRI

To evaluate the effects of the SDDT on beverage purchases in San Francisco, retail scanner data are obtained from Information Resources, Inc. (IRI), a market research company. IRI collects the average price during the period (a weighted quantity), dollar sales, unit sales, and volume sales in ounces for products with UPC codes from a sample of 108 stores (Table 4). While the store names are masked, the 5-digit zip code in which a store resides is available. Stores included in the sample are predominately chain stores and include groceries, pharmacies and mass merchandizers. Not included in the sample are corner stores, convenience stores, and warehouses. Data, going back to 2015, are aggregated to 4-week periods which are denoted as months. While data will be obtained through 2020, as of the writing of this report data through 2017 are available.

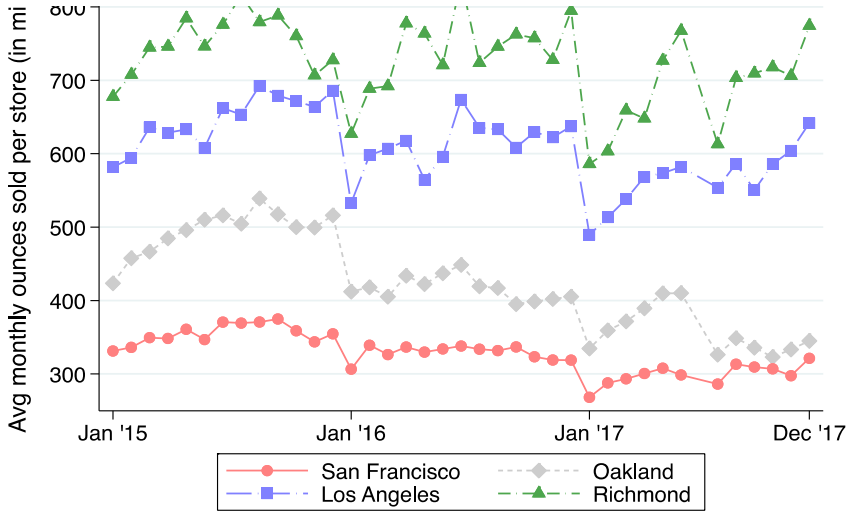
Table 4. Stores included, zip codes represented, and total number of UPC codes included in the IRI dataset, 2015-2017

	Total	San Francisco	Oakland	Los Angeles	Richmond
Number of Stores	519	124	102	264	29
City Proper	358	108	42	201	7
Neighboring areas	161	16	60	63	22
Number of zip codes	124	27	23	67	7
City proper	95	24	13	55	3
Neighboring areas	29	3	10	12	4
Number of UPCs	20,187				
Drink items	13,643				
Food items	6,554				

*No Stores from zip codes 94129 (Presidio), 94130 (Treasure Island), and 94158 (parts of Mission Bay & Potrero Hill) are included in the sample for San Francisco. IRI data does not include independent retailers and local chains; SFDPH food retail permit data indicate that while there no retailers in the 94129 zip code, 4 small markets exist in 94130 and 1 local grocery store is in 94158.

IRI classifies UPCs into product categories. Beverage categories include-- regular soda, diet soda, sports drinks, energy drinks, juice and juice drinks, bottled water, club soda, milk, and teas and coffees. Additionally, the categories or cookies and donuts will be analyzed as potential untaxed food substitutes. All analyses included in this report rely on IRI's product classification scheme and should be treated as preliminary. IRI categories are not based on the added sugar of a beverage and therefore preliminary analysis are not available for the following categories which combine sugar-sweetened and non-sugar-sweetened beverages-juice and juice drinks, and teas and coffees. For future analysis nutrition facts panels and lists of ingredients for each UPC will be examined to determine whether each meets the definition of a taxable SSB under the municipal tax ordinances (Section 552 for San Francisco, Section 4.52.020 for Oakland).

Figure 51. Pre-existing trends in monthly ounces sold per store, 2015-2017



Note: This figure shows IRI data from 2015 through 2017, restricted to stores found within the city proper of each metro area. UPCs are sorted into beverage categories based on IRI's classification scheme, not based on final classification currently underway. Oakland's SSB tax went into effect in July 2017. San Francisco's SSB tax went into effect in January 2018.

Once post SDDT implementation data are available, a difference-in-differences study design will be employed to evaluate changes in drink and food sales. We will compare the change in ounces sold of different beverage categories over time in tax-affected cities (San Francisco and Oakland) and tax-unaffected comparator cities (Richmond and Los Angeles).

Difference-in-differences designs rely on an assumption that unmeasured factors do not vary between groups (in this case between tax-affected and tax-unaffected cities). While this assumption is not directly testable, it is commonly inferred by testing whether pre-existing trends in outcomes for each group are parallel. Using data from 2015

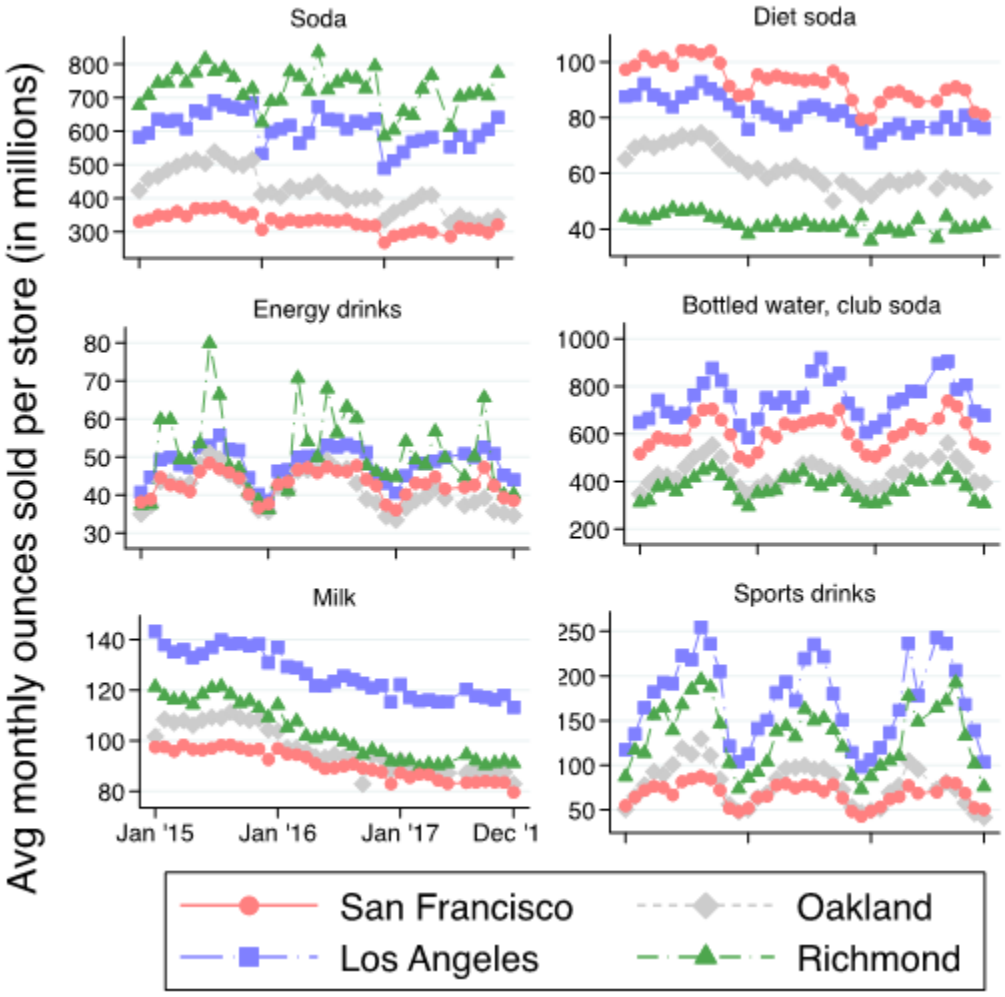
Table 5. Test of pre-existing trends in volume sold, by beverage category

	Tax-affected city × *t'21 (standard error)*	Mean Dependent Variable
Soda	-0.25 (0.91)	616.8
Energy Drinks	-0.04 (0.07)	48.4
Sports Drinks	0.33 (0.20)*	169.1
Diet Soda	-0.09 (0.12)	81.1
Water/Club Soda	-0.79 (1.02)	722.2
Milk	0.29 (0.19)	127.4

This table shows a test of the linear time trend by group (tax-affected vs. tax-unaffected cities) during the pre-tax period, denoted by the coefficient in the first row of the table. The dependent variable is total ounces sold per month in a store, in millions, by beverage category. The model adjusts for store and week fixed effects. For each category there were 11,456 observations and 95 clusters. Robust standard errors, clustered by zip code, are in parentheses. Statistical significance: * denotes significance at $p < 0.10$, ** at $p < 0.05$, and * at $p < 0.01$. The mean of the dependent variable is the mean for control areas (Los Angeles and Richmond) during the pre-tax period.**

through 2017, the linear trends in ounces sold in San Francisco and Oakland were visualized and tested to see if they were similar (Figures 51 and 52). Tests for differences in pre-existing trends in outcomes by group did not reveal large differences in trends supporting the assumption that there were parallel trends between tax-affected and tax-unaffected cities prior to the implementation of the tax (Table 5).

Figure 52. Pre-existing trends in average monthly ounces sold per store, by beverage category, 2015-2017



Note: This figure shows IRI data from 2015 through 2017, restricted to stores found within the city proper of each metro area. UPCs are sorted into beverage categories based on IRI's classification scheme, not based on final classification currently underway. Oakland's SSB tax went into effect in July 2017. San Francisco's SSB tax went into effect in January 2018.

The primary model will look at the pre- vs. post-tax change in ounces sold of taxed beverage product categories. Estimated on month-by-product category data, the model will include an indicator for after-tax implementation, an indicator for city, and an interaction between the two. The coefficient on the latter is an estimate of the difference-in-differences effect. Models will adjust for fixed effects (i.e., indicator variables) for store, thereby accounting for all fixed store characteristics (including store type, location, chain), and fixed effects for month of purchase, thereby accounting for period-specific events (including seasonality trends). In sensitivity analyses, we will also adjust for a group-specific linear time trend that relaxes the standard parallel trends assumption for difference-in-differences models.

Building on the primary model, we will assess month-by-month tax effects on ounces sold of taxed products in an event study framework. This will accomplish several things: 1) testing whether tax-affected and tax-unaffected areas had observed differences in sales of taxed products during the pre-tax period (a test of the "parallel trends"); 2) examining whether there the tax induced anticipatory responses from consumers; and 3) examining how the effects of the SSB taxes varied over time. For example, it would be plausible for the effect to grow over time as consumers learn about new prices or adjust their ingrained consumption habits, or it is possible that the effect shrunk over time as the tax becomes less salient to consumers over time.

We will also look separately at pre-post changes in ounces sold for several taxed product categories: regular soft drinks, fruit drinks and juices with sugar added, energy drinks, sports drinks, and coffee and tea products with sugar added.

In a secondary analysis, we will examine dollar sales, substitution to selected untaxed beverage and food categories, spillover effects in nearby areas, and heterogeneous effects by area-level characteristics (at the zip code level).

Our substitution analysis will assess changes in ounces sold of all untaxed product categories as well as separate analyses for the following untaxed product categories: diet soft drinks, 100% fruit juice, (flavored) water and club soda, and milk without added sugars. Moreover, we will examine substitution to two untaxed food categories: cookies and doughnuts. The food categories were selected to be representative, plausible substitutes, namely ones that are high in sugar and potential impulse purchases.

Our spillover analysis will determine whether consumers shift purchases of taxed beverages to neighboring cities (negative spillovers) or whether people in untaxed neighboring areas reduce consumption of taxed products in response to media exposure from tax campaigns (positive spillovers). We will use stores within an approximately 10-mile radius of a tax city to compare changes in ounces sold of taxed products in neighboring jurisdictions in tax-affected cities versus tax-unaffected comparator cities. In San Francisco, the neighboring jurisdictions are: Daly City, San Bruno, and South San Francisco.

Our analysis of area-level characteristics will focus on differences by zip code in the effect of SSB taxes. Area-level characteristics will include factors such as population, household income, educational attainment, and race and ethnicity.

Kindergarten Oral Health Screening Program

The San Francisco Unified School District (SFUSD) and the San Francisco Department of Public Health (SFDPH) Dental Services jointly run the Kindergarten Oral Health Screening Program which assesses all SFUSD kindergarteners for the experience of caries and treated caries.

Maternal and Infant Health Assessment

The Maternal and Infant Health Assessment (MIHA), is an annual, statewide-representative survey of women with a recent live birth in California. MIHA questions on mother's intention to breastfeed, food security during pregnancy, and more.

SFUSD FitnessGram

Measure of fitness and weight among San Francisco youth are captured by the FitnessGram® which SFUSD measures annually in grades 5, 7, and 9. The FitnessGram® assesses students in 6 areas-aerobic capacity, body composition, abdominal strength, trunk extension strength, upper body strength and flexibility. For each students are determined to be in the "Healthy Fitness Zone" or not. Body composition within the "Healthy Fitness Zone" is determined by BMI and a measure of body fat. Aerobic capacity testing includes the pacer, one mile run and the walk test.

SFUSD School Health Survey

Since 2015, University of California, Berkeley and the Nutrition Policy Institute in partnership with SFUSD have been administering the School Health Survey to 7th to 10th grade students each spring. The survey includes a modified beverage frequency questionnaire, which asks students how often (calculated as times per day) they drink various sugar-sweetened beverages (e.g., soda, energy drinks, coffees and teas) and other beverages (including water, milk and diet soda) (See Appendix x for full survey).

University of California, Berkeley Madsen Group Pricing Study

In April-June of 2017 and 2018, beverage retail prices were collected from stores in San Francisco and the comparison cities of Richmond and San Jose, which do not have SSB taxes.[125] Stores were selected for price collection using stratified

random sampling. First, a list of all stores in these cities classified by the following NAICS codes were obtained: supermarket and other grocery (445110); convenience store (445120); beer, wine or liquor store (445310); pharmacies and drug stores (446110); and gasoline stations (4471) from the ReferenceUSA database. Additional stores were identified through corporate websites and Google Maps. All stores were classified as chain supermarket, independent supermarket, discount supermarket, mass merchandiser, small grocery, drugstore, convenience store, and liquor store based in NAICS code or name recognition. Stores were geocoded and assigned census tract median income. Within each city, store category, and chain (where applicable), retailers were randomly sampled. Sampling was further stratified by tertile of census tract median income for non-chain stores and supermarkets, to ensure representation across neighborhood SES. Specialty (e.g., "natural grocery") chains and chain liquor stores were not included. Data collection is expected to continue through 2020.

The final sample of stores includes 39 stores in San Francisco, 30 stores in Richmond, and 45 stores in San Jose. Across all cities, 11.28% are chain convenience stores, 39.13% are corner stores, 5.22% are discount supermarkets, 6.08% are drugstores, 6.83% are independent supermarkets, 8.70% are liquor stores, 13.05% are chain supermarkets, and 8.70% are mass merchandizers.

Price data are collected for the following categories of sugar-sweetened beverages: soda, energy drinks, sport drinks, sweetened water, presweetened tea, presweetened coffee, and fruit-flavored drinks.[126] Brands were selected based on industry reports of top-selling sugar-sweetened beverages in the United States and researcher observations of drinks commonly sold in the San Francisco Bay Area. Prices are also collected for the following untaxed drinks: diet soda, diet energy drinks, unsweetened flavored waters, reduced fat milk, water, and 100% orange juice brands from top selling producers. Prices of "single serving" (<33.8 fl. oz) sizes were collected for all beverages. Prices of larger sizes were also collected for beverages as available for soda (e.g., 1L, 2L, multipacks), fruit-flavored drinks (e.g., 64 fl oz) and water (1L, 1 gal). Data collectors gathered prices either by directly recording visible price tags or by asking store staff when price tags were not available. In cases where prices could not be provided by store staff, beverages were purchased, and prices recorded from receipts. Both regular and sales prices were collected. If a beverage was on-sale, the sale price was used in the analysis.

Price changes were assessed using a longitudinal design, contrasting absolute changes in pre-tax (April-June 2017) versus post-tax (April-June 2018) beverage prices in San Francisco to changes in Richmond and San Jose (which have no beverage tax) over the same time period to adjust for non-tax factors that might affect price changes. Prices for each beverage (in cents per oz) were used to estimate category-level (i.e. regular soda, diet soda, sports drinks, etc.) and SSB level (i.e. SSB and non-SSB) price changes. Prices were weighted by local sales of each product or category. The data were fit to a linear high dimensional fixed-effects regression model, including a binary indicator for period (pre-tax or post-tax), a binary indicator for San Francisco, their interaction, and fixed effects for each store[127].

VRBIS

The California Department of Public Health maintains a dataset of all deaths in California. Each death has a recorded and coded primary cause of death. The analysis presented in this document examines only the indicated primary cause of death and cannot consider co-morbid or contributing causes of death. Specific cause-of-death categories were designed based on the World Health Organization Global Burden of Disease and Injury (WHO GBD) and the National Center for Health Statistics 113 Selected and 50 Rankable Causes of Death.[128,129] Race/ethnicity was categorized according to San Francisco ethnicity data guidelines.[130]

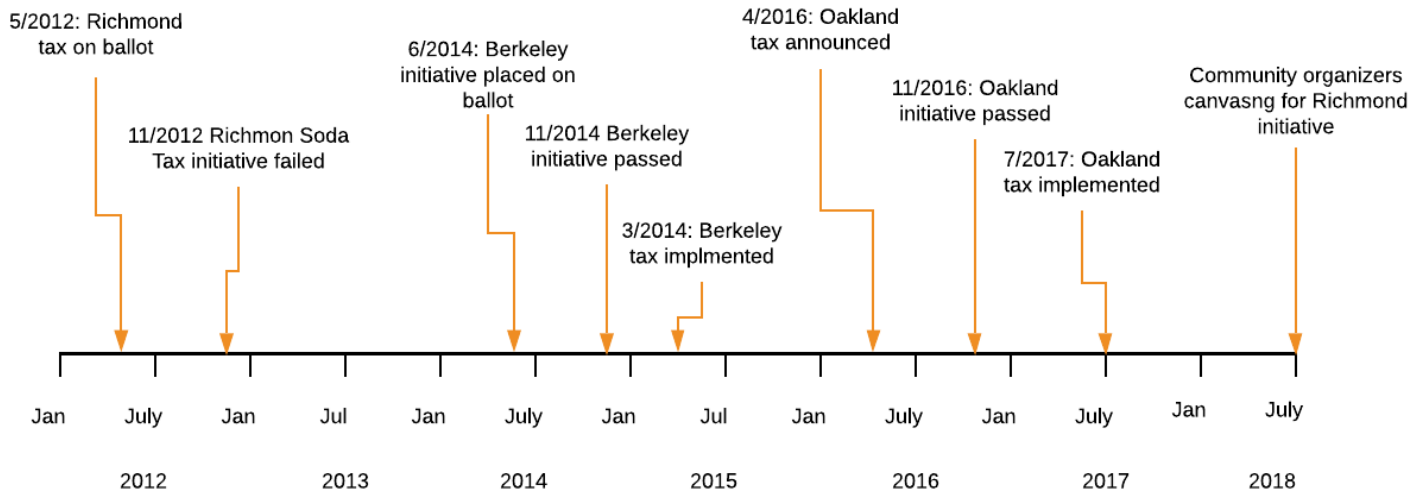
Youth Risk Behavior Surveillance Survey

The Youth Risk Behavior Surveillance Survey (YRBS) is a national biennial survey that asks students a range of health-related questions. With respect to sugar-sweetened beverage consumption the survey asks two questions, "How many times did you drink a can, bottle, or glass of soda or pop, such as Coke, Pepsi, or Sprite? (Do not count diet soda or diet pop.)", and "How many times did you drink a can, bottle, or glass of a sugar-sweetened beverage such as a soda, sports

drink, energy drink, lemonade, sweetened tea or coffee drink, or flavored milk?" High school students are asked about their consumption during the past 7 days while middle school students reflect only upon the prior day.

Sugar-sweetened beverage Tax Timelines for Comparison Cities

Figure 53. Sugar-Sweetened Tax Initiatives Timeline for Comparison Cities



Contributor Biographies:

Kristine Madsen, MD, MPH

Dr. Madsen is an Associate Professor of Public Health Nutrition in the School of Public Health and faculty director of the Berkeley Food Institute at UC Berkeley. She is a pediatrician and research scientist with expertise in the design and evaluation of interventions related to pediatric obesity, cardiovascular risk, and health disparities. She has partnered with schools, health departments, and cities to expand the reach of school and community programs that promote health, and her team recently conducted the first study to examine the impact of Berkeley's soda tax on sugar-sweetened beverage consumption in low-income neighborhoods in Berkeley.

Jennifer Falbe, ScD, MPH

Dr. Falbe's research focuses on studying programmatic, policy, and environmental interventions to prevent chronic disease and reduce health disparities. Dr. Falbe led an evaluation of the nation's first soda tax in Berkeley, California. She has also examined primary care obesity interventions for underserved youth, healthy retail programs, multi-sector community interventions to address childhood obesity, and the impact of screen time on adolescent sleep and health. Dr. Falbe's research employs quantitative and qualitative methods and experimental and observational designs.

Christina Goette

Christina Goette, Healthy Eating Active Living (HEAL) Program Manager in the Community Health Equity and Promotion Branch, manages chronic disease prevention programs related to HEAL, including supporting the Shape Up SF Coalition, managing the community-based Sugary Drinks Distributor Tax (SDDT) grants, providing backbone support to the Sugary Drinks Distributor Tax Advisory Committee which includes the evaluating the impact of the SDDT which this report is a key element.

Ana Ibarra, BA

Ana Ibarra worked as a Research Associate with Dr. Kris Madsen and her research team for 3 years at UC Berkeley School of Public Health. She coordinated data collection for several studies and provided data collection support for the soda tax evaluation. Ana is passionate about leveraging technology to improve food systems as well as advancing social justice and equity.

Michelle Kirian, MPH

Michelle Kirian, MPH, REHS, is a Senior Epidemiologist with the San Francisco Department of Public Health (SFDPH). She is currently dedicated to understanding the impacts of the Sugary Drinks Distributor Tax and more generally in determining the status of chronic diseases in San Francisco and the impacts of interventions to reduce their burden. Over the more than 10 years she has worked with SFDPH she has been a key contributor on many divergent projects. As the lead epidemiologist of the Community Health Assessment and Impact Unit, she and her team provided data supporting population health policies, programs, and funding through health assessment, data access, and knowledge integration. She has also led or contributed to outbreak investigations, communicable disease surveillance, and regulatory design for onsite non-potable water re-use systems.

Matthew Lee, MS

Matthew Lee is a research associate with the Madsen research group and holds a Master of Science degree in Epidemiology from the UC Berkeley School of Public Health. He has helped support the design, management, and analysis of the Bay Area soda tax evaluation and is interested in examining long-term health trajectories related to nutrition policies at the state and federal levels, with a focus on quantitative epidemiologic methods.

Rita Nguyen, MD

Rita Nguyen, MD is an Assistant Health Officer for the San Francisco Department of Public Health Population Health Division and serves as the Chronic Disease Physician Specialist. In this role, she supports and provides thought leadership to chronic disease prevention efforts for the City and County of San Francisco. This includes supporting community-based initiatives, working collaboratively with health systems to advance population health, and informing efforts that promote policy, systems, and environmental changes that support health. She occupies the SFDPH Chronic Disease Seat on the Sugary Drinks Distributor Tax Committee. She is a practicing hospitalist at Zuckerberg San Francisco General Hospital and an Assistant Clinical Professor at UCSF.

Julian Ponce, BA

Julian Ponce's experiences growing up in a rural, low-income, farm-working household has taught him the importance of culture, food, and nutrition in health outcomes. Moreover, as a Mexican-American son of immigrants he witnessed firsthand the contributions of immigrant communities to the food system in the United States. Julian earned a public health (B.A) degree from UC Berkeley where he conducted research on sugar-sweetened beverage consumption in schools and Latinx communities with non-potable tap water. His recent work as a research associate with Professor Kristine Madsen at the UC Berkeley School of Public Health builds on his past research by evaluating the Berkeley soda tax's effect on beverage consumption, price, and businesses.

Jodi Stookey, PhD

Jodi Stookey is currently a Senior Epidemiologist at San Francisco Department of Public Health, Maternal, Child & Adolescent Health. She has a PhD in Nutrition Epidemiology from the School of Public Health, UNC Chapel Hill, and was a postdoctoral fellow at Duke University Center for the Study of Aging and Human Development and the Stanford Prevention Research Center. As Assistant Staff Scientist at Children's Hospital Oakland Research Institute, she was the Principal Investigator on outpatient interventions to promote drinking water for weight management among adolescents and improve fruit, vegetable intake of lower income children. Over the past 20 years, she has worked on a variety of projects, including different population groups, social,

behavioral, and biological risk factors, and short- and longer-term health outcomes. She has worked with data from randomized clinical studies as well as population-based surveys.

Justin White, PhD

Justin White, Ph.D., is Assistant Professor of Health Economics in the UCSF School of Medicine, with joint appointments in the Philip R. Lee Institute for Health Policy Studies and the Department of Epidemiology and Biostatistics. Dr. White studies how monetary and non-monetary incentives can be used to promote healthy behavior, informed by research from the field of behavioral economics. His main research focus is chronic disease prevention, notably smoking cessation. He is currently testing several incentive-based interventions using randomized designs. This work is being undertaken in several countries, including Thailand, Indonesia, and the US. In other recent and ongoing projects, he is evaluating the health impacts of economic and social policies, including: sugar-sweetened beverage taxes, cash and food assistance programs, and poverty alleviation programs.

Sofia B. Villas-Boas, PhD

Sofia Berto Villas-Boas is a professor in the Department of Agricultural and Resource Economics at U C Berkeley. Born in Portugal in 1971 she received her Ph.D. in Economics from U. C. Berkeley in May 2002. Her research interests include industrial organization, consumer behavior, food policy, and environmental regulation. Her recent empirical work estimates the effects of policies on consumer behavior, such a bottled water tax, a plastic bag ban, and a soda tax campaign and its implementation. Other published work has focused on the economics behind wholesale price discrimination banning legislation, contractual relationships along a vertical supply chain, and identifying the role of those contracts in explaining pass-through of cost shocks along the supply chain into retail prices that consumers face. She has published in top economics and field journals such as Review of Economic Studies, Rand Journal of Economics, American Journal of Agricultural Economics, Journal of Environmental Economics and Management, Marketing Science, Management Science, and Review of Economics and Statistics.

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