CITY AND COUNTY OF SAN FRANCISCO
BOARD OF SUPERVISORS

BUDGET AND LEGISLATIVE ANALYST

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POLICY ANALYSIS REPORT

To: Supervisor Mar
From: Budget and Legislative Analyst
Date: December 10, 2013
Re: Study of the Health and Financial Impacts Caused by High Consumption of Sugar-Sweetened Beverages

SUMMARY OF REQUESTED ACTION

You requested that the Budget and Legislative Analyst study the impacts caused by the high consumption of sugar-sweetened beverages, including an analysis of: 1) the health risks associated with high consumption of sugar-sweetened beverages; 2) the long-term financial risks that the City and its residents face due to related healthcare costs; and (3) policies that other cities have explored and implemented to mitigate the impact.

For further information about this report, contact: Fred Brousseau at the Budget and Legislative Analyst's Office.

EXECUTIVE SUMMARY

- Over the past 50 years, consumption of sugar has tripled worldwide, much of which can be attributed to the consumption of sugar-sweetened beverages (SSBs). Sugar-sweetened beverages (SSBs) are those with added sugar or other caloric sweeteners, such as high fructose corn syrup, and include sodas, sports drinks, fruit drinks, teas, flavored/enhanced waters, and energy drinks.

- According to a 2009 San Francisco Department of Public Health (SFDPH) report, U.S. adults consume approximately 13% of their daily calories from sugar-sweetened beverages (SSBs). Additionally, the Rudd Center at Yale University reports that, since the late 1970s, intake of SSBs among adults ages 19 and older has more than doubled.

- At the same time as consumption of sugar and sugar-sweetened beverages has increased significantly throughout the U.S., the rates of obesity and diabetes have also increased. While many factors can contribute to the onset of these two diseases, excessive sugar consumption has been shown to be linked to these two diseases, according to the San Francisco Department of Public Health and others.

- Exhibit A presents changes in U.S. sugar consumption and diabetes and obesity rates between 1980 and 2010.

Exhibit A: Changes in U.S. Sugar Consumption, Diabetes Rate and Obesity Rate, 1980-2010

	Added Sugars Per Capita	% of Americans with Diabetes	% of Obese US Adults	% of Obese US Children
1980	120 lbs	2.50%	15.00%	5.50%
2010	132 lbs	6.80%	37.50%	16.90%

Source: USDA, Centers for Disease Control and Prevention, US Census Bureau

- According to the U.S. Centers for Disease Control and Prevention (CDC), 108,855 adult San Franciscans, or 16 percent of the adult population of 690,963, were classified as obese in 2010. In the same year, the CDC reported 46,909 adult San Franciscans, or 6.9 percent of the adult population, had diabetes. In addition, the California Health Interview Survey (CHIS) conducted by the UCLA Center for Health Policy in 2011-12 found that another 18,000 San Francisco residents have received a diagnosis of borderline (or, pre-) diabetes.

- The obesity rate for children in San Francisco, though lower than in all neighboring Bay Area counties except Marin, grew between 2005 and 2010, the most recent year for which this data is available. While this study did not identify an effective methodology for estimating the costs related to obesity from high SSB consumption by children, a study by the National Center for Chronic Disease Prevention and Health Promotion shows that nearly two-thirds, or 63 percent, of obese children become obese adults.

- Exhibit B below presents the obesity rates for children in San Francisco, Bay Area counties and California as a whole for 2005 and 2010.

Exhibit B: Local California Rates of Overweight or Obese Children

County	2005	2010	% Change from 2005-2010
Alameda	33.51%	34.48%	2.9%
Contra Costa	32.69%	33.85%	3.5%
Marin	23.61%	24.90%	5.5%
San Francisco	**32.04%**	**32.16%**	**0.4%**
San Mateo	36.11%	34.07%	-5.6%
Santa Clara	32.83%	32.88%	0.2%
San Francisco Bay Area	**33.09%**	**33.28%**	**0.6%**
California	**38.44%**	**38.00%**	**-1.1%**

Source: Patchwork for Progress Report, UCLA, November 2011

- A number of studies have been conducted that: a) estimate the portion of total medical costs attributable to obesity and diabetes, and b) estimate the additional annual medical costs incurred per capita by individuals with obesity or diabetes. The per capita cost estimates cover direct costs, such as the costs of medical services, and indirect costs such as lost productivity at

work due to obesity and diabetes. Other studies provide estimates of the portion of these costs that are attributable to the consumption of SSBs.

- Using studies prepared by the Cook County Department of Public Health, the Brookings Institution, the National Bureau of Economic Research, George Washington University and academic studies published in *Health Affairs*, the Budget and Legislative Analyst prepared a series of estimates of the direct and indirect costs to San Francisco residents with obesity and diabetes. While such direct costs are covered by health insurance plans for many individuals, they still represent costs that are incurred by the population at large through health insurance rates or taxes and fees to cover public health care. Low and high cost estimates of $48.1 million to $61.8 million, shown in Exhibit C, represent costs incurred by San Franciscans with obesity and diabetes that are attributable to SSB consumption, based on the range of cost factors presented in the studies reviewed.

Exhibit C: Estimated Costs of Obesity and Diabetes Attributed to SSBs for SF Residents

	Low		High	
Disease	**Total Direct and Indirect Costs**	**Attributable to SSBs (8.66%/4.85%)**	**Total Direct and Indirect Costs**	**Attributable to SSBs (8.66%/4.85%)**
Obesity	$309,519,782	$26,804,413	$418,742,470	$36,263,098
Diabetes	$439,162,058	$21,299,360	$526,600,434	$25,540,121
Total	$748,681,840	$48,103,773	$945,342,904	$61,803,219

Source: Budget and Legislative Analyst, incorporating cost factors and assumptions described in report.

- The City and County of San Francisco ("the City") incurs costs related to diabetes and obesity in two ways. First, as a healthcare service provider, a portion of the City's expenditures for health services are attributable to diabetic and obese patients who receive services at City healthcare facilities. Second, the City incurs costs though its contributions to health insurance and medical claims payments for City employees, retirees, and their dependents, a portion of which covers medical services for diabetic and obese employees.
- Applying the same general approach as described above for estimating costs attributable to sugar-sweetened beverages incurred by San Francisco residents as a whole due to the diseases of obesity and diabetes, the Budget and Legislative Analyst has prepared a range of estimates of City costs. Exhibit D presents three scenarios of City costs attributable to SSBs, which stem from: 1) the provision of medical services to diabetic and obese patients, and 2) the payment of health care insurance premiums and claims for diabetic and obese employees, retirees and their dependents.
- Exhibit D presents three scenarios of City costs. As can be seen, the cost estimates range from $10.8 million per year to $28 million per year.
- Scenario 2 is higher than Scenario 1 because it uses the City's health insurance contributions instead of claims as the basis for City costs covering employees and retirees. Scenario 3 is higher because it uses the City's total expenditures for healthcare services to patients rather than just the General Fund subsidy of those costs, as was used in Scenarios 1 and 2.

Exhibit D: Estimated Costs Attributed to SSBs Incurred by the City and County of San Francisco due to Obesity and Diabetes

	Scenario 1		Scenario 2		Scenario 3	
Disease	**Total Direct and Indirect Costs**	**Attributable to SSBs**	**Total Direct and Indirect Costs**	**Attributable to SSBs**	**Total Direct and Indirect Costs**	**Attributable to SSBs**
Obesity	$20,781,370	$1,799,667	$46,064,917	$3,989,222	$96,668,587	$8,371,500
Diabetes	$87,221,078	$4,230,222	$193,338,154	$9,376,900	$405,725,822	$19,677,702
Total	$125,143,286	**$10,837,409**	$239,403,070	**$13,366,122**	$502,394,409	**$28,049,202**

Source: Budget and Legislative Analyst, incorporating cost factors and assumptions described in report.

- Three additional higher cost scenarios are presented in Appendix 2 using higher cost assumptions from the studies reviewed.

- A number of cities throughout the country have attempted to establish a sales or excise tax on SSBs in an attempt to curb their consumption and reduce some of the health impacts associated with the consumption of SSBs. The Budget and Legislative Analyst identified 12 cities that have attempted to establish such taxes but, to date, none of those cities have established such a tax, or those that have, have been stopped by legal action. Some cities have taken related actions in lieu of a tax, such as prohibiting sales of certain SSBs in municipal buildings in Boston and imposition of a tax on non-reusable containers used for SSBs in Baltimore. All other such taxes have been defeated either by the legislative body for the city or by the voters.

HEALTH RISKS ASSOCIATED WITH HIGH CONSUMPTION OF SUGAR-SWEETENED BEVERAGES

According to the American Medical Association, a number of studies have shown that intake of sugar-sweetened beverages has been strongly and consistently associated with increased body weight and a number of chronic health conditions. Sugar-sweetened beverages comprise nearly half of Americans' added sugar intake, and reducing consumption of these beverages is a simple way to reduce intake of added sugar and empty calories.

WHAT ARE SUGAR-SWEETENED BEVERAGES?

Sugar-sweetened beverages (SSBs) are those with added sugar[1] or other caloric sweeteners, such as high fructose corn syrup, including sodas, sports drinks, fruit drinks, teas, flavored/enhanced waters, and energy drinks.

HOW DOES SSB CONSUMPTION IMPACT HEALTH RISKS?

According to the American Heart Association (AHA), the maximum recommended sugar consumption for women is 6 teaspoons (100 calories) of added sugar a day, and 9 teaspoons (150 calories) for men.. Every twenty-ounce bottle of a typical sugar-sweetened beverage contains nearly 17 teaspoons (240 calories) of sugar, according to the AHA.

Over the past 50 years, consumption of sugar has tripled worldwide – much of which can be attributed to the consumption of sugar-sweetened beverages. According to a 2009 San Francisco Department of Public Health (SFDPH) report[2], U.S. adults consume approximately 13% of their daily calories from SSBs. Additionally, the Yale Rudd Center[3] reports that, since the late 1970s, intake of SSBs among adults ages 19 and older has more than doubled.

CONNECTIONS TO CHRONIC DISEASES

The problem with this high level of sugar consumption is that unless the additional calories are offset by consuming fewer calories elsewhere in the diet, increased weight gain will result. Because SSBs add substantial calories to the diet without providing significant nutrition, the U.S. Dietary Guidelines classifies them as "discretionary calories". But unlike ice cream or candy bars, consumers may not be treating SSBs as special additions (i.e. treats) to the diet and may not be making any adjustments for the additional calories. In 2009, the San Francisco Department of Public Health conducted a nexus study in order to explain the justification for a regulatory fee on sugar-sweetened beverages and to calculate the proper amount of that fee. As noted in that study[4]:

[1] Added sugars include all sugars used as ingredients in processed and prepared foods such as breads, cakes, soft drinks, ice cream and sugars eaten separately or added to foods at the table.
[2] "The Public Burden of Liquid Candy: The Costs of Sugared Beverages in San Francisco", San Francisco Department of Public Health, 2009.
[3] "Sugar-Sweetened Beverage Taxes: An Updated Policy Brief", Yale Rudd Center for Food Policy and Obesity, October 2012.
[4] "The Public Burden of Liquid Candy: The Costs of Sugared Beverages in San Francisco", San Francisco Department of Public Health, 2009.

> "When a positive energy balance exists (energy intake exceeds energy expenditure), people gain weight, and when the energy balance is negative (energy expenditure exceed energy intake), people lose weight. Obesity and being overweight are defined conceptually as "ranges of weights that are greater than what is generally considered healthy for a given height [and] that have been shown to increase the likelihood of certain diseases and other health problems…Developing obesity and being overweight are simply and directly the results of a net positive energy balance over periods of time."

According to Dr. Robert Lustig[5] of the University of California, San Francisco, "A growing body of scientific evidence shows that fructose can trigger processes that lead to liver toxicity and a host of other chronic conditions."

The health effects of high levels of SSB consumption among adults include the following conditions[6]:

- weight gain and obesity
- cardiovascular risk
- high blood pressure
- higher risk of stroke
- type 2 diabetes
- liver toxicity
- myocardial infarction
- risk of pancreatic and breast cancer

While there are many factors that can contribute to obesity and diabetes, the increase in both of these diseases in recent years corresponds to increased sugar consumption in the U.S., as shown in Exhibit 1.

Exhibit 1: Changes in U.S. Sugar Consumption, Diabetes Rate and Obesity Rate, 1980-2010

	Added Sugars Per Capita	% of Americans with Diabetes	% of Obese U.S. Adults	% of Obese U.S. Children
1980	120 lbs	2.5%	15.0%	5.5%
2010	132 lbs	6.8%	37.5%	16.9%

Source: USDA, Centers for Disease Control and Prevention, U.S. Census Bureau

While sugar consumption has decreased among some groups in the last ten years, it is still considered high and a major contributor to obesity and diabetes.

Studies[7] show that SSB consumption is highest among groups that are at greatest risk of obesity and type 2 diabetes, including ethnic minorities and low-income populations, as noted in a 2012 report from the Brookings Institution.

[5] Lustig, Schmidt and Brindis, "The toxic truth about Sugar", *Nature*, February 2012.
[6] Ibid; Institute of Medicine, "Accelerating Progress in Obesity Prevention", May 2012; "Sugar-Sweetened Beverage Taxes: An Updated Policy Brief", Yale Rudd Center for Food Policy and Obesity, October 2012.
[7] Brookings Institution, "Obesity, Prevention, and Health Care Costs", 2012, and "Type 2 Diabetes Mellitus in Children", *Journal of American Medical Association*, September 2001.

Obesity

According to the U.S. Centers for Disease Control and Prevention, the clinical definition of being overweight is having a body mass index (BMI) between 25.0 and 29.9, and the definition of obese is having a BMI of more than 30.0.

With approximately 3,600 new cases of type 2 diabetes occurring yearly in children nationwide, childhood obesity is now an epidemic in this country, according to the Center for American Progress[8]. A recent report in the *Journal of the American Medical Association*[9] estimates that one-third of all children born in the US today (and one half of all Latino and African-American children) will develop type 2 diabetes in their lifetime.

Childhood obesity and overweight rates are especially high in families living below the poverty line. Whereas one in three children in the general population, or 33 percent, is considered overweight or obese, the Center for American Progress finds that 44.8 percent of children in poverty fall into these categories.

Childhood obesity can mean more chronic disease will begin earlier in life for more people – driving up lifetime costs considerably. According to the Institute of Medicine[10], the health risks of obesity include a much higher incidence of cardiovascular disease, diabetes, hypertension, high cholesterol, asthma, osteoarthritis, liver disease and several cancers.

A report[11] published by the *American Journal of Preventive Medicine* predicts that 42 percent of Americans will be obese by 2030, and 11 percent will be severely obese – or roughly 100 pounds overweight – by that year.

Diabetes

As obesity rises, the risk of developing obesity-related health problems – type 2 diabetes, coronary heart disease and stroke, hypertension, arthritis, and obesity-related cancer – increases exponentially. Twenty years ago, only 7.8 million Americans had been diagnosed with diabetes, and today, approximately 25.8 million Americans have diabetes[12].

According to the Center for Disease Control and Prevention's 2004 National Vital Statistics Report[13], diabetes was the sixth leading cause of death in the United States and the seventh leading cause of death in California.

The American Diabetes Association (ADA) estimates[14] that a total of 20.8 million children and adults nationwide (7% of the population) have diabetes. Of this total, only 14.6 million have been diagnosed, leaving 6.2 million undiagnosed. An additional 54 million people are living with pre-diabetes, according to ADA estimates.

[8] Emilie Openchowski, "Linking Obesity and Health Care", Center for American Progress, May 2012.
[9] "Type 2 Diabetes Mellitus in Children", *Journal of American Medical Association*, September 2001.
[10] Ibid.
[11] Institute of Medicine, "Accelerating Progress in Obesity Prevention", May 2012
[12] Robert Wood Johnson Foundation, "How Obesity Threatens America's Future", 2012.
[13] Center for Disease Control and Prevention, 2004 National Vital Statistics Report, February 2004.
[14] American Diabetes Association, "Economic Costs of Diabetes in the US in 2012", March 2013.

Three prospective observational studies[15] reviewed showed positive associations between the consumption of sugar-sweetened beverages and the risk of type 2 diabetes. In these studies, the risk of diabetes among women who consumed one or more servings of SSBs per day was nearly double the risk among women who consumed less than one serving of SSBs per month. As noted in the *New England Journal of Medicine*, because of the high glycemic load of SSBs, consumption of sugar-sweetened beverages would be expected to increase the risk of diabetes by causing insulin resistance.

SAN FRANCISCO'S LONG-TERM FINANCIAL RISKS

Given the impact of high consumption of sugar-sweetened beverages on health risks, the City and County of San Francisco ("the City") and its residents face increased long-term financial risk, as these consumer behaviors continue.

DEFINING THE IMPACTED POPULATION IN SAN FRANCISCO

Obese

According to a 2009 California Center for Public Health Advocacy study[16], the annual cost of obesity in California, including direct medical costs and lost productivity was $40.2 billion in 2006.

While this study did not identify an effective methodology for estimating the costs of high SSB consumption for children, a study by the National Center for Chronic Disease Prevention and Health Promotion[17] shows that nearly two-thirds, or 63 percent, of obese children become obese adults. As such, it is useful for policy-makers to understand the current obesity rates in children in San Francisco to gain insight into the potential future implications and costs to the City for their long-term care. As shown in Exhibit 2, the obesity rate for children in San Francisco (while lower than all neighboring counties, except Marin) grew between 2005 and 2010, the most recent year for which this data is available.

[15] A prospective observational study is a clinical research study in which people who presently have a certain condition or receive a particular treatment are followed over time and compared with another group of people not affected by the condition.
[16] California Center for Public Health Advocacy, "The Economic Costs of Overweight, Obesity, and Physical Inactivity among California Adults", July 2009,
[17] National Center for Chronic Disease Prevention and Health Promotion, "Do obese children become obese adults?", 1993.

Exhibit 2: Local California Rates of Overweight or Obese Children[18]

County	2005	2010	% Change from 2005-2010
Alameda	33.51%	34.48%	2.9%
Contra Costa	32.69%	33.85%	3.5%
Marin	23.61%	24.90%	5.5%
San Francisco	**32.04%**	**32.16%**	**0.4%**
San Mateo	36.11%	34.07%	-5.6%
Santa Clara	32.83%	32.88%	0.2%
San Francisco Bay Area	**33.09%**	**33.28%**	**0.6%**
California	**38.44%**	**38.00%**	**-1.1%**

Source: Patchwork for Progress Report, UCLA, November 2011

In the absence of significant intervention, over half of these children will develop chronic conditions associated with obesity as adults, and within 5-10 years, the City will see an increase in direct and indirect costs related to their care. As shown in Appendix 1, there is an adverse impact of overweight and obesity on minority and low-income children in San Francisco.

Exhibit 3 presents obesity rates for San Franciscans, ages 20 and older. As shown, obesity impacts men at a higher rate than women in San Francisco. AS shown, 16 percent of San Francisco's population was classified as obese in 2010, the most recent year for which this data is available.

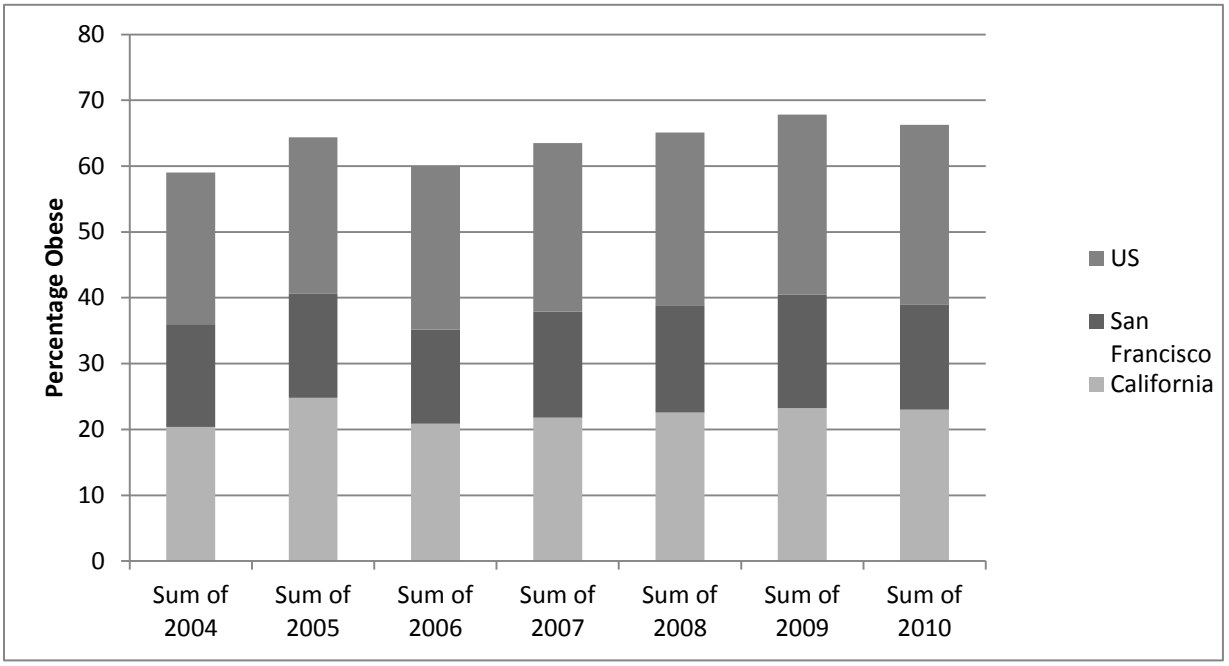
Exhibit 3: Adult Obesity Rate in San Francisco 2010

Adult Population	2010
Men	56,102
Women	52,853
Total	108,955
Total Adult Pop	680,963
% Total Pop	16.0

Source: CDC Interactive Atlas

[18] Children surveyed were in grades 5, 7 and 9.

Exhibit 4: Obesity Rates for Adults 20+ Years of Age, San Francisco and U.S., 2004-2010



Source: Community Health Needs Assessment

Exhibit 5 presents obesity rate data for the adult population in San Francisco, as well as a breakdown for the Latino, African-American and white adult population between 2001/2003 (using pooled data, or the results of statistical analyses using multiple comparable data sources for the two years) and 2005, the most recent year for which this race/ethnicity breakdown is available. As can be seen, the prevalence of obesity among Latino and African Americans is more than twice the prevalence among white San Franciscans.

Exhibit 5: Percentage of Obese San Francisco Adults, Total and By Latino, African American and White

Percentage of Adults (18 +) with a BMI of 30.0+	2001/2003[19]	2005
San Francisco Total	11.0%	14.8%
Latino	14.4%	27.0%
African American	28.5%	34.2%
White	10.3%	13.1%

Source: Shape Up San Francisco

Type 2 Diabetes

Another chronic disease that, according to numerous studies[20], is closely linked to excessive consumption of sugar-sweetened beverages is type 2 diabetes. In 2010, approximately 6.7% of San Francisco's adult population had received diabetes diagnoses. According to the Centers for Disease

[19] "Pooled Data": refers to statistical analysis using multiple comparable data sources, in this case data from two years.
[20] Institute of Medicine, "Accelerating Progress in Obesity Prevention", May 2012; "Sugar-Sweetened Beverage Taxes: An Updated Policy Brief", Yale Rudd Center for Food Policy and Obesity, October 2012.

Control and Prevention, there were 46,909 cases of diagnosed type 2 diabetes in San Francisco in 2010, or 6.9% percent of the 2010 adult population as shown in the exhibit below.

Exhibit 6: Number of Diabetes Diagnoses in San Francisco 2009 and 2010, Ages 20+ by Gender

Population	2009	2010
Men	25,952	24,478
Women	23,136	22,431
Total	49,088	46,909

Source: CDC Diabetes Atlas

According to the U.S. Agency for Healthcare Research and Quality[21], "medical research has shown that the obesity epidemic is a major contributing factor in the rise in the number of persons with diabetes." In a study published in 2004, the CDC[22] found that the prevalence of obesity among adults with diagnosed diabetes was 54.8%.

Exhibit 7 presents a summary of the number of obese and diabetic City residents age 20 and above as of 2010. This includes the Budget and Legislative Analyst's estimate of 83,249 as the number of obese adults without diagnosed diabetes, using the CDC prevalence rated noted above of 54.8% (108,955 obese less estimated 27,506 with diabetes and obesity = 83,249).

Exhibit 7: Number and Percentage of Obese and Diabetic Relative to Total San Francisco Population Age 20+ 2010	
City Residents	805,235
City Residents, 20 years and older	680,963
City Obesity Count	108,955
Number Obese Women	52,853
Number Obese Men	56,102
% SF Obese of City Population 20+	16.0%
City Diabetic Count	46,909
% SF Diabetic of City Population 20+	6.9%
% Diabetic and Obese	54.8%
Total SF Diabetic and Obese of City Pop. 20+	25,706
Total SF Obese Only	83,249
Total SF Diabetic Only	46,909
Total City employees	27,669
Estimated Obese City employees	4,427
Estimated Diabetic City employees	1,906

Source(s): Centers for Disease Control and Prevention, SF Controllers Office, Budget and Legislative Analyst's estimates removing overlapping obese and diabetic population.

[21] AHRQ, "The Prevalence of Obesity and Other Chronic Health Conditions Among Diabetic Adults", 2001.
[22] CDC, "Prevalence of Overweight and Obesity Among Adults with Diagnosed Diabetes, US 1988-1994 and 1999-2002", November 2004.

Overweight and Borderline Diabetic Populations

While this report does not include cost estimates related to the overweight and borderline diabetic populations in San Francisco, given their risk for obesity and diabetes, it is useful to understand their size and potential future impact on costs.

According to the most recent data from the UCLA California Health Interview Survey, nearly 30% of San Francisco adults are overweight (BMI 25.0-29.99). The exhibit below shows the socioeconomic details of this overweight population.

Exhibit 8: San Francisco Overweight Population

Total Overweight (BMI 25.0-29.99)	197,490
Gender	
Male	124,303
Female	73,187
Race	
Latino	20,475
Asian	50,403
African American	12,392
White	104,236
Other Single/Multiple Race	9,503
Federal Poverty Level	
0-99	16,932
100-199	28,572
200-299	36,883
300+	115,102

Source: UCLA, CHIS, 2009-2012 Pooled Data

In addition, the California Health Interview Survey (CHIS) conducted by the UCLA Center for Health Policy in 2011-12 found that another 18,000 San Francisco residents have received a diagnosis of borderline (or, pre-) diabetes.

DEFINING THE COSTS

Direct Costs

Direct costs are those that arise directly from an intervention into the course of the disease. These costs include outpatient visits, prescription drugs and emergency room visits.

Indirect Costs

In addition to the direct costs discussed above, there are also indirect costs related to health risks caused by high consumption of SSBs. These indirect costs are measured in order to capture the loss of productivity that is caused by morbidity, disability or mortality due to a disease. This includes lost productivity as a result of absenteeism (sick leave, disability) and presenteeism (lower productivity from being unable to keep up physically at work).

The effect of obesity on worker productivity can be high: obese men take 5.9 more sick days per year and obese women take 9.4 more sick days per year than do their non-obese counterparts, according to a study[23] conducted by Eric Finkelstein. This absenteeism costs U.S. employers up to $12.8 billion per year. Obese workers can lose up to one month of productive work per year from being unable to keep up physically at work. At a rate of $3,792 per month per obese male worker and $3,037 per month per obese female worker, this total loss of productivity is estimated to cost employers nationally up to $30 billion per year[24].

Costs Attributable to Sugar-Sweetened Beverages

In 2009, the San Francisco Department of Public Health (SFDPH) performed an analysis to estimate the causal effect of SSB consumption on weight gain and obesity in San Francisco. SFDPH conducted a meta-analysis, or compilation of studies, and produced a combination of results from available studies to determine the additional risk of obesity due to SSB consumption (or, the attributable risk) and found that "the excess incidence of obesity attributable to SSB consumption is 8.66%".[25]

In its report, SFDPH acknowledges that this risk factor is likely an underestimation, due to the highly rigorous standards used to select relevant studies for the meta-analysis and to the difficulty in measuring SSB exposure over time.

Similarly, Cook County[26] estimated that new cases of type 2 diabetes would be prevented by a reduction in SSB consumption amounting to between 2.4 and 7.3 percent of all new cases. As such, the Budget and Legislative Analyst used the midpoint of that range (4.85%) to estimate the portion of diabetes-related costs in San Francisco attributable to SSBs.

METHODOLOGIES TO CALCULATE THE COSTS OF EXCESSIVE SUGAR-SWEETENED BEVERAGE CONSUMPTION

Based on an extensive literature review, there are three widely accepted methodologies to measure the cost of high consumption of SSBs:

(1) as a percentage of total direct medical expenditures;
(2) as an additional annual cost per obese population; and
(3) as an additional annual cost per type 2 diabetes population.

Calculating Direct Costs

Measuring Direct Costs for Obesity and Diabetes as a Function of Total Medical Costs

Three recent studies conclude that obesity-attributable medical costs can be estimated as a percentage of total medical costs. The percentages found in the studies range from 10% to 21% of total medical costs, as shown below.

[23] Eric Finkelstein et al, "The Costs of Obesity in the Workplace", *Journal of Occupational and Environmental Medicine*, October 2010.
[24] Ibid.
[25] "The Public Burden of Liquid Candy: The Costs of Sugared Beverages in San Francisco", San Francisco Department of Public Health, 2009.
[26] Cook County Department of Public Health, "Estimating the Potential Impact of Sugar-Sweetened and Other Beverage Excise Taxes in Illinois", October 2011.

- Finkelstein[27] (2009): 10% of total medical costs,
- Brookings[28] (2012): 12% of total medical costs,
- Cawley[29] (2010): 20% of total medical costs.

The American Diabetes Association estimates that 23% of total medical care costs, or a higher rate than the three cited in the studies referenced above, can be attributed to care for the diabetic population.

Measuring Direct Costs per Capita for the Obese Population

Three studies conclude that total obesity-attributable costs can be estimated by measuring the additional per capita spending for obese individuals multiplied by the number of obese individuals. These estimates range from $1,429 to $2,741 per obese person per year, as shown below.

- Finkelstein[30] (2009): $1,429 in additional expenditures per year;
- Cawley[31] (2010): $2,741 in additional expenditures per year;
- George Washington University[32] (2010): $1,474 in additional expenditures per year.

Measuring Direct Costs per Capita for the Diabetic Population

A study conducted by the Cook County, Illinois Department of Public Health[33] estimates the additional per capita spending for individuals with diabetes at $6,000 per year.

Calculating Indirect Costs

Indirect Costs per Capita for Obese Population

As part of a 2010 study, George Washington University also analyzed the additional indirect costs incurred by the obese population. Its findings identify a variance in productivity costs between obese men and obese women, where workforce-related costs of obesity are significantly higher for women, as shown below:

- Annual per capita additional indirect costs for obese women: $3,405
- Annual per capita additional indirect costs for obese men: $1,172

Indirect Costs per Capita for Diabetic Population

The Cook County, Illinois Department of Public Health[34] also measured indirect costs in its analysis of costs related to diabetes, and found that the average annual per capita cost for lost productivity in the diabetic population is $3,326.

[27] Finkelstein, Trogdon, Cohen and Dietz, "Annual Medical Spending Attributable to Obesity", Health Affairs, July 2009.
[28] Brookings Institution, "Obesity, Prevention, and Health Care Costs", 2012.
[29] Cawley and Meyerhoefer, "The Medical Care Costs of Obesity", National Bureau of Economic Research, October 2010.
[30] Finkelstein, Trogdon, Cohen and Dietz, "Annual Medical Spending Attributable to Obesity", Health Affairs, July 2009.
[31] Cawley and Meyerhoefer, "The Medical Care Costs of Obesity", National Bureau of Economic Research, October 2010.
[32] George Washington University Department of Health Policy, "A Heavy Burden: The Individual Costs of Being Overweight and Obese in the United States", September 2010.
[33] Cook County Department of Public Health, "Estimating the Potential Impact of Sugar-Sweetened and Other Beverage Excise Taxes in Illinois", October 2011.
[34] Ibid.

CALCULATING THE COSTS OF EXCESSIVE SUGAR-SWEETENED BEVERAGE CONSUMPTION IN SAN FRANCISCO

Financial Costs Incurred by all San Francisco Residents

Using the methodologies listed above, the direct and indirect costs attributable to the consumption of sugar-sweetened beverages for all San Francisco residents can be estimated. As shown in Exhibit 9, the 54.8% prevalence of obesity among adults with diabetes has been accounted for in the calculations below to prevent the duplication of cost estimates. Thus, the 108,955 obese population in San Francisco has been reduced by 25,706 for these estimates to account for 54.8 percent of the diabetic population also estimated to be obese. Exhibit 9 below shows a low cost scenario for direct and indirect costs incurred by all San Francisco residents and attributable to SSB consumption for the obese and diabetic populations.

Exhibit 9: Estimated Costs Attributable to SSBs to SF Residents with Obesity and Diabetes

		Direct Costs		Indirect Costs			
Disease	Population	Annual Cost Factor	Direct	Annual Cost Factor	Indirect	Total Costs	Attributable to SSBs (8.66%/4.85%)
Obesity	83,249	$1,429	$118,962,821	$3,495/$1,172	$190,556,961	$309,519,782	$26,804,413
Diabetes	46,909	$6,000	$281,454,000	$3,362	$157,708,058	$439,162,058	$21,299,360
Total			$400,416,821		$348,265,019	$748,681,840	$48,103,773

Source: Budget and Legislative Analyst, incorporating cost factors and assumptions described above.

The range of costs incurred by the obese and diabetic populations in San Francisco that are attributable to the consumption of sugar-sweetened beverages is between $48,103,773 (shown in the exhibit above) and $61,803,219 (shown in Appendix 2), with the higher amount based on higher cost factors from the studies cited above. While a portion of these costs would be paid through insurance, the estimates are intended to show the greater societal impact of SSB consumption.

Financial Costs Incurred by the City and County of San Francisco

The City and County of San Francisco ("the City") incurs costs related to diabetes and obesity in two ways. First, as a healthcare service provider, a portion of the City's expenditures for health services are attributable to diabetic and obese patients who receive services at San Francisco General Hospital, City-run health clinics, Laguna Honda Hospital and other City facilities. Second, the City incurs costs though its contributions to health insurance and claims payments for City employees, retirees, and their dependents, a portion of which covers medical services for diabetic and obese employees.

To estimate the costs incurred by the City and County of San Francisco ("the City"), the Budget and Legislative Analyst estimated the City's direct medical expenditures and payments to the Health Service System. Only the General Fund subsidies provided for San Francisco General Hospital, Laguna Honda Hospital and Healthy SF, which totaled $210,472,295 for FY 2012-13, were used for our Scenario 1 cost estimate, instead of the City's total medical costs, which would include all reimbursed amounts such as payments from Medi-Cal and other federal and State sources. Total medical expenditures, including

reimbursed amounts and funding from federal and State sources, is included in the Budget and Legislative Analyst's Scenario 3 cost estimate.

To estimate the City's costs attributable to diabetic and obese employees, retirees and their dependents, a portion of City payments to the Health Service System (HSS) can be estimated two ways: (1) measuring the relevant percentages of the total medical claims paid by the City and (2) measuring relevant percentages of the City's annual employer contributions to HSS; and (2). The claims method is used for the Budget and Legislative Analyst's Scenario 1 cost estimate, presented in Exhibit 10. The employer contributions method is used for the Budget and Legislative Analyst's Scenarios 2 and 3 cost estimates, shown in Exhibits 11 and 12. Appendix 2 presents three other cost scenarios using other sets of assumptions.

Using these methodologies, three cost scenarios to the City are presented in Exhibits 10-12 below.

Exhibit 10. Scenario 1: Estimated Costs to the City, Using General Fund Subsidies and Medical Claims Paid

	Cost Factor	City Direct Medical Cost Expenditures (GF Subsidy only = $210,472,300)	Total Medical Claims Paid 2013 ($168,749,780)	Total (54.8% for Obese Population)	Attributable to SSBs (8.66% for obese/4.85%) for diabetic
Obese	10%	$21,047,230	16,874,978	$20,781,370	$1,799,667
Diabetic	23%	$48,408,629	38,812,449	$87,221,078	$4,230,222
Total		$69,455,859	55,687,427	$125,143,286	**$10,837,409**

Source: Budget and Legislative Analyst, incorporating cost factors and assumptions described above.

Exhibit 11. Scenario 2: Estimated Costs to the City, Using General Fund Subsidies and Health Insurance Contributions for Active Employees and Retirees 2013

	Cost Factor	City Direct Medical Cost Expenditures (GF Subsidy only = $210,472,300)	City Health Insurance Contribution: Active Employees (=$436,263,609)	City Health Insurance Contribution: Retirees ($193,864,759)	Total (54.8% for Obese Population)	Attributable to SSBs (8.66% for obese/4.85%) for diabetic
Obese	10%	$21,047,230	$43,626,361	$19,386,476	$46,064,917	$3,989,222
Diabetic	23%	$48,408,629	$100,340,630	$44,588,895	$193,338,154	$9,376,900
Total		$69,455,859	$143,966,991	$63,975,370	$239,403,070	**$13,366,122**

Source: Budget and Legislative Analyst, incorporating cost factors and assumptions described above.

If the City's total direct medical expenditures are used, based upon the total operating expenditures for San Francisco General Hospital, Laguna Honda Hospital and Healthy SF, and including third party reimbursements and State and federal funding rather than based only on the City's General Fund subsidies for those operations, cost estimates range from $28,049,202 (shown in Exhibit 12) to $37,257,852 (shown in Appendix 2).

Exhibit 12. Scenario 3: Estimated Costs to the City, Using Total Operating Expenditures for SFGH/LHH/HSF and Health Insurance Contributions for Active Employees and Retirees 2013

	Cost Factor	Total Expenditures for SFGH, LHH, Healthy SF (= $1,133,896,943)	City Health Insurance Contribution: Active Employees ($436,263,609)	City Health Insurance Contribution: Retirees ($193,864,759)	Total	Attributable to SSBs (8.66% for obese/4.85%) for diabetic
Obese	10%	$113,389,694	$43,626,361	$19,386,476	$96,668,587	$8,371,500
Diabetic	23%	$260,796,297	$100,340,630	$44,588,895	$405,725,822	$19,677,702
Total		$374,185,991	$143,966,991	$63,975,370	$502,394,409	**$28,049,202**

Source: Budget and Legislative Analyst, incorporating cost factors and assumptions described above.

SSB TAX POLICIES EXPLORED BY OTHER CITIES

As of December 2013, no city in the United States has implemented an excise or sales tax on sugar-sweetened beverages. However, there have been several attempts at passing such legislation. The summary details on those efforts can be seen in Exhibit 13 below. As shown, come cities have succeeded in adopting related legislation such as prohibiting sales of certain SSBs in municipal buildings in the City of Boston and imposition of a tax on non-reusable containers in Baltimore.

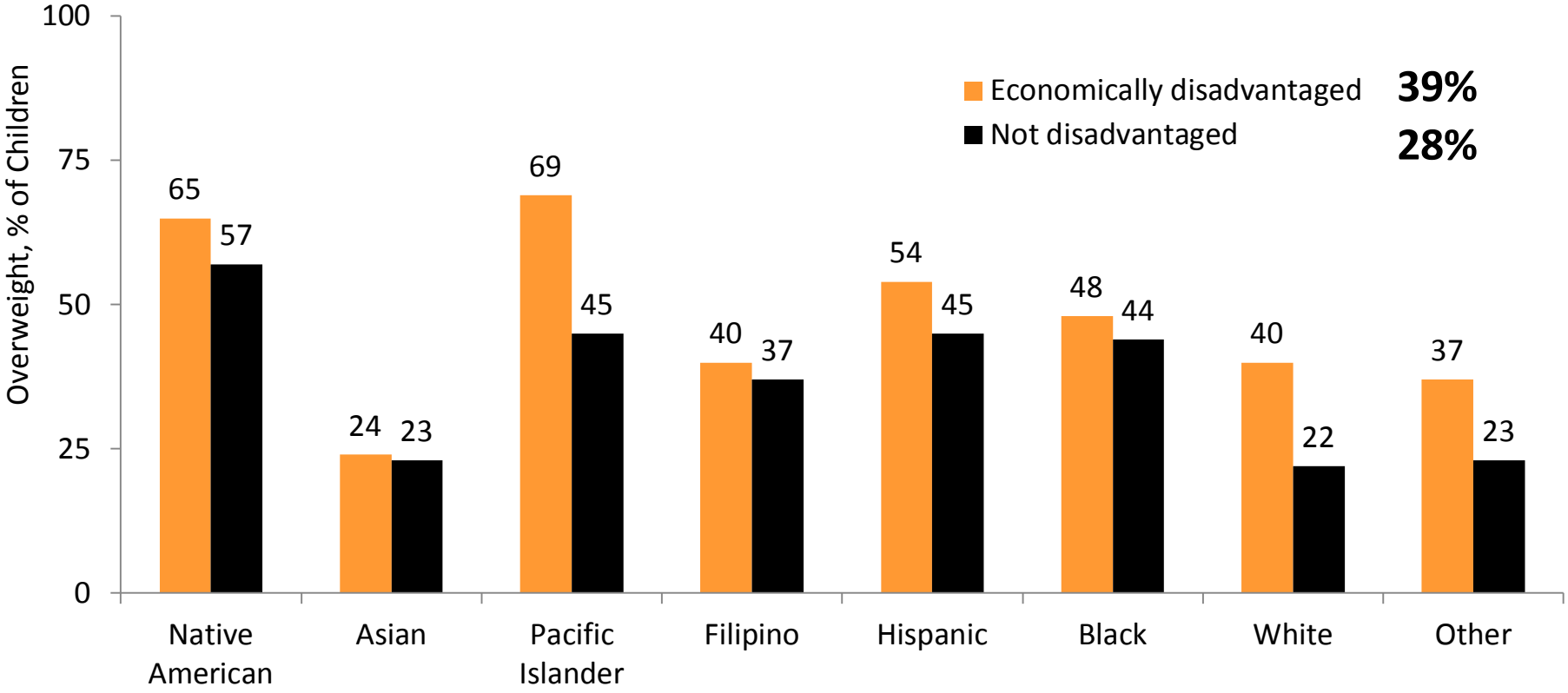
Exhibit 13: Summary of SSB Legislative Efforts in U.S. Cities

City	Year	Proposed Tax Structure			Process	Status	Expected Revenue Generation
		1 cent/oz	2 cents/oz	Other			
Baldwin Park, CA	2012				Ballot Measure	Defeated in City Council	
Baltimore, MD	2010			2 cents (per non-reusable container)	City Council	Passed	$4.7M
	2013			5 cents (per non-reusable container)	City Council	Passed	$10M
Boston, MA	2011			no sales in municipal bldgs	Mayoral Executive Order	Issued by Mayor	
Cambridge, MA				size limit		Under Review	
Chicago, IL	2012	X			City Council	No Vote	$129M
El Monte, CA	2012	X			Ballot Measure	Defeated	$3.5-7M
New York, NY				size limit	Mayoral Executive Order	Court Overturned; Under Appeal	
Philadelphia, PA	2010		X		City Council	Defeated	$77M
	2011		X		City Council	Defeated	$77M
Redlands, CA	2012				City Council	Defeated	$1-1.5M
Richmond, CA	2012	X			Ballot Measure	Defeated	$2-4M
Telluride, CO		X			Ballot Measure	Defeated	$200,000
Washington, DC	2010	X			City Council	Defeated	$6.5M
	2010			6% sales tax	City Council	Passed	$7.92M

In addition, many states have attempted to enact excise taxes on SSBs, including California.

- Lower income children are 60% more likely to be overweight than higher income children
- Hispanic, Black, Native American and Pacific Islander children are twice as likely to be overweight

Prevalence of overweight in SFUSD 5th, 7th & 9th graders by socio-economic status, 2011-2012



Data source: CDE Fitnessgram, 2011-2012 for 9,749 students ages 10-18y. Data analyzed by SFDPH MCAH Epidemiology
Overweight: BMI percentiles from measured weight and height ≥ 85%

Appendix 2
Estimated High Range Costs to the City - Using 3 Methodologies Detailed in Report

Estimated Costs to the City - Using General Fund Subsidies and Claims Paid

	Cost Factor	City Direct Expenditures (GF Subsidy only = $210,472,300)	Total Medical Claims Paid 2013 ($168,749,780)	Total (54.8% for Obese Population)	Attributable to SSBs (8.66% for obese/4.85% for diabetic)
Obese	21%	$44,199,183	35,437,454	$43,640,877	$3,779,300
Diabetic	23%	$101,658,121	38,812,449	$140,470,570	$6,812,823
Total		$145,857,304	74,249,903	$220,107,207	**$19,061,284**

Estimated Costs to the City - Using General Fund Subsidies and Health Insurance Contributions

		City	City Healthcare Contributions 2013			
	Cost Factor	City Direct Expenditures (GF Subsidy only = $210,472,300)	City Health Insurance Contribution: Active Employees ($436,263,609)	City Health Insurance Contribution: Retirees ($193,864,759)	Total (54.8% of Obese Costs)	Attributable to SSBs (8.66%/4.85%)
Obese	21%	$44,199,183	$91,615,358	$40,711,599	$96,736,325	$8,377,366
Diabetic	23%	$101,658,121	$100,340,630	$44,588,895	$246,587,646	$11,959,501
Total		$145,857,304	$191,955,988	$85,300,494	$343,323,970	**$20,336,867**

Estimated Costs to the City - Using Total Expenditures for SFGH/LHH/HSF and Health Insurance Contributions

		City	City Healthcare Contributions 2013			
	Cost Factor	Total Expenditures for SFGH, LHH, Healthy SF and SF PATH ($1,133,896,943)	City Health Insurance Contribution: Active Employees ($436,263,609)	City Health Insurance Contribution: Retirees (193,864,759)	Total	Attributable to SSBs
Obese	21%	$238,118,358	$91,615,358	$40,711,599	$203,004,033	$17,580,149
Diabetic	23%	$260,796,297	$100,340,630	$44,588,895	$405,725,822	$19,677,702
Total		$498,914,655	$191,955,988	$85,300,494	$608,729,854	**$37,257,852**