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## Bubbling Over: Soda Consumption and Its Link to Obesity in California

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In California, 62% of adolescents ages 12-17 and 41% of children ages 2-11 drink at least one soda or other sweetened beverage every day. In addition, 24% of adults drink at least one soda or other sweetened beverage on an average day. Adults who drink soda occasionally (not every day) are 15% more likely to be overweight or obese, and adults who drink one or more sodas per day are 27% more likely to be overweight or obese than adults who do not drink soda, even when adjusting for poverty status and race/ethnicity.

This policy brief, produced collaboratively by the California Center for Public Health Advocacy and the UCLA Center for Health Policy Research, examines soda consumption in California by cities and counties using data from the 2005 California Health Interview Survey (CHIS 2005). In addition, the brief investigates whether there is an association between soda consumption and the prevalence of overweight and obesity.

There are major differences in soda consumption rates by geographic area in California, suggesting that social and environmental factors affect the consumption of soda. Also, the prevalence of overweight and obesity is higher among those who drink one or more sodas or other sweetened beverages every day than among those who do not consume these soft drinks. Establishing public policies that focus on reducing soda consumption could contribute to reversing California's increasing overweight and obesity problem.

### Background

The prevalence of overweight and obesity has increased dramatically in both adults and children in the last three decades in the

United States. In the 1970s, about 15% of adults were obese and by 2004 the rate had climbed to 32%.<sup>1</sup> Although the prevalence of overweight among children is lower than among adults, the rates among children and adolescents have increased considerably more. The prevalence of overweight and obesity nearly tripled among 12-19 year olds and more than quadrupled among 6-11 year olds in the last three decades.

In California, 21% of adults are currently obese and an additional 35% are overweight. Among adolescents, 14% are obese and another 16% are overweight.<sup>2</sup> Similar to national trends, the trend in California is toward increasing weight in both adults and adolescents.<sup>3</sup> Each year in California, overweight and obesity cost families, employers, the health care industry and the government \$21 billion.<sup>4</sup> California spends more public and private money on the health consequences of obesity than any other state.<sup>5</sup>

Overweight and obesity are associated with serious health risks. In children and adolescents, overweight and obesity are associated with increased risk for cardiovascular disease indicators including



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high total cholesterol, high blood pressure, and high fasting insulin, an early indicator of diabetes risk.<sup>6</sup> In addition, overweight children and adolescents are more likely to be overweight or obese as adults.<sup>7</sup> In adults, overweight and obesity are associated with increased risk for diabetes, heart disease, stroke, some types of cancer and premature death.<sup>1, 8, 9</sup>

Drinking sweetened beverages such as soda and fruit drinks that have added caloric sweeteners (e.g., sucrose, high fructose corn syrup) is one marker of a poor diet, and is associated with overweight and obesity in people of all ages.<sup>10-13</sup> A number of studies have found that greater consumption of sweetened beverages is associated with overweight and obesity among both adults and children.<sup>12-19</sup> In addition, randomized controlled trials that examine the impact of reducing intake of sweetened beverages on weight indicate that reducing consumption of soda and other sweetened drinks leads to reductions in overweight and obesity.<sup>20, 21</sup> Among adults, drinking soda is also associated with increased risk for type 2 diabetes.<sup>13</sup>

Moreover, drinking sweetened beverages has increased, and it is now more common than ever, particularly among adolescents.<sup>22</sup> Between 1977 and 2002 Americans increased their calorie intake from soft drinks by 228%.<sup>23</sup> Portion sizes have also increased from an average serving size of 6.5 fl oz (88 calories) in the 1950s, to 12 fl oz (150 calories), 20 fl oz (266 calories), and even larger portion sizes common today.<sup>24-26</sup> The average serving size of soft drinks in fast food restaurants in 2002 was 23 fl oz (299 calories), with some chains now commonly selling soft drinks in 32 to 64 fl oz portions (416 to 832 calories, respectively).<sup>27</sup> Sweetened beverages are a significant contributor to total caloric intake, especially for children and adolescents, and they lack the nutrients our bodies need.<sup>24, 26, 28</sup> Additionally, eating habits established in childhood are important determinants of eating habits as adults.<sup>29, 30</sup>

### **Soda Consumption in California**

Drinking sweetened beverages is common among California adults, adolescents and children. Data from CHIS 2005 show that nearly one out of four adults (24%) drink at least one soda every day—6.4 million California adults—and 36% drink soda occasionally, but not every day. Forty percent of adults report not drinking soda at all. In addition, 41% of children ages 2-11 drink at least one soda every day, nearly 2.2 million children in all. The rates of soda consumption among adolescents are much higher than among adults or children. More than 62% of adolescents ages 12-17—over two million teens—drink soda every day, including 13% (over 400,000) who drink three or more sodas every day. California adolescents drink 1.2 sodas per day on average. Conservatively assuming one soda is a 12-ounce can which contains 10 teaspoons of sugar, the average California adolescent consumes the equivalent of 39 pounds of sugar each year from soda and other sweetened beverages.

### **Soda Consumption Associated with Higher Prevalence of Overweight and Obesity**

In California, 56% of adults and 30% of adolescents are either overweight or obese. The prevalence of overweight and obesity is higher among adults and adolescents who drink soda than among those who don't.

For both adults and adolescents, rates of overweight and obesity are 18% higher among those who drink one or more sodas every day compared to those who do not drink soda. Among adults, 62% of those who drink one or more sodas daily are either overweight or obese compared to 52% of adults who do not drink soda. Among adolescents, 32% of those who consume at least one soda per day are either overweight or obese, while 27% of those who consume no sodas on a typical day are either overweight or obese.

Soda consumption is associated with poverty and race/ethnicity; lower income people and people of color tend to drink more soda.<sup>31</sup> These same groups also tend to be at higher risk for overweight and obesity. However, in our analysis of California adults, the association between soda consumption and overweight or obesity was independent of poverty status and race/ethnicity. Adults who drink soda occasionally (not every day) are 15% more likely to be overweight or obese, and adults who drink one or more sodas per day are 27% more likely to be overweight or obese than adults who do not drink soda, even when adjusting for poverty status and race/ethnicity (Exhibit 1).

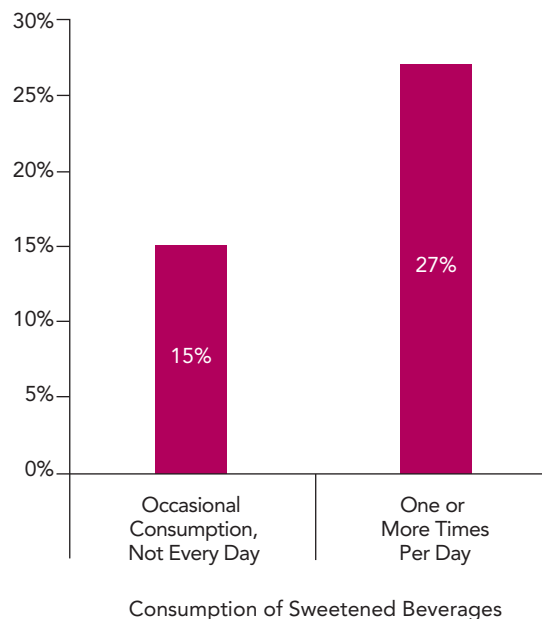
Among adolescents, the association between soda consumption and overweight is not independent of poverty status and race/ethnicity. This may be partially due to the relatively small sample size for adolescents compared to adults. Compared to white adolescents, African-American and Latino adolescents are more likely to consume soda daily, while Asian adolescents are less likely. Adolescents from lower-income families are more likely to drink soda every day compared to adolescents from higher-income families.

### Soda Consumption Varies from Place to Place in California

Trends in soda consumption and obesity may be influenced by social and environmental factors. For example, the food environment, including the presence of fast-food outlets, convenience stores, grocery stores and other food vendors, has an impact on health and dietary choices of the local population.<sup>32-34</sup> A recent study by the California Center for Public Health Advocacy showed that California has more than four times as many fast-food restaurants and convenience stores as grocery stores and produce vendors—suggesting that Californians have greater access to foods with lower nutritional values than to healthier foods.<sup>35</sup> Moreover, this food environment has been linked to the prevalence of obesity and diabetes among California adults.<sup>32</sup>

### Increased Likelihood of Being Overweight or Obese for Those Who Drink Sodas Compared to Those Who Do Not, Adjusted for Race/Ethnicity and Income, Adults Age 18 and Over, California, 2005

Exhibit 1



Source: 2005 California Health Interview Survey

At the same time, soda consumption is associated with the use of fast-food restaurants among adolescents, and there is wide variation in the relative availability of fast-food restaurants in California communities.<sup>32, 36, 37</sup>

Findings from CHIS 2005 show that there are major geographic differences in soda consumption in California (Exhibit 2). The percent of children drinking at least one soda each day ranges from 18% in Marin County to 61% in Imperial County. Among adolescents, the percent drinking one or more sodas each day ranges from 39% in Mendocino County to 78% in San Joaquin County. Among adults, the percent drinking one or more sodas each day ranges from just 11% in Marin County to 39% in Kings County.

Soda consumption also varies considerably among cities and census designated places (Exhibit 3). Among children and adolescents ages 2-17, the percent drinking at least one

## Exhibit 2

## Percent Drinking One or More Sodas per Day by County or County Group, Children, Adolescents and Adults, California, 2005

	Children Ages 2–11	Adolescents Ages 12–17	Adults Age 18 and Over
	One or More Sodas %	One or More Sodas %	One or More Sodas %
<b>California</b>	<b>41.2</b>	<b>62.2</b>	<b>24.3</b>
Alameda	31.0	58.9	17.4
Butte	30.4	61.8	20.3
Contra Costa	40.7	47.2	21.2
Del Norte, Siskiyou, Lassen, Trinity, Modoc, Plumas, Sierra	24.5	63.0	20.8
El Dorado	31.8	55.3	21.6
Fresno	53.1	68.7	35.0
Humboldt	33.2	50.3	16.4
Imperial	60.7	61.2	36.4
Kern	55.0	67.2	36.6
Kings	57.2	57.7	39.1
Lake	31.6	62.8	30.1
Los Angeles	44.3	64.9	25.5
Madera	39.9	75.3	37.4
Marin	18.4	41.3	10.6
Mendocino	38.1	39.0	18.8
Merced	55.4	*	32.7
Monterey	32.8	58.1	27.1
Napa	41.5	56.8	27.3
Nevada	25.6	40.9	17.5
Orange	36.9	56.4	23.4
Placer	31.5	66.2	18.4
Riverside	40.6	69.5	29.5
Sacramento	35.4	55.5	23.6
San Benito	26.4	58.9	25.6
San Bernardino	49.6	68.5	29.6
San Diego	34.8	63.1	21.1
San Francisco	21.5	42.1	10.9
San Joaquin	44.2	77.8	26.6
San Luis Obispo	41.7	66.8	18.3
San Mateo	32.5	50.1	14.4
Santa Barbara	39.8	53.8	19.0
Santa Clara	40.9	48.2	21.1
Santa Cruz	41.4	56.0	15.5
Shasta	32.0	60.0	27.5
Solano	45.2	58.7	26.1
Sonoma	42.0	60.7	20.7
Stanislaus	47.5	*	34.3
Sutter	44.5	*	29.2
Tehama, Glenn, Colusa	36.8	*	30.1
Tuolumne, Calaveras, Amador, Inyo, Mariposa, Mono, Alpine	35.0	*	17.3
Tulare	44.2	71.0	36.1
Ventura	39.0	60.4	24.8
Yolo	37.3	62.4	13.9
Yuba	50.5	62.9	30.9

## Note:

\* Indicates the estimate was not statistically reliable. Not all differences between rates are statistically significant. The 95% confidence intervals are available at: [http://www.healthpolicy.ucla.edu/soda\\_consumption.html](http://www.healthpolicy.ucla.edu/soda_consumption.html)

Source: 2005 California Health Interview Survey

Percent Drinking One or More Sodas per Day by Cities and Census Designated Places,  
California, 2005

Exhibit 3

	Children and Adolescents Ages 2–17 %	Adults Age 18 and Over %		Children and Adolescents Ages 2–17 %	Adults Age 18 and Over %
<b>California</b>	<b>49.4</b>	<b>24.3</b>	Mission Viejo	43.3	18.0
Anaheim	45.4	26.5	Modesto	57.0	31.8
Antioch	44.8	21.9	Moreno Valley	55.4	33.7
Bakersfield	60.1	33.9	Murrieta	49.7	26.5
Baldwin Park	52.2	29.0	Norwalk	51.5	31.0
Bellflower	51.3	30.9	Oakland	44.1	20.6
Buena Park	44.0	24.5	Oceanside	47.7	20.8
Burbank	48.3	19.6	Ontario	57.7	32.9
Carlsbad	43.5	16.3	Orange	46.0	22.6
Carson	52.7	25.0	Oxnard	50.6	30.0
Chino	56.3	31.2	Palmdale	54.9	32.1
Chino Hills	52.4	22.2	Pasadena	54.2	22.9
Chula Vista	46.2	23.1	Pomona	56.6	29.5
Citrus Heights	39.4	21.9	Rancho Cucamonga	54.6	26.0
Clovis	53.8	27.0	Redding	44.2	25.3
Compton	54.7	33.2	Rialto	59.4	32.8
Concord	44.2	21.5	Richmond	46.1	28.4
Corona	50.7	29.6	Riverside	49.8	31.7
Costa Mesa	43.5	25.0	Roseville	43.6	16.4
Daly City	38.3	13.7	Sacramento	44.3	25.4
Downey	51.4	29.6	Salinas	46.9	28.9
East Los Angeles *	53.3	38.4	San Bernardino	58.6	32.7
El Cajon	47.6	22.2	San Buenaventura (Ventura)	46.6	22.3
El Monte	51.8	29.2	San Diego	46.2	22.8
Elk Grove *	43.3	21.2	San Francisco	36.9	11.5
Escondido	48.1	22.6	San Jose	42.8	21.7
Fairfield	47.0	26.5	Santa Ana	47.3	33.2
Florence-Graham *	54.2	36.5	Santa Clara	40.6	19.2
Fontana	57.5	31.9	Santa Clarita	49.9	20.6
Fremont	38.0	14.1	Santa Maria	48.3	24.1
Fresno	57.4	33.5	Santa Rosa	45.4	19.7
Fullerton	44.0	23.6	Simi Valley	44.0	20.5
Garden Grove	43.9	24.0	Southgate	52.9	36.8
Glendale	47.6	19.6	Stockton	57.3	28.1
Hawthorne	53.2	31.4	Sunnyvale	39.8	18.7
Hayward	41.3	18.4	Temecula	47.8	28.2
Hesperia	55.5	27.2	Thousand Oaks	43.8	19.8
Huntington Beach	40.7	20.7	Torrance	46.0	18.9
Indio	55.6	37.5	Tracy	56.9	24.9
Inglewood	55.0	32.6	Vacaville	45.4	25.4
Irvine	43.6	19.5	Vallejo	48.8	25.7
Lancaster	54.8	30.7	Victorville	57.0	29.2
Livermore	41.1	15.1	Visalia	56.3	30.8
Long Beach	51.5	27.2	Vista	48.8	23.8
Los Angeles	51.9	24.8	West Covina	50.4	21.6
Lynwood	53.5	33.3	Westminster	42.8	22.4
Merced	61.9	33.3			

Note:

\* Indicates a Census Designated Place. Census designated places are communities that lack separate governments but otherwise resemble incorporated places such as cities. This table includes only cities in which the combined population of children and adolescents ages 2-17 was at least 20,000. Not all differences between rates are statistically significant. The 95% confidence intervals are available at: [http://www.healthpolicy.ucla.edu/soda\\_consumption.html](http://www.healthpolicy.ucla.edu/soda_consumption.html)

Source: 2005 California Health Interview Survey



soda per day ranged from 37% in San Francisco to 62% in Merced. Among adults, the percent drinking at least one soda per day ranged from 12% in San Francisco to 38% in East Los Angeles.

### Conclusions

In California, 62% of adolescents ages 12-17 and 41% of children ages 2-11 drink at least one soda or other sweetened beverage every day. In addition, nearly one out of four adults (24%) drink soda every day and 36% drink soda occasionally. This amounts to 10.7 million Californians over the age of one who drink at least one soda each day. This soda consumption greatly increases the amount of added sugar and other caloric sweeteners in the diet of Californians without contributing substantially to the nutritional needs of the population.

For both adults and adolescents, the prevalence of overweight and obesity is higher among those who drink one or more sodas or other sweetened beverages every day than among those who do not. Among adults, even after adjusting for race and household income, those who drink one or more sodas each day are 27% more likely to be overweight or obese than adults who do not drink soda. These findings are consistent with other research.<sup>38</sup> Additionally, childhood eating habits and weight status are important determinants of health as adults.<sup>7, 29, 30</sup> Taken together, these findings suggest a number of potential benefits from reducing soft drink consumption including reduced risk of obesity, improved dietary intake and reduced risk of diabetes.

### Data Source and Methods

This policy brief examines geographical variation in soda consumption among children, adolescents and adults in California as well as its association with overweight and obesity among adults and adolescents using data from the 2005 California Health Interview Survey (CHIS 2005). All statements in this report that compare rates for one group with another group reflect statistically significant differences ( $p < 0.05$ ) unless otherwise noted. CHIS 2005 completed interviews with over 4,000 adolescents and over 43,000 adults, drawn from every county in the state, in English, Spanish, Chinese (both Mandarin and Cantonese),

Vietnamese and Korean. The California Health Interview Survey is a collaboration of the UCLA Center for Health Policy Research, California Department of Public Health, the California Department of Health Care Services and the Public Health Institute. Funding for the CHIS 2005 statewide survey was provided by the California Department of Health Care Services, The California Endowment, the National Cancer Institute, The Robert Wood Johnson Foundation, the California Children and Families Commission, the California Office of the Patient Advocate, the California Department of Mental Health, the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente. For local funders and other information on CHIS, visit [www.chis.ucla.edu](http://www.chis.ucla.edu).

In adults, overweight is defined as a Body Mass Index (BMI) between 25 and 30, while obesity is defined as BMI of 30 or greater. Among adolescents, overweight is defined as having a BMI between the 85th and 95th percentile on the Centers for Disease Control and Prevention's BMI-for-age growth charts, while obesity is defined as having a BMI above the 95th percentile.<sup>39</sup>

Adults and adolescents self-reported their consumption of soda and other sweetened beverages. Adults were asked the following two questions: "During the past month, how many times (per day, per week or per month) did you drink soda such as Coke or 7-Up? Do not include diet soda." and "How many times did you drink fruit-flavored drinks such as lemonade or Sunny Delight? Do not include diet drinks." Responses to these questions were combined and converted to a common metric to estimate daily consumption of soda and other sweetened beverages. Adolescents were asked: "Yesterday, how many glasses or cans of soda such as Coke, or other sweetened drinks such as fruit punch or Sunny Delight did you drink? Do not count diet drinks." For children ages 2-11, the most knowledgeable parent or guardian responded to the following question: "Yesterday, how many glasses or cans of soda such as Coke or other sweetened drinks such as fruit punch or Sunny Delight did (he/she) drink? Do not count diet drinks." For all respondents, consumption of 100% fruit juice was reported in a previous question and is not included in our estimates of sweetened beverage consumption.

We used small-area estimation to generate model-based estimates of the proportion of adults and children who consume one or more sodas per day for each city.<sup>40, 41</sup> Small-area estimation uses modeling to produce estimates for small geographic areas, such as cities, for which there is not sufficient sample to produce direct estimates. The models are based on

individual-level demographic and health outcome data from CHIS 2005 as well as demographic data at the census block group level from the Census and Claritas Inc. To maximize the reliability and validity of the estimates, we present only estimates for cities with a population of at least 20,000 for the age group being modeled. For more information about small-area estimation methodology, see: Yu H, Meng YY, Mendez-Luck CA, Jhavar M, Wallace SP. *Small-Area Estimation of Health Insurance Coverage for California Legislative Districts*.

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