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**Authors**

Babey, Susan H

Wolstein, Joelle

Diamant, Allison L

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## Food Environments Near Home and School Related to Consumption of Soda and Fast Food

Susan H. Babey, Joelle Wolstein and Allison L. Diamant

**SUMMARY:** In California, more than 2 million adolescents (58%) drink soda or other sugar-sweetened beverages every day, and more than 1.6 million adolescents (46%) eat fast food at least twice a week. Adolescents who live and go to school in areas with more fast food restaurants and convenience stores than

healthier food outlets such as grocery stores are more likely to consume soda and fast food than teens who live and go to school in areas with healthier food environments. State and local policy efforts to improve the retail food environment may be effective in improving adolescents' dietary behaviors.

*“More than half of all California teens drink a sugar-sweetened beverage daily.”*

Consumption of both sugar-sweetened beverages and fast food has increased considerably since the 1970s. Between 1977 and 2002 Americans increased their caloric intake from soft drinks by 228%.<sup>1</sup> Likewise, consumption of fast food has increased substantially since 1977.<sup>2</sup> Consumption of both sugar-sweetened beverages and fast food is linked with greater caloric intake, and the increased intake of these items may have contributed to the rise in obesity rates.<sup>3</sup> Furthermore, consumption of both sugar-sweetened beverages and fast food has been associated with decreased intake of more nutritious foods, such as milk, fruits and vegetables. Eating these more nutritious foods can help reduce the risk of developing chronic health conditions, such as diabetes and cardiovascular disease.<sup>4</sup>

and weight status or the association of the food environment near school with diet and weight status. Studies have found less healthy food environments are associated with poor diet quality and a higher prevalence of obesity compared to healthier food environments.<sup>5</sup>

This policy brief examines the retail food environment near where adolescents live and go to school and its relationship to the consumption of fast food, soda and other sugar-sweetened beverages. The findings presented are based on data from the 2007 California Health Interview Survey (CHIS 2007) and the 2007 InfoUSA business file. This policy brief also presents county-by-county variation in consumption of sugar-sweetened beverages and fast food, as well as differences in the home and school retail food environment.

Increasingly, research suggests that the retail food environment is associated with dietary behaviors and health outcomes. Previous research has examined either the association of the food environment near home with diet

### Home and School Retail Food Environment

To examine the relationship between the food environment near home and school and consumption of fast food and sugar-sweetened beverages, we constructed a Home and School

## The Home and School Retail Food Environment Index

$$\text{HSRFEI} = \frac{\# \text{ Fast Food Restaurants} + \# \text{ Convenience Stores} + \# \text{ Liquor Stores} + \# \text{ Dollar Stores} + \# \text{ Pharmacies}}{\# \text{ Grocery Stores} + \# \text{ Warehouse Stores} + \# \text{ Produce Vendors}}$$

The Home and School Retail Food Environment Index (HSRFEI) is constructed by dividing the number of fast food restaurants, convenience stores (including gas stations with convenience stores), liquor stores, dollar stores and pharmacies by the number of grocery stores (including supermarkets), warehouse stores and produce vendors (including produce stores and farmer's markets) within 0.5 miles of the adolescent's school and within a given radius around their home (one mile in urban areas, two miles in smaller cities and suburban areas and five miles in rural areas).

The HSRFEI is an indicator of the density of food outlets that are less likely to carry healthy foods, such as fresh produce, relative to those that are more likely to have such healthy options available. Cut-offs of 5.0 and 8.0 were selected to provide sufficient sample size to support descriptive analyses using the HSRFEI. Although an HSRFEI of less than 5.0 represents a healthier food environment relative to an HSRFEI of 8.0 and above, it does not necessarily represent the optimal mix of food outlets for a community.

*“Nearly 75% of California teens live and go to school in less healthy food environments.”*

Retail Food Environment Index (HSRFEI). See Definitions Box and Data Source and Methods for more detail. This study builds on the methods used in *Designed for Disease: The Link between Local Food Environments and Obesity and Diabetes*.<sup>6</sup> The HSRFEI is an indicator of the density of food outlets that are less likely to offer healthy foods, relative to those more likely to have healthy options available, such as fresh produce. Throughout the brief, we refer to food environments with a higher HSRFEI number as less healthy food environments and those with a lower index number as healthier food environments.

The average HSRFEI for California adolescents is 7.9, meaning the average California teen has more than seven times as many fast food restaurants, convenience stores, liquor stores, dollar stores and pharmacies near home and school as they do grocery stores, warehouse stores and produce vendors. Nearly 75% of California teens live and go to school in less healthy food environments (HSRFEI of at least 5.0), while only 21% do so in healthier food environments (HSRFEI of less than 5.0).

**Home and School Food Environment Associated with Consumption of Soda and Fast Food**

*Soda and Other Sugar-Sweetened Beverages*

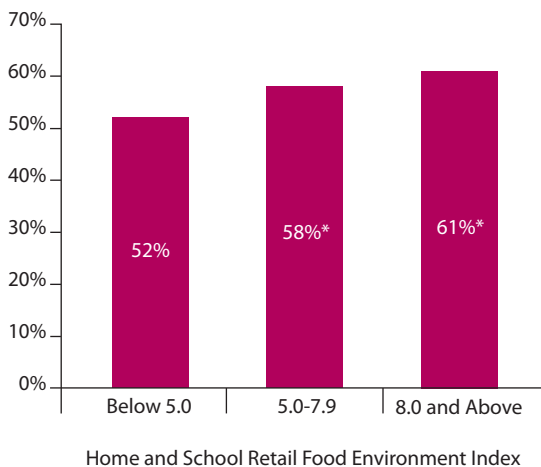
In California, more than 2 million teens (58%) drink at least one soda or other sugar-sweetened beverage every day, including 10% who drink three or more each day. Soda consumption is highest among California teens with the least healthy food environments near their home and school. The prevalence of daily soda consumption is 17% higher among teens with an HSRFEI equal to or greater than 8.0 than it is among teens with an HSRFEI below 5.0 (61% vs. 52%, respectively; Exhibit 1). Even when adjusting for age, gender, race and income, teens in areas with a higher HSRFEI are more likely to drink soda or other sugar-sweetened beverages than those in areas with a lower HSRFEI.

*Fast Food*

More than 1.6 million California teens (46%) eat fast food at least two times per week, including 13% who eat fast food four or more times per week. Adolescents with the least healthy food environments near their home and school have the highest fast food consumption. The prevalence of eating fast food at least twice a week is 18% higher among teens with an HSRFEI of 8.0 and above than it is among teens with an HSRFEI below 5.0 (52% vs. 44%, respectively; Exhibit 2). Even when adjusting for age, gender, race and income, teens in areas with a higher HSRFEI are more likely to consume fast food at least twice per week than those in areas with a lower HSRFEI.

**Percent Drinking One or More Sodas and Other Sugar-Sweetened Beverages Per Day by Home and School Retail Food Environment Index, Adolescents Ages 12-17, California, 2007**

**Exhibit 1**

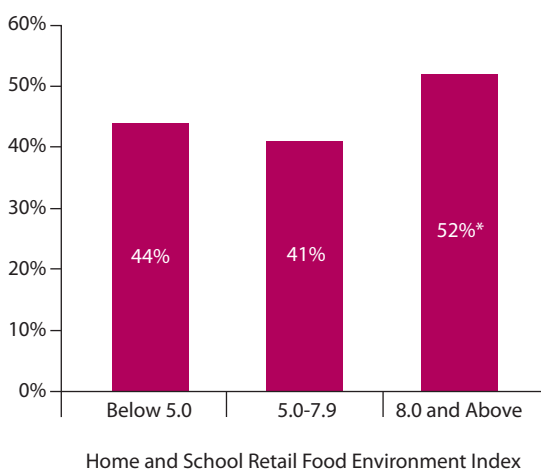


\* Significantly different from *Below 5.0*, p<0.05.

Source: 2007 California Health Interview Survey and 2007 InfoUSA Business File

**Percent Eating Fast Food at Least Twice a Week by Home and School Retail Food Environment Index, Adolescents Ages 12-17, California, 2007**

**Exhibit 2**



\* Significantly different from *Below 5.0*, p<0.05.

Source: 2007 California Health Interview Survey and 2007 InfoUSA Business File

## Exhibit 3

## Home and School Retail Food Environment Index, Consumption of Soda and Other Sugar-Sweetened Beverages and Fast Food by County or County Group, California, 2007

	Home and School Retail Food Environment Index		Drinks One or More Sodas per Day		Eats Fast Food At Least Twice per Week	
	Average	95% CI	%	95% CI	%	95% CI
<b>Northern and Sierra Counties</b>	<b>5.2</b>	<b>(4.7 - 5.7)</b>	<b>53</b>	<b>(46 - 59)</b>	<b>34</b>	<b>(28 - 40)</b>
Butte	5.8	(4.7 - 6.8)	54	(34 - 74)	35	(17 - 54)
Shasta	5.4	(4.5 - 6.3)	61	(45 - 78)	30	(14 - 45)
Humboldt	3.1	(2.5 - 3.8)	49	(32 - 66)	31	(15 - 47)
Del Norte, Siskiyou, Lassen, Trinity, Modoc, Plumas, Sierra	4.0	(2.7 - 5.3)	57	(36 - 78)	–	–
Mendocino	3.5	(2.9 - 4.1)	41	(23 - 60)	34	(15 - 52)
Lake	6.2	(4.9 - 7.5)	55	(35 - 74)	–	–
Tehama, Glenn, Colusa	4.4	(3.2 - 5.6)	63	(42 - 84)	37	(17 - 58)
Sutter	10.3	(8.6 - 12.1)	72	(58 - 86)	45	(28 - 62)
Yuba	7.9	(4.7 - 11.1)	39	(19 - 58)	41	(21 - 61)
Nevada	2.7	(2.4 - 3.1)	41	(21 - 61)	–	–
Tuolumne, Calaveras, Amador, Inyo, Mariposa, Mono, Alpine	5.3	(2.3 - 8.2)	–	–	–	–
<b>Greater Bay Area</b>	<b>7.3</b>	<b>(6.7 - 7.9)</b>	<b>50</b>	<b>(44 - 55)</b>	<b>39</b>	<b>(34 - 45)</b>
Santa Clara	8.7	(7.0 - 10.3)	54	(42 - 66)	46	(34 - 58)
Alameda	7.3	(6.1 - 8.5)	56	(44 - 69)	36	(24 - 49)
Contra Costa	7.3	(6.4 - 8.3)	40	(26 - 53)	40	(26 - 53)
San Francisco	6.0	(5.3 - 6.8)	53	(27 - 80)	–	–
San Mateo	5.5	(4.3 - 6.7)	46	(30 - 63)	39	(23 - 55)
Sonoma	5.1	(3.8 - 6.4)	38	(19 - 56)	–	–
Solano	9.7	(8.4 - 10.9)	54	(36 - 72)	40	(22 - 58)
Marin	5.6	(4.4 - 6.9)	47	(27 - 67)	–	–
Napa	4.0	(3.4 - 4.6)	51	(33 - 69)	39	(21 - 57)
<b>Sacramento Area</b>	<b>9.3</b>	<b>(7.9 - 10.6)</b>	<b>53</b>	<b>(44 - 62)</b>	<b>46</b>	<b>(37 - 56)</b>
Sacramento	10.2	(8.3 - 12.0)	53	(41 - 66)	49	(36 - 61)
Placer	8.4	(6.5 - 10.3)	52	(35 - 69)	49	(32 - 67)
Yolo	6.8	(4.5 - 9.1)	52	(35 - 70)	35	(17 - 52)
El Dorado	5.5	(4.8 - 6.1)	57	(42 - 72)	34	(20 - 48)
<b>San Joaquin Valley</b>	<b>8.3</b>	<b>(7.7 - 8.8)</b>	<b>66</b>	<b>(60 - 73)</b>	<b>52</b>	<b>(46 - 59)</b>
Fresno	8.0	(7.0 - 9.1)	77	(65 - 88)	54	(39 - 69)
Kern	9.8	(8.3 - 11.4)	58	(42 - 74)	65	(50 - 79)
San Joaquin	6.2	(5.3 - 7.1)	61	(42 - 81)	48	(29 - 67)
Stanislaus	9.4	(8.2 - 10.5)	51	(35 - 67)	46	(30 - 62)
Tulare	8.6	(7.1 - 10.1)	–	–	57	(41 - 74)
Merced	7.6	(6.5 - 8.7)	74	(60 - 89)	38	(21 - 55)
Kings	8.3	(7.4 - 9.3)	–	–	38	(21 - 55)
Madera	5.3	(4.4 - 6.3)	64	(47 - 81)	41	(22 - 59)
<b>Central Coast</b>	<b>5.1</b>	<b>(4.8 - 5.4)</b>	<b>56</b>	<b>(48 - 64)</b>	<b>47</b>	<b>(39 - 55)</b>
Ventura	6.4	(5.7 - 7.0)	64	(51 - 77)	59	(46 - 73)
Santa Barbara	5.1	(4.5 - 5.8)	52	(33 - 72)	40	(21 - 59)
Santa Cruz	3.9	(3.4 - 4.4)	45	(26 - 65)	36	(18 - 54)
San Luis Obispo	4.5	(4.0 - 4.9)	47	(29 - 65)	32	(16 - 49)
Monterey	3.6	(3.2 - 3.9)	52	(31 - 72)	41	(20 - 62)
San Benito	3.5	(3.2 - 3.8)	71	(57 - 86)	47	(30 - 63)
<b>Los Angeles</b>	<b>8.5</b>	<b>(8.0 - 9.1)</b>	<b>58</b>	<b>(54 - 63)</b>	<b>45</b>	<b>(40 - 50)</b>
Los Angeles	8.5	(8.0 - 9.1)	58	(54 - 63)	45	(40 - 50)
<b>Other Southern California</b>	<b>8.1</b>	<b>(7.8 - 8.4)</b>	<b>59</b>	<b>(55 - 64)</b>	<b>49</b>	<b>(45 - 53)</b>
Orange	8.8	(8.1 - 9.6)	57	(48 - 66)	45	(36 - 54)
San Diego	6.7	(6.2 - 7.2)	58	(52 - 65)	47	(40 - 53)
San Bernardino	8.9	(8.1 - 9.7)	62	(52 - 72)	49	(38 - 59)
Riverside	8.4	(7.8 - 9.0)	61	(51 - 72)	58	(48 - 68)
Imperial	4.2	(3.7 - 4.7)	70	(55 - 84)	48	(32 - 63)
<b>California</b>	<b>7.9</b>	<b>(7.7 - 8.1)</b>	<b>58</b>	<b>(55 - 60)</b>	<b>46</b>	<b>(43 - 48)</b>

Note: The 95% Confidence Interval (CI) is a range that provides a more reliable estimate compared to the *point estimate*. It should be noted that counties with different estimates are not necessarily significantly different from one another.

– Indicates the estimate for that county was not statistically reliable.

Source: 2007 California Health Interview Survey and 2007 InfoUSA Business File

### Home and School Retail Food Environment, Soda and Fast Food Consumption Vary from County to County

Trends in soda and fast food consumption may be influenced by social, economic and environmental factors, including the availability of fast food outlets, convenience stores and other types of food outlets. There is wide variation from county to county in the relative availability of healthy food outlets near where adolescents live and go to school. In Nevada, Humboldt, Mendocino, San Benito, Santa Cruz and Monterey counties, the average HSRFEI for adolescents is below 4.0 (representing relatively healthier food environments), but it is above 9.5 in Kern, Solano, Sutter and Sacramento counties (Exhibit 3).

There is also considerable geographic variation in the consumption of soda and other sugar-sweetened beverages and fast food across California counties. In Sonoma, Yuba, Contra Costa, Mendocino and Nevada counties, less than 45% of teens consume at least one soda per day. However, in San Benito, Sutter, Merced and Fresno counties, more than 70% of teens consume at least one soda per day. In Shasta, Humboldt, San Luis Obispo, Mendocino and El Dorado counties, less than 35% of teens consume fast food at least twice per week. But more than 55% of teens in Tulare, Riverside, Ventura and Kern counties eat fast food at least twice per week. It should be noted that there is likely to be considerable variation in the food environment and in consumption patterns within a county as well as between counties.

### Conclusions and Policy Recommendations

In California, more than half of adolescents (58%) drink at least one soda or other sugar-sweetened beverage every day, and nearly half (46%) eat fast food at least twice a week. Adolescents who live and go to school in areas with less healthy food environments are more likely to consume soda and fast food than teens who live and go to school in areas with healthier food environments. Living in areas with less healthy food environments has also been linked with higher rates of obesity and diabetes.<sup>6</sup> The existing research supports efforts to enhance the local food environment by increasing the relative availability of food outlets more likely to offer healthy options. Such efforts may prove effective in improving dietary behaviors and combating obesity.

Policymakers should consider the following options to promote healthy food environments by increasing the availability of affordable healthy foods:

- **Increase the presence of farmer's markets, food cooperatives and community gardens.** The number of farmer's markets in the state of California has increased over the past few years, making fresh produce more accessible throughout the state. However, many areas lack access to farmer's markets and other sources of fresh produce. Local governments should work with community groups to bring farmer's markets, food cooperatives and community gardens to underserved areas and low-income communities. For example, some communities have instituted innovative programs such as mini farmer's markets to increase access to fresh produce. In addition, vacant city-owned land and unused parking lots can be converted to community gardens or used as sites for farmer's markets.

*“Policymakers should help bring fresh and healthy food into underserved communities.”*

- **Encourage the development of farm to institution programs.** Programs that make fresh food available at schools, worksites, hospitals and other facilities can be an important and convenient source of healthy food for families. Local governments can partner with organizations promoting sustainable, local agriculture to develop these sorts of programs. For example, with the California Farm to School Program, a number of school districts are taking advantage of California's year-round production of fruits and vegetables by working with local farms to make fresh produce available in schools.
- **Develop and provide incentives to attract grocery stores and improve foods available in existing stores.** Neighborhoods and local government agencies have been working with grocery chains and wholesalers to attract businesses to areas with a relative paucity of nutritious food options. This process should continue and expand. In addition, training and incentives provided to small business owners can help these existing stores carry healthier food items, including fresh produce.
- **Consider zoning and land use policies that improve food environments near schools and in underserved communities.** The California Obesity Prevention Plan suggests that local governments can implement land-use policies and zoning to limit fast food establishments near schools and playgrounds as a strategy to improve access to healthy food.<sup>7</sup> Focusing on underserved communities is also important as low-income neighborhoods and communities of color often have worse food environments than more affluent areas. Some cities and neighborhoods, such as South Los Angeles

*“Limit fast food outlets near schools and playgrounds.”*

and Fresno, have implemented zoning changes to limit the density of fast food venues and to facilitate the establishment of farmer's markets. Local governments should work with community members to determine the appropriate balance of retailers for their community to support community health while providing economic opportunity.

### Data Source and Methods

The findings in this brief are based primarily on data from the 2007 California Health Interview Survey (CHIS 2007). All statements in this report that compare rates for one group to another group reflect statistically significant differences ( $p < 0.05$ ) unless otherwise noted. Using Geographic Information System (GIS) software, we linked CHIS 2007 data with the locations of retail food outlets from the 2007 InfoUSA business file. For each adolescent CHIS respondent, we determined the number of fast food restaurants, convenience stores (including those in gas stations), liquor stores, dollar stores, pharmacies, grocery stores (including supermarkets and warehouse stores) and produce vendors (including produce stores and farmer's markets) within 0.5 miles of their school and within a given radius around their home (one mile in urban areas, two miles in smaller cities and suburban areas, and five miles in rural areas). Buffers around home and school were drawn simultaneously to ensure that each store was only counted once in cases where the home and school buffers overlapped. We then calculated a Home and School Retail Food Environment Index (HSRFEI) by dividing the number of fast food restaurants, convenience stores (including gas stations with convenience stores), liquor stores and dollar stores by the number of grocery stores (including supermarkets and warehouse stores) and produce vendors (including produce stores and farmer's markets). It should be noted that values for the HSRFEI will be higher than values for the original Retail Food Environment Index as the HSRFEI includes more types of food outlets in the numerator than the original RFEI, and the HSRFEI incorporates the food environment around schools as well as home.

Approximately 3.7% of California teens have no grocery or warehouse stores or produce vendors within a half-mile of their school or within the specified distance from their home address. The HSRFEI cannot be calculated for these individuals. We maintained a separate category for cases where the HSRFEI could not be calculated, however results for this category are not presented in this policy brief. Estimates of consumption of soda and other sugar-sweetened beverages are based on adolescent responses to the question “Yesterday, how many glasses or cans of soda such as Coke, or other sweetened drinks such as fruit punch or sports drinks did you drink? Do not count diet drinks.” Fast food consumption is based on adolescent responses to the question “In the past week, how many times did you eat fast food? Include fast food meals eaten at school, at home or at fast food restaurants, carryout, or drive thru.”

CHIS 2007 completed interviews for over 50,000 households including interviews with 3,638 adolescents, 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, the California Department of Public Health, the California Department of Health Care Services and the Public Health Institute. For funders and other information on CHIS, visit [www.chis.ucla.edu](http://www.chis.ucla.edu).

### Author Information

Susan H. Babey, PhD, is a senior research scientist at the UCLA Center for Health Policy Research. Joelle Wolstein, MPP, is a graduate student researcher at the UCLA Center for Health Policy Research and doctoral student in the UCLA School of Public Health, Department of Health Services. Allison L. Diamant, MD, MSHS, is an associate professor in the Division of General Internal Medicine and Health Services Research at the David Geffen School of Medicine at UCLA.

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### Endnotes

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This publication contains data from the California Health Interview Survey (CHIS), the nation's largest state health survey. Conducted by the UCLA Center for Health Policy Research, CHIS data give a detailed picture of the health and health care needs of California's large and diverse population. Learn more at: [www.chis.ucla.edu](http://www.chis.ucla.edu)



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Phone: 310-794-0909  
Fax: 310-794-2686  
Email: [chpr@ucla.edu](mailto:chpr@ucla.edu)  
[www.healthpolicy.ucla.edu](http://www.healthpolicy.ucla.edu)



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