

# Solid Fat and Added Sugar Intake Among U.S. Children

## The Role of Stores, Schools, and Fast Food from 1994 to 2010

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### Appendix A

For all surveys, each food was recorded as consumed using a discrete food code. Modification codes were used to indicate modifications that alter the nutrient content of a food code, such as addition of fat during cooking. Calorie, total fat, and total sugar content of each food code–modification code combination was obtained from the Survey Nutrient Database for the Continuing Survey of Food Intakes by Individuals (CSFII) 1994–1998 and from the Food and Nutrient Database for Dietary Studies (FNDDS) for the National Health and Nutrition Examination Survey (NHANES) 2003–2004 (FNDDS 2.0); NHANES 2005–2006 (FNDDS 3.0); NHANES 2007–2008 (FNDDS 4.1); and NHANES 2009–2010 (FNDDS 5.0).<sup>1,2</sup>

Food codes reported in CSFII 1994–1998 were directly linked to the MyPyramid Equivalents Database (MPED), version 1.0, while those reported in NHANES 2003–2004 were directly linked to MPED, version 2.0. An updated MPED that directly links to NHANES 2005–2010 has not been released by the U.S. Department of Agriculture (USDA). However, the majority of food codes used in 2003–2004 were retained in subsequent surveys (92% in 2005–2008, 89% in 2009–2010); therefore, solid fat and added sugar (SoFAS) content was obtained from directly linking these food codes to MPED, version 2.0.

Instead of directly using MPED added sugar and solid fat, the MPED values were adjusted using up-to-date total fat and total sugar content from FNDDS specific for 2005–2010. For these exact foodcode matches, MPED, version 2.0 was used to calculate the ratio of solid fat to total fat and the ratio of added sugar to total sugar. These ratios were applied to the FNDDS total fat and total sugar content for these food codes in 2005–2010. This method allows more accurate estimation of SoFAS that incorporates FNDDS updates to total fat and total sugar information, which reflect changes in the food supply from 2003 to 2010.

Food codes that were newly introduced in NHANES 2005–2006 and 2007–2008 have exact SoFAS content provided by The Center for Nutrition Policy and Promotion’s MPED 2.0 Addendum, which uses USDA’s methodology (8% of reported food codes in 2005–2008 and 9% in 2009–2010).<sup>36</sup> Of the 69 food code–modification code combinations that were newly introduced in NHANES 2009–2010, a total of 44 were matched to items with similar food codes and food descriptions. As an example, “CASHEW NUTS, DRY ROASTED, WITHOUT SALT” was newly introduced in 2009–2010 and was matched to “CASHEW NUTS, DRY ROASTED” in MPED. For the remaining 25 food code–modification code combinations, matches could not be found.

Of the 3425 food code–modification code combinations reported by children on Day 1 in 2005–2008, 3158 had direct matches to MPED, and 267 were included in the MPED Addendum. Of the 2656 unique food code–modification code combinations reported by children on Day 1 in 2009–2010, the majority were an exact match to MPED (2351) or the Addendum (236); 44 were estimated from similar food codes (consumed by 505 children); and 25 could not be estimated (consumed by 29 children). Thus, children consuming these unmatched foods ( $n=29$ ) were excluded from the final analytic sample for this study. Of these excluded children, 23 were store consumers only, three were store and fast-food consumers, and three were store and school food consumers.

Solid fat and added sugar quantities from MPED were converted into total energy from SoFAS by applying conversion factors of 9 kcal/g for solid fat and 16 kcal/tsp for added sugar. These estimations were used in previous analysis of SoFAS consumption by location using data from NHANES 2009–2010 (unpublished observations, 2013). Sensitivity analyses were performed that (1) did not exclude children who consumed items that could not be directly matched to MPED or the MPED Addendum, but instead excluded those specific food items; and (2) did not use ratios to adjust MPED added sugar and solid fat; estimates were robust to these methods and conclusions did not differ (unpublished observations, 2013).

## References for Appendix A

1. U.S. Department of Agriculture, Agricultural Research Service. Food Survey Technical Databases. [www.ars.usda.gov/Services/docs.htm?docid=7826](http://www.ars.usda.gov/Services/docs.htm?docid=7826).
2. U.S. Department of Agriculture (USDA), Agricultural Research Service. USDA Food and Nutrient Database for Dietary Studies. [www.ars.usda.gov/services/docs.htm?docid=12089](http://www.ars.usda.gov/services/docs.htm?docid=12089).

## Appendix B

Sociodemographic characteristics of consumers of foods from each location among U.S. children aged 2–18 years, 1994–2010, % unless otherwise noted

	Store food consumers					School food consumers					Fast-food consumers				
	1994–1998	2003–2004	2005–2006	2007–2008	2009–2010	1994–1998	2003–2004	2005–2006	2007–2008	2009–2010	1994–1998	2003–2004	2005–2006	2007–2008	2009–2010
<b>n (%)<sup>a</sup></b>															
Any consumption <sup>b</sup>	8649 (97.8)	3478 (98.7)	3683 (98.9)	2906 (98.6)	3040 (98.9)	1873 (26.8)	701 (22.3)	828 (21.2)	717 (24.9)	697 (24.3)	2296 (28.9)	1400 (38.3)	1494 (36.3)	1036 (32.6)	1035 (31.6)
Milk <sup>c</sup>	6433 (65.1)	1927 (62.4)	2044 (60.3)	1693 (59.0)	1800 (59.9)	1394 (72.6)	446 (67.2)	518 (68.0)	495 (67.9)	512 (74.2)	91 (2.8)	12 (1.0)	28 (3.3)	28 (4.4)	30 (3.1)
Pizza	384 (4.5)	145 (5.0)	190 (6.2)	121 (4.9)	158 (6.0)	250 (18.1)	146 (15.3)	188 (21.5)	170 (19.5)	171 (22.3)	513 (22.6)	368 (29.9)	348 (22.2)	276 (25.4)	235 (19.1)
French fries	536 (5.8)	196 (4.6)	162 (4.4)	142 (4.1)	143 (4.5)	224 (17.4)	94 (11.4)	108 (7.8)	86 (14.0)	49 (8.3)	1059 (42.2)	535 (37.0)	560 (37.5)	367 (35.5)	397 (36.3)
SSBs	4465 (54.8)	2326 (64.3)	2172 (55.0)	1672 (53.9)	1669 (52.1)	242 (14.6)	107 (14.4)	121 (10.2)	68 (9.5)	41 (5.9)	1017 (46.5)	540 (42.7)	537 (35.9)	330 (35.3)	322 (28.6)
<b>Age group, years</b>															
2–5	25.0	22.7	22.9	23.8	23.6	16.0	18.7	20.1	16.7	17.1	20.9	19.7	21.0	21.8	21.0
6–11	35.4	35.2	34.4	34.6	34.7	45.7	45.6	50.7	46.4	47.5	31.4	36.2	30.2	34.8	32.8
12–18	39.6	42.0	42.7	41.6	41.8	38.3	35.7	29.2	36.9	35.4	47.7	44.2	48.8	43.4	46.2
<b>Female</b>	48.9	48.1	49.0	50.2	49.7	49.0	47.9	49.7	45.2	50.7	46.4	48.7	48.5	52.8	50.4
<b>Race/ethnicity</b>															
Non-Hispanic white	65.6	62.7	60.7	59.9	57.6	63.2	59.6	42.9	51.3	44.8	67.8	65.5	60.6	61.3	55.9
Non-Hispanic black	15.9	15.0	14.5	14.6	13.4	17.8	16.2	25.5	18.9	20.6	17.3	14.9	14.3	16.2	15.7
Mexican-American	6.4	12.7	13.3	13.3	14.4	7.4	14.8	19.7	18.4	19.7	4.2	11.1	11.2	13.2	13.8
Other	12.1	9.6	11.5	12.2	14.6	11.6	9.4	12.0	11.4	15.0	10.7	8.5	13.9	9.3	14.5
<b>Household income<sup>d</sup></b>															
≤130	26.3	33.8	27.2	33.3	33.5	30.2	37.8	30.6	37.3	43.9	21.1	31.0	23.4	33.5	32.4
131–299	34.7	31.2	32.5	28.6	28.6	32.7	35.3	33.8	22.5	27.0	35.3	32.0	35.6	30.7	31.5
≥300	39.1	35.0	40.3	38.1	37.9	37.1	27.0	35.6	40.2	29.1	43.6	37.0	41.0	35.8	36.1
<b>Household education<sup>e</sup></b>															
< High school	11.0	20.3	18.5	21.1	20.4	11.2	20.0	22.5	22.1	25.2	7.2	18.9	15.2	20.2	22.5
High school <sup>f</sup>	29.4	26.7	24.7	25.0	20.9	32.8	25.4	29.1	25.7	24.3	29.8	29.4	24.1	25.4	21.7
Some college	25.3	34.4	34.3	28.4	30.0	25.8	36.5	31.3	28.0	26.8	28.0	34.2	36.7	33.9	31.1
College degree	34.3	18.5	22.5	25.5	28.8	30.2	18.1	17.1	24.2	23.7	35.0	17.5	24.0	20.5	24.8

*Note:* The 1994–1998 data are from the Continuing Survey of Food Intakes by Individuals (CSFII); all other data are from the National Health and Nutrition Examination Survey (NHANES).

<sup>a</sup> All percentages take into account survey design and sample weights.

<sup>b</sup> Percentage of total sample who consumed any foods or beverages from stores, schools, or fast-food restaurants

<sup>c</sup> Percentage of location consumers who consumed the specified food group at that location

<sup>d</sup> Household income expressed as percentage of the Federal Poverty Level

<sup>e</sup> Education level of household referent

<sup>f</sup> Graduated from high school or completed General Educational Development test

SSB, sugar-sweetened beverage

## Appendix C

Distribution of milk consumption by type and location among U.S. children aged 2–18 years<sup>a</sup>

	Store		School		Fast food	
	CSFII	NHANES	CSFII	NHANES	CSFII	NHANES
	1994–1998	2009–2010	1994–1998	2009–2010	1994–1998	2009–2010
High-fat milk, plain	80.8 ± 0.8	56.6 ± 2.1	64.5 ± 1.7	30.3 ± 3.6	79.9 ± 9.5	7.2 ± 2.7
High-fat milk, flavored	6.7 ± 0.5	11.2 ± 0.8	31.7 ± 1.8	43.8 ± 3.2	7.6 ± 4.1	77.1 ± 9.1
Low-fat milk, plain	10.9 ± 0.8	28.6 ± 2.0	3.2 ± 0.6	12.7 ± 1.9	3.8 ± 3.7	4.2 ± 4.2
Low-fat milk, flavored	1.6 ± 0.2	3.6 ± 0.7	0.6 ± 0.3	13.3 ± 1.9	8.8 ± 8.3	11.6 ± 7.9

<sup>a</sup> Weighted frequencies indicate the percentage of milk reported as each type from the given location and have been adjusted to be nationally representative estimates. High-fat milk includes 2% and whole milk; low-fat milk includes 1% and nonfat milk. Plain milk includes plain/unsweetened milk, and flavored milk includes chocolate, fruit-flavored, and other sweetened milks and cocoa.

CSFII, Continuing Survey of Food Intakes by Individuals; NHANES, National Health and Nutrition Examination Survey

## Appendix D

Distribution of sugar-sweetened beverage consumption by type and location among U.S. children aged 2–18 years<sup>a</sup>

	Store		School		Fast food	
	CSFII 1994–1998	NHANES 2009–2010	CSFII 1994–1998	NHANES 2009–2010	CSFII 1994–1998	NHANES 2009–2010
Soft drinks, regular <sup>b</sup>	46.8 ± 1.4	37.7 ± 1.6	45.4 ± 3.6	4.6 ± 2.3	87.6 ± 1.8	75.4 ± 3.8
Soft drinks, low-calorie	5.7 ± 0.6	7.1 ± 0.9	4.0 ± 2.0	0.0 ± 0.0	4.3 ± 1.0	1.7 ± 0.9
Fruit drinks, regular <sup>c</sup>	41.5 ± 1.3	38.4 ± 1.5	47.0 ± 3.5	60.7 ± 10.3	7.5 ± 1.5	20.2 ± 3.5
Fruit drinks, low-calorie	2.7 ± 0.3	7.8 ± 1.0	2.4 ± 0.8	23.9 ± 8.1	0.2 ± 0.2	0.1 ± 0.1
Sports drinks, regular <sup>d</sup>	2.8 ± 0.5	8.3 ± 1.5	1.2 ± 0.7	10.8 ± 5.4	0.3 ± 0.2	2.6 ± 1.1
Sports drinks, low-calorie	0.4 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
Energy drinks, regular <sup>e</sup>	0.0 ± 0.0	0.6 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0

<sup>a</sup> Weighted frequencies indicate the percentage of sugar-sweetened beverages reported as each beverage type at the given location and have been adjusted to be nationally representative estimates. Regular beverages contain >20 kcal/100 ml, and low-calorie beverages contain ≤20 kcal/100ml.

<sup>b</sup> Soft drinks include cola-type, fruit-flavored, and pepper-type soft drinks; root beer; cream soda; and ginger ale; includes both caffeinated and decaffeinated versions.

<sup>c</sup> Fruit drinks includes fruit juice drinks, fruit-flavored drinks, lemonade, apple cider drinks, fruit punch, grapeade, orangeade, and light orange juice beverages; includes beverages made from powdered mix.

<sup>d</sup> Sports drinks include fruit-flavored thirst quencher beverages (such as Gatorade® or Powerade®) and fluid-replacement beverages.

<sup>e</sup> Energy drinks includes Monster energy drink, Red Bull® energy drink, and Mountain Dew AMP® energy drink. There are no food codes for energy drinks with ≤20 kcal/100 ml.

CSFII, Continuing Survey of Food Intakes by Individuals; NHANES, National Health and Nutrition Examination Survey