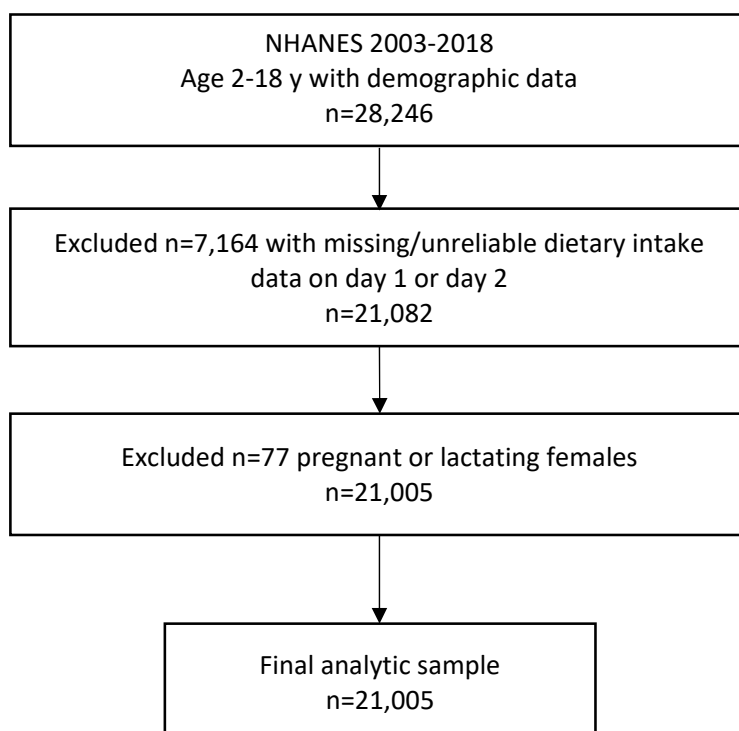


Intakes of added sugars with a focus on beverages and the associations with micronutrient adequacy in US children, adolescents and teens (NHANES 2003-2018), Ricciuto, L., et al.



Supplemental Figure S1. NHANES 2003-2018 analytic sample flow chart.

Intakes of added sugars with a focus on beverages and the associations with micronutrient adequacy in US children, adolescents and teens (NHANES 2003-2018), Ricciuto, L., et al.

Supplemental Table S1. Percent of children, adolescents and teens (2-18 y) reporting intake (consumers) of beverage sources of added sugars from the pooled sample (NHANES 2003-2018, n=21,005).

Food Group	Sweetened Beverages		Soft Drinks		Fruit Drinks		Sport and Energy Drinks		Coffee and Tea		Flavored Milk	
2-8 y (n=8,599)												
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	82.16 ± 1.82		55.23 ± 2.52		57.93 ± 2.62		0.12 ± 0.08		12.98 ± 3.06		35.27 ± 1.99	
2005-06	73.16 ± 2.02	<0.01*	42.04 ± 1.76	<0.01*	51.36 ± 2.79	0.09	8.83 ± 2.11	<0.01*	6.85 ± 1.30	0.07	30.81 ± 2.53	0.17
2007-08	75.21 ± 1.79	0.01	42.15 ± 2.89	<0.01*	54.00 ± 2.19	0.25	6.34 ± 2.04	<0.01*	12.16 ± 2.68	0.84	35.35 ± 2.75	0.98
2009-10	67.97 ± 1.93	<0.01*	33.69 ± 3.08	<0.01*	48.51 ± 1.94	<0.01*	6.04 ± 1.51	<0.01*	8.31 ± 1.23	0.16	36.18 ± 1.92	0.74
2011-12	71.28 ± 3.26	<0.01*	38.09 ± 4.17	<0.01*	50.60 ± 2.43	0.04	7.38 ± 1.31	<0.01*	10.18 ± 1.33	0.40	34.77 ± 3.56	0.90
2013-14	58.42 ± 3.26	<0.01*	25.45 ± 2.65	<0.01*	42.95 ± 3.39	<0.01*	9.12 ± 1.82	<0.01*	9.15 ± 1.93	0.29	29.77 ± 1.50	0.03
2015-16	59.59 ± 2.85	<0.01*	25.11 ± 2.50	<0.01*	43.02 ± 1.67	<0.01*	6.51 ± 0.92	<0.01*	8.39 ± 1.97	0.21	26.57 ± 1.83	<0.01*
2017-18	60.66 ± 2.97	<0.01*	28.17 ± 2.32	<0.01*	37.91 ± 3.15	<0.01*	9.12 ± 1.31	<0.01*	10.89 ± 2.28	0.58	32.29 ± 2.99	0.41
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-3.15 ± 0.39	<0.01	-3.80 ± 0.38	<0.01	-2.53 ± 0.42	<0.01	0.72 ± 0.20	<0.01	-0.17 ± 0.37	0.65	-0.73 ± 0.37	0.05
9-18 y (n=12,406)												
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	89.91 ± 1.28		74.99 ± 2.34		50.94 ± 2.14		0.27 ± 0.13		16.39 ± 2.16		20.36 ± 1.58	
2005-06	83.99 ± 2.13	0.02	68.05 ± 2.26	0.03	40.08 ± 2.21	<0.01*	15.13 ± 1.69	<0.01*	13.27 ± 1.60	0.25	19.76 ± 1.84	0.81
2007-08	80.01 ± 1.94	<0.01*	60.50 ± 2.64	<0.01*	39.15 ± 1.95	<0.01*	14.21 ± 1.87	<0.01*	19.03 ± 2.62	0.44	22.78 ± 3.05	0.48
2009-10	78.71 ± 1.73	<0.01*	58.80 ± 2.21	<0.01*	40.23 ± 3.14	0.01	14.06 ± 2.13	<0.01*	15.77 ± 2.51	0.85	28.59 ± 2.72	0.01
2011-12	82.78 ± 2.24	0.01	57.16 ± 2.52	<0.01*	42.98 ± 2.05	0.01	15.60 ± 1.52	<0.01*	19.89 ± 1.95	0.23	22.33 ± 2.41	0.50
2013-14	73.95 ± 1.48	<0.01*	51.21 ± 1.60	<0.01*	37.46 ± 1.98	<0.01*	14.76 ± 1.59	<0.01*	18.66 ± 1.56	0.40	22.22 ± 1.97	0.46
2015-16	72.71 ± 2.11	<0.01*	50.61 ± 2.43	<0.01*	32.31 ± 1.64	<0.01*	11.43 ± 1.47	<0.01*	16.58 ± 2.58	0.96	23.46 ± 2.82	0.34
2017-18	71.57 ± 2.04	<0.01*	45.13 ± 2.39	<0.01*	33.88 ± 2.33	<0.01*	12.52 ± 1.20	<0.01*	20.72 ± 1.72	0.12	19.87 ± 2.35	0.86
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-2.37 ± 0.28	<0.01	-3.87 ± 0.36	<0.01	-1.91 ± 0.32	<0.01	0.82 ± 0.20	<0.01	0.59 ± 0.31	0.06	0.08 ± 0.34	0.82
2-18 y (n=21,005)												
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	86.83 ± 0.95		67.13 ± 1.81		53.72 ± 1.67		0.21 ± 0.07		15.04 ± 1.67		26.29 ± 1.25	
2005-06	79.69 ± 1.55	<0.01*	57.73 ± 1.52	<0.01*	44.55 ± 1.98	<0.01*	12.63 ± 1.59	<0.01*	10.72 ± 0.97	0.03	24.14 ± 1.73	0.32
2007-08	78.10 ± 1.35	<0.01*	53.18 ± 2.04	<0.01*	45.07 ± 1.66	<0.01*	11.07 ± 1.24	<0.01*	16.29 ± 2.15	0.65	27.79 ± 2.41	0.58
2009-10	74.37 ± 1.71	<0.01*	48.67 ± 2.31	<0.01*	43.57 ± 2.31	<0.01*	10.82 ± 1.52	<0.01*	12.76 ± 1.90	0.37	31.65 ± 2.04	0.03
2011-12	77.93 ± 2.31	<0.01*	49.13 ± 2.88	<0.01*	46.19 ± 1.68	<0.01*	12.14 ± 1.24	<0.01*	15.80 ± 1.03	0.70	27.57 ± 2.63	0.66
2013-14	67.84 ± 1.55	<0.01*	41.07 ± 1.87	<0.01*	39.62 ± 1.86	<0.01*	12.54 ± 1.35	<0.01*	14.91 ± 1.41	0.96	25.20 ± 1.49	0.57
2015-16	67.42 ± 2.04	<0.01*	40.33 ± 2.34	<0.01*	36.63 ± 1.37	<0.01*	9.45 ± 0.80	<0.01*	13.28 ± 2.29	0.54	24.71 ± 2.07	0.52
2017-18	67.31 ± 2.10	<0.01*	38.50 ± 1.98	<0.01*	35.45 ± 2.04	<0.01*	11.19 ± 0.74	<0.01*	16.88 ± 1.85	0.46	24.73 ± 1.82	0.48
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-2.68 ± 0.26	<0.01	-3.84 ± 0.30	<0.01	-2.16 ± 0.28	<0.01	0.78 ± 0.15	<0.01	0.29 ± 0.27	0.29	-0.24 ± 0.27	0.36

*Significantly different from reference cycle (2003-04), p<0.01

¹Linear trend across all cycles, statistically significant at p<0.01

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Supplemental Table S2. Trends in added sugars intake (% kcal) from beverage sources and the rest of the diet among all children, adolescents and teens and consumers only from the pooled sample (NHANES 2003-2018, n=21,005).

Food Group	Sweetened Beverages		Soft Drinks		Fruit Drinks		Sport and Energy Drinks		Coffee and Tea		Flavored Milk		Rest of the Diet	
All Individuals 2-8 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	5.30 ± 0.26		2.55 ± 0.22		2.73 ± 0.18		0.004 ± 0.003		0.38 ± 0.13		0.84 ± 0.09		8.95 ± 0.26	
2005-06	4.23 ± 0.20	<0.01*	1.66 ± 0.13	<0.01*	2.24 ± 0.14	0.03	0.29 ± 0.10	0.01	0.14 ± 0.03	0.07	0.74 ± 0.08	0.36	9.78 ± 0.27	0.03
2007-08	4.51 ± 0.21	0.02	1.71 ± 0.19	<0.01*	2.67 ± 0.15	0.78	0.12 ± 0.03	<0.01*	0.29 ± 0.08	0.58	0.94 ± 0.11	0.50	9.27 ± 0.21	0.34
2009-10	3.68 ± 0.15	<0.01*	1.23 ± 0.12	<0.01*	2.27 ± 0.15	0.05	0.16 ± 0.05	<0.01*	0.28 ± 0.03	0.48	0.98 ± 0.08	0.27	8.53 ± 0.23	0.23
2011-12	3.73 ± 0.25	<0.01*	1.44 ± 0.22	<0.01*	2.10 ± 0.14	0.01	0.19 ± 0.05	<0.01*	0.28 ± 0.05	0.50	0.88 ± 0.16	0.85	9.02 ± 0.28	0.85
2013-14	2.97 ± 0.27	<0.01*	0.95 ± 0.10	<0.01*	1.71 ± 0.23	<0.01*	0.28 ± 0.08	<0.01*	0.34 ± 0.11	0.80	0.68 ± 0.06	0.12	9.26 ± 0.35	0.48
2015-16	2.82 ± 0.19	<0.01*	0.98 ± 0.11	<0.01*	1.62 ± 0.10	<0.01*	0.19 ± 0.05	<0.01*	0.23 ± 0.06	0.31	0.61 ± 0.06	0.03	8.57 ± 0.25	0.29
2017-18	2.58 ± 0.22	<0.01*	0.99 ± 0.17	<0.01*	1.31 ± 0.12	<0.01*	0.23 ± 0.05	<0.01*	0.38 ± 0.12	1.00	0.81 ± 0.11	0.78	8.79 ± 0.30	0.69
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-0.37 ± 0.04	<0.01	-0.19 ± 0.03	<0.01	-0.19 ± 0.02	<0.01	0.02 ± 0.01	0.02	0.01 ± 0.02	0.66	-0.02 ± 0.01	0.13	-0.08 ± 0.04	0.06
All Individuals 9-18 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	9.18 ± 0.43		6.54 ± 0.33		2.62 ± 0.23		0.01 ± 0.003		0.53 ± 0.08		0.39 ± 0.04		8.46 ± 0.21	
2005-06	7.93 ± 0.46	0.05	5.42 ± 0.33	0.02	1.86 ± 0.13	0.01	0.62 ± 0.08	<0.01*	0.38 ± 0.06	0.13	0.41 ± 0.04	0.77	8.48 ± 0.18	0.95
2007-08	7.56 ± 0.50	0.01	4.92 ± 0.51	0.01	2.04 ± 0.09	0.02	0.58 ± 0.09	<0.01*	0.67 ± 0.12	0.37	0.40 ± 0.05	0.93	8.65 ± 0.23	0.54
2009-10	6.67 ± 0.36	<0.01*	4.09 ± 0.21	<0.01*	2.05 ± 0.22	0.07	0.50 ± 0.10	<0.01*	0.64 ± 0.11	0.44	0.63 ± 0.08	0.01	8.37 ± 0.27	0.79
2011-12	6.38 ± 0.21	<0.01*	3.76 ± 0.21	<0.01*	1.98 ± 0.15	0.02	0.64 ± 0.07	<0.01*	1.23 ± 0.18	<0.01*	0.41 ± 0.05	0.72	7.83 ± 0.24	0.05
2013-14	5.86 ± 0.27	<0.01*	3.60 ± 0.23	<0.01*	1.43 ± 0.12	<0.01*	0.80 ± 0.21	<0.01*	1.14 ± 0.29	0.04	0.40 ± 0.05	0.96	7.78 ± 0.21	0.02
2015-16	4.78 ± 0.26	<0.01*	3.06 ± 0.20	<0.01*	1.26 ± 0.10	<0.01*	0.41 ± 0.07	<0.01*	0.86 ± 0.14	0.04	0.42 ± 0.06	0.67	7.83 ± 0.22	0.04
2017-18	4.67 ± 0.30	<0.01*	2.76 ± 0.28	<0.01*	1.33 ± 0.14	<0.01*	0.49 ± 0.05	<0.01*	0.94 ± 0.09	<0.01*	0.35 ± 0.04	0.42	8.40 ± 0.26	0.84
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-0.63 ± 0.06	<0.01	-0.51 ± 0.05	<0.01	-0.17 ± 0.03	<0.01	0.04 ± 0.01	<0.01	0.09 ± 0.02	<0.01	-0.01 ± 0.01	0.42	-0.08 ± 0.03	0.02
All Individuals 2-18 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	7.64 ± 0.31		4.95 ± 0.25		2.67 ± 0.15		0.01 ± 0.002		0.47 ± 0.07		0.57 ± 0.04		8.65 ± 0.13	
2005-06	6.46 ± 0.29	0.01	3.93 ± 0.21	<0.01*	2.01 ± 0.10	<0.01*	0.49 ± 0.08	<0.01*	0.29 ± 0.03	0.02	0.54 ± 0.05	0.61	9.00 ± 0.16	0.10

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2007-08	6.34 ± 0.33	0.01	3.64 ± 0.34	<0.01*	2.29 ± 0.07	0.03	0.39 ± 0.06	<0.01*	0.52 ± 0.09	0.68	0.62 ± 0.06	0.58	8.90 ± 0.14	0.21
2009-10	5.46 ± 0.26	<0.01*	2.94 ± 0.16	<0.01*	2.14 ± 0.17	0.02	0.37 ± 0.07	<0.01*	0.50 ± 0.07	0.81	0.77 ± 0.05	<0.01*	8.43 ± 0.18	0.32
2011-12	5.27 ± 0.18	<0.01*	2.78 ± 0.19	<0.01*	2.03 ± 0.11	<0.01*	0.45 ± 0.05	<0.01*	0.83 ± 0.11	0.01	0.61 ± 0.09	0.70	8.33 ± 0.22	0.20
2013-14	4.72 ± 0.23	<0.01*	2.55 ± 0.18	<0.01*	1.54 ± 0.12	<0.01*	0.60 ± 0.14	<0.01*	0.82 ± 0.20	0.10	0.51 ± 0.04	0.28	8.36 ± 0.25	0.30
2015-16	3.99 ± 0.20	<0.01*	2.22 ± 0.15	<0.01*	1.40 ± 0.07	<0.01*	0.32 ± 0.06	<0.01*	0.61 ± 0.10	0.28	0.50 ± 0.05	0.24	8.13 ± 0.20	0.03
2017-18	3.85 ± 0.21	<0.01*	2.07 ± 0.21	<0.01*	1.32 ± 0.11	<0.01*	0.39 ± 0.03	<0.01*	0.72 ± 0.10	0.04	0.53 ± 0.06	0.53	8.55 ± 0.22	0.68
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-0.52 ± 0.04	<0.01	-0.38 ± 0.03	<0.01	-0.18 ± 0.02	<0.01	0.03 ± 0.01	<0.01	0.05 ± 0.01	<0.01	-0.01 ± 0.01	0.12	-0.08 ± 0.03	0.01
Consumers Only 2-8 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	6.45 ± 0.33		4.61 ± 0.27		4.72 ± 0.28		3.79 ± 0.40		2.90 ± 0.65		2.40 ± 0.19		8.95 ± 0.26	
2005-06	5.79 ± 0.21	0.10	3.94 ± 0.23	0.06	4.37 ± 0.19	0.30	3.29 ± 0.55	0.47	2.01 ± 0.26	0.21	2.39 ± 0.15	0.98	9.78 ± 0.27	0.03
2007-08	6.00 ± 0.20	0.25	4.05 ± 0.30	0.17	4.94 ± 0.25	0.56	1.86 ± 0.35	<0.01*	2.41 ± 0.30	0.50	2.66 ± 0.20	0.35	9.28 ± 0.21	0.33
2009-10	5.42 ± 0.18	0.01	3.66 ± 0.21	0.01	4.68 ± 0.18	0.90	2.67 ± 0.36	0.04	3.42 ± 0.29	0.47	2.70 ± 0.16	0.23	8.53 ± 0.23	0.24
2011-12	5.24 ± 0.35	0.01	3.79 ± 0.40	0.09	4.14 ± 0.27	0.14	2.53 ± 0.36	0.02	2.80 ± 0.39	0.90	2.53 ± 0.26	0.68	9.02 ± 0.28	0.85
2013-14	5.08 ± 0.28	<0.01*	3.72 ± 0.26	0.02	3.97 ± 0.26	0.05	3.12 ± 0.57	0.34	3.66 ± 0.67	0.42	2.29 ± 0.17	0.70	9.26 ± 0.35	0.48
2015-16	4.72 ± 0.15	<0.01*	3.91 ± 0.25	0.06	3.75 ± 0.17	<0.01*	2.96 ± 0.72	0.32	2.78 ± 0.28	0.87	2.31 ± 0.22	0.76	8.57 ± 0.25	0.30
2017-18	4.25 ± 0.29	<0.01*	3.52 ± 0.40	0.03	3.45 ± 0.20	<0.01*	2.55 ± 0.29	0.01	3.45 ± 0.51	0.51	2.49 ± 0.18	0.71	8.79 ± 0.30	0.69
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-0.28 ± 0.04	<0.01	-0.12 ± 0.05	0.02	-0.18 ± 0.04	<0.01	-0.01 ± 0.10	0.93	0.11 ± 0.09	0.20	-0.01 ± 0.03	0.72	-0.08 ± 0.04	0.06
Consumers Only 9-18 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	10.21 ± 0.42		8.73 ± 0.33		5.15 ± 0.33		2.13 ± 0.69		3.26 ± 0.24		1.93 ± 0.08		8.46 ± 0.21	
2005-06	9.44 ± 0.40	0.18	7.97 ± 0.34	0.11	4.65 ± 0.16	0.18	4.12 ± 0.22	0.01	2.90 ± 0.14	0.19	2.07 ± 0.16	0.43	8.48 ± 0.18	0.95
2007-08	9.45 ± 0.51	0.25	8.13 ± 0.63	0.40	5.20 ± 0.17	0.88	4.06 ± 0.42	0.02	3.51 ± 0.33	0.54	1.75 ± 0.11	0.20	8.65 ± 0.23	0.54
2009-10	8.47 ± 0.42	<0.01*	6.96 ± 0.29	<0.01*	5.09 ± 0.29	0.90	3.59 ± 0.29	0.06	4.05 ± 0.31	0.05	2.22 ± 0.14	0.08	8.38 ± 0.27	0.80
2011-12	7.71 ± 0.27	<0.01*	6.58 ± 0.26	<0.01*	4.60 ± 0.35	0.25	4.08 ± 0.27	0.01	6.20 ± 0.58	<0.01*	1.86 ± 0.09	0.53	7.83 ± 0.24	0.05
2013-14	7.92 ± 0.35	<0.01*	7.02 ± 0.36	<0.01*	3.82 ± 0.18	<0.01*	5.42 ± 1.22	0.02	6.13 ± 1.70	0.10	1.79 ± 0.15	0.39	7.79 ± 0.22	0.02
2015-16	6.57 ± 0.28	<0.01*	6.04 ± 0.21	<0.01*	3.90 ± 0.25	<0.01*	3.59 ± 0.63	0.12	5.17 ± 0.34	<0.01*	1.81 ± 0.12	0.38	7.86 ± 0.23	0.05
2017-18	6.52 ± 0.38	<0.01*	6.13 ± 0.43	<0.01*	3.94 ± 0.32	0.01	3.89 ± 0.41	0.03	4.53 ± 0.37	<0.01*	1.77 ± 0.19	0.41	8.42 ± 0.26	0.90
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-0.54 ± 0.06	<0.01	-0.38 ± 0.06	<0.01	-0.20 ± 0.05	<0.01	0.02 ± 0.09	0.79	0.33 ± 0.07	<0.01	-0.03 ± 0.02	0.13	-0.08 ± 0.03	0.03
Consumers Only														

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2-18 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	8.79 ± 0.34		7.38 ± 0.29		4.96 ± 0.23		2.50 ± 0.69		3.13 ± 0.32		2.18 ± 0.11		8.66 ± 0.13	
2005-06	8.11 ± 0.27	0.12	6.80 ± 0.25	0.14	4.52 ± 0.13	0.09	3.89 ± 0.27	0.06	2.67 ± 0.15	0.19	2.23 ± 0.09	0.71	9.00 ± 0.16	0.10
2007-08	8.12 ± 0.35	0.17	6.84 ± 0.47	0.33	5.08 ± 0.14	0.68	3.56 ± 0.45	0.20	3.18 ± 0.24	0.90	2.21 ± 0.13	0.85	8.90 ± 0.14	0.20
2009-10	7.35 ± 0.27	<0.01*	6.04 ± 0.21	<0.01*	4.90 ± 0.18	0.84	3.38 ± 0.26	0.23	3.88 ± 0.27	0.07	2.44 ± 0.08	0.07	8.44 ± 0.18	0.33
2011-12	6.76 ± 0.26	<0.01*	5.67 ± 0.28	<0.01*	4.39 ± 0.22	0.07	3.69 ± 0.26	0.11	5.27 ± 0.53	<0.01*	2.21 ± 0.16	0.86	8.33 ± 0.22	0.20
2013-14	6.96 ± 0.28	<0.01*	6.21 ± 0.33	0.01*	3.88 ± 0.17	<0.01*	4.76 ± 0.89	0.05	5.53 ± 1.28	0.07	2.02 ± 0.12	0.34	8.37 ± 0.25	0.31
2015-16	5.91 ± 0.19	<0.01*	5.50 ± 0.19	<0.01*	3.83 ± 0.14	<0.01*	3.42 ± 0.50	0.28	4.56 ± 0.23	<0.01*	2.02 ± 0.10	0.31	8.14 ± 0.21	0.04
2017-18	5.72 ± 0.26	<0.01*	5.38 ± 0.37	<0.01*	3.73 ± 0.20	<0.01*	3.46 ± 0.28	0.20	4.26 ± 0.31	0.01	2.14 ± 0.16	0.83	8.56 ± 0.22	0.72
Trend ¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-0.44 ± 0.05	<0.01	-0.28 ± 0.05	<0.01	-0.19 ± 0.03	<0.01	0.002 ± 0.07	0.98	0.29 ± 0.06	<0.01	-0.03 ± 0.02	0.19	-0.08 ± 0.03	0.01

*Significantly different from reference cycle (2003-04), p<0.01

¹Linear trend across all cycles, statistically significant at p<0.01

Intakes of added sugars with a focus on beverages and the associations with micronutrient adequacy in US children, adolescents and teens (NHANES 2003-2018), Ricciuto, L., et al.

2003-04	40.38 ± 1.59		26.21 ± 1.33		14.10 ± 0.78		0.03 ± 0.01		2.39 ± 0.32		2.95 ± 0.23		44.93 ± 0.65	
2005-06	34.31 ± 2.33	0.03	21.78 ± 1.88	0.06	9.77 ± 0.48	<0.01*	2.61 ± 0.33	<0.01*	1.59 ± 0.26	0.06	2.67 ± 0.30	0.46	44.72 ± 0.84	0.84
2007-08	30.46 ± 1.51	<0.01*	18.14 ± 1.66	<0.01*	10.16 ± 0.34	<0.01*	2.05 ± 0.30	<0.01*	2.40 ± 0.45	0.99	2.82 ± 0.29	0.74	42.06 ± 0.87	0.01
2009-10	26.64 ± 1.18	<0.01*	14.54 ± 0.76	<0.01*	10.06 ± 0.74	<0.01*	1.94 ± 0.40	<0.01*	2.62 ± 0.46	0.69	3.57 ± 0.24	0.07	39.75 ± 0.65	<0.01*
2011-12	24.98 ± 0.92	<0.01*	13.25 ± 0.89	<0.01*	9.49 ± 0.38	<0.01*	2.20 ± 0.27	<0.01*	3.84 ± 0.56	0.03	2.89 ± 0.44	0.91	39.73 ± 1.22	<0.01*
2013-14	22.71 ± 1.48	<0.01*	12.76 ± 0.93	<0.01*	6.64 ± 0.44	<0.01*	3.16 ± 1.04	<0.01*	3.52 ± 0.62	0.11	2.30 ± 0.22	0.04	38.72 ± 1.56	<0.01*
2015-16	18.85 ± 1.07	<0.01*	10.86 ± 0.74	<0.01*	6.22 ± 0.37	<0.01*	1.58 ± 0.27	<0.01*	2.97 ± 0.53	0.36	2.27 ± 0.21	0.03	37.55 ± 1.32	<0.01*
2017-18	17.97 ± 1.00	<0.01*	9.95 ± 1.01	<0.01*	5.92 ± 0.46	<0.01*	1.80 ± 0.17	<0.01*	3.29 ± 0.45	0.11	2.23 ± 0.24	0.03	39.16 ± 0.99	<0.01*
Trend¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-3.08 ± 0.23	<0.01	-2.21 ± 0.20	<0.01	-1.02 ± 0.08	<0.01	0.13 ± 0.05	0.01	0.21 ± 0.07	<0.01	-0.11 ± 0.04	<0.01	-1.02 ± 0.15	<0.01
Consumers Only														
2-8 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	31.44 ± 1.73		22.67 ± 1.63		22.87 ± 1.59		14.05 ± 3.56		15.32 ± 3.53		11.55 ± 1.14		41.57 ± 1.31	
2005-06	24.77 ± 1.09	<0.01*	17.34 ± 1.15	0.01	18.39 ± 0.86	0.01	13.42 ± 1.69	0.87	8.36 ± 0.88	0.06	10.54 ± 0.71	0.46	42.10 ± 1.26	0.77
2007-08	25.15 ± 0.68	<0.01*	17.72 ± 1.34	0.02	20.13 ± 0.84	0.13	7.96 ± 1.62	0.12	9.41 ± 1.10	0.11	11.30 ± 0.85	0.86	38.54 ± 1.08	0.08
2009-10	23.29 ± 0.80	<0.01*	16.04 ± 1.04	<0.01*	19.80 ± 0.84	0.09	11.86 ± 1.67	0.58	13.07 ± 0.85	0.54	11.83 ± 0.66	0.83	35.70 ± 1.05	<0.01*
2011-12	23.27 ± 1.31	<0.01*	17.10 ± 1.54	0.01	18.17 ± 1.10	0.02	11.35 ± 2.05	0.51	11.82 ± 1.54	0.36	11.37 ± 1.32	0.92	39.20 ± 1.30	0.20
2013-14	20.41 ± 1.09	<0.01*	15.18 ± 1.13	<0.01*	15.82 ± 0.98	<0.01*	12.33 ± 2.19	0.68	14.62 ± 3.13	0.88	9.39 ± 0.67	0.10	37.89 ± 1.70	0.09
2015-16	19.89 ± 0.80	<0.01*	16.98 ± 1.17	0.01	15.59 ± 0.97	<0.01*	11.78 ± 2.67	0.61	11.79 ± 1.88	0.38	9.66 ± 0.80	0.18	34.97 ± 0.92	<0.01*
2017-18	18.15 ± 1.39	<0.01*	15.48 ± 1.80	<0.01*	14.39 ± 0.86	<0.01*	11.66 ± 1.82	0.55	14.54 ± 2.18	0.85	9.95 ± 0.80	0.25	36.08 ± 1.32	<0.01*
Trend¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-1.60 ± 0.22	<0.01	-0.81 ± 0.25	<0.01	-1.05 ± 0.19	<0.01	0.03 ± 0.38	0.93	0.19 ± 0.46	0.67	-0.26 ± 0.14	0.07	-0.86 ± 0.20	<0.01
Consumers Only														
9-18 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	55.61 ± 2.11		47.02 ± 2.00		28.79 ± 1.63		12.09 ± 2.64		16.21 ± 1.38		10.83 ± 0.58		47.15 ± 1.10	
2005-06	53.54 ± 3.75	0.63	46.00 ± 4.08	0.82	24.91 ± 1.01	0.04	23.50 ± 0.70	<0.01*	17.05 ± 1.67	0.70	11.57 ± 1.43	0.63	46.44 ± 0.85	0.61
2007-08	47.65 ± 2.49	0.02	41.69 ± 3.19	0.16	24.75 ± 0.96	0.03	21.65 ± 2.18	0.01	16.98 ± 1.83	0.74	8.98 ± 0.57	0.02	44.44 ± 1.27	0.11
2009-10	43.15 ± 1.98	<0.01*	35.25 ± 1.26	<0.01*	25.77 ± 1.36	0.16	19.66 ± 2.08	0.03	23.20 ± 3.32	0.05	10.81 ± 0.69	0.98	42.54 ± 0.90	<0.01*
2011-12	37.57 ± 1.38	<0.01*	31.76 ± 1.41	<0.01*	22.57 ± 1.38	<0.01*	20.42 ± 1.13	<0.01*	28.98 ± 2.64	<0.01*	9.51 ± 0.45	0.07	40.11 ± 1.68	<0.01*
2013-14	40.18 ± 3.07	<0.01*	36.20 ± 2.13	<0.01*	17.46 ± 0.68	<0.01*	30.35 ± 10.15	0.08	26.49 ± 4.45	0.03	8.92 ± 0.95	0.09	39.31 ± 1.76	<0.01*

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2015-16	32.43 ± 1.70	<0.01*	30.27 ± 1.32	<0.01*	18.24 ± 1.32	<0.01*	18.69 ± 2.63	0.08	25.97 ± 2.05	<0.01*	8.83 ± 0.58	0.02	39.43 ± 1.85	<0.01*
2017-18	31.35 ± 2.16	<0.01*	29.99 ± 2.27	<0.01*	18.35 ± 1.47	<0.01*	18.16 ± 1.14	0.04	21.15 ± 1.72	0.03	8.05 ± 0.70	<0.01*	41.24 ± 1.25	<0.01*
Trend¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-3.63 ± 0.38	<0.01	-2.67 ± 0.38	<0.01	-1.58 ± 0.22	<0.01	-0.30 ± 0.53	0.57	1.25 ± 0.29	<0.01	-0.41 ± 0.13	<0.01	-1.11 ± 0.20	<0.01
Consumers Only														
2-18 y														
Year	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P	Mean ± SE	P
2003-04	46.51 ± 1.79		39.05 ± 1.85		26.25 ± 1.06		12.53 ± 1.99		15.91 ± 1.60		11.21 ± 0.68		44.93 ± 0.65	
2005-06	43.06 ± 2.48	0.26	37.72 ± 2.92	0.70	21.93 ± 0.61	<0.01*	20.70 ± 0.61	<0.01*	14.85 ± 1.60	0.64	11.05 ± 0.72	0.87	44.72 ± 0.84	0.84
2007-08	39.01 ± 1.59	<0.01*	34.11 ± 2.38	0.10	22.54 ± 0.67	<0.01*	18.52 ± 2.36	0.05	14.73 ± 1.39	0.58	10.16 ± 0.56	0.23	42.09 ± 0.86	0.01
2009-10	35.82 ± 1.28	<0.01*	29.88 ± 0.95	<0.01*	23.09 ± 0.81	0.02	17.90 ± 1.73	0.04	20.54 ± 2.56	0.13	11.28 ± 0.34	0.93	39.78 ± 0.65	<0.01*
2011-12	32.06 ± 1.20	<0.01*	26.97 ± 1.23	<0.01*	20.54 ± 0.79	<0.01*	18.10 ± 1.28	0.02	24.32 ± 2.60	0.01	10.50 ± 0.87	0.52	39.73 ± 1.22	<0.01*
2013-14	33.48 ± 2.18	<0.01*	31.07 ± 1.95	<0.01*	16.76 ± 0.61	<0.01*	25.19 ± 7.22	0.09	23.62 ± 3.49	0.05	9.14 ± 0.65	0.03	38.75 ± 1.56	<0.01*
2015-16	27.96 ± 1.23	<0.01*	26.93 ± 0.98	<0.01*	16.98 ± 0.76	<0.01*	16.77 ± 2.24	0.16	22.36 ± 1.21	<0.01*	9.19 ± 0.42	0.01	37.63 ± 1.33	<0.01*
2017-18	26.70 ± 1.40	<0.01*	25.84 ± 1.77	<0.01*	16.69 ± 0.93	<0.01*	16.09 ± 0.90	0.11	19.49 ± 1.36	0.09	9.02 ± 0.61	0.02	39.22 ± 1.01	<0.01*
Trend¹	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P	Beta ± SE	P
	-2.82 ± 0.27	<0.01	-1.96 ± 0.31	<0.01	-1.34 ± 0.14	<0.01	-0.31 ± 0.39	0.43	1.04 ± 0.25	<0.01	-0.34 ± 0.10	<0.01	-1.01 ± 0.15	<0.01

*Significantly different from reference cycle (2003-04), p<0.01

¹Linear trend across all cycles, statistically significant at p<0.01

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Supplemental Table S4. Trends in % <EAR (>AI¹) for selected micronutrients by beverage source of added sugars and the rest of the diet among children, adolescents and teens (2-18 y) from the pooled sample (NHANES 2003-2018, n=21,005); weighted n's are shown in the table.

2-18 y							
Sweetened Beverages							
	Q1 ² n=17,501,646 % <EAR (SE)	Q2 n=17,351,739 % <EAR (SE)	Q3 n=17,431,391 % <EAR (SE)	Q4 n=17,421,108 % <EAR (SE)	Quantile Trend ³ Beta (SE), P	Q1 vs. Q2,3,4 ⁴ Beta (SE), P	Q2-Q4 Trend ⁵ Beta (SE), P
Calcium	38.65 (1.49)	45.62 (1.31)	52.41 (1.51)	49.46 (1.47)	3.77 (1.75), 0.16	10.61 (4.14), 0.12	1.81 (2.83), 0.64
Magnesium	27.88 (1.15)	33.70 (1.24)	39.18 (1.18)	42.02 (1.03)	4.74 (0.51), 0.01	10.60 (5.17), 0.18	4.13 (0.77), 0.12
Phosphorus	13.54 (1.10)	16.48 (1.04)	18.17 (1.13)	12.03 (1.12)	-0.42 (1.54), 0.81	1.94 (3.99), 0.67	-2.31 (2.27), 0.49
Vitamin A	17.44 (1.41)	20.45 (1.30)	29.08 (1.33)	32.92 (1.62)	5.53 (0.75), 0.02§	10.32 (7.80), 0.32	6.18 (1.39), 0.14
Vitamin C	20.93 (1.40)	17.79 (1.48)	19.00 (1.58)	18.17 (1.74)	-0.67 (0.57), 0.36	-2.60 (0.75), 0.07	0.17 (0.59), 0.83
Vitamin D	88.86 (1.08)	91.38 (0.91)	93.99 (0.80)	94.17 (0.73)	1.82 (0.42), 0.05	4.38 (1.90), 0.15	1.37 (0.70), 0.30
Choline ¹	26.55 (1.27)	18.80 (1.18)	17.38 (1.04)	17.52 (0.96)	-2.82 (1.31), 0.16	-8.65 (0.93), 0.01§	-0.64 (0.46), 0.39
Potassium ¹	37.51 (1.63)	32.91 (1.76)	30.32 (1.60)	32.91 (1.39)	-1.53 (1.18), 0.32	-5.47 (1.85), 0.10	0.05 (1.51), 0.98
Soft Drinks							
	Q1 ² n=35,273,939 % <EAR (SE)	Q2 n=11,356,667 % <EAR (SE)	Q3 n=11,573,927 % <EAR (SE)	Q4 n=11,501,350 % <EAR (SE)	Quantile Trend ³ Beta (SE), P	Q1 vs. Q2,3,4 ⁴ Beta (SE), P	Q2-Q4 Trend ⁵ Beta (SE), P
Calcium	39.20 (0.98)	53.39 (1.66)	55.34 (1.96)	52.54 (1.76)	5.33 (2.45), 0.16	14.55 (1.18), 0.01†	-0.40 (1.36), 0.82
Magnesium	26.44 (0.73)	40.28 (1.71)	45.12 (1.21)	50.01 (1.32)	8.22 (1.40), 0.03§	18.61 (4.04), 0.04§	4.87 (0.02), 0.00†
Phosphorus	12.88 (0.68)	20.67 (1.30)	17.92 (1.54)	12.85 (1.47)	0.61 (1.90), 0.78	4.33 (3.28), 0.32	-3.90 (0.67), 0.11
Vitamin A	17.26 (0.94)	26.84 (1.74)	33.92 (1.75)	37.91 (2.05)	7.24 (0.78), 0.01§	15.52 (4.66), 0.08	5.55 (0.88), 0.10
Vitamin C	12.58 (0.93)	20.01 (1.75)	24.59 (2.14)	31.66 (2.56)	6.27 (0.32), 0.00†	12.74 (4.86), 0.12	5.81 (0.71), 0.08
Vitamin D	90.25 (0.67)	94.22 (0.96)	94.01 (0.97)	94.00 (0.94)	1.40 (0.63), 0.16	3.82 (0.10), 0.00†	-0.11 (0.06), 0.31
Choline ¹	25.05 (0.86)	15.16 (1.22)	13.69 (1.28)	15.52 (1.34)	-3.94 (1.72), 0.15	-10.28 (0.77), 0.01†	0.12 (0.96), 0.92
Potassium ¹	37.80 (1.15)	28.56 (1.86)	28.79 (1.94)	30.00 (1.87)	-3.06 (1.58), 0.19	-8.69 (0.64), 0.01†	0.71 (0.28), 0.24
Fruit Drinks							
	Q1 ² n=39,689,880 % <EAR (SE)	Q2 n=9,979,489 % <EAR (SE)	Q3 n=10,027,750 % <EAR (SE)	Q4 n=10,008,765 % <EAR (SE)	Quantile Trend ³ Beta (SE), P	Q1 vs. Q2,3,4 ⁴ Beta (SE), P	Q2-Q4 Trend ⁵ Beta (SE), P
Calcium	46.71 (1.05)	45.00 (2.01)	47.69 (1.55)	45.14 (1.71)	-0.29 (0.52), 0.63	-0.77 (1.22), 0.59	-0.04 (1.51), 0.99
Magnesium	39.63 (0.86)	29.11 (1.40)	31.33 (1.37)	29.66 (1.17)	-3.49 (1.48), 0.14	-9.58 (0.91), 0.01†	0.20 (1.12), 0.89
Phosphorus	16.07 (0.80)	15.42 (1.38)	13.97 (1.52)	10.97 (1.21)	-1.55 (0.31), 0.04	-2.80 (1.85), 0.27	-2.25 (0.45), 0.12
Vitamin A	26.68 (1.02)	20.83 (1.73)	21.39 (1.32)	24.71 (1.73)	-1.09 (1.23), 0.47	-4.20 (1.73), 0.14	2.00 (0.79), 0.24

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Vitamin C	29.96 (1.22)	11.20 (1.69)	4.03 (1.46)	1.47 (1.02)	-10.25 (2.17), 0.04§	-24.79 (4.00), 0.03§	-4.77 (1.33), 0.17
Vitamin D	90.91 (0.63)	93.33 (0.92)	94.14 (0.94)	93.93 (0.95)	1.14 (0.35), 0.08	2.91 (0.33), 0.01	0.28 (0.30), 0.52
Choline¹	19.90 (0.75)	20.49 (1.66)	20.07 (1.44)	20.34 (1.51)	0.14 (0.10), 0.32	0.40 (0.17), 0.14	-0.07 (0.20), 0.79
Potassium¹	32.68 (1.10)	30.58 (1.90)	33.39 (2.01)	39.11 (1.83)	1.75 (1.04), 0.23	2.03 (3.56), 0.63	4.33 (0.84), 0.12
Sport and Energy Drinks							
	Q1² n=62,719,734 % <EAR (SE)	Q2 n=2,248,682 % <EAR (SE)	Q3 n=2,358,945 % <EAR (SE)	Q4 n=2,378,523 % <EAR (SE)	Quantile Trend³ Beta (SE), P	Q1 vs. Q2,3,4⁴ Beta (SE), P	Q2-Q4 Trend⁵ Beta (SE), P
Calcium	46.17 (0.85)	56.69 (3.40)	47.72 (4.59)	41.41 (4.56)	-0.06 (2.34), 0.98	2.68 (4.64), 0.62	-7.66 (0.77), 0.06
Magnesium	34.53 (0.69)	48.67 (3.30)	45.87 (3.13)	43.22 (3.77)	4.48 (2.21), 0.18	11.47 (1.64), 0.02§	-2.73 (0.05), 0.01
Phosphorus	14.76 (0.63)	23.34 (3.55)	14.94 (3.58)	13.83 (2.73)	0.42 (1.71), 0.83	2.75 (3.17), 0.48	-4.82 (2.12), 0.26
Vitamin A	24.24 (0.80)	32.38 (3.15)	32.88 (4.47)	26.86 (5.27)	2.38 (1.65), 0.28	6.56 (1.99), 0.08	-2.71 (1.89), 0.39
Vitamin C	19.31 (0.86)	10.27 (5.03)	21.56 (3.86)	15.52 (6.57)	-1.10 (1.84), 0.61	-3.58 (3.45), 0.41	2.76 (5.03), 0.68
Vitamin D	92.00 (0.52)	94.51 (1.85)	92.17 (2.24)	91.76 (2.74)	0.15 (0.50), 0.79	0.86 (0.90), 0.44	-1.39 (0.56), 0.24
Choline¹	20.98 (0.69)	13.20 (2.16)	14.64 (2.26)	14.96 (3.10)	-2.73 (1.12), 0.13	-6.73 (0.57), 0.01†	0.89 (0.32), 0.22
Potassium¹	33.14 (1.11)	27.58 (3.25)	31.21 (3.78)	39.07 (4.40)	0.60 (1.60), 0.75	-0.71 (3.52), 0.86	5.71 (1.23), 0.13
Coffee and Tea							
	Q1² n=59,622,348 % <EAR (SE)	Q2 n=3,317,496 % <EAR (SE)	Q3 n=3,406,193 % <EAR (SE)	Q4 n=3,359,846 % <EAR (SE)	Quantile Trend³ Beta (SE), P	Q1 vs. Q2,3,4⁴ Beta (SE), P	Q2-Q4 Trend⁵ Beta (SE), P
Calcium	44.58 (0.85)	62.76 (2.63)	55.44 (3.77)	53.26 (3.80)	4.79 (3.12), 0.26	12.95 (3.12), 0.05	-4.86 (1.51), 0.19
Magnesium	33.76 (0.72)	45.71 (2.51)	44.96 (2.37)	46.90 (3.22)	5.31 (1.54), 0.08	12.03 (0.58), 0.00†	0.53 (0.79), 0.62
Phosphorus	14.23 (0.68)	23.12 (2.22)	19.06 (2.53)	16.01 (3.35)	1.76 (1.71), 0.41	5.47 (2.20), 0.13	-3.58 (0.30), 0.05
Vitamin A	23.21 (0.85)	33.94 (3.54)	32.72 (3.63)	38.89 (3.72)	5.48 (1.19), 0.04§	11.72 (1.94), 0.03§	2.31 (2.17), 0.48
Vitamin C	17.03 (0.92)	28.35 (3.72)	27.66 (4.54)	36.95 (4.57)	6.56 (1.17), 0.03§	13.54 (3.07), 0.05§	4.07 (2.93), 0.40
Vitamin D	91.47 (0.56)	96.73 (0.97)	95.76 (1.21)	93.74 (1.92)	1.52 (0.96), 0.26	4.07 (0.92), 0.05	-1.47 (0.31), 0.13
Choline¹	21.15 (0.67)	13.94 (1.69)	16.12 (2.21)	13.77 (2.22)	-2.80 (0.96), 0.10	-6.52 (0.82), 0.02§	-0.01 (1.33), 0.99
Potassium¹	33.33 (0.96)	29.22 (3.06)	33.41 (3.03)	41.05 (3.88)	1.29 (1.48), 0.47	0.70 (3.63), 0.86	5.84 (1.02), 0.11
Flavored Milk							
	Q1² n=51,222,508 % <EAR (SE)	Q2 n=5,797,437 % <EAR (SE)	Q3 n=6,342,564 % <EAR (SE)	Q4 n=6,343,373 % <EAR (SE)	Quantile Trend³ Beta (SE), P	Q1 vs. Q2,3,4⁴ Beta (SE), P	Q2-Q4 Trend⁵ Beta (SE), P
Calcium	52.59 (0.94)	38.64 (2.97)	30.18 (2.51)	10.15 (2.39)	-13.30 (1.07), 0.01†	-26.06 (9.76), 0.12	-14.21 (3.39), 0.15
Magnesium	40.50 (0.79)	22.34 (1.95)	23.04 (1.74)	18.56 (1.67)	-8.20 (2.17), 0.06	-19.14 (1.61), 0.01†	-1.87 (1.52), 0.43
Phosphorus	18.87 (0.70)	7.68 (1.32)	5.03 (1.40)	0.61 (0.36)	-6.55 (1.03), 0.02§	-14.38 (2.38), 0.03	-3.53 (0.52), 0.09

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Vitamin A	30.00 (0.90)	10.85 (2.58)	11.02 (1.85)	6.74 (1.26)	-8.75 (2.29), 0.06	-20.42 (1.62), 0.01†	-2.05 (1.30), 0.36
Vitamin C	20.72 (1.07)	11.92 (1.66)	15.25 (1.99)	16.24 (1.85)	-2.17 (1.47), 0.28	-6.26 (1.52), 0.05	2.17 (0.69), 0.20
Vitamin D	93.44 (0.47)	98.77 (0.83)	93.45 (2.03)	84.90 (4.14)	-1.68 (1.79), 0.45	-0.98 (4.67), 0.85	-6.92 (0.95), 0.09
Choline¹	18.20 (0.71)	17.85 (1.63)	22.75 (2.45)	34.72 (2.19)	4.29 (1.53), 0.11	6.58 (5.77), 0.37	8.38 (2.08), 0.16
Potassium¹	29.90 (0.96)	31.52 (2.36)	40.04 (2.67)	62.96 (3.11)	8.91 (2.61), 0.08	14.70 (10.85), 0.31	15.68 (4.22), 0.17
Rest of the Diet							
Added Sugars (% kcal)	Q1 n=17,415,441 ≤5.19	Q2 n=17,427,804 >5.19 to ≤7.95	Q3 n=17,414,410 >7.95 to ≤11.15	Q4 n=17,448,227 >11.15	Quartile Trend⁶		
	% <EAR (SE)	% <EAR (SE)	% <EAR (SE)	% <EAR (SE)	Beta (SE), P		
Calcium	62.10 (1.25)	46.58 (1.34)	43.28 (1.72)	30.43 (1.41)	-9.91 (1.58), 0.02§		
Magnesium	49.74 (1.19)	36.71 (1.09)	31.88 (1.17)	21.35 (1.08)	-9.07 (1.05), 0.01§		
Phosphorus	31.14 (1.41)	14.70 (1.09)	10.37 (1.01)	4.13 (0.55)	-8.72 (1.90), 0.04§		
Vitamin A	46.41 (1.39)	24.15 (1.44)	17.63 (1.66)	7.25 (1.16)	-12.62 (2.34), 0.03§		
Vitamin C	26.58 (1.63)	19.83 (1.42)	16.86 (1.61)	12.55 (1.37)	-4.55 (0.53), 0.01		
Vitamin D	95.05 (0.55)	93.57 (0.99)	92.11 (0.81)	88.63 (1.02)	-2.04 (0.34), 0.03		
Choline¹	17.22 (0.96)	19.03 (1.19)	19.66 (1.23)	23.01 (1.33)	1.78 (0.35), 0.04		
Potassium¹	19.33 (1.38)	30.64 (1.68)	34.04 (1.53)	49.95 (1.77)	9.49 (1.56), 0.03§		

EAR, estimated average requirement; AI, adequate intake

¹>AI for choline and potassium

²Quantile 1 represents non-consumers; the remaining sample of those reporting intake (consumers) was divided into tertiles (quantiles 2, 3 and 4)

³From regression analysis among all individuals, test for trend

⁴From regression analysis among all individuals, test for differences between non-consumers (Q1) and consumers (Q2,3,4)

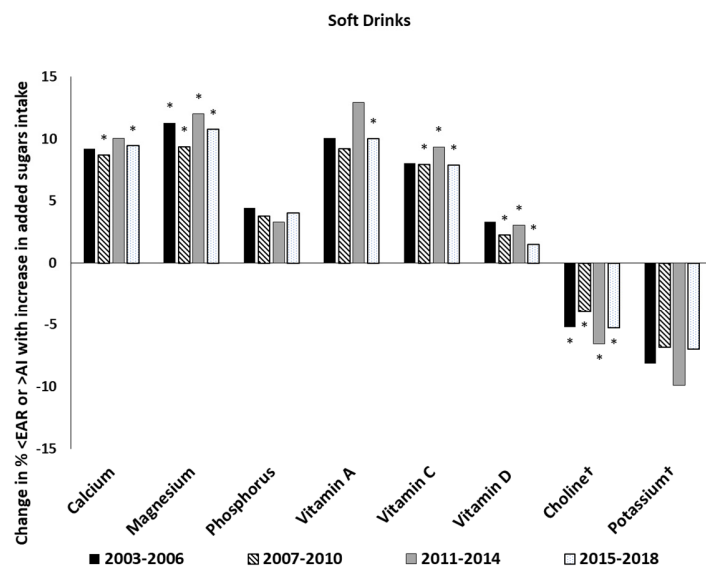
⁵From regression analysis among consumers (Q2-Q4), test for trend

⁶From regression analysis, test for trend

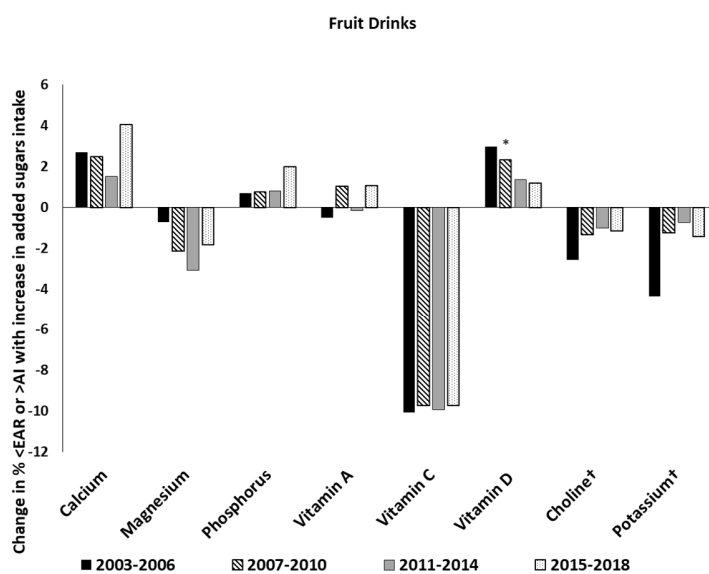
†Statistically significant at p<0.01; §Statistically significant at p<0.05

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A

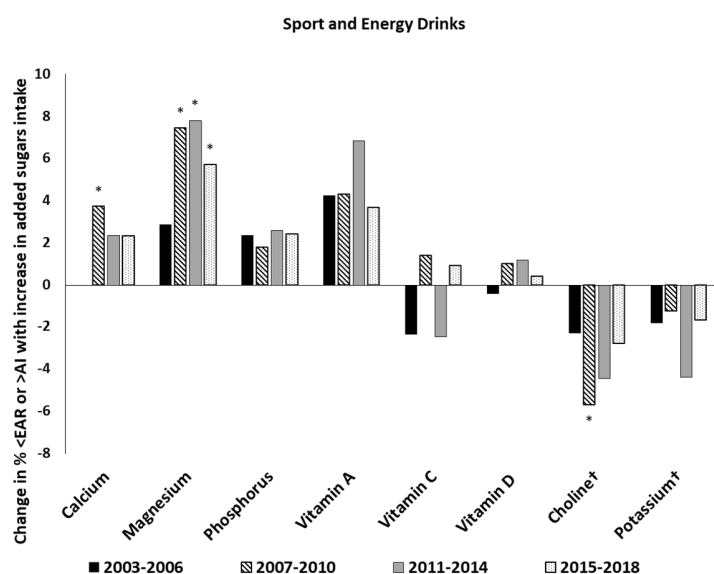


B

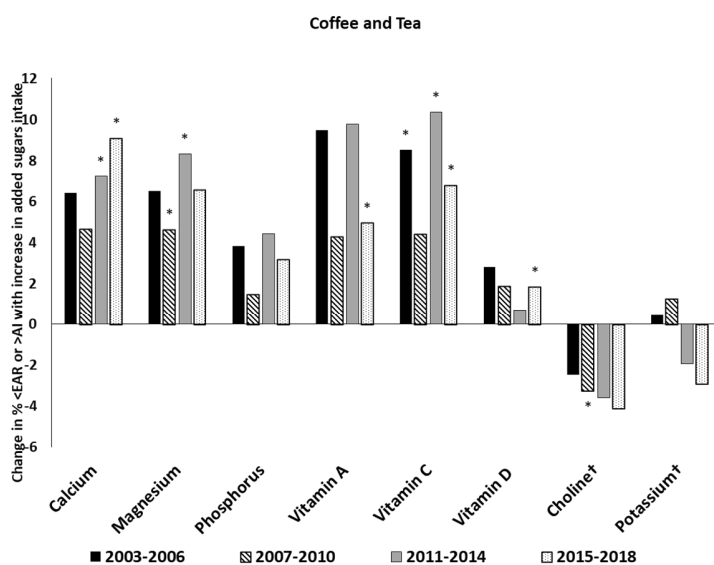


Intakes of added sugars with a focus on beverages and the associations with micronutrient adequacy in US children, adolescents and teens (NHANES 2003-2018), Ricciuto, L., et al.

C



D



Supplemental Figure S2. Change in % <EAR (>AI[†]) in association with increased added sugars intake from select beverage sources: **A.** soft drinks and **B.** fruit drinks, by NHANES 4-y cycles, among children, adolescents and teens (2-18 y). **C.** sport and energy drinks and **D.** coffee and tea, by NHANES 4-y cycles, among children, adolescents and teens (2-18 y).

EAR, estimated average requirement; AI, adequate intake

[†]>AI for choline and potassium

*Statistically significant at $p < 0.05$; from regression analysis, test for trend across quantiles of added sugars intake.

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Supplemental Table S5. Association between added sugars intake from select beverages and % <EAR (>AI¹) among children, adolescents and teens (2-18 y) by NHANES 4-y cycles.

	NHANES 2003-2006	NHANES 2007-2010	NHANES 2011-2014	NHANES 2015-2018
Soft Drinks				
Nutrient	Beta (SE), P ²	Beta (SE), P	Beta (SE), P	Beta (SE), P
Calcium	9.18 (3.00), 0.09	8.71 (1.75), 0.04*	10.02 (2.60), 0.06	9.43 (2.19), 0.05*
Magnesium	11.26 (2.41), 0.04*	9.35 (1.23), 0.02*	11.98 (2.18), 0.03*	10.74 (1.49), 0.02*
Phosphorus	4.42 (2.61), 0.23	3.76 (1.47), 0.12	3.32 (2.16), 0.26	4.05 (3.15), 0.33
Vitamin A	10.05 (3.26), 0.09	9.20 (2.38), 0.06	12.93 (4.93), 0.12	10.01 (1.32), 0.02*
Vitamin C	8.05 (3.32), 0.14	7.94 (1.17), 0.02*	9.34 (1.83), 0.04*	7.89 (1.16), 0.02*
Vitamin D	3.35 (0.81), 0.05	2.25 (0.43), 0.03*	3.04 (0.45), 0.02*	1.49 (0.14), 0.01*
Choline ¹	-5.22 (1.02), 0.04*	-3.94 (0.52), 0.02*	-6.56 (1.19), 0.03*	-5.26 (0.24), 0.00*
Potassium ¹	-8.14 (4.12), 0.19	-6.84 (2.15), 0.09	-9.90 (3.55), 0.11	-6.98 (3.60), 0.19
Fruit Drinks				
Nutrient	Beta (SE), P	Beta (SE), P	Beta (SE), P	Beta (SE), P
Calcium	2.72 (3.10), 0.47	2.48 (3.66), 0.57	1.53 (3.21), 0.68	4.05 (3.45), 0.36
Magnesium	-0.71 (4.18), 0.88	-2.12 (2.90), 0.54	-3.06 (3.25), 0.45	-1.83 (3.73), 0.67
Phosphorus	0.70 (2.54), 0.81	0.76 (1.86), 0.72	0.81 (2.73), 0.79	2.01 (3.28), 0.60
Vitamin A	-0.50 (2.86), 0.88	1.03 (2.50), 0.72	-0.13 (4.20), 0.98	1.08 (3.32), 0.78
Vitamin C	-10.07 (2.65), 0.06	-9.73 (2.46), 0.06	-9.94 (2.88), 0.07	-9.72 (3.39), 0.10
Vitamin D	2.98 (1.54), 0.19	2.33 (0.17), 0.01*	1.36 (0.38), 0.07	1.19 (0.40), 0.10
Choline ¹	-2.55 (3.30), 0.52	-1.32 (1.50), 0.47	-1.01 (0.33), 0.09	-1.16 (2.32), 0.67
Potassium ¹	-4.35 (4.61), 0.44	-1.24 (2.39), 0.66	-0.73 (1.72), 0.71	-1.42 (1.89), 0.53
Sport and Energy Drinks				
Nutrient	Beta (SE), P	Beta (SE), P	Beta (SE), P	Beta (SE), P
Calcium	0.00 (7.41), 1.00	3.72 (0.80), 0.04*	2.35 (2.25), 0.41	2.33 (3.81), 0.60
Magnesium	2.86 (3.75), 0.53	7.43 (1.24), 0.03*	7.79 (1.66), 0.04*	5.71 (1.07), 0.03*
Phosphorus	2.37 (3.66), 0.58	1.80 (2.23), 0.50	2.59 (4.20), 0.60	2.42 (3.32), 0.54
Vitamin A	4.23 (3.88), 0.39	4.29 (3.51), 0.35	6.83 (1.60), 0.05	3.66 (2.89), 0.33
Vitamin C	-2.39 (4.51), 0.65	1.41 (3.31), 0.71	-2.50 (1.02), 0.13	0.92 (5.40), 0.88
Vitamin D	-0.42 (4.03), 0.93	1.01 (2.22), 0.69	1.19 (0.82), 0.28	0.42 (1.51), 0.81
Choline ¹	-2.31 (2.82), 0.50	-5.71 (0.28), 0.00*	-4.45 (2.83), 0.26	-2.81 (1.23), 0.15
Potassium ¹	-1.84 (6.36), 0.80	-1.23 (2.53), 0.67	-4.40 (2.88), 0.27	-1.71 (5.19), 0.77
Coffee and Tea				
Nutrient	Beta (SE), P	Beta (SE), P	Beta (SE), P	Beta (SE), P
Calcium	6.42 (2.42), 0.12	4.67 (2.41), 0.19	7.22 (1.57), 0.04*	9.09 (1.05), 0.01*
Magnesium	6.52 (2.62), 0.13	4.64 (0.87), 0.03*	8.32 (1.58), 0.03*	6.56 (1.62), 0.06
Phosphorus	3.83 (2.34), 0.24	1.48 (3.59), 0.72	4.43 (2.06), 0.16	3.20 (1.31), 0.13
Vitamin A	9.46 (2.90), 0.08	4.29 (3.27), 0.32	9.77 (2.29), 0.05	4.96 (0.44), 0.01*
Vitamin C	8.52 (1.90), 0.05*	4.41 (2.09), 0.17	10.35 (1.33), 0.02*	6.80 (0.71), 0.01*

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Vitamin D	2.81 (1.89), 0.27	1.90 (1.68), 0.38	0.69 (0.82), 0.49	1.86 (0.33), 0.03*
Choline¹	-2.50 (3.50), 0.55	-3.25 (0.19), 0.00*	-3.61 (1.54), 0.14	-4.11 (1.44), 0.10
Potassium¹	0.44 (4.31), 0.93	1.29 (2.22), 0.62	-1.95 (3.50), 0.63	-2.92 (2.90), 0.42

EAR, estimated average requirement; AI, adequate intake

¹>AI for choline and potassium

²Beta represents the regression coefficient (change) in percentage of the population <EAR (>AI) across quantiles of added sugars from the select beverage, testing hypothesis that regression coefficient (slope) equals 0

*Statistically significant at p<0.05

Intakes of added sugars with a focus on beverages and the associations with micronutrient adequacy in US children, adolescents and teens (NHANES 2003-2018), Ricciuto, L., et al.

Supplemental Table S6. Quartiles of added sugars intake (% kcal) from the rest of the diet and trends in % <EAR (>AI¹) for selected micronutrients among children, adolescents and teens from the pooled sample (NHANES 2003-2018, n=21,005); weighted n's are shown in the table.

2-8 y (n=8,599)					
Added Sugars (% kcal)	Q1 n=6,974,607 <5.79	Q2 n=6,993,758 5.79 to ≤8.46	Q3 n=6,974,352 >8.46 to ≤11.62	Q4 n=6,995,657 >11.62	Quartile Trend²
	% <EAR* (SE)	% <EAR* (SE)	% <EAR* (SE)	% <EAR* (SE)	Beta (SE), P
Calcium	24.96 (1.48)	17.89 (1.46)	18.55 (1.91)	13.80 (1.42)	-3.34 (1.00), 0.08
Magnesium	1.52 (0.33)	0.20 (0.12)	0.15 (0.07)	0.07 (0.04)	-0.46 (0.22), 0.17
Phosphorus	0.21 (0.09)	0.02 (0.02)	0.00 (0.00)	0.00 (0.00)	-0.07 (0.03), 0.17
Vitamin A	4.94 (0.81)	1.35 (0.49)	1.66 (0.52)	0.44 (0.24)	-1.37 (0.54), 0.13
Vitamin C	0.90 (0.32)	0.91 (0.30)	0.96 (0.34)	0.83 (0.31)	-0.02 (0.03), 0.61
Vitamin D	89.27 (1.08)	89.58 (1.48)	89.59 (1.16)	87.73 (1.30)	-0.42 (0.35), 0.35
Choline¹	41.75 (2.16)	43.35 (2.15)	42.84 (2.14)	47.67 (2.40)	1.66 (0.70), 0.14
Potassium¹	33.37 (1.92)	38.63 (1.99)	38.67 (2.13)	48.07 (2.13)	4.35 (1.18), 0.07
9-18 y (n=12,406)					
Added Sugars (% kcal)	Q1 n=10,440,833 <4.78	Q2 n=10,434,047 4.78 to ≤7.57	Q3 n=10,440,058 >7.57 to ≤10.87	Q4 n=10,452,571 >10.87	Quartile Trend²
	% <EAR (SE)	% <EAR (SE)	% <EAR (SE)	% <EAR (SE)	Beta (SE), P
Calcium	87.09 (1.50)	65.71 (1.96)	59.84 (2.48)	41.42 (1.89)	-14.39 (2.00), 0.02§
Magnesium	82.03 (1.20)	61.30 (1.47)	52.94 (1.75)	35.67 (1.76)	-14.84 (1.58), 0.01§
Phosphorus	51.38 (2.06)	24.29 (1.79)	17.37 (1.64)	7.00 (0.88)	-14.28 (3.12), 0.04§
Vitamin A	74.24 (1.68)	39.79 (2.29)	28.47 (2.63)	11.83 (1.83)	-20.16 (3.45), 0.03§
Vitamin C	43.89 (2.40)	32.53 (2.18)	27.58 (2.38)	20.39 (2.13)	-7.62 (0.90), 0.01§
Vitamin D	98.82 (0.25)	96.11 (0.77)	93.85 (0.79)	89.30 (1.12)	-3.06 (0.34), 0.01
Choline¹	0.98 (0.31)	2.95 (0.80)	4.56 (0.94)	6.04 (1.17)	1.69 (0.08), 0.00†
Potassium¹	9.80 (1.24)	25.17 (1.80)	30.83 (1.95)	50.81 (2.16)	12.86 (1.77), 0.02§

EAR, estimated average requirement; AI, adequate intake

¹>AI for choline and potassium

²From regression analysis, test for trend

†Statistically significant at p<0.01; §Statistically significant at p<0.05