

## Search Plan and Results

### Question

[Is intake of sugar-sweetened beverages associated with adiposity in children? \(DGAC 2010\)](#)

### Date Searched

7/7/2009

### Inclusion Criteria

- Publication date August 1, 2004 through July 7, 2009
- English language
- Human subjects
- Children (zero to 18 years)
- Included at least one outcome measure of adiposity (e.g., body weight, body mass index, skinfolds, percent body fat).

### Exclusion Criteria

- Conducted in a developed country
- Published in journals that are not peer-reviewed
- Included no measure of adiposity (e.g., body weight, body mass index, skinfolds, percent body fat)
- Involved exclusively children less than two years old or adolescents over 18 years old
- Treatment trial conducted for less than eight weeks (not including duration of follow-up)
- Prevention trial conducted for less than six months (not including duration of follow-up)
- Treatment trial involved fewer than 10 subjects total (or fewer than 10 in the intervention group)
- Prevention trial involved fewer than 60 subjects total (or fewer than 30 in the intervention group)
- Treatment trials involving pharmacological interventions (because of lack of research in these areas)
- Narrative reviews, systematic reviews, meta-analyses, cross-sectional studies.

### Search Terms: Search Vocabulary

"Body Fat Distribution"[Mesh] OR "Body Mass Index"[Mesh] OR "Body Weights and Measures"[majr] OR "Overweight"[majr] OR "Obesity"[majr] OR "Weight Gain"[majr]) AND ("Carbonated Beverages"[Mesh] OR ((Soft drink\* OR soda OR sugar\* OR sweet\*) AND beverages[mh])) Limit to all child 0-18 yrs

## Electronic Databases

Pubmed

**Total hits from all electronic database searches: 111**

**Total articles identified to review from electronic databases: 45**

Articles Identified Via Handsearch or Other Means

- Articles identified via hand search: One
- Articles identified from the ADA Evidence Review on this topic: Seven.

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Summary of Articles Identified to Review

**Number of Primary Articles Identified: 12**

**Number of Review Articles Identified: 0**

**Total Number of Articles Identified: 19**

**Number of Articles Reviewed but Excluded: 35**

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List of Articles Included for Evidence Analysis

### **INCLUDED ARTICLES (19)**

#### ***Articles Identified via the NELSearch (12)***

Blum JW, Jacobsen DJ, Donnelly JE. Beverage consumption patterns in elementary school aged children across a two-year period. *J Am Coll Nutr.* 2005 Apr; 24(2): 93-98. PMID: 15798075.

Dubois L, Farmer A, Girard M, Peterson K. Regular sugar-sweetened beverage consumption between meals increases risk of overweight among preschool-aged children. *J Am Diet Assoc.* 2007 Jun; 107(6): 924-934; discussion 934-935. PMID: 17524711.

Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: A randomized, controlled pilot study. *Pediatrics.* 2006 Mar; 117(3): 673-680. PMID: 16510646.

Fiorito LM, Marini M, Francis LA, Smiciklas-Wright H, Birch LL. Beverage intake of girls at age five years predicts adiposity and weight status in childhood and adolescence. *Am J Clin Nutr*. 2009 Oct; 90(4): 935-942. Epub 2009 Aug 19. PMID: 19692492. (Hand search)

Johnson L, Mander AP, Jones LR, Emmett PM, Jebb SA. Is sugar-sweetened beverage consumption associated with increased fatness in children? *Nutrition*. 2007 Jul-Aug; 23(7-8): 557-563. PMID: 17616342.

Kral TV, Stunkard AJ, Berkowitz RI, Stallings VA, Moore RH, Faith MS. Beverage consumption patterns of children born at different risk of obesity. *Obesity (Silver Spring)*. 2008 Aug; 16(8): 1, 802-1, 808. Epub 2008 May 29. PMID: 18535546.

Kvaavik E, Andersen LF, Klepp KI. The stability of soft drinks intake from adolescence to adult age and the association between long-term consumption of soft drinks and lifestyle factors and body weight. *Public Health Nutr*. 2005 Apr; 8(2): 149-157. PubMed PMID: 15877908.

Libuda L, Alexy U, Sichert-Hellert W, Stehle P, Karaolis-Danckert N, Buyken AE, Kersting M. Pattern of beverage consumption and long-term association with body-weight status in German adolescents: Results from the DONALD study. *Br J Nutr*. 2008 Jun; 99(6): 1, 370-1, 379. Epub 2007 Nov 23. PMID: 18034911.

Mundt CA, Baxter-Jones AD, Whiting SJ, Bailey DA, Faulkner RA, Mirwald RL. Relationships of activity and sugar drink intake on fat mass development in youths. *Med Sci Sports Exerc*. 2006 Jul; 38(7): 1, 245-1, 254. PMID: 16826021.

Striegel-Moore RH, Thompson D, Affenito SG, Franko DL, Obarzanek E, Barton BA, Schreiber GB, Daniels SR, Schmidt M, Crawford PB. Correlates of beverage intake in adolescent girls: the National Heart, Lung, and Blood Institute Growth and Health Study. *J Pediatr*. 2006 Feb; 148(2): 183-187. PMID: 16492426.

Tam CS, Garnett SP, Cowell CT, Campbell K, Cabrera G, Baur LA. Soft drink consumption and excess weight gain in Australian school students: results from the Nepean study. *Int J Obes (Lond)*. 2006 Jul; 30(7): 1.091-1, 093. Epub 2006 Mar 21. PMID: 16801946.

Welsh JA, Cogswell ME, Rogers S, Rockett H, Mei Z, Grummer-Strawn LM. Overweight among low-income preschool children associated with the consumption of sweet drinks: Missouri, 1999-2002. *Pediatrics*. 2005 Feb; 115(2): e223-229. PMID: 15687430.

### **Articles Identified from the ADAEvidence Review (7)**

Berkey CS, Rockett HRH, Field AE, Gillman MW, Colditz GA. Sugar-added beverages and adolescent weight change. *Obes Res*. 2004; 12: 778-788.

James J, Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: Cluster randomised controlled trial. *BMJ*. 2004 May 22; 328(7, 450): 1, 237. Epub 2004 Apr 23.

Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity. *Lancet*. 2001; 357: 505-508.

Mrdjenovic G, Levitsky DA. Nutritional and energetic consequences of sweetened drink consumption in 6- to 13-year-old children. *J Pediatr*. 2003; 142: 604-610.

Newby PK, Peterson KE, Berkey CS, Leppert J, Willett WC, Colditz GA. Beverage

consumption is not associated with changes in weight and body mass index among low-income preschool children in North Dakota. *J Am Diet Assoc.* 2004; 104: 1, 086-1, 094.

Phillips SM, Bandini LG, Naumova EN, Cyr H, Colclough S, Dietz WH, Must A. Energy-dense snack food intake in adolescence: Longitudinal relationship to weight and fatness. *Obes Res.* 2004; 12: 461-472.

Sugimori H, Yoshida K, Izuno T, Miyakawa M, Suka M, Sekine M, Yamagami T, Kagamimori S. Analysis of factors that influence body mass index from ages 3 to 6 years: A study based on the Toyama cohort study. *Pediatr Int.* 2004 Jun; 46(3): 302-310.

#### List of Excluded Articles with Reason

Article (A-K)	Reason for Exclusion
Albala C, Ebbeling CB, Cifuentes M, Lera L, Bustos N, Ludwig DS. Effects of replacing the habitual consumption of sugar-sweetened beverages with milk in Chilean children. <i>Am J Clin Nutr.</i> 2008 Sep; 88(3): 605-611. PMID: 18779274; PMCID: PMC2583441.	Study population not from a developed country as defined by the Human Development Index.
Boutelle KN, Fulkerson JA, Neumark-Sztainer D, Story M, French SA. Fast food for family meals: Relationships with parent and adolescent food intake, home food availability and weight status. <i>Public Health Nutr.</i> 2007 Jan; 10(1): 16-23. PMID: 17212838.	Does not answer question; does not examine the relationship between sweetened beverage intake and adiposity.
Brekke HK, van Odijk J, Ludvigsson J. Predictors and dietary consequences of frequent intake of high-sugar, low-nutrient foods in 1-year-old children participating in the ABIS study. <i>Br J Nutr.</i> 2007 Jan; 97(1): 176-181. PMID: 17217574.	Does not include adiposity as a measured outcome.
Bremer AA, Auinger P, Byrd RS. Relationship between insulin resistance-associated metabolic parameters and anthropometric measurements with sugar-sweetened beverage intake and physical activity levels in US adolescents: findings from the 1999-2004 National Health and Nutrition Examination Survey. <i>Arch Pediatr Adolesc Med.</i> 2009 Apr; 163(4): 328-335. PMID: 19349561.	Study design is cross-sectional.
Campbell KJ, Crawford DA, Ball K. Family food environment and dietary behaviors likely to promote fatness in 5- to 6-year-old children. <i>Int J Obes (Lond).</i> 2006 Aug; 30(8): 1, 272-1, 280. Epub 2006 Feb 21. PMID: 16491108.	Does not include adiposity as a measured outcome.

<p>Denova-Gutiérrez E, Jiménez-Aguilar A, Halley-Castillo E, Huitrón-Bravo G, Talavera JO, Pineda-Pérez D, Díaz-Montiel JC, Salmerón J. Association between sweetened beverage consumption and body mass index, proportion of body fat and body fat distribution in Mexican adolescents. <i>Ann Nutr Metab.</i> 2008; 53(3-4): 245-251. Epub 2009 Jan 9. PMID: 19136819.</p>	<p>Study population not from a developed country as defined by the Human Development Index.</p>
<p>Forshee RA, Anderson PA, Storey ML. Sugar-sweetened beverages and body mass index in children and adolescents: A meta-analysis. <i>Am J Clin Nutr.</i> 2008 Jun; 87(6): 1, 662-1, 671. Erratum in: <i>Am J Clin Nutr.</i> 2009 Jan; 89(1): 441-442. PMID: 18541554.</p>	<p>Study is a meta-analysis.</p>
<p>Forshee RA, Anderson PA, Storey ML. The role of beverage consumption, physical activity, sedentary behavior, and demographics on body mass index of adolescents. <i>Int J Food Sci Nutr.</i> 2004 Sep; 55(6): 463-478. PMID: 15762311.</p>	<p>Study design is cross-sectional.</p>
<p>Forshee RA, Storey ML, Allison DB, Glinsmann WH, Hein GL, Lineback DR, Miller SA, Nicklas TA, Weaver GA, White JS. A critical examination of the evidence relating high fructose corn syrup and weight gain. <i>Crit Rev Food Sci Nutr.</i> 2007; 47(6): 561-582. Review. PMID: 17653981.</p>	<p>Study is a narrative review.</p>
<p>Forshee RA, Storey ML, Ginevan ME. A risk analysis model of the relationship between beverage consumption from school vending machines and risk of adolescent overweight. <i>Risk Anal.</i> 2005 Oct; 25(5): 1, 121-1, 135. PMID: 16297219.</p>	<p>Study design is cross-sectional.</p>
<p>Franko DL, Thompson D, Bauserman R, Affenito SG, Striegel-Moore RH; National Heart, Lung, and Blood Institute Growth and Health Study (NGHS). What's love got to do with it? Family cohesion and healthy eating behaviors in adolescent girls. <i>Int J Eat Disord.</i> 2008 May; 41(4): 360-367. PMID: 18318040.</p>	<p>Does not include adiposity as a measured outcome.</p>
<p>Gibson S, Neate D. Sugar intake, soft drink consumption and body weight among British children: Further analysis of National Diet and Nutrition Survey data with adjustment for under-reporting and physical activity. <i>Int J Food Sci Nutr.</i> 2007 Sep; 58(6): 445-460. PMID: 17710589.</p>	<p>Study design is cross-sectional.</p>
<p>Gibson S. Sugar-sweetened soft drinks and obesity: A systematic review of the evidence from observational studies and interventions. <i>Nutr Res Rev.</i> 2008 Dec; 21(2): 134-147. Review. PMID: 19087367.</p>	<p>Study is a systematic review.</p>

Gill TP, Rangan AM, Webb KL. The weight of evidence suggests that soft drinks are a major issue in childhood and adolescent obesity. <i>Med J Aust.</i> 2006 Mar 20; 184(6): 263-264. PMID: 16548828.	Study is a commentary.
He FJ, Marrero NM, MacGregor GA. Salt intake is related to soft drink consumption in children and adolescents: A link to obesity? <i>Hypertension.</i> 2008 Mar; 51(3): 629-634. PMID: 18287345.	Does not answer question; does not examine the relationship between sweetened beverage intake and adiposity.
Huffman L, West DS. Readiness to change sugar sweetened beverage intake among college students. <i>Eat Behav.</i> 2007 Jan; 8(1): 10-14. Epub 2006 May 30. PMID: 17174846.	Study subjects are adults.

Article (L-S)	Reason for Exclusion
LaRowe TL, Moeller SM, Adams AK. Beverage patterns, diet quality, and body mass index of US preschool and school-aged children. <i>J Am Diet Assoc.</i> 2007 Jul; 107(7): 1, 124-1, 133. PMID: 17604741.	Study design is cross-sectional.
Leatherman TL, Goodman A. Coca-colonization of diets in the Yucatan. <i>Soc Sci Med.</i> 2005 Aug; 61(4): 833-846. Epub 2004 Dec 10. PMID: 15950095.	Does not answer question; does not examine the relationship between sweetened beverage intake and adiposity.
Lee SK, Novotny R, Daida YG, Vijayadeva V, Gittelsohn J. Dietary patterns of adolescent girls in Hawaii over a 2-year period. <i>J Am Diet Assoc.</i> 2007 Jun; 107(6): 956-961. PMID: 17524716.	Does not answer question; does not examine the relationship between sweetened beverage intake and adiposity.
Linardakis M, Sarri K, Pateraki MS, Sbokos M, Kafatos A. Sugar-added beverages consumption among kindergarten children of Crete: Effects on nutritional status and risk of obesity. <i>BMC Public Health.</i> 2008 Aug 6; 8: 279. PMID: 18684334; PMCID: PMC2525654	Study design is cross-sectional.
Mahmood M, Saleh A, Al-Alawi F, Ahmed F. Health effects of soda drinking in adolescent girls in the United Arab Emirates. <i>J Crit Care.</i> 2008 Sep; 23(3): 434-440. PMID: 18725052.	Study design is cross-sectional.

Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: A systematic review. <i>Am J Clin Nutr.</i> 2006 Aug; 84(2): 274-288. Review. PMID: 16895873.	Study is a systematic review.
Nguyen S, Choi HK, Lustig RH, Hsu CY. Sugar-sweetened beverages, serum uric acid, and blood pressure in adolescents. <i>J Pediatr.</i> 2009 Jun; 154(6): 807-813. Epub 2009 Apr 17. PMID: 19375714.	Does not answer question; does not examine the relationship between sweetened beverage intake and adiposity.
Novotny R, Daida YG, Acharya S, Grove JS, Vogt TM. Dairy intake is associated with lower body fat and soda intake with greater weight in adolescent girls. <i>J Nutr.</i> 2004 Aug; 134(8): 1, 905-1, 909. PMID: 15284374.	Study design is cross-sectional.
O'Connor TM, Yang SJ, Nicklas TA. Beverage intake among preschool children and its effect on weight status. <i>Pediatrics.</i> 2006 Oct; 118(4): e1, 010-e1, 018. PMID: 17015497.	Study design is cross-sectional.
Popkin BM, Armstrong LE, Bray GM, Caballero B, Frei B, Willett WC. A new proposed guidance system for beverage consumption in the United States. <i>Am J Clin Nutr.</i> 2006 Mar; 83(3): 529-542. Erratum in: <i>Am J Clin Nutr.</i> 2007 Aug; 86(2): 525. PMID: 16522898.	Study is a commentary.
Rajeshwari R, Yang SJ, Nicklas TA, Berenson GS. Secular trends in children's sweetened-beverage consumption (1973 to 1994): The Bogalusa Heart Study. <i>J Am Diet Assoc.</i> 2005 Feb; 105(2): 208-214. PMID: 15668676.	Study design is cross-sectional.
Rangan AM, Randall D, Hector DJ, Gill TP, Webb KL. Consumption of 'extra' foods by Australian children: Types, quantities and contribution to energy and nutrient intakes. <i>Eur J Clin Nutr.</i> 2008 Mar; 62(3): 356-364. Epub 2007 Mar 14. PMID: 17356553.	Did not include adiposity as a measured outcome.
Roseman MG, Yeung WK, Nickelsen J. Examination of weight status and dietary behaviors of middle school students in Kentucky. <i>Am Diet Assoc.</i> 2007 Jul; 107(7): 1, 139-1, 145. PMID: 17604742J	Study design is cross-sectional.
Sanigorski AM, Bell AC, Swinburn BA. Association of key foods and beverages with obesity in Australian schoolchildren. <i>Public Health Nutr.</i> 2007 Feb; 10(2): 152-157. PMID: 17261224.	Study design is cross-sectional.

Article (T-Z)	Reason for Exclusion
Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: A systematic review and meta-analysis. <i>Am J Public Health</i> . 2007 Apr; 97(4): 667-675. Epub 2007 Feb 28. Review. PMID: 17329656; PMCID: PMC1829363.	Study is a systematic review and meta-analysis.
Wang YC, Ludwig DS, Sonneville K, Gortmaker SL. Impact of change in sweetened caloric beverage consumption on energy intake among children and adolescents. <i>Arch Pediatr Adolesc Med</i> . 2009 Apr; 163(4): 336-343. PMID: 19349562.	Did not include adiposity as a measured outcome.
Warner ML, Harley K, Bradman A, Vargas G, Eskenazi B. Soda consumption and overweight status of 2-year-old Mexican-American children in California. <i>Obesity. (Silver Spring)</i> . 2006 Nov; 14(11): 1, 966-1, 974. PMID: 17135613.	Study design is cross-sectional.
Wolff E, Dansinger ML. Soft drinks and weight gain: How strong is the link? <i>Medscape J Med</i> . 2008; 10(8): 189. Epub 2008 Aug 12. Review. PMID: 18924641; PMCID: PMC2562148.	Study is a systematic review.