# Preliminary outcomes of the systematic review on effects of level of sugars' intake on obesity & other related NCDs

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# Systematic reviews required for recommendations

Sugar(s) and obesity/excessive weight gain
Sugar(s) and dental caries
Sugars and NCD’s/surrogates

# HIERARCHY OF EVIDENCE

Metaanlyses
RCT's
Cohort studies
Case control studies
Cross sectional studies, case series
Correlation studies
Expert opinion

Feeding/experimental studies

# Effects of Soft Drink Consumption on Nutrition and Health: A Systematic Review and Meta-Analysis

Lenny R. Vartanian, PhD, Marlene B. Schwartz, PhD, and Kelly D. Brownell, PhD

*Am Journal of Public Health 2007;97:667-675*

# Vartanian Meta-analysis (AJPH 2007)

**TABLE 2—Effect Sizes for Average Body Weight, by Type of Research Design**

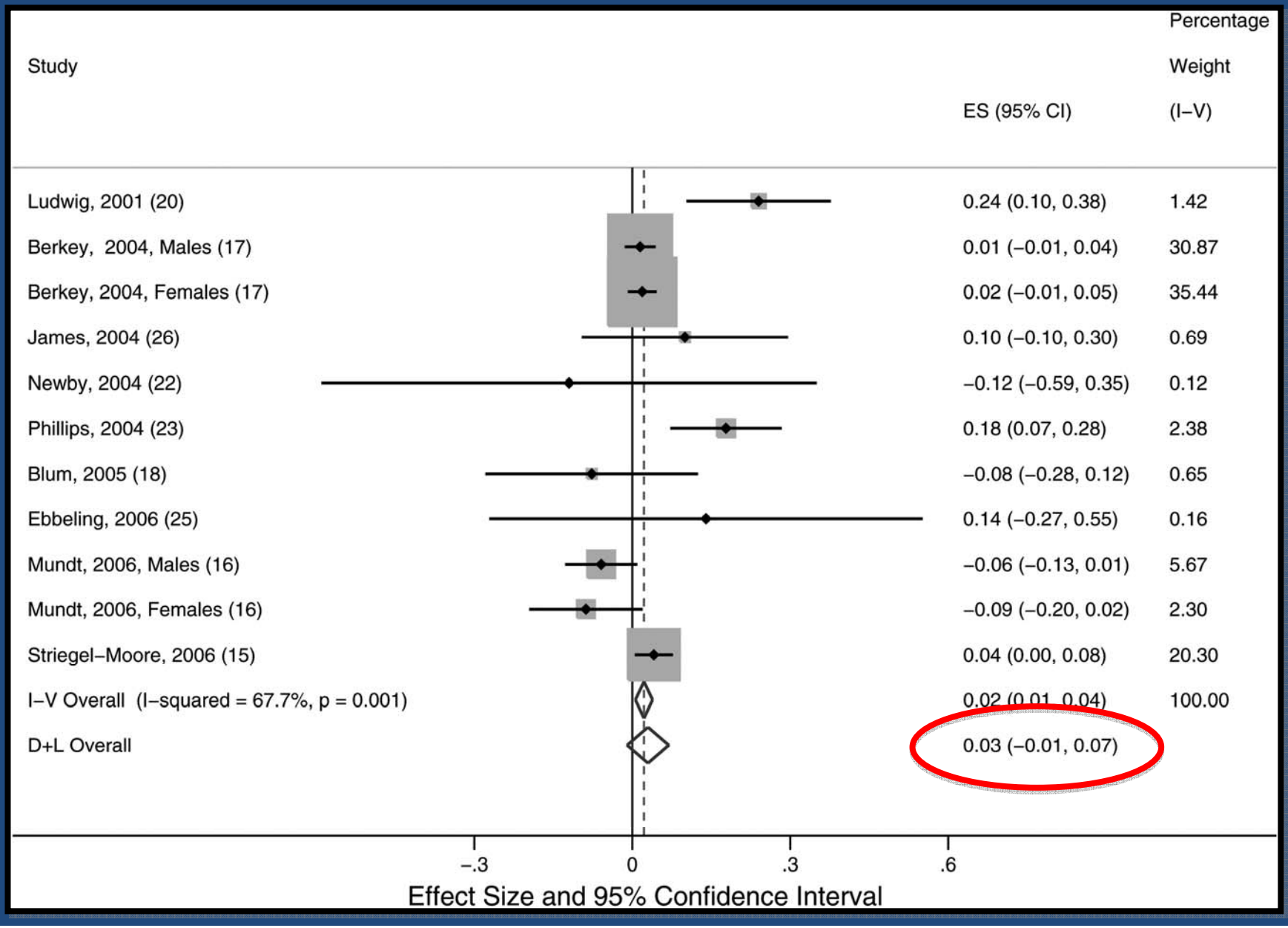
| | Cross-Sectional | | Longitudinal | | Experimental (Long) | | Overall | |
|---|---|---|---|---|---|---|---|---|
| | *r* (95% CI) | No.[a] | *r* (95% CI) | No.[a] | *r* (95% CI) | No.[a] | *r* (95% CI) | No.[a] |
| Gender | | | | | | | | |
| Male | 0.02* (−0.01, 0.05) | 5 | 0.03* (0.00, 0.05) | 2 | 0.17 (0.01, 0.32) | 2 | 0.03* (0.01, 0.05) | 9 |
| Female | 0.02* (−0.00, 0.04) | 8 | 0.11* (0.10, 0.13) | 5 | 0.49 (0.17, 0.72) | 1 | 0.09* (0.08, 0.10) | 13 |
| Mixed | 0.07* (0.06, 0.09) | 9 | 0.04* (0.01, 0.07) | 5 | 0.24 (0.18, 0.30) | 5 | 0.08* (0.06, 0.09) | 18 |
| Age group | | | | | | | | |
| Children | 0.03* (0.01, 0.04) | 13 | 0.03* (0.01, 0.04) | 7 | 0.29 (0.22, 0.35) | 2 | 0.03* (0.02, 0.04) | 22 |
| Adults | 0.06* (0.05, 0.08) | 5 | 0.14* (0.13, 0.16) | 3 | 0.15 (0.05, 0.24) | 5 | 0.11* (0.10, 0.12) | 11 |
| Type of beverage | | | | | | | | |
| Sugared soda | 0.04 (0.03, 0.05) | 10 | 0.13* (0.11, 0.14) | 7 | 0.15 (0.04, 0.25) | 4 | 0.09* (0.08, 0.10) | 19 |
| Mixed/other | 0.07 (0.04, 0.09) | 8 | 0.03* (0.01, 0.04) | 3 | 0.27 (0.21, 0.34) | 3 | 0.05* (0.04, 0.06) | 14 |
| Soda intake | | | | | | | | |
| Self-reported | 0.05 (0.03, 0.06) | 17 | 0.09 (0.08, 0.10) | 9 | 0.07 (−0.12, 0.26) | 1 | 0.07 (0.07, 0.08) | 25 |
| Measured | 0.20 (0.04, 0.35) | 1 | 0.13 (−0.08, 0.33) | 1 | 0.15 (0.05, 0.24) | 5 | 0.16 (0.08, 0.23) | 7 |
| Weight | | | | | | | | |
| Self-reported | 0.05 (0.03, 0.06) | 5 | 0.10* (0.09, 0.11) | 4 | … | … | 0.08 (0.07, 0.09) | 7 |
| Measured | 0.06 (0.03, 0.08) | 12 | 0.03* (0.00, 0.06) | 6 | 0.24 (0.18, 0.29) | 7 | 0.06 (0.05, 0.08) | 25 |
| Adjusted values | | | | | | | | |
| No | 0.06 (0.05, 0.08) | 10 | 0.06 (0.02, 0.09) | 4 | 0.25 (0.20, 0.31) | 6 | 0.08 (0.06, 0.09) | 19 |
| Yes | 0.03 (0.02, 0.05) | 9 | 0.10 (0.09, 0.11) | 6 | 0.07 (−0.12, 0.26) | 1 | 0.08 (0.07, 0.09) | 15 |
| Industry funded | | | | | | | | |
| No | 0.06* (0.05, 0.08) | 12 | 0.13* (0.11, 0.14) | 8 | 0.26 (0.20, 0.31) | 5 | 0.10* (0.09, 0.11) | 23 |
| Yes | 0.02* (0.00, 0.04) | 6 | 0.03* (0.01, 0.04) | 2 | 0.11 (−0.05, 0.26) | 2 | 0.02* (0.01, 0.04) | 10 |

*Note.* CI = confidence interval. Because some studies reported both cross-sectional and longitudinal data, the numbers for the Overall column do not necessarily equal the sum of the numbers for the other columns.

[a]Number of studies included in the analysis.

*$P < .0056$ (adjusted for multiple comparisons) for differences in effect sizes within each column and research design variable.

# Forshee meta-analysis (AJCN 2008)



# Intake of sugar-sweetened beverages and weight gain: a systematic review[1–3]

*Vasanti S Malik, Matthias B Schulze, and Frank B Hu*

*"…….The weight of epidemiologic & experimental evidence indicates that a greater consumption of SSBs is associated with weight gain & obesity.*

*Although more research is needed, sufficient evidence exists for public health strategies to discourage consumption of sugary drinks as part of a healthy lifestyle."*

*Am J Clin Nutr 2006; 84:274-88*

# Sugar-Sweetened Beverages, Obesity, Type 2 Diabetes Mellitus, and Cardiovascular Disease Risk

Vasanti S. Malik, MSc; Barry M. Popkin, PhD; George A. Bray, MD;
Jean-Pierre Després, PhD; Frank B. Hu, MD, PhD

*Circulation 2010; 121; 1356-1364*

# Effects of the level of sugars intake in relation to weight gain in children and adults separately (using indicators of body fatness such as BMI and waist circumference) using all appropriate RCTs and observational studies

**Wayne Douthwaite, Carolyn Summerbell & Helen Moore**
**(ORB Research Group, Durham University)**

## Background

Total sugars intake is derived from intrinsic plus free sugars, which are described as follows:

1. Intrinsic sugars are incorporated within the structure of intact fruit and vegetables and from milk (lactose and galactose).

2. Free sugars are referred by the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases held in 2002 (WHO TRS 916, Geneva, 2003) as "all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices".

**Wayne Douthwaite, Carolyn Summerbell & Helen Moore**
**(ORB Research Group, Durham University)**

# Objectives

To assess the relationship between the level of sugars intake on indicators of body fatness (including obesity, body fatness, waist circumference, BMI) using all appropriate RCTs and cohort studies in a) adults and b) children.

***Questions of interest:***

- Is there any association between intake of total sugars and weight gain in adults and in children at different ages?
- Is there evidence that increasing total sugars intake leads to weight gain in adults and children?
- Is there an association between increasing population average total sugars intake and increasing mean population weight gain?

**Wayne Douthwaite, Carolyn Summerbell & Helen Moore**
**(ORB Research Group, Durham University)**

# Breakdown of studies identified by country

| | Intervention Studies | | Cohort Studies | |
|---|---|---|---|---|
| | Adults | Children | Adults | Children |
| USA | | | 5 | 7 |
| United Kingdom | | 1 | | 1 |
| Brazil | | 1 | | |
| China | | | 1 | |
| Spain | | | 1 | |
| Finland | | | | 1 |
| Australia | | | | 1 |
| Japan | | | | 1 |
| Germany | | | | 1 |
| **Total** | **0** | **2** | **7** | **12** |

Wayne Douthwaite, Carolyn Summerbell & Helen Moore
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## Methodology (Study inclusion criteria)

Participants of interest were apparently healthy adults and children, in developing and transitional countries as well as in industrial countries.

| | Randomised Controlled Trials | Cohort studies |
|---|---|---|
| Timescale | 6 months follow-up or greater | 12 months + |
| Comparison | Usual diet, a control diet or a diet with a different sugar content. | N/A |
| Intervention | Intention to alter intake of total sugars or one element of total sugars in one arm of the study, compared to another study arm. Interventions with weight loss intention were excluded. | N/A |

Wayne Douthwaite, Carolyn Summerbell & Helen Moore
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# Cohort studies (adults, exposure/outcome relationship)

| First author, year and country | + / 0 / - | Predictor | n |
|---|---|---|---|
| Odegaard, 2010, China | 0<br>+ | Juice drinks<br>SSBs | 43,580 men and women |
| Vanselow, 2009, USA | 0 | Soft drinks and fruit juice | 4,746 men and women |
| Bes-Rastrollo, 2006, Spain | 0 (except in subjects reporting previous weight gain of ≥ 3kg five years before baseline)<br>0 | SSBs<br>Fruit juice | 7,194 men and women |
| Palmer, 2008, USA | +<br>0 | SSBs<br>Fruit juice | 43,960 women |
| Dhingra, 2007, USA | + | Soft drinks | 6,039 men and women |
| Colditz, 1990, USA | 0 (unclear) | Sucrose | 31,940 women |
| Parker, 1997, USA | 0 | Sucrose | 465 men and women |

Wayne Douthwaite, Carolyn Summerbell & Helen Moore
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# Cohort studies (children, exposure/outcome relationship)

| First author, year and country | + / 0 / - | Predictor | n |
|---|---|---|---|
| Ludwig, 2001, USA | + | SSBs | 780 male and female |
| Ishihara, 2003, Japan | 0 | Carbonated beverages | 737 male and female |
| Newby, 2004, USA | 0 | Fruit drinks (not including juice) | 1,345 male and female |
| Skinner, 2001, USA | 0 | Juice only | 72 male and female |
| Butte, 2007, USA | 0 | Fructose, sucrose and added sugars | 1,030 male and female |
| DONALD Study (Alexy 1999, Buyken 2008, Libuda 2008), Germany | 0<br>0 | Fruit juice<br>SSBs | Various, n=205, n=380, n=244, all analyses male and female |
| Johnson, 2007/2008, UK | 0<br>0 | SSBs<br>Fruit juice | 1,432 male and female |
| Nissinen, 2009, Finland | 0 (men)<br>0 (women) | SSBs | 2,139 male and female |
| Williams, 2008, USA | - | Sucrose | 519 male and female |
| Lim, 2009, USA | + | SSBs | 365 male and female |
| Tam, 2006, Australia | +<br>0 | Soft drink/cordial<br>Fruit juice | 436 male and female |
| Fiorito, 2009, USA | + | SSBs | 170 female only |

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# Sweets and sugar-sweetened soft drink intake in childhood in relation to adult BMI and overweight. The Cardiovascular Risk in Young Finns Study

Katja Nissinen[1,*], Vera Mikkilä[2], Satu Männistö[3], Marjaana Lahti-Koski[1,4], Leena Räsänen[2], Jorma Viikari[5] and Olli T Raitakari[6]

***"Conclusions**:*

*We conclude that direct associations exist between adulthood overweight & BMI and an increase in consumption of sugar-sweetened soft drinks in women.*

*Thus sugar-sweetened soft drinks consumption may be important when considering weight management in women."*

*Public Health Nutrition: 12 (11), 2018-2026*

We are some way from making a definitive recommendation

- still work in progress
- systematic review on dental caries is underway
- NUGAG Sub-group on Diet and Health will be meeting in Feb 2011

Further systematic reviews relating to other critical endpoints may be undertaken

# WHO report – adult cohort studies

| First author, year and country | + / 0 / - | Predictor | n |
|---|---|---|---|
| Odegaard, 2010, China | 0<br>+ | Juice drinks<br>SSBs | 43,580 men and women |
| Vanselow, 2009, USA | 0 | Soft drinks and fruit juice | 4,746 men and women |
| Bes-Rastrollo, 2006, Spain | 0 (except in subjects reporting previous weight gain of ≥ 3kg five years before baseline)<br>0 | SSBs<br>Fruit juice | 7,194 men and women |
| Palmer, 2008, USA | +<br>0 | SSBs<br>Fruit juice | 43,960 women |
| Dhingra, 2007, USA | + | Soft drinks | 6,039 men and women |
| Colditz, 1990, USA | 0 (unclear) | Sucrose | 31,940 women |
| Parker, 1997, USA | 0 | Sucrose | 465 men and women |

# WHO Report (child studies)

| First author, year and country | + / 0 / - | Predictor | n |
|---|---|---|---|
| Ludwig, 2001, USA | + | SSBs | 780 male and female |
| Ishihara, 2003, Japan | 0 | Carbonated beverages | 737 male and female |
| Newby, 2004, USA | 0 | Fruit drinks (not including juice) | 1,345 male and female |
| Skinner, 2001, USA | 0 | Juice only | 72 male and female |
| Butte, 2007, USA | 0 | Fructose, sucrose and added sugars | 1,030 male and female |
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| Lim, 2009, USA | + | SSBs | 365 male and female |
| Tam, 2006, Australia | +<br>0 | Soft drink/cordial<br>Fruit juice | 436 male and female |
| Fiorito, 2009, USA | + | SSBs | 170 female only |

# Sugar-sweetened beverages and risk of obesity and type 2 diabetes: Epidemiologic evidence

Frank B. Hu [a,b,*], Vasanti S. Malik [a]

*Physiology & Behaviour 100 (2010) 47-54*

# SYSTEMATIC REVIEWS REQUIRED FOR RECOMMENDATIONS:

Sugars and obesity/excessive weight gainand

Sugars and dental caries

Sugars and chronic diseases/surrogatesaaand