

Relationship between consumption of sugar-containing beverages and weight gain in children

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Co-authors

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Background on SSB

- * Associated with obesity in adults and children, but unclear in younger children
- * Mechanism unclear
- * Increased total calorie consumption (liquid calories less satisfying)
- * Independent effect of the sugars themselves
 - * Non-controlled for total energy
 - * Controlled for total energy

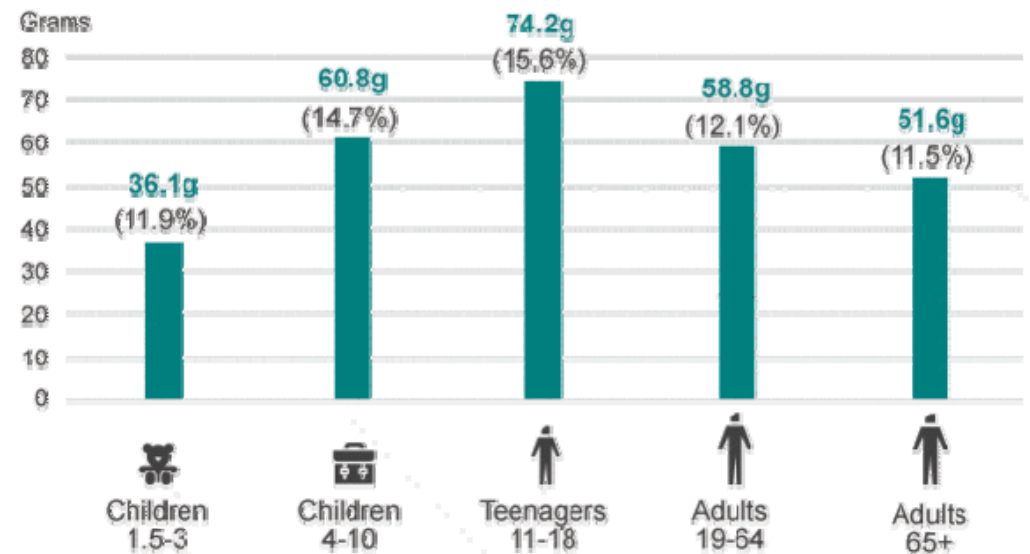


Background on SSB

- * Associated with obesity in adults and children, but unclear in younger children
- * Mechanism unclear
 - * Increased total calorie consumption (liquid calories less satisfying)
 - * Independent effect of the sugars themselves
- * Despite reduction in recent years, SSB and added sugar consumption greatly exceeds recommendations

Daily added sugar intake, by age groups

Percentage of daily food energy from added sugars shown in brackets



Source: National Diet & Nutrition Survey, rolling programme 2008-12

Background on SSB

- * We examined fruit juice content
 - * Nutrient content is very similar to SSB
 - * High consumption among young children
- * Sugar Containing Beverages (SCB)
SCB= SSB + Fruit Juice
- * SCB may affect body fat distribution
 - * Total Adiposity
 - * Central Adiposity



Clinical Question

Does increased consumption of sugar-containing beverages among children under 12 years result in excess weight gain?



Results

2887 Unique Citations

2762 Citations Excluded

124 Citations

86 Citations Excluded

38 Citations

31 studies with SCB as exposure

15 studies with fruit juice as exposure

31 with total adiposity as outcome

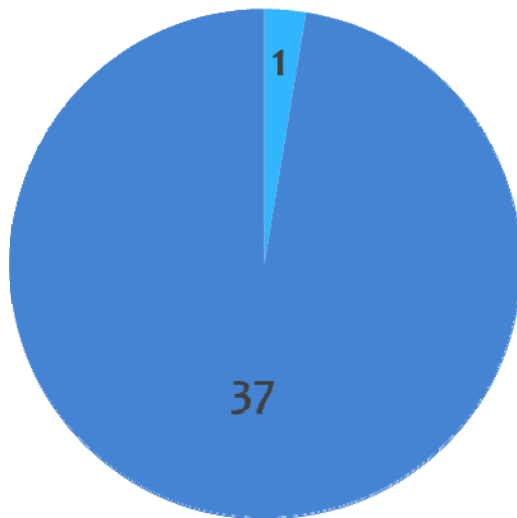
6 with central adiposity as outcome

15 with total adiposity as outcome

2 with central adiposity as outcome

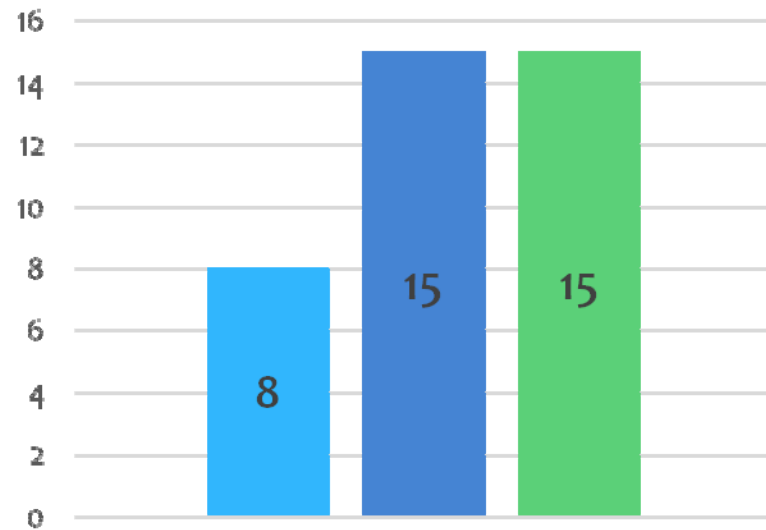
Included Studies

Study Design



■ RCT ■ Cohort

Risk of Bias



■ High ■ Moderate ■ Low

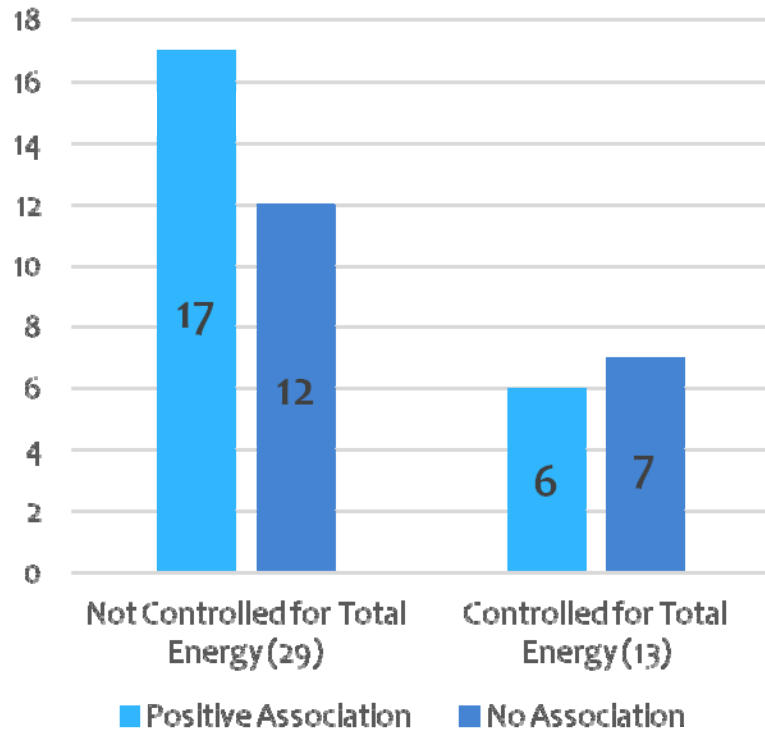
* Substantial heterogeneity (Qualitative SR)

- populations
- exposures
- study designs
- covariates

<12: SCB ~ Total Adiposity



<12 SCB & Total Adiposity
(31 studies)

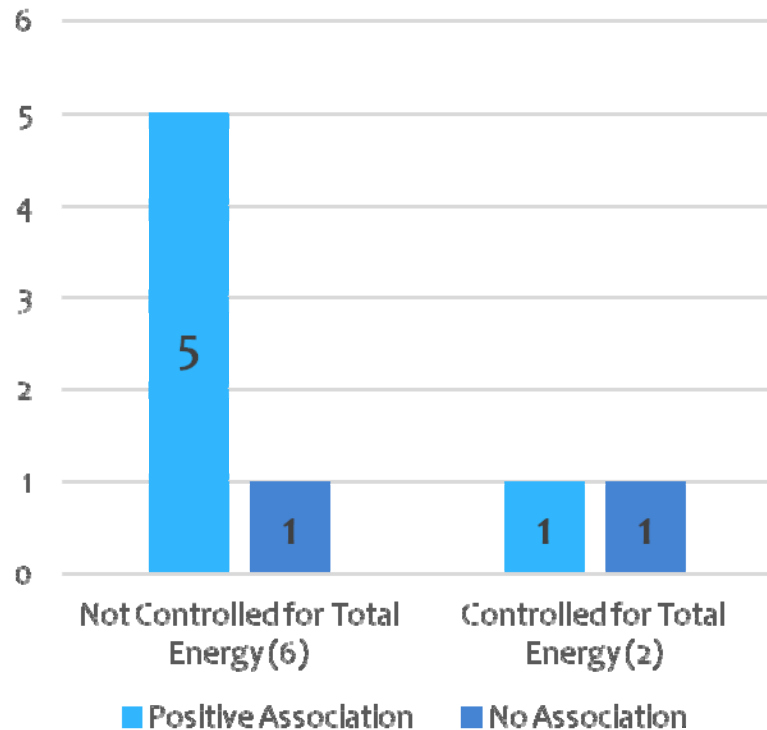


- * 40%-71% of analyses tended positive whether or not:
 - * Change over change analysis design
 - * Sample size ≥ 250
 - * Risk of bias low
 - * Controlled for age, sex, PA
 - * U.S. study

<12: SCB ~ Central Adiposity



<12 SCB & Central Adiposity
(6 studies)

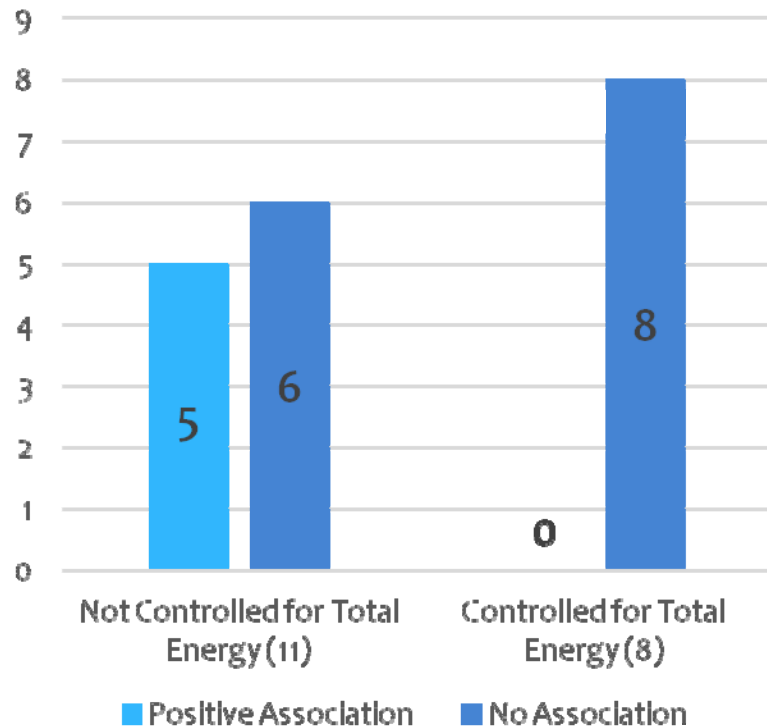


- * 67%-100% of analyses tended positive whether or not:
 - * Change over change analysis design
 - * Sample size ≥ 250
 - * Risk of bias low
 - * Controlled for age, sex, PA
 - * U.S. study

<12: Juice ~ Total Adiposity



<12 Juice & Total Adiposity
(15 studies)



- * 20%-40% of analyses tended positive whether or not:
 - * Change over change analysis
 - * Sample size ≥ 250
 - * Risk of bias low vs. moderate or high
 - * Controlled or not controlled for age, sex, PA
 - * U.S. study or not
- * No studies were positive if:
 - * Sample size < 250

<12: Juice ~ Central Adiposity

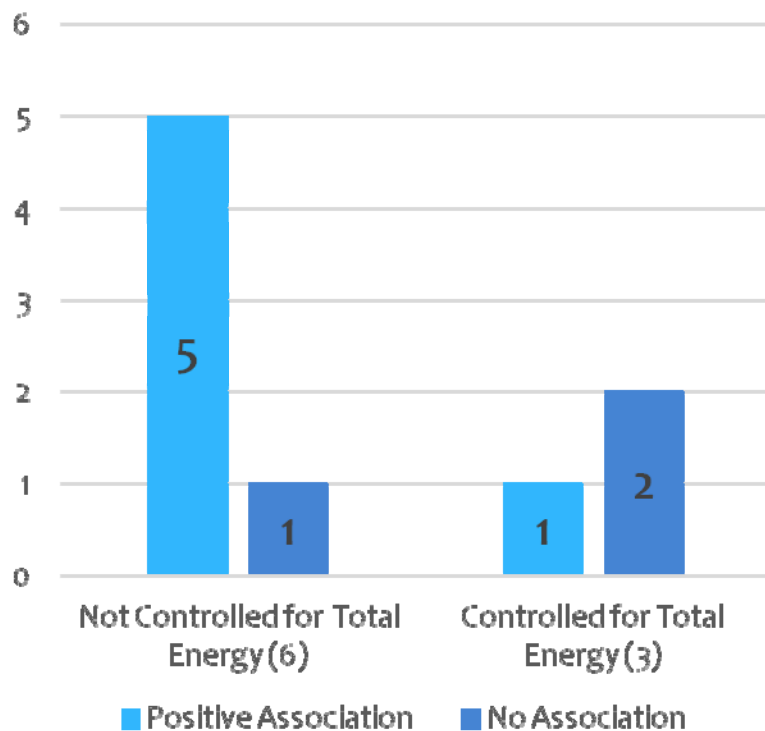


- * 2 studies
 - * Differing study designs
 - * 2 of 2 were negative
 - * Whether controlling or not controlling for total energy

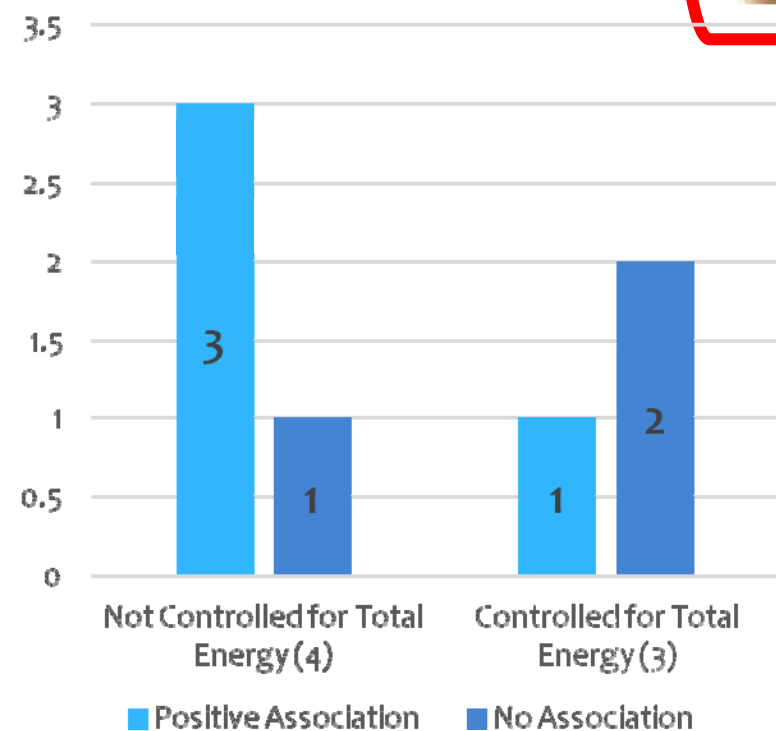
<5: SCB or Juice ~ Total Adiposity



<5 SCB & Total Adiposity
(6 studies)



<5 Fruit & Total Adiposity
(6 studies)



* 70%-100% of analyses were positive if:

- Sample size ≥ 250
- Risk of bias low
- Not controlled for age, sex, PA
- Non-U.S. study

Summary of Results

- * Methods used in published studies vary widely
- * Results of review indicate:
 - * A positive association between **SCB consumption** among children < 12 and both **total and central adiposity**, regardless of study design
 - * The association with **total adiposity** may be strongest among children <5 at baseline

Summary of Results

- * Methods used in published studies vary widely
- * Results of review indicate:
 - * Mixed results with **fruit juice** only and **total adiposity**
 - * Most studies are positive in **children <5** but **not in children <12**
 - * No studies of **SCBs** or **fruit juice** among children < 5 and **central** adiposity
- * Controlling for total energy decreases but does not eliminate likelihood of a positive association

Strengths

- * Robust methodology
 - * Adhered to PRISMA Guidelines for conducting and reporting a systematic review
 - * Comprehensive literature search
 - * Screening, data abstraction in duplicate

Strengths

- * Only SR focused on children <12 years
- * Conducted several sub-group analyses
 - * Controlled for total energy vs not
 - * SCB vs fruit juice
- * No studies identified as having been funded by the food, beverage or sugar industry
 - * It is possible that funding could have been provided indirectly

Weaknesses

- * Substantial variation in the definition of SCB
 - * sweetened beverages
 - * 100% fruit juice
 - * sweetened tea/coffee
 - * variation in recording sweet beverage exposure
- * No two studies had similar methodology
- * Meta-analysis could not be performed
 - * Vote counting utilized
- * Did not look at data stratified by baseline weight
 - * SCB may have greater impact on those with different weight & obesity status at baseline

Weaknesses

- * Out of 38 studies, only one was an RCT
 - * High risk of bias
- * Measurement of exposure
 - * Some studies evaluated exposure during either one or multiple observations at baseline and assumed that the exposure level extended for the duration of the study
 - * Some studies calculated an average exposure from longitudinal observations, but did not describe how this average was calculated

Weaknesses

- * Most studies:
 - * Were retrospective
 - * Had significantly small numbers of subjects in the cohort used for the analysis compared to the original cohort
 - * Did not control for age, sex and physical activity

Weaknesses

- * The clinical relevance of any association is unclear
 - * Even for those studies that did demonstrate an association most had a small magnitude of effect
 - * Difficultly in measurement
 - * Effect within the range of usual consumption of children at this age is possibly minimal

Of note: To reduce the prevalence of obesity among U.S. children age 2-5 years to 5%, the level observed in the 1970s, it has been estimated that an average reduction of only **33 calories/day** would be needed (Wang, 2012)

Conclusions

- * Evidence exists for a positive association between SCBs and total and central adiposity among children
 - * the evidence related to fruit juice is much weaker
- * Evidence is most consistent with SCB consumption among children <5 years
- * The observed association appears to be due in part due to an increase in total energy intake with increased SCBs
 - * SCBs may have an energy independent effect

Conclusions

- * Additional high-quality RCTs and well-designed long-term cohort studies are needed to determine the extent to which the differences observed are due to
 - * residual confounding
 - * differences in the
 - * exposure (type or amount) of beverage consumed
 - * metabolic condition of the children studied
 - * other factors
- * Additional studies could significantly alter these conclusions



How much
SUGAR
is in that

RETHINK YOUR DRINK

Drink	Sugar Content
Water	0g
Kool-Aid Jammers	10g
Organic Fruit Juice	10g
Oat Gold	10g
Red Bull	27g
Adventure's Fruit Maverik X-Large	27g
Diet Dew	0g

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