Office of Evidence Based Practice (EBP) – Critically Appraised Topic: Low Fat Dairy Intake and BMI

Specific Care Question: In pediatric patients, does three servings of low-fat or nonfat dairy foods help in the prevention and/or treatment of obesity?

Question Originator:
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Literature Summary:

Background
About one-third of children and adolescents in the United States are either overweight or obese (UpToDate, 2017). Diet, physical activity, and behavioral interventions are often used in the treatment of overweight or obesity. The purpose of this review is determining if low-fat or nonfat dairy foods help in the prevention and/or treatment of obesity in the pediatric population.

Study Characteristics
The literature search timeframe included 2007 to present. The search for suitable studies was completed on 8/23/2017. The team leads reviewed the 106 titles and abstracts found in the search and identified 16 articles believed to answer the question. Another six articles were identified from two systematic reviews within the found studies. After an in-depth literature analysis only 11 articles specifically looked at low-fat or nonfat dairy intake in the prevention and/or treatment of obesity: two randomized control trials (RCTs) and nine non-randomized studies.

Key results
No recommendation can be made on the use of low-fat and nonfat dairy to prevent and/or treat obesity in pediatric patients. While there is evidence in children and adolescents indicating that there is either a beneficial or neutral effect of dairy food consumption on body weight or body composition (Spence, Cifelli, & Miller, 2011), The Office of Evidence Based Practice focused mainly on the type of dairy such as low-fat, skim milk, or yogurt.

This review is based on the current review of literature and the 2007 AAP guideline on the Prevention, Assessment, and Treatment of Child and Adolescent Obesity (Barlow, 2007). Barlow (2007) was used as the parent guideline and AGREE II (Brouwers et al., 2010) was used to evaluate its strength (Appendix). However, Barlow (2007) recommends eating a diet rich in calcium, and does not discuss the fat content of the dairy foods consumed. Therefore, the American Academy of Pediatrics guideline (Barlow (2007) indirectly answers the question of this review.

Two RCTs are included in this synopsis, the remaining studies are non-randomized studies. The risk of bias for the randomized trials is serious due to the inability to blind participants on the type of dairy intake which could have led to change in behavior of participants. When comparisons are made based on non-randomized samples, confounding factors such as socioeconomic factors, initial BMI, or exercise patterns cannot be assumed to be evenly dispersed between groups, and therefore may influence the outcome.

There was also serious imprecision due to the relatively few patients and few events reported in the RCTs. The non-randomized studies had serious risk of bias due to limitation of food frequency questionnaires (FFQ) in general. A common confounder of FFQs is the over and under reporting of food intake. Both the randomized control trials and the non-randomized control trials had very serious inconsistency due to the large amount of heterogeneity (examples are different populations and interventions) between the studies.

Summary by Outcome:
Changes in body weight or composition. The outcomes from the included studies on the effect of low- fat or non-fat dairy intake on body weight or composition are separated into three groups: (a) no effect on body weight or composition, (b) negative effect on body weight or composition, or (c) positive effect on body weight or composition. Studies in the negative effect group show an increase in body weight or composition, whereas, studies in the positive effect group show a decrease in body weight or composition.

No effect on body weight or body composition with low-fat or non-fat dairy intake

A RCT by Lappe et al. (2017) of 274 adolescent girls (mean age 13.5 years) divided the participants into two groups. Over 12 months Group One was asked to consume low-fat milk (skim, 1% or 2%) or low-fat or yogurt servings providing ≥1200 mg Ca/day. Group Two was asked to continue their usual diet of ≤ 600 mg Ca/day. The study failed to detect a statistically significant difference between groups in BMI percentile (p = .47) and weight change (p = .58). The study also failed to detect a statistically significant difference with waist circumference (see Figure 2), hip circumference (see Figure 3), and abdominal girth (see Figure 4). The effect of the intervention did not differ by baseline BMI percentile. Blinding was not possible in this study and may have contributed to participant bias.

St-Onge et al. (2009) reported in a RCT that compared 45 overweight children (mean age 9 years) in both the high-milk intake (≥ 4 servings of low or non-fat milk) and low-milk intake (≤1 serving of low or non-fat milk). The study occurred over 12 weeks. Both groups increased in weight and height (p < .0001). Both groups saw a reduced BMI but it was not significant between the two groups (p = .057) (see Figure 5). There was no difference found between waist circumferences (see Figure 6). Blinding was not possible in this study and may have contributed to participant bias.

A prospective cohort study (Phillips et al., 2003) of 8-12 year old US girls (N = 196) found neither full-fat nor low-fat dairy consumption associated with BMI change over time. A food frequency questionnaire (FFQ) was used at baseline and at each annual follow-up visit over a 3-year period. Consumption of full-fat dairy, when expressed as a percent of calories from full-fat dairy, did not have a significant relationship to BMI (p = .76) when adjusted for daily servings of fruits and vegetables, quartile of percentage calories from soda, percentage of calories from protein, and parental overweight. Consumption of low-fat dairy, when expressed as quartile of percent of calories from low-fat dairy, did not have a significant relation to BMI (p = .74) when adjusted for daily servings of fruits and vegetables, quartile of percentage calories from soda, percentage of calories from protein, and parental overweight.

A cross-sectional study (Barba et al., 2005) of 3 to 11 year old Italian boys and girls (N = 884) found the prevalence of overweight was inversely associated with the consumption of whole milk. Whole-milk consumption was significantly and inversely associated with BMI z score (p = .005) when controlling for age and the frequency of consumption of various foods. The association was no longer significant (p = .21) when children consuming skimmed milk were included in the analysis. Children who consumed skimmed milk were older and heavier than those consuming whole milk.

A cohort study (Noel et al., 2011) of 10 to 13 year old British children (N = 2245) found higher full-fat milk intake at age 13 years was inversely associated with percent body fat in those with plausible dietary intakes (p = .01); however, reduced-fat milk was not associated with percent body fat (p = .1). Intake was assessed using 3-day dietary records. Models were adjusted for the cofounding variables of age, sex, height, physical activity, pubertal status, maternal BMI, maternal education, and intakes of total fat, sugar-sweetened beverages, 100% fruit juice, and ready-to-eat cereals. In the prospective analysis, neither baseline full-fat nor low-fat milk consumption assessed at age 10 was associated with percent body fat at age 13 (p ≥ 0.09).

A cross-sectional study (Eriksson, 2010) of 8 years old Swedish children (n = 114) found a significantly lower BMI who drank full-fat (but not low-fat or skim) milk regularly compared with those who seldom/never drank full-fat milk (p < .001).

Negative Effect (increase BMI or overweight) with low-fat or non-fat dairy intake.

A prospective cohort (Berkey et al., 2005) of 9 to 14 year old US boys and girls (N = 12,829) found that whole milk intake was not associated with BMI change; 1% and skim milk intake was associated (p ≤ .05) with BMI increase in boys and girl, respectively. Subjects were mailed self-administered semi-quantitative FFQ. Children self-reported their height and weight using specific measuring instructions. Intake was adjusted for dietary intake, physical activity, and inactivity.

A retrospective study (Te Velde et al., 2011) of 13 to 36 year old Dutch men and women (N = 374) found participants who were overweight at age 36 years consumed more low-fat dairy at age 21 than their normal weight counterparts (unadjusted p = .001), and this difference remained significant after adjustment for gender ($p \le .001$) and lifestyle factors (p = .001).

Scharf et al. (2013) reported on a longitudinal study of two and four year old children (N = 10,700). Most of the children drank whole or 2% milk (87% at 2 years, 79.3% at 4 years). In multivariate analyses, increasing the fat content in the type of milk consumed was inversely associated with BMI z-score ($p < .0001$). Compared to those drinking 2%/whole milk, children drinking 1%/skim milk had an increased adjusted odds of being overweight age 2: OR = 1.64, $p < .0001$, 95% CI [1.3, 2.0]; age 4 OR =1.63 $p < .0001$, 95% CI [1.2, 1.0]; or obese age 2: OR = 1.57 $p < .01$, 95% CI [1.2, 2.1]; age 4 OR = 1.64, $p < .0001$, 95% CI [1.3, 2.1]. In longitudinal analysis, children drinking 1%/skim milk at both 2 and 4 years were more likely to become overweight/obese between these time points (adjusted OR = 1.57, $p < .05$).

Positive Effect (decrease BMI or overweight) with low-fat or non-fat dairy intake.

A cross-sectional study (Keast et al., 2015) of US children aged 8 to 18 years old yogurt consumers (n = 280) had lower prevalence of BMI-for-age, waist circumference, and subscapular skinfold persisted in the fully-adjusted Model two (energy (kcal) intake, gender, years of age, race-ethnicity, poverty income level, physical activity level, TV/video/computer use, alcohol use, and tobacco use) ($p < .05$) when compared to the non-yogurt consumers (n = 3506). The study assumes that the yogurt was low-fat or fat-free.

Abreu et al. (2014) performed a cross-sectional study on adolescents (N = 1209) aged 15 to 18 years old. Adolescent food intake was measured using a semi-quantitative food frequency questionnaire, and milk intake was categorized as 'low milk intake' (<2 servings per day) or 'high milk intake' (>2 servings per day). Most adolescents consumed semi-skimmed or skimmed milk (92.3%). After adjusting for confounders, low-active and active adolescents, high levels of milk intake were less likely to have abdominal obesity, compared with low-active adolescents with low milk intake high milk intake/low active, OR = 0.412, 95% CI [.201, .845]; high milk intake/active adolescents, OR = .445, 95% CI [.235, .845].

Search Strategy and Results:

("Milk"[Majr] OR "Dairy Products"[Majr]) AND ("Weight Loss"[Mesh] OR "Anti-Obesity Agents"[Mesh] OR "Obesity/prevention and control"[Mesh] OR "Obesity/diet therapy"[Mesh]) AND (child OR children OR infant OR pediatric* OR paediatric* OR adolescence)

("Dairy Products"[Majr]) AND ("Weight Loss"[Mesh] OR "Anti-Obesity Agents"[Mesh] OR "Obesity/prevention and control"[Mesh] OR "Obesity/diet therapy"[Mesh]) AND (child OR children OR infant OR pediatric* OR paediatric* OR adolescence)

Search return: 106 Team Leads Selected: 16

Studies included in this review:

Abreu et al. (2014)
Barba et al. (2005)
Berkey et al. (2005)
Eriksson & Strandvik (2010)
Keast et al. (2015)
Lappe et al. (2017)
Noel et al. (2011)
Phillips et al. (2003)
Scharf et al. (2013)
St-Onge et al. (2009)
Te Velde et al. (2011)

Studies <u>not</u> included in this review with exclusion rationale:

First Author (year)	Reason for exclusion
Nezami et al. (2016)	Did not distinguish between low and high fat dairy
Abreu et al. (2012)	Did not distinguish between low and high fat dairy
Murphy et al. (2008)	Compared plain milk versus flavored
Fiorito et al. (2006)	Did not distinguish between low and high fat dairy
Yuan et al. (2013)	Did not distinguish between low and high fat dairy
Gates et al. (2013)	Did not distinguish between low and high fat dairy
Hasnain et al. (2014)	Did not distinguish between low and high fat dairy
Alonso et al. (2009)	Looked at 18-24 year olds
Kelishadi et al.(2009)	Compared dairy-rich diet and calorie restricted diet
Moreno et al. (2015)	Review article
Van Loan et al. (2009)	Review article

Method Used for Appraisal and Synthesis:
The Cochrane Collaborative computer program, Review Manager (Higgins & Green, 2011)[a] was used to synthesize the eleven included studies. GRADEpro GDT (Guideline Development Tool) is the tool used to create the Summary of Findings Tables for this analysis.

[a]Higgins, J. P. T., & Green, S. e. (2011). *Cochrane Handbook for Systematic Reviews of Interventions [updated March 2011]* (Version 5.1.0 ed.): The Cohcrane Collaboration, 2011.

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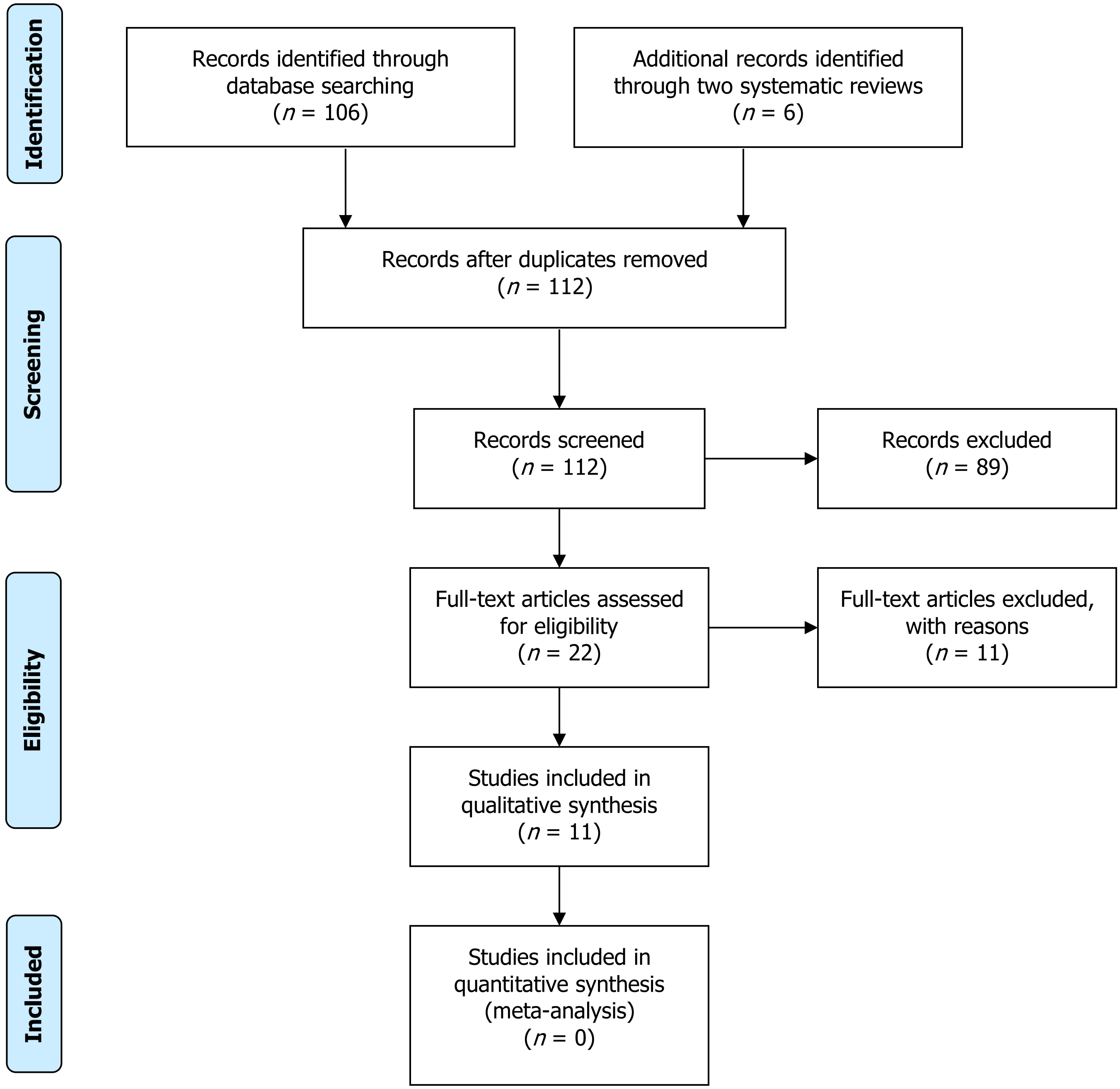
Date Developed/Updated: January 2018

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRIMSA)[b]



[b]Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Table *1*
Characteristics of Studies

Abreu 2013

Methods	Cross-sectional study
Participants	**Participants:** Adolescents age 15-18 **Setting:** Azorean Archipelago, Portugal **Number enrolled:** N=1515 **Number completed:** N=1209 **Gender, males:** 41.6% **Age, years (median):** 16 **Inclusion criteria:** -15-18 year olds from The Azorean Physical Activity and Health Study II **Exclusion criteria:** -Information missing on their dietary intake -Information missing on their waist circumference **Covariates identified:** Body height and weight, waist circumference, pubertal stage, socio-demographic and lifestyle variables, smoking, parental education, dietary intake, physical activity I removed body height and weight, waist circumference as those are the primary outcomes...however, you could really argue that since this is a secondary analysis none of these variables were the researchers primary interest
Interventions	Data derived from The Azorean Physical Activity and Healthy Study II (a school based study from 2008) which aimed to evaluate physical activity, physical fitness, overweight/obesity prevalence, dietary intake, health-related quality of life and other factors
Outcomes	**Anthropometrics:** Determined using standard methods **Waist circumference:** Taken midway between the 10th rib and the iliac crest, subjects divided into 2 categories (<90th%ile and >90th%ile) **Dairy intake:** Measured via a self-administered semi-quantitative food frequency questionnaire, subjects divided into 2 categories (2 or more servings/day = high milk intake group and <2 servings/day = low milk intake) **Physical activity:** Assessed via a self-report questionnaire, participants divided into active and low active groups based on a points questionnaire (>10 points = active, <10 points = low active)
Results	**Results for BMI and waist circumference compared to low milk and high milk intake:** **low milk + low active:** BMI = 22.3, waist = 80 cm, milk intake = 0.9 servings/day **low milk + active:** BMI = 22.1, waist = 78 cm, milk intake = 1 serving/day **high milk + low active:** BMI = 21.6, waist 77 cm, milk intake = 2.4 servings/day **high milk + high active:** BMI = 21.9, waist 76 cm, milk intake = 2.4 servings/day • After adjusting for confounders, low-active and active adolescents with high levels of milk intake were less likely to have AO, compared with low-active adolescents with low milk intake (high milk intake/low active, OR = 0.412, 95% CI [.201, .845]; high milk intake/active adolescents, OR = 0.445, 95% CI [.235, .845]). • The study participants were asked to report the different foods (including milk) and activity expended in the previous twelve months. This type of self-reporting can be viewed as a study limitation identified as *respondent bias.*

Barba2005

Methods	Cross-sectional study
Participants	**Participants:** Children who underwent weight and height measurements during a survey on childhood obesity **Setting:** Schools in Avellino district of southern Italy **Number enrolled:** *N = 1087* **Number completed:** *N = 884* **Gender, males:** • **Group 1 (whole milk):** Boys (%) 51.5 • **Group 2: (Skim milk):** Boys (%) 51.4 **Age, years/month (mean):** • **Group 1 (Whole milk):** 7.5 • **Group 2 (Skim milk):** 7.9 **Inclusion Criteria:** • Children who had a complete a lifestyle and dietary habits survey • had no specific dietary regimens/exclusions • did not exclusively consume skimmed milk or partially skimmed milk. **Exclusion Criteria:** • Data set incomplete • Following a specific dietary regimen • Children reporting that they consumed only skim milk or partially skimmed milk **Covariates identified:** **Whole milk group, model 1:** Age, sex, birth weight, parental overweight, physical activity, parental education, frequency of milk consumption **Whole milk group, model 2:** Age, sex, birth weight, parental overweight, physical activity, parental education, frequency of milk consumption, dairy foods, fish, cereals, meat, fruit, vegetables, sweet beverages, snacks **Whole+skimmed milk, model 1:** age, sex, birth weight, parental overweight, physical activity, parental education, frequency of milk consumption **Whole+skimmed milk, model 2:** age, sex, birth weight, parental overweight, physical activity, parental education, frequency of milk consumption, dairy foods, fish, cereals, meats, fruit, vegetables, sweet beverages, snacks
Interventions	1) Lifestyle and dietary habits were investigated by a questionnaire 2) Underwent body weight and height measurement. **Milk consumption categories:** • High (>/= 2/d; *n* = 218) • Regular (1/d; *n* = 408) • Moderate >1 but </= 5-6/week; *n* = 133) • Poor </= 1/week; *n* = 125)
Outcomes	**Primary outcome(s):** • Significant inverse association between frequency of milk consumption and body mass **Secondary outcome(s)** • Variables contributing to BMI along with milk consumption: Age, sex, birth weight, parental overweight, physical activity, parental education, frequency of milk consumption, dairy foods, fish, cereal, meat, fruit, vegetables, sweet beverages, snacks.
Results	-Children in the four categories of frequency of whole-milk consumption showed significant differences for age and BMI

	• **Poor:** *n* = 125, age 8.0 (SD 2.1) years, BMI 20.0 (SD 3.5) kg/m2 • **Moderate:** *n* = 133, age 8.4 (SD 1.9) years, BMI 19.4 (SD 4) kg/m2 • **Regular:** *n* = 408, age 8.1 (SD 1.9) years, BMI 18.9 (SD 3.4) kg/m2 • **High:** *n* = 218, age 7.1 (SD 2.1) years, BMI 18.2 (SD 3) kg/m2 - Whole-Milk consumption was significantly and inversely associated with BMI z score (*p* = .005) when controlling for age and the frequency of consumption of various foods; this association was no longer significant (*p* = .21) when children consuming skimmed milk were included in the analysis. -The prevalence of overweight is significantly lower in children consuming whole milk daily than in those who consumed milk less frequently.

Berkey 2005

Methods	Prospective Cohort
Participants	**Participants:** Children from 50 US states, enrolled in the Growing Up Today Study. These children were offspring of participants in the Nurses' Health Study II (NHSII). Growing Up Today Study was established in 1996, and this cohort study occurred between 1996 thru 1999. **Setting:** United States **Number enrolled:** *N* = 16,771 enrolled in Growing Up Today Study **Number complete:** *N* = *12,829 (*Authors comment that a final analysis that estimated the cumulative effect of milk intake on BMI change from 1996 thru 1999 used data from children who provided longitudinal data for all 4 years, and that *N* was 9166.) **Age, years:** 9 to 14 years in 1996 **Inclusion Criteria:** (for longitudinal study inclusion) • Enrolled in Growing Up Today Study • Children who returned survey in adjacent years • Children who did not change milk type (fat) between years **Exclusion Criteria (before computing BMI):** • Any height more than 3 standard deviations from the sex- and age-specific mean height growth distribution • Any 1-year height change that declined more than 1 inch or increased by more than the 99.7th percentile of the sex- and age-specific height growth distribution • Any BMI less than 12.0 as a biological lower limit • Any BMI more than 3 standard deviations above or below the sex- and age-specific mean height growth distribution • Any annualized BMI changes that were more than 3 standard deviations above or below the mean change **Covariates identified:** Dietary Intake, Physical Activity, Inactivity
Interventions	Subjects were mailed questionnaires annually. Children self-reported their height and weight using specific measuring instructions provided in the questionnaire and the suggestion to ask someone for assistance. BMI was then calculated as weight in kilograms divided by height in meters squared. Additionally, subjects reported the following: • race/ethnic group (6 options given) • Tanner maturation stage • Girls reported whether or when menstrual periods had begun To assess dietary intake, the researchers designed a self-administered semiquantitative food frequency questionnaire (FFQ) specific to older children and adolescents. Questions included frequency of intake of 132 food items in the past

	year, beverage questions that indicated serving size (can, glass, bottle, etc), fat content of milk. Separate questionnaires were also used to assess physical activity, and weekly hours of recreational inactivity.
Outcomes	To assess the associations between milk, calcium from foods and beverages, dairy fat, and weight change over time.
Results	**Boys:** • Those who drank more than 3 servings per day of milk were 35% more likely to become overweight (relative risk [RR] = 1.35; 95% confidence interval [CI], 0.96-1.90) during 1 year than boys who drank more than 1.0 but less than 2.0 servings. • Those who drank more than 3 servings were 26% more likely to become overweight than boys who drank more than 2.0 but less than or equal to 3.0 servings (RR = 1.26; 95% CI, 0.95-1.66). **Girls:** • Those who drank more than 3 servings per day were 36% more likely to become overweight (RR = 1.36; 95% CI, 0.92-2.01) than those who drank more than 1.0 but less than or equal to 2.0 servings. • Those who drank more than 3 servings per day were 25% more likely than those who drank more than 2.0 but less than or equal to 3.0 servings (RR = 1.25; 95% CI, 0.91-1.72). Skim and 1% milk appeared more strongly linked (per serving) to weight gain than whole or 2% milk. Dietary calcium intake was positively correlated with weight gain, and dairy fat was not.

Eriksson2010

Methods	Cohort study
Participants	**Participants:** healthy 8 year olds previously enrolled in cohort study at age of 4 **Setting:** Gothenburg, Sweden **Number enrolled:** *N = 120* **Number completed:** *N = 114* **Gender, males:** • **Group 1:** *n* = 65 **Age, years/month (mean):** • **Group 1:** *n* = 8 (SD 8.21) **Inclusion Criteria:** • Participants of previous cohort study at the age of four • Students from two school classes from lower socioeconomic area **Exclusion Criteria:** • Parents' inability to understand the Swedish language (assessed by the school teachers) **Covariates identified:** • Socioeconomic variables
Interventions	• The children were weighed and measured with standardized equipment

	• Questionnaire on socioeconomic variables the parents were asked about country of birth, educational level, income, living conditions and family size • Energy and nutritional intake was assessed by a 24-hr dietary recall • Blood sampling of 25(OH)D in serum was performed
Outcomes	**Primary outcome**: Analyzing food intake and food choice in healthy 8 year olds examining the relationship between these parameters to anthropometry, blood parameters, and socioeconomic variable. **Secondary outcome**: Impact of low fat milk vs full fat milk on BMI
Results	• Children who drank full fat milk regularly had significantly lower BMI than children who seldom/never had full fat milk ($p < 0.001$) • No differences in BMI or bodyweight were seen with respect to the intake of medium or low fat milk (p value not provided) • The total protein intake showed a positive correlation to weight only within the group of overweight children • Low vitamin D intake based on self reported 24 hour dietary recall • Fish intake amount the 8 year old sample population was low but noted to be higher than previous study at age 4 • The low dietary intake of vitamin D was reflected in serum analysis of 25(OH)D. 1/3 of children had levels below 50 nmol/L. 2/3 of children had levels below 75 nmol/L (recommended adult levels to reach full health benefit is 75-100 nmol/L) • Correlation of consumption of junk food was not accurate as the 24 hour recall was performed on Monday-Friday excluding weekends hence showing too low of results

Keast 2015

Methods	Cross-sectional survey
Participants	**Participants:** Data collected from participants (U.S. children) of the 2005-2006 and 2007-2008 National Health and Nutrition Examination Survey (NHANES). **Setting:** United States **Number enrolled:** N = 3821 **Number complete:** N = 3786 Non-Yogurt consumers: n = 3506 Yogurt consumers: n = 280 **Gender, males:** Did not disclose **Age, years(mean):** Did not disclose **Inclusion Criteria:** • Children aged 8-18 years • Dietary interview data identified as complete and reliable as assessed by USDA Food Surveys Research Group (FSRG) staff **Exclusion Criteria:** • Pregnant or lactating females **Covariates identified:** In analyses of anthropometric dependent variables: • Model 1 covariates included energy (kcal) intake, gender, years of age, and race-ethnicity • Model 2 covariates included energy (kcal) intake, gender, years of age, race-ethnicity, poverty income level, physical activity level, TV/video/computer use, alcohol use, and tobacco use.
Interventions	

	The What We Eat in America (WWEIA) dietary component of NHANES, conducted by the United States Department of Agriculture (USDA) Food Surveys Research Group (FSRG), included two, non-consecutive 24-hour recall dietary intake interviews administered using an automated multiple-pass method: • The Day 1 24-hour dietary recall was conducted via in-person interview at the Mobile Examination Center • The Day 2 24-hour recall was conducted via telephone interviews o Survey participants 12 years and older completed the dietary interview on their own, proxy-assisted interviews were conducted with children 6–11 years of age. Participants were classified to dairy and yogurt consumption groups using 24-hour recall data. The MyPyramid Equivalents Database quantified dairy consumption as cup-equivalent servings per day, which will be referred to as "servings". Classification of participants to groups consuming based on MyPyramid dairy intake from the Day 1 24-hour recall: • less than one serving (<1) • one but less than 2 servings (1 to <2) • two or more (2+) dairy servings Yogurt consumers were defined as those who reported eating yogurt during one or both 24-hour dietary intake interviews in order to obtain a sample size sufficient to produce reliable estimates. Total daily energy, macronutrient, sodium, potassium, calcium, and vitamin D intake was assessed using the Day 1 dietary recall for both dairy and yogurt consumption groups. Tertiles of calcium and vitamin D intake were determined for gender strata, and these cut-points were used to form groups. Waist circumference, weight and height were measured by trained personnel in a Mobile Examination Center (MEC) according to NHANES protocols Body mass index (BMI) was calculated as body weight (kg) divided by height (m) squared. • The percentile of BMI-for-age was calculated using the Statistical Analysis Software program for Centers for Disease Control and Prevention Growth Charts. • Children who had a BMI ≥85th percentile of BMI-for-age were classified as overweight/obese • Reference percentiles of waist circumference for children grouped by gender and year of age were used to determine abdominal obesity defined as a waist circumference ≥85th percentile.
Outcomes	**Primary outcome:** Dairy and yogurt consumption association with adiposity or obesity.
Results	• Yogurt consumers (n = 280) had lower prevalence of overweight or obesity, lower BMI-for-age, lower waist circumference, and smaller subscapular skinfold after adjusting for demographic and energy intake differences than non-yogurt consumers (n = 3506) in Model 1. • However, only differences in BMI-for-age, waist circumference, and subscapular skinfold persisted in the fully-adjusted Model 2 ($p < .05$). • Low-fat and fat-free yogurts represent a large proportion of the yogurt available and consumed in the United States.

Lappe 2017

Methods	Randomized Control Trial
Participants	**Setting:** Single site - Osteoporosis Research Center, Creighton University, Omaha, NE from May 2008-Sept 2013

	Randomized into Study: *N* = 274 • **Group 1:** Dairy; *n* = 136 • **Group 2:** Control; *n* = 138 **Completed Study:** *N* = 274 • **Group 1:** *n* = 136 • **Group 2:** *n* = 138 **Gender:** all female **Mean age, years:** • **Group 1:** 13.5 • **Group 2:** 13.5 **Inclusion criteria:** • healthy girls aged 13 or 14 and > 1.5 years post-menarche • habitual dietary calcium intake $\leq$ 600 mg/d • willingness to increase dietary calcium intake for 1 yr • BMI >50th and <98th percentiles for age and sex **Exclusion criteria:** • menarche before age 10 y • history of lactose intolerance or milk allergy • dieting behavior with weight loss >4.5 kg in the last 3 months • weight >136 kg or metal in the skeleton (pins, rods) because of dual energy X-ray absorptiometry (DXA) limitations • current pregnancy • chronic disease or disorder such diabetes, polycystic ovarian syndrome, thyroid disease, eating disorder, seizures, or cancer • use of steroids, contraceptives, antidepressants, Accutane, high dose Vitamin A, or weight-reducing or seizure medications • A total body bone mineral content (BMC) z score <-2.0 measured by DXA • individual's or a sibling's participation in a dietary study in the last 5 y **Power:** This study was designed to detect a 2.8% between-group difference in percentage of body fat measured at 1 y and assumed a 4%SD with 90%power, a 5% type I error rate, and a 2-factor fixed effects ANOVA with covariate adjustment for baseline percentage of body fat correlating with outcome at an *r* value of 0.50; based on these assumptions a sample size of 228 participants was needed with 38 participants in each arm of the striated BMI population groups.
Interventions	• **Group 1:** asked to consume low-fat milk (skim, 1% or 2%) or low-fat or yogurt servings providing $\geq$1200 mg Ca/day • **Group 2:** asked to continue their usual diet of $\leq$ 600 mg Ca/day Dietary compliance assessed by multiple-pass 3-d dietary recall using Nutrition Data System for Research software. Study nurses received training from University of Minnesota and obtained certification to use the data system for research.
Outcomes	Primary Outcome: • change in percentage of body fat at 0, 6, and 12 months Secondary Outcomes: • change in BMI percentile and weight at 0, 6, and 12 months Exploratory Outcomes: • trunk fat mass, percentage trunk fat, lean mass • **waist circumference, hip circumference, abdominal girth.**
Notes	• there were more Caucasians (*n = 223*) versus other races African American (*n = 32*) and Other (*n = 19*) and a 1.7 cm greater hip circumference in the dairy group at baseline

	• the dairy group completed daily recording of dairy intake whereas the control group did not keep daily recording, which may create a bias in that the dairy group focused more on their intake. • baseline diet and physical activity levels were similar between groups

Risk of bias table

Bias	**Scholars' Judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	The statistician (DJM) used a computer-generated scheme to randomly assign eligible girls
Allocation concealment (selection bias)	Low risk	see above
Blinding of participants and personnel (performance bias)	High risk	blinding was not possible in this study and may have contributed to participant bias
Blinding of outcome assessment (detection bias)	Low risk	assessors were not blinded to treatment group but measurements were objective and unlikely to be affected by lack of blinding
Incomplete outcome data (attrition bias)	Low risk	intent-to-treat completed as planned with multiple imputation with fully conditional specification and predictive mean-matching method used to analyze missing data (5 subjects)
Selective reporting (reporting bias)	Low risk	outcomes reported as expected
Other bias	High risk	see notes

Noel 2011

Methods	Cross-Sectional and Prospective Cohort Review
Participants	**Setting:** Children aged 10-13 from Avon Longitudinal Study of Parents and Children (ALSPAC) living in or around Bristol, UK **Randomized:** N/A **Completed Study:** • **Cross-Sectional:** *N* = 2770 • **Prospective:** *N* = 2245 **Gender, males (%):** 45 **Mean age, years:** 10.6 **Inclusion criteria:** Children in database for whom desired measurements were available • Cross-sectional analysis modeled intakes at age 13 with percent body fat at age 13 • Prospective analysis modeled baseline intakes (at age 10) with percent body fat at ages 11 and 13 **Exclusion criteria:** None reported but several multivariable adjusted models were built to account for differences in baseline BMI, physical activity, pubertal status, maternal BMI, maternal education, and dietary intakes of total fat, ready-to-eat breakfast cereal, 100% fruit juice, sugar-sweetened beverage intake, calcium intake, total energy, and plausible dietary intakes (determined by ratio of reported dietary intake: predicated energy requirement) **Power:** Authors report they had >80% power to detect associations between milk intakes and percent body fat as small as .003 and .003 at ages 11 and 13 y, respectively, at a = .05.

Interventions	Differences in milk intake (full-fat, reduced-fat, and skim) between reported groups vs. body fat
	• 3-day diet records were collected prior to age 10 and 13 yr visits
	  o Children were instructed to record all foods and beverages consumed in household measures for 2 weekdays and 1 weekend day; reported beverages were used to create milk groups (see above), however, skim milk drinkers were not examined separately due to small sample size
	  o Milk intakes were quantified in g/d and servings/d where an 8-oz serving was 244g regular milk and 250g flavored
	• Body fat was measured by Lunar Prodigy DXA Scanner

Outcomes	• Cross-sectional - Milk (total, full fat, reduced fat) intakes at age 13 years with body fat at 13 years. • Prospective - Baseline milk (total, full fat, reduced fat) Intakes and percent body fat at 11 and 13 years. • Secondary - Change in milk (total, full fat, reduced fat) take from 11 to 13 years and change in percent body fat from age 10 to 13 years.

Results	• Cross-Sectional Results:
	  o An inverse association was seen between milk intake and percent body fat at age 13 y in the simple adjusted model ($P < .001$), but associations were attenuated in multivariable adjusted models
	  o Higher full-fat milk intake at age 13 y was inversely associated with percent body fat at 13 y in all models and in those with plausible dietary intakes ($P < 0.01$ for all); however, reduced-fat milk was not associated with percent body fat
	• Prospective Results:
	  o Total milk at age 10 y was associated with body fat at age 11 y in multivariable adjusted models ($P = .01$); the association remained after additional adjustment for total energy ($P = .03$) but was attenuated in the analysis among those with plausible dietary intakes ($P = .16$)
	  o Total milk intake at age 10 y was not associated with body fat at 13 y in multivariable adjusted models.
	  o Full-fat and reduced-fat milk at age 10 y was not related to percent body fat at ages 11 or 13 y.
	• Secondary Analysis:
	  o There were no associations between changes in milk intake from ages 10 to 13 y and changes in percent body fat from ages 11 to 13 y
	  o There was no relationship between change in full-fat or reduced-fat milk intake and change in body fat ($P < .09$).
	Notes:
	• All models were tested for effect modification of milk on adiposity by sex and baseline overweight/obesity using separate 2-way interaction terms
	  o Interactions with sex were observed between changes in total milk and body fat (P-interaction = .09) and changes in reduced fat milk and percent body fat (P-interaction = .08).
	  o Interactions with baseline overweight/obesity were observed for associations between high-fat milk intake at age 10 y and body fat at age 11 y (P-interaction = .09) and between reduced-fat milk at age 13 y and body fat at age 13 y (P-interaction = .09).
	• Participants recruited from a relatively small geographical area may limit generalizability of results (limited variability in race/ethnicity)

	• Limitations in accelerometer measurements may have underestimated predicted energy requirements thereby affecting "plausible dietary intake" calculations

Phillips 2003

Methods	Prospective cohort
Participants	**Participants:** Preadolescent girls followed until 4 years post menarche **Setting:** Cambridge and Somerville, Massachusetts public schools, MIT summer day camp, MIT faculty contacts family and friends. Participants recruited fall 1990 to spring 1993. (Massachusetts Institute of Technology (MIT) Growth and Development Study) **Number enrolled:** *N* = 196 **Number completed:** Unclear. 'Data exclusions' state data analyzed for 178 participants. Table 1 shows *n* = 166 for study entry, *n* =141 for study exit. **Gender, males:** There were no male subjects **Age, years (mean):** 10 at baseline study entry **Inclusion Criteria:** • Age 8 to 12 years old at study entry • Premenarcheal at study entry • Non-obese based on triceps skinfold thickness (TSF) <=85th percentile for age and sex according to NHANES I • In good health as assessed by physical examination and medical histories **Exclusion Criteria:** • Participants left more than 12 out of 116 items blank on FFQ (food frequency questionnaire) • Daily energy intake < 500 kcal or > 5000 kcal as calculated from FFQ • Participants with less than three annual visits **Covariates identified (10):** age (years), TV (h/day), activity index, inactivity index, daily kilocalories, daily servings of fruits and vegetables, % of daily calories from soda, % calories from fat, % calories from protein, % calories from carbohydrates
Interventions	Food frequency questionnaire (FFQ) at baseline and each annual follow-up visit. Serving sizes were of natural units or typical servings sizes. When completing the FFQ's, participants indicated how often, on average, they had consumed the amount of each food item in the past year. The nine response categories available ranged from 'never or less than 1 per month' to '6 or more per day'.
Outcomes	**Primary outcome(s):** • BMI (body mass index) z-score • %BF (body fat) **Secondary outcome(s)** • Daily servings of dairy food • % daily calories from dairy foods • Dairy calcium • % of calories from low-fat dairy • % of calories from full-fat dairy
Results	• Consumption of full-fat dairy, when expressed as a percent of calories from full-fat dairy, does not have a significant relation to BMI (*p* = .76) when adjusted for daily servings of fruits and vegetables, quartile of percentage calories from soda, percentage of calories from protein, and parental overweight.

	• Consumption of low-fat dairy, when expressed as quartile of percent of calories from low-fat dairy, does not have a significant relation to BMI (*p* = .74) when adjusted for daily servings of fruits and vegetables, quartile of percentage calories from soda, percentage of calories from protein, and parental overweight.

Scharf 2013

Methods	Longitudinal study
Participants	Study data pulled from the Early Childhood Longitudinal Survey – Birth (ECLS-B) cohort, a prospective, representative survey of children born in the United States in 2001 and assessed at both 2 and 4 years old. **Number of participants:** • 14000 birth certificates randomly sampled, of which • 10700 had completed parent interviews at child's age of 2 years and/or 4 years: 1. 7450 at child's age of 2 years 2. 8300 at child's age of 4 years who were milk drinkers 3. 200 at child's age of 4 years who were non-milk drinkers **Gender** (4 year old group of milk drinkers): 51.2% male **Inclusion Criteria:** Children whose parents completed at least 1 of the interviews **Exclusion Criteria:** • non-milk drinkers • surveys/interviews which did not include complete data on milk type **Covariates identified:** • sex • race • socioeconomic status • juice intake • sugary beverage
Interventions	Data was analyzed for several types of milk consumed: Whole, 2%, 1%, skim
Outcomes	BMI z-score BMI z-score increase over time
Notes	**Results: BMI z-scores (the only data on BMI z-scores is shown in bar charts)** 2 year olds: *p* <.001 (shown in figure 1A) 2%/whole milk drinkers 1%/skim milk drinkers 4 year olds: *p* <.001 (Shown in figure 1C) Whole milk drinkers 2% milk drinkers 1% milk drinkers skim milk drinkers • Mean BMI z-score among children reported to drink 1%/skim (n=250) and 2%/whole (n=4900) at both time points shown in figure 2. • Significance is following adjustment for sex, race/ethnicity and socio-economic status. • BMI z-scores were higher at 4 years than 2 years for both groups (p<0.001) but change in BMI z-score over time was not different between groups. • P values: BMI z-score for consistent drinkers of 1%/skim milk vs. 2%/whole milk at each time point: p<0.01, p<0.001.

	• Using linear regression and adjusting for sex, race/ethnicity and SES there was no significant difference between the low-fat group and the high-fat group in the change in BMI z-score over time (p=0.6). • These results persisted when change in raw BMI was assessed between the time points (data not shown). • Compared to those drinking 2%/whole milk, 2- and 4-year-old children drinking 1%/skim milk had an increased adjusted odds of being overweight (age 2 OR 1.64, p<0.0001; age 4 OR 1.63 p<0.0001) or obese (age 2 OR 1.57 p<0.01; age 4 OR 1.64, p<0.0001). • In longitudinal analysis, children drinking 1%/skim milk at both 2 and 4 years were more likely to become overweight/obese between these time points (adjusted *OR* = 1.57, p<0.05).

St-Onge 2009

Methods	Randomized Control Trial
Participants	**Setting:** University of Alabama at Birmingham, Pittman General Clinical Research Center **Randomized into study:** N=55 • **Group 1:** High-milk diet =Unclear • **Group 2** Low-milk diet =Unclear **10 children dropped out, did not disclose from which group **Completed Study:** N=45 • **Group 1:** High-milk diet n=21 • **Group 2** Low-milk diet n=24 **Gender, males:** • **Group 1:** High-milk diet n= 4 • **Group 2** Low-milk diet n= 5 **Age, years (mean):** • **Group 1:** High-milk diet, 9.2 • **Group 2** Low-milk diet, 9.6 **Inclusion Criteria:** • required to be low-milk and calcium consumers ($\leq$1 serving of milk/d and <600 mg/d of calcium) • above 95th percentile for BMI for age • BMI fell within the 85th–95th percentile range only if they had a parent with type 2 diabetes or the child had fasting serum insulin concentrations $\geq$173.6 pmol/L. • Waist circumference above the 95th percentile for age **Exclusion Criteria:** • Did Not Disclose **Power Analysis:** Did Not Disclose

Interventions	• Baseline visit included dietary counseling, body composition assessment (height, weight, % body fat waist and hip circumferences, magnetic resonance imaging [MRI]), blood pressure measurement, and oral glucose tolerance test (OGTT)
	    ○ Nutrition counseling at week 1, 2, 4, 6, 8, and 12.
	        ▪ Asked if any study beverages were missed, if energy beverages were consumed, and if they were following the guidelines of 1 treat/d or 7/week

	▪ 24-hour food recall format used to assess compliance with and knowledge of diet o Fasting blood samples obtained at weeks 4, 8, and 12 and all baseline measurements were obtained at endpoint (week 16) • Healthy eating guidelines were given: eating 3 meals/d, eating slowly, portioning food out of large containers, using sugar-free and low-fat products, and making a goal to exercise 30-45 minutes, 5 times/week o Used Stoplight Diet • **Group 1:** High-milk diet (708 mL skim milk/day and 236mL 1% low fat chocolate milk/day) o Counseled to consume 3 x 236 mL of skim milk and one 236 mL of 1% low fat chocolate milk/day • **Group 2** Low-milk diet (600 mL sugar-sweetened beverage/day, 944 mL skim milk/week, and 1180 1% low fat chocolate milk/week) o Counseled to consume 3 X 200 mL of sugar-sweetened beverage/d, 4 X 236 mL of skim milk/week, and 5 X 236 mL of 1% low fat chocolate milk/week
Outcomes	**Primary outcome(s):** • greater weight loss **Secondary outcome(s)** • improvements in metabolic risk factors
Notes	Instructed to only drink non-energy beverages in addition to the study provided beverages provided. **Results**: • Children in both the high- and low-milk groups increased in weight and height (effect of time, both P < 0.0001) while tending to reduce BMI (effect of time, P=0.057). Time and the time X beverage interaction did not affect waist circumference, % body fat, or BMI. • The beverage intake did not affect any of the metabolic variables measured in fasting children (blood pressure, serum lipids, glucose, and insulin) • There was a beverage X time interaction on insulin AUC, as assessed with an OGTT (P =.044). High-milk consumption leads to lower insulin AUC than low-milk consumption. Beverage, time, and beverage X time interaction did not affect glucose AUC.

Risk of bias table

Bias	Scholars judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Did not disclose method of randomization
Allocation concealment (selection bias)	High risk	During the baseline visit, the dietitian informed the child and parent to which beverage group the child was randomized
Blinding of participants and personnel (performance bias)	High risk	Participants were aware of the group they were in
Blinding of outcome assessment (detection bias)	Unclear risk	The study did address this outcome. They stated the same analyst analyzed pre- and post-study scans, but did not disclose whether they were blinded.
Incomplete outcome data (attrition bias)	High risk	Outcome data was based off who completed the study. 10 children dropped out during the study, and it is unclear to which group they were assigned.

Selective reporting (reporting bias)	Low risk	All outcomes were reported
Other bias	Low risk	The study appears to be free of other sources of bias

Velde 2011

Methods	Cohort Study
Participants	**Participants:** Pupils from two secondary schools in the Netherlands. Study was conducted from 1977-2000. **Setting:** Netherlands **Number enrolled:** *N* **=** 634 boys and girls. **Number completed:** *N* **=** 374 **Gender, males:** n=176 at 36 years **Age, years:** • Looked at subjects that are 13-36 years old **Inclusion Criteria:** • All 13-year olds in two secondary schools. **Exclusion Criteria:** • None **Covariates identified:** Total energy intake, total physical activity, and smoking status.

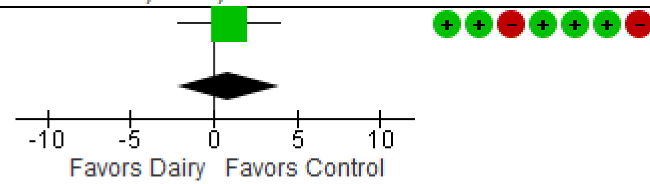
Interventions	• Children were recruited at age 13
	  ○ School 1 - Data was collected at ages 13,14,15,16,21,27,32, and 36 years of age.
	  ○ School 2- Data was collected at ages 13, 14, 15, 16, 32/33, and 36 years of age
	• Measured body weight and height
	• Calculated BMI
	• Measure waist circumference
	• Estimate body fat with DXA
	• Screen for metabolic syndrome and individual components of metabolic syndrome
	• Dietary intake evaluation by cross-check dietary history, specifically dairy intake

Outcomes	**Primary outcome(s):** • Overweight for high fat and low fat dairy
Results	• At age 36 being overweight or not overweight did not differ significantly based on the time course of dairy consumption. • The difference in intake of low-fat dairy products at age 21 years became more significant (P = .020) after adjustment for gender and lifestyle factors. • Participants who were overweight at age 36 years consumed less high-fat dairy at age 21 years than their normal weight counterparts (unadjusted P = 0.001; Fig. 2), and this difference remained significant after adjustment for gender (P < 0.001) and lifestyle factors (P = 0.001). • A significant difference was apparent for high-fat dairy consumption at age 21 years, with higher intake levels for participants with a BF% below the median (unadjusted P = 0.026; Fig. 3), even after adjustment for gender and lifestyle factors (P = 0.045).

Figure 2
Lappe et al. (2017)
Comparison: Dairy versus Control (at 12 months), Outcome: Waist Circumference (cm)

	Dairy			Control				Mean Difference	Risk of Bias
Study or Subgroup	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Weight**	**IV, Fixed, 95% CI**	**A B C D E F G**
Lappe 2017	78.1	13.3	136	77.2	13.1	138	100.0%	0.90 [-2.23, 4.03]	+ + − + + + −
Total (95% CI)			**136**			**138**	**100.0%**	**0.90 [-2.23, 4.03]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.56 (P = 0.57)

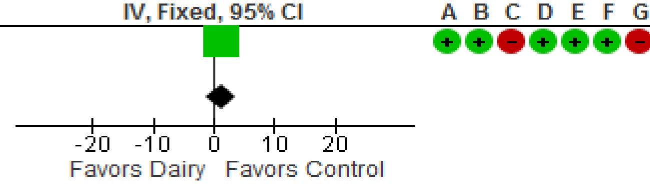


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Figure 3
Lappe et al. (2017)
Comparison: Dairy versus Control (at 12 months), Outcome: Hip Circumference (cm)

	Dairy			Control				Mean Difference	Risk of Bias
Study or Subgroup	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Weight**	**IV, Fixed, 95% CI**	**A B C D E F G**
Lappe 2017	95.6	10.6	136	94.4	10.4	138	100.0%	1.20 [-1.29, 3.69]	+ + − + + + −
Total (95% CI)			**136**			**138**	**100.0%**	**1.20 [-1.29, 3.69]**	

Heterogeneity: Not applicable
Test for overall effect: Z = 0.95 (P = 0.34)

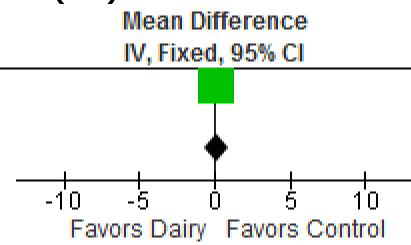


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Figure 4
Lappe et al. (2017)
Comparison: Dairy versus Control (at 12months), Outcome: Abdominal Girth (cm)

	Dairy			Control				Mean Difference	Risk of Bias						
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI	A	B	C	D	E	F	G
Lappe 2017	16.8	3.4	136	16.7	3.3	138	100.0%	0.10 [-0.69, 0.89]	+	+	−	+	+	+	−
Total (95% CI)			**136**			**138**	**100.0%**	**0.10 [-0.69, 0.89]**							

Heterogeneity: Not applicable
Test for overall effect: Z = 0.25 (P = 0.80)

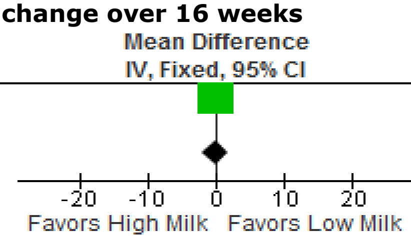


Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Figure 5
St-Onge et al. (2009)
Comparison: High Milk Intake versus Low Milk Intake, Outcome: BMI (kg/m2) change over 16 weeks

	High Milk			Low Milk				Mean Difference	Risk of Bias						
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI	A	B	C	D	E	F	G
St-Onge 2009	0.2	0.4583	21	0.3	4.899	24	100.0%	-0.10 [-2.07, 1.87]	?	−	−	?	−	+	+
Total (95% CI)			**21**			**24**	**100.0%**	**-0.10 [-2.07, 1.87]**							

Heterogeneity: Not applicable
Test for overall effect: Z = 0.10 (P = 0.92)



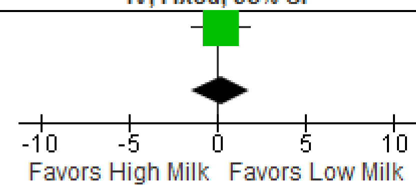
Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Figure 6
St-Onge et al. (2009)
Comparison: High Milk Intake versus Low Milk Intake, Outcome: Waist Circumference (cm) change over 16 weeks

	High Milk			Low Milk				Mean Difference	Risk of Bias						
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI	A	B	C	D	E	F	G
St-Onge 2009	-0.3	2.7495	21	-0.5	2.9394	24	100.0%	0.20 [-1.46, 1.86]	?	–	–	?	–	+	+
Total (95% CI)			**21**			**24**	**100.0%**	**0.20 [-1.46, 1.86]**							

Heterogeneity: Not applicable
Test for overall effect: Z = 0.24 (P = 0.81)

Mean Difference
IV, Fixed, 95% CI



Risk of bias legend
(A) Random sequence generation (selection bias)
(B) Allocation concealment (selection bias)
(C) Blinding of participants and personnel (performance bias)
(D) Blinding of outcome assessment (detection bias)
(E) Incomplete outcome data (attrition bias)
(F) Selective reporting (reporting bias)
(G) Other bias

Appendix

AGREE II[c] Summary for Barlow et al. (2007) Expert Committee Recommendations Regarding the Prevention, Assessment, and Treatment of Child and Adolescent Overweight and Obesity: Summary Report

Domain	Percent Agreement
1 - SCOPE AND PURPOSE	48%
2 - STAKEHOLDER INVOLVEMENT	41%
3 - RIGOR OF DEVELOPMENT	28%
4 - CLARITY AND PRESENTIATION	28%
5 - APPLICABILITY	43%
6 - EDITORIAL INDEPENDENCE	36%
Overall Guideline Assessment	33%

Note: Three EBP Scholars completed the AGREE II on this guideline.

[c]AGREE II is an international instrument* used to assess the quality and reporting of clinical practice guidelines.

A quality score is calculated for each of the six AGREE II domains (scope and purpose; stakeholder involvement; rigor of development; clarity of presentation; applicability; editorial independence). A higher domain percent reflects a stronger agreement that the guideline met the domain criteria. The AGREE II quality score does not judge the evidence used or the strength of the recommendations made by the guideline, only the process used to develop the guideline (Brouwers, et al., 2010).

*Brouwers, M.C. et al. for the AGREE Next Steps Consortium. (2010) AGREE II: Advancing guideline development, reporting and evaluation in healthcare. *Canadian Medical Association Journal, 182*, E839-842. Retrieved from https://www.agreetrust.org/wp-content/uploads/2017/12/AGREE-II-Users-Manual-and-23-item-Instrument-2009-Update-2017.pdf

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