YOGURT IN NUTRITION

INITIATIVE FOR A BALANCED DIET

Summaries of scientific studies and publications

YOGURT AND CHILDREN

2017

INFORMATION FOR HEALTHCARE PROFESSIONALS AND SCIENTISTS

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CONTENTS

INTRODUCTION

Yogurt: a valuable tool for improving children's health

There is accumulating evidence that adult yogurt consumers have better dietary intakes, reduced cardiometabolic risk factors and healthier lifestyles than non-consumers of yogurt. The current epidemic of childhood obesity – with its associated metabolic syndrome, burgeoning risk of cardiovascular disease and diabetes upsurge among younger age groups – not only poses a threat to individuals, but also places an enormous burden on health care resources in many nations. As such, investigation into the potential beneficial roles of yogurt consumption in paediatric populations is merited.

The goal of these summaries of scientific studies and reviews is to summarise the current evidence regarding the associations between yogurt and overall diet quality, nutrient and sugar intake. In addition, associations between dairy and yogurt intakes on child health outcomes are reviewed, including risk of obesity, metabolic profiles and cardiovascular risk, and quality of life.

Yogurt is a high-nutrient, low-energy food source that can help meet the dietary requirements for calcium, potassium and vitamin D. Yogurt is also a source of high quality protein. Recent data from national surveys in many countries consistently reveal that current dietary intakes by children and teens fall short in many key nutrients. Of these, calcium, potassium, vitamin D and dietary fibre are considered nutrients of public health concern.

Many children and teenagers, like their parents, exceed the recommended intake for sugar (which should be <10% of total daily energy intake according to the World Health Organization). There is a common misconception that sweetened yogurt consumption contributes to this problem. However, as summarised herein, consumption of low-fat fruit flavoured yogurt contributes only a small proportion of children's sugar intakes, and is linked to a reduced saturated fat intake. In addition, there is evidence that children who eat yogurt have a lower risk of being overweight or obese in childhood than those who do not.

We hope that you find this a useful resource for your clinical practice. More information can be found on the Yogurt in Nutrition Initiative website: **http://www.yogurtinnutrition.com/**

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STUDY 1.1

Zhu Y,
Wang H,
Hollis JH,
Jacques PF.

The associations between yogurt consumption, diet quality, and metabolic profiles in children in the USA

European Journal of Nutrition. 2015;54(4):543–50.

AIM

This study investigated whether yogurt consumption in children is linked to healthier diet and metabolic profile. Such an association has previously been shown in studies of adults, including the Framingham Heart Study[1].

> *"Frequent yogurt consumption may contribute to improved diet quality and a healthier insulin profile in children."*

Study methodology

The study used data from the large-scale National Health and Nutrition Examination Survey (NHANES) in the USA. Data were analysed from 5124 children aged 2–18 years who participated in NHANES between 2003 and 2006.

The survey used a food frequency questionnaire (FFQ) with a 24-hour dietary recall to determine how often the children consumed yogurt over a 12-month period.

Outcome measures

- Healthy Eating Index 2005 (HEI-2005) to measure diet quality:
  - total score
  - component scores for 9 adequacy components (food groups such as fruits, vegetables, grains), and 3 moderation components (saturated fat, sodium, and calories from solid fats, alcohol, added sugars).
- Metabolic profiles obtained from the NHANES data

RESULTS

Participant characteristics

- Among these US children aged 2–18 years, one-third (33.1%) consumed yogurt at least once a week and were classified as frequent consumers. Their median frequency of consumption was twice a week – compared with 1–6 times per year for infrequent consumers.
- The children who frequently consumed yogurt were more likely than the infrequent consumers to meet the recommendations for physical activity ($p < 0.05$).

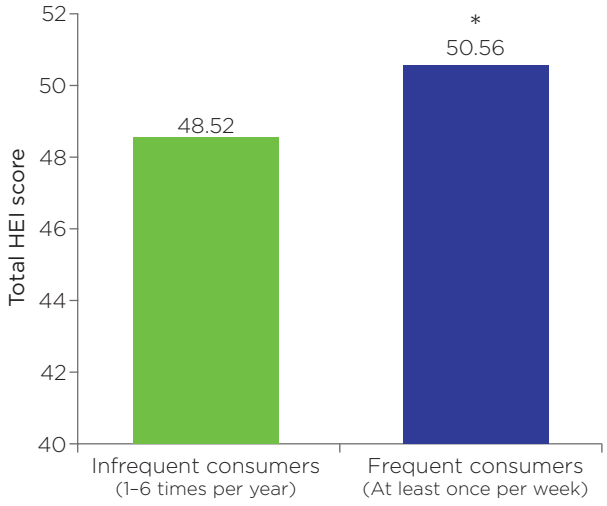
Diet quality

Compared with infrequent yogurt consumers, frequent consumers:

- ✔ Had better healthy eating scores
- ✔ Ate more fruit and whole grains
- ✔ Had a lower calorie intake from solid fats and added sugars

- Mean total energy intake between frequent and infrequent yogurt consumers was similar.
- Frequent yogurt-consuming children and teenagers had a better diet quality than those who consumed yogurt less often, as shown by a higher HEI-2005 total score ($p = 0.04$) (Figure 1).

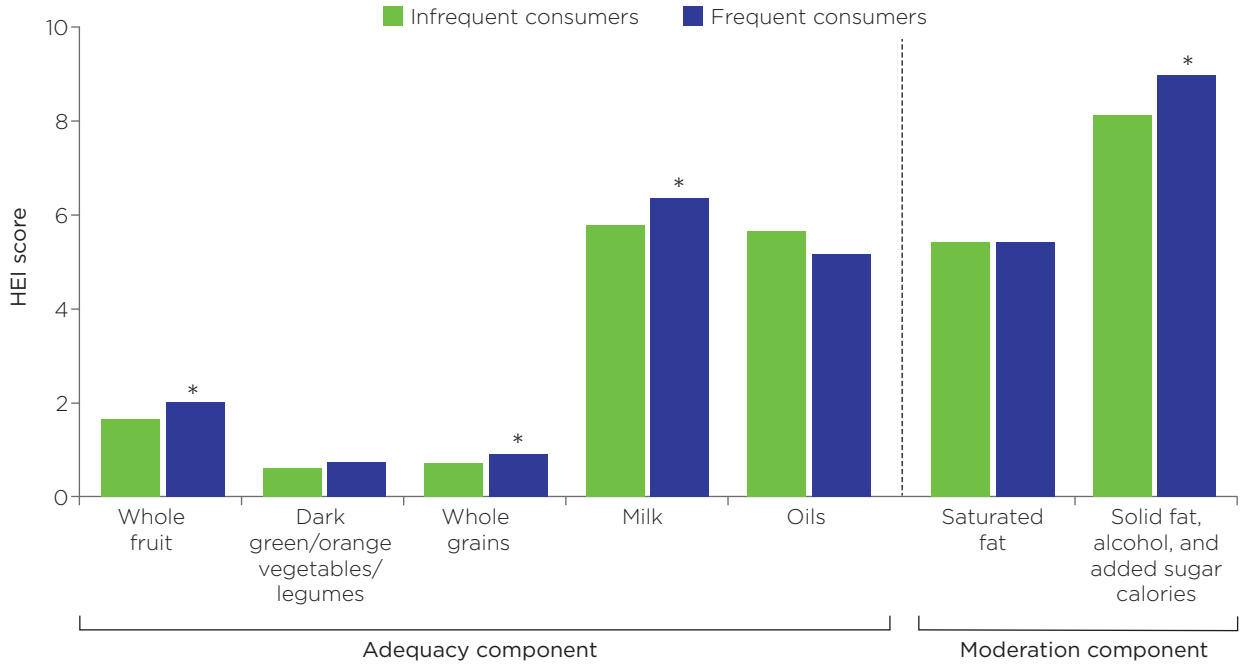
Figure 1: Total HEI-2005 scores



*Statistically signficant
Adapted from Zhu Y et al. European Journal of Nutrition. 2015;54(4):543–50.

- The frequent yogurt consumers ate more fruit and whole grains and drank more milk than the infrequent yogurt consumers ($p < 0.05$), reflecting an overall healthier diet (Figure 2).
- Frequent yogurt consumers were more likely than infrequent consumers to have a diet that followed the Dietary Guidelines for Americans, as shown by their HEI-2005 component scores.

Figure 2: Diet quality as shown by HEI-2005 scores



Shown as least square mean, adjusted for age, gender, race, income-to-poverty level, physical activity level, and energy intake.
*Statistically signficant. Adapted from Zhu Y et al. European Journal of Nutrition. 2015;54(4):543–50.

Metabolic profiles

See Study 3.2, page 20

Children who ate yogurt frequently had on average a healthier diet, containing more fruit and whole grains, than those who rarely ate yogurt

CONCLUSION

- In this nationally representative population of US children, eating yogurt more than once a week was associated with an overall better diet quality.
- Frequent yogurt consumers also scored more highly on several component scores of the HEI-2005, and they were more likely to have a diet that followed national dietary recommendations.

Reference

1. Wang H et al. International Journal of Obesity; 38(2):299–305.

STUDY 1.2

Keast DR,
Hill Gallant KM,
Albertson AM,
Gugger CK,
Holschuh NM.

Associations between yogurt, dairy, calcium, and vitamin D intake and obesity among US children aged 8–18 years: NHANES, 2005–2008

Nutrients 2015;7:1577–1593.

AIM

This study aimed to examine associations between yogurt and dairy consumption with energy, macronutrients, calcium and vitamin D intakes among US children taking part in the National Health and Nutrition Examination Survey (NHANES).

> ***"This study supports the role for yogurt and dairy as foods that increase intake of key shortfall nutrients in children, including potassium, calcium and vitamin D. Yogurt consumption had additional favourable associations with lower total fat and saturated fat intakes."***

Study methodology

Data collected from children aged 8–18 years who participated in the 2005–2006 and 2007–2008 National Health and Nutrition Examination Survey (NHANES) cross-sectional surveys were combined for this analysis.

The dietary component of NHANES includes two 24-hour recall dietary intake interviews: the first in-person and the second by telephone.

Outcome measures

- Nutrient intakes from foods were determined using the Food and Nutrient Database for Dietary Studies.
- Participants were classified to dairy and yogurt consumption groups using the first 24-hour recall data.
- Total daily energy, macronutrient, sodium, potassium, calcium, vitamin D intake was assessed for both dairy and yogurt consumption groups.

Covariates

- The covariates used in analyses of nutrient intake were energy (kcal) intake, gender, years of age, and race-ethnicity.

RESULTS

Participant characteristics

- A total of 3786 NHANES 2005–2008 participants aged 8-18 years were included in the analysis.
- Among participants, 8.5% were yogurt consumers, i.e. they reported eating yogurt during one or both 24-hour dietary intake interviews.
- For dairy consumption, 30% of children had a low dairy intake (they consumed <1 dairy serving per day), 28% had a 'middle' dairy intake (more than 1 but less than 2 servings per day), and 41% had a high intake (2 or more servings each day).

Association with nutrient intake

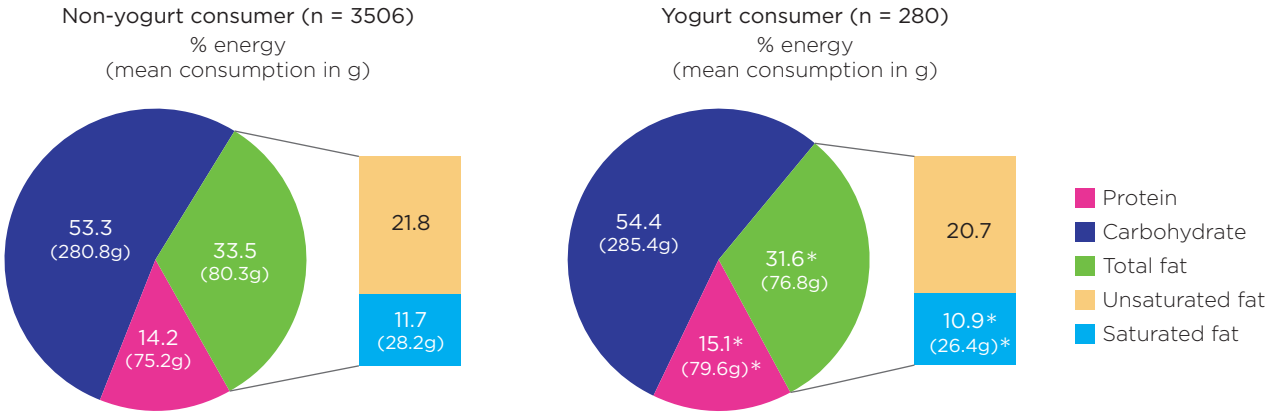
Yogurt:

Compared with non-consumers, children who ate yogurt had:

- ✔ Lower total and saturated fat intake
- ✔ Greater essential nutrient intake
- ✔ Similar intakes of energy, carbohydrate and sugars

- Yogurt consumers ate less total fat (% daily energy) and saturated fat (g/day, % daily energy) than non-yogurt consumers (Figure 1).
- Energy (kcal/day), carbohydrate (g/day), total sugars (g/day), added sugars (g/day), and total fat (g/day) did not differ between groups ($p < 0.05$).

Figure 1: Proportion of macronutrients in the diet of yogurt and non-yogurt consumers among children (aged 8–18 years; N=3786)



*Statistically signficant. Adapted from Keast DR et al. Nutrients 2015;7:1577–1593.

- Yogurt consumers had higher intakes of calcium, vitamin D, protein, and potassium than non-yogurt consumers ($p < 0.01$) (Table 1).

Table 1: Association between yogurt consumption and micronutrient intake among children (aged 8–18 years; N=3786)

Nutrient	Non-yogurt consumer (n=3506) Mean ± SE	Yogurt consumer (n=280) Mean ± SE
Calcium (mg)	1001 ± 14	1105 ± 27*
Vitamin D (µg)	4.97 ± 0.12	5.97 ± 0.33*
Sodium (mg)	3383 ± 43	3334 ± 87
Potassium (mg)	2215 ± 27	2478 ± 63*

Covariates in analyses of energy (kcal) and macronutrient (% energy) intake include gender, years of age and race-ethnicity; covariates in analyses of macronutrient (gram) and micronutrient intake include energy (kcal) intake, gender, years of age and race-ethnicity; Vitamin D conversion: 1 µg = 40 IU; *p < 0.01 significant difference between yogurt consumer and non-yogurt consumer.
Adapted from Keast DR et al. Nutrients 2015;7:1577–1593.

Frequent yogurt consumption was associated with higher intakes of micronutrients and less saturated fat in the diet

Dairy:

- Among the dairy groups, greater dairy consumption was associated with higher intakes of energy (kcal/day) and protein (g/day), and lower intakes of carbohydrate (g/day) and added sugars (g/day) ($p < 0.05$).
- Unlike the results seen with yogurt consumption, increased dairy consumption was also associated with a higher intake of saturated fat (mean 25.2g/day for low dairy consumers, 27.1g/day for mid consumers, and 30.8g/day for high consumers).
- Children who consumed more dairy also had higher calcium, vitamin D, and potassium intakes ($p < 0.05$) than those who had less dairy in their diet.

CONCLUSION

- In this large cross-sectional survey of the US population, among children aged 8–18 years yogurt and dairy consumption were associated with higher intakes of shortfall nutrients: calcium, vitamin D and potassium.
- Yogurt consumption had additional favourable associations with lower total fat and saturated fat intakes, whereas dairy was associated with higher energy and saturated fat intakes. The authors suggested this discrepancy may be due to the wide range of fat contained in dairy foods such as cheese, ice cream and milk, and the higher fat foods that contain dairy such as pizza. Conversely, much of the yogurt available in the USA is low-fat or fat-free.

STUDY 1.3

Williams EB, Hooper B, Spiro and A, Stanner S.

The contribution of yogurt to nutrient intakes across the life course

British Nutrition Foundation Nutrition Bulletin, 2015;40:9–32.

AIM AND CONTEXT

This study examined yogurt consumption in the UK using national survey data. The contribution of yogurt to nutrient intakes at different stages of life within the context of nutritional challenges in each age group was assessed. The intake of some minerals is found to be below the Reference Nutrient Intakes (RNIs) for certain age groups, particularly adolescents (11–18 years). Furthermore, the National Diet and Nutrition Survey (NDNS) suggests that the UK population's intake of non-milk extrinsic sugars (NMES) is too high, exceeding the Dietary Reference Value (DRV) (of no more than 11% of food energy) in children and adolescents[1].

The study also investigated the potential benefits to adolescents if they were to add an extra container of low-fat yogurt to their diet.

> ***"Encouraging teenagers to increase their consumption of yogurt could help meet recommended intakes for several micronutrients particularly calcium and iodine, which are in short supply in many adolescent diets, with low intakes persisting into later life."***

Study methodology

Food consumption data from the National Diet and Nutrition Survey (NDNS),[1] and the Diet and Nutrition Survey of Infants and Young Children (DNSIYC)[2] were obtained,[3] and categorised by age:

Outcome measures

- Yogurt consumption was described as the mean intake per day (g/day) across the whole data set (consumers and non-consumers).
- All data coded for yogurt – both separately for individual types (yogurt, fromage frais, and dairy desserts) and together as a yogurt group were examined to assess the nutritional contribution of yogurt across the life course.
- Nutrients included in the analysis were:
  - Micronutrients of which yogurt is defined as a source (calcium, iodine, phosphorus, vitamin B2 (riboflavin), vitamin B12)
  - Macronutrients (total fat, saturated fats, total sugars, non-milk extrinsic sugars [NMES], protein)
  - Micronutrients present in lower amounts where yogurt may contribute to total intake (potassium, magnesium, vitamin A, zinc, selenium and folate)
  - Vitamin D from fortified yogurt group products.

Infants	Young children	Young children	Adolescents	Adults	Middle aged	Older adults
4–18 months	1.5–3 years	4–10 years	11–18 years	19–49 years	50–64 years	≥65 years

RESULTS

Yogurt consumption across the life course

- The proportion of yogurt consumers (as identified by their food diaries) varied by age group: from around 80% in the younger age group (≤3 years), to two-thirds of young children (aged 4–10 years), dropping to only one third of adolescents and adults aged up to 49 years (36%), and rising to around 45% yogurt consumers among middle-aged and older adults (Figure 1).

Figure 1: Proportion of yogurt consumers by age group

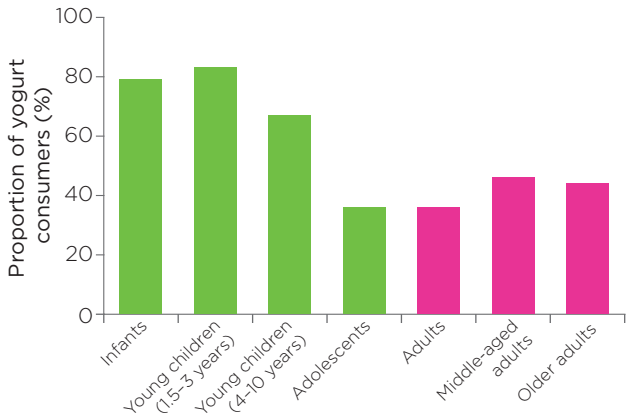


Figure is adapted from Williams EB et al. British Nutrition Foundation Nutrition Bulletin, 2015;40:9–32.

- The amount of yogurt consumed was highest among children aged 3 and under (44 g/day at 4–18 months and 47 g/day at 1.5-3 years) and lowest in adolescents (21 g/day).
- There is a change in the type of yogurt food people choose as they get older.
- Among children, fromage frais and low-fat and whole milk fruit/flavoured yogurts and fortified yogurts were frequently consumed.
- Among adults, low fat and whole milk fruit/flavoured yogurt was the most popular, and more plain/unsweetened yogurt was eaten by adults than by children.

Nutritional contribution of yogurt to children's diets: micronutrients

✔ Yogurt contributed significantly to children's intakes of: vitamin B12, riboflavin, calcium, iodine, phosphorus and vitamin D

✔ Yogurt was a low contributor to energy, protein and sugars

- Yogurt in the diet made a substantial contribution to intakes of some micronutrients (>10 % of the RNI) for children aged 3 years and under, particularly vitamin B12, riboflavin, calcium, iodine, and phosphorus (Table 1).
- Yogurt also contributed towards vitamin D intakes particularly in young children.
- Low yogurt consumption among teenagers contributed to the lower contribution to nutrient intakes compared with the younger age groups. The largest contributions (as a percentage of the RNIs) were for vitamin B12, iodine, riboflavin, phosphorus and calcium.

Table 1: Contribution of yogurt group to average daily vitamin and mineral intakes as percentage of Reference Nutrient Intake (RNI) excluding supplements

	Infants* (n = 2683)	Young children (1.5–3 years) (n = 303)	Young children (4–10 years) (n = 613)	Adolescents (n = 666)
% contribution of yogurt group to RNIs of:				
Folate	2.9	2.8	1.5	0.6
Riboflavin	21.3	17.0	9.5	3.7
Vitamin B12	53.8	42.1	16.8	4.8
Calcium	13.5	18.7	9.5	2.9
Iodine	15.8	16.4	9.4	4.2
Phosphorus	13.7	20.3	11.1	3.6

*DNSIYC data.

Adapted from Williams EB et al. British Nutrition Foundation Nutrition Bulletin, 2015;40:9–32.

Nutritional contribution of yogurt to children's diets: macronutrients

- The contribution of yogurt to macronutrient intakes across different life stages is shown in Table 2.

Table 2: Percentage contribution of yogurt to daily energy and macronutrient intake by age

	Infants (n = 2683)	Young children (1.5–3 years) (n = 303)	Young children (4–10 years) (n = 613)	Adolescents (n = 666)
% contribution of yogurt group to				
Total energy	4.9	4.2	2.6	1.2
Total fat	3.6	3.4	2.2	1.1
Total sugar	8.4	8.2	5.5	2.7
Total protein	7.4	5.5	3.2	1.3

Adapted from Williams EB et al. British Nutrition Foundation Nutrition Bulletin, 2015;40:9–32.

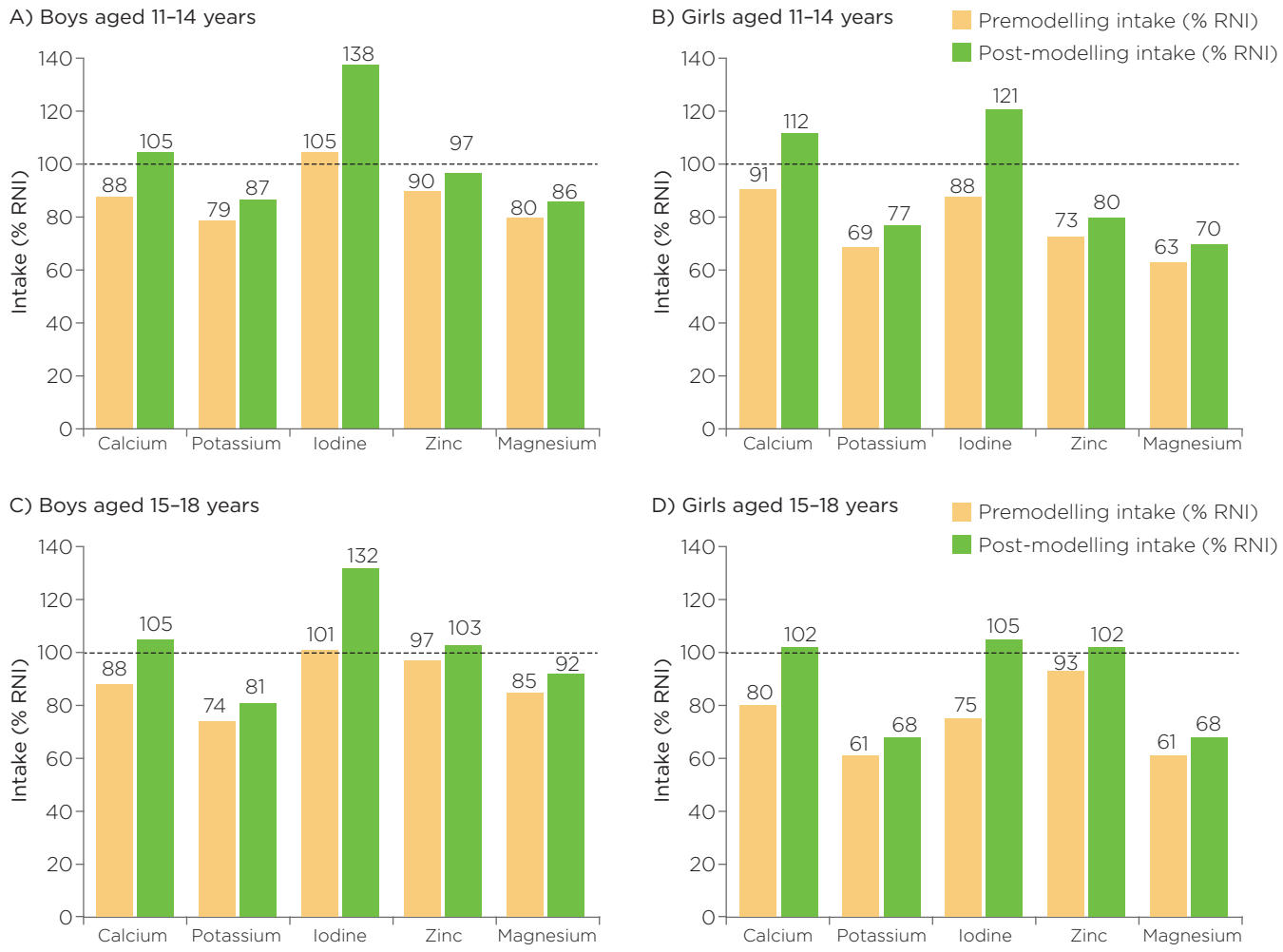
- The percentage contribution of yogurt to NMES intake was higher in very young children, at 22,7%, compared with 11.1% in those aged 1.5–3 years (3.6 and 4.0 g/day, respectively). However, total NMES intake for those aged 4–18 months was relatively low, contributing 6.7% compared with 11.6% of total energy intake in 1.5–3 year-olds (compared with the population DRV of ≤11% food energy).

- The contribution of yogurt to energy intake declined as children aged. In children aged 4–10 years, yogurt provided 2.6% of the total energy consumed, and contributed 5.5% to both total sugars and NMES.
- Consumption of yogurt among adolescents was low, providing 1.2% of energy, 2.7% of total sugars and 2.2% of NMES.
- The contribution of yogurt to total energy and macronutrient intakes was low (1.1% and <3%, respectively) among adults aged 19–49 years.
- Although yogurt consumption was higher in middle-aged adults (50-64 years), its contribution to macronutrient intake remained low at 4% for total sugars.
- Among older adults (≥65 years) yogurt provided 4.4% of total sugars and 4% of NMES.

Could increasing yogurt consumption benefit micronutrient intakes of vulnerable groups?

- The impact of adding an extra container of low-fat fruit yogurt per day (125 g) on the nutrient intake of adolescents was examined using simple modelling.
- In adolescents, the addition of a low-fat fruit yogurt would increase mean calcium intake from below to above the RNI (Figure 2).
- Among older teenagers (15–18 years), the daily addition of an extra container of yogurt would increase mean zinc intake from below to above the RNI, and for the older girls mean iodine intake would increase from below to above the RNI.

Figure 2: Effect of the addition of 1 extra container of low-fat yogurt per day (125 g) on mean micronutrient intakes in adolescents

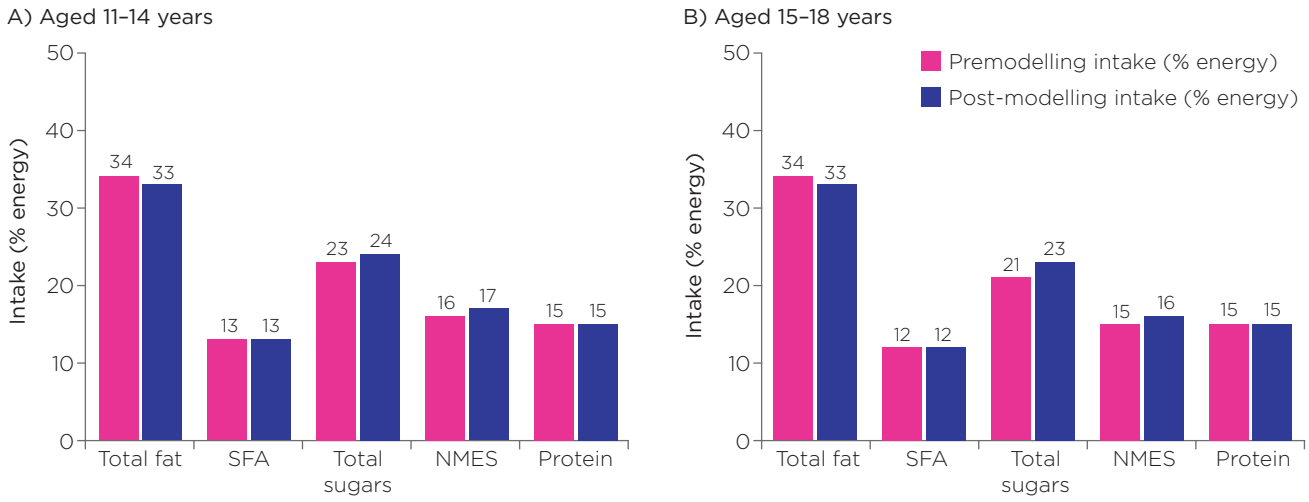


Adapted from Williams EB et al. British Nutrition Foundation Nutrition Bulletin, 2015;40:9–32.

Could increasing yogurt consumption benefit macronutrient intakes of vulnerable groups?

- Modelling revealed that, without substitution for other foods, an extra pot of low-fat yogurt per day (125 g) would increase energy intake by 98 kcal, including NMES by 8.2 g.
- In adolescents, the intake of NMES is above the DRV: 16% in 11–14 year olds and 15% in 15–18 year olds (vs. DRV of ≤11%).

Figure 3: Effect of the addition of 1 extra pot of low-fat yogurt per day (125 g) on mean energy and macronutrient intakes in adolescents



Adapted from Williams EB et al. British Nutrition Foundation Nutrition Bulletin, 2015;40:9–32.

Yogurt is an important dietary source of micronutrients without being a major contributor to intake of sugars

CONCLUSION

- This study shows that despite, being consumed in relatively small amounts in all age groups (21–47 g/day), yogurt makes a useful contribution to micronutrient intakes, while its contribution to mean energy and NMES intake remains low.
- Encouraging teenagers to eat low-fat yogurt as a healthy snack may make a useful contribution to intakes of key nutrients.

References

1. Bates B, et al. Public Health England, 2014.
2. Lennox A, et al. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/139572/DNSIYC_UK_report_ALL_chapters_DH_V10.0.pdf
3. NatCen (National Centre for Social Research), RC (Medical Research Council, Resource Centre for Human Nutrition Research) & UCL (University College London, Medical School) (2012) National Diet and Nutrition Survey, 2008–2010, 3rd edn. UK Data Archive: Colchester, Essex. doi.org/10.5255/UKDA-SN-6533-2. [distributor], [computer file], February 2012. SN: 6533.

STUDY 2.1

Azaïs-Braesco V, Sluik D, Maillot M, Kok F, Moreno LA.

A review of total and added sugar intakes and dietary sources in Europe

Nutrition Journal, 2017;16(1):6.

AIM

The study summarised and reviewed the available data in the European member states concerning sugar intake in children and adults. The findings can be used by policy-makers to form recommendations for limiting the intakes of added and free sugars, hence combat the obesity epidemic.

While no thresholds have been set for appropriate intake of total sugar, the WHO recommends reducing intake of free sugars to <10% of total daily energy intake for children and adults[1]. Free sugars (or non-milk extrinsic sugars [NMES]) are defined as all mono- and disaccharides added to foods by the manufacturer, cook and consumer, plus sugars naturally present in honey, syrup and unsweetened fruit juice[1].

> ***"Sweet products and beverages provide more than two-thirds of added sugars or NMES, while dairy products contributes 11 to 14% of added sugars and only 5% of NMES."***

Study methodology

Eleven nationwide surveys providing reliable data on total and/or added sugars or NMES were identified in 10 countries: Belgium, Denmark, France, Hungary, Ireland, Italy, the Netherlands, Norway, Spain and the UK, of which 7 provided estimates on added sugar intake.

Covariates

- Total and added sugar intakes across levels of education were calculated using general linear models.
- Models were adjusted for age, gender and energy (kcal/day).

Outcome measures

- Dietary data collection was carried out with different tools, collecting food consumption data from 24-hour recall, 3-, 4- and 7-day records.
- Harmonised food categories were examined, where possible, by redistributing food sub-groups consistently.
- Only categories that contribute significantly to sugar intakes were considered
- The added sugar content was defined from recipes and/or using the ingredient list; in Denmark the whole sugar content of specific food groups was considered as added sugar.

RESULTS

Intake in total sugars

- In all countries, at all ages, women/girls had a lower intake of sugars than men (g/day), although the contribution of sugar to the total energy intake was similar, in both genders, due to the higher energy intake of males.
- Among adults, sugar contributed more to women's than to men's energy intake (8–17% more).
- A higher intake and energy contribution of sugars was found in children compared with adults, e.g. 22–30% higher sugar intakes among children in Belgium and The Netherlands.

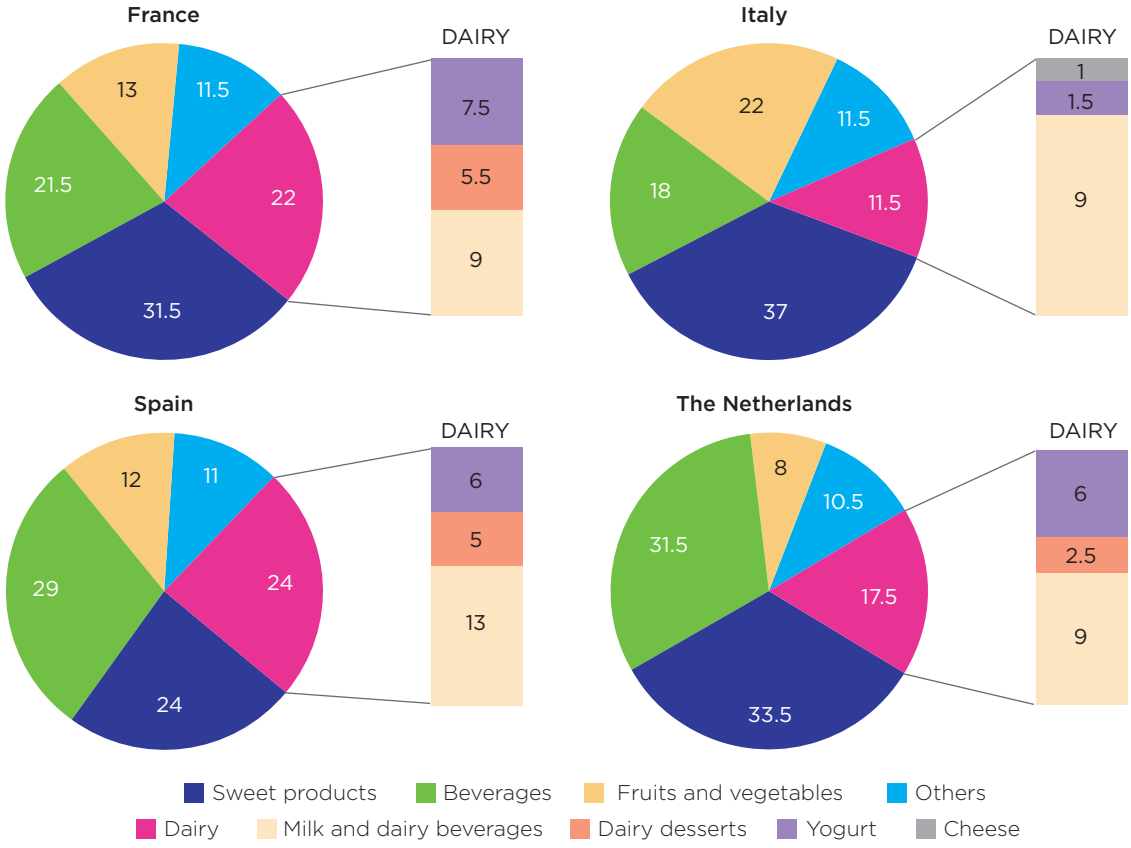
Intake in added sugars or non-milk extrinsic sugars (NMES)

- The same gender differences for total sugars were seen with added sugars in adults, with a higher intake in men (+14% to +49%).
- The contribution of added sugars to the energy intake was not dependent on gender but was dependent on age; added sugar contributed at least 30% more to total energy intake in children versus adults (+32% to +50%).

Contributors to intake of total sugars

- The contribution of different food groups to intakes of total sugars in children is detailed in Figure 1 and Table 1 including a breakdown for different dairy products.

Figure 1: Percent contribution of food groups to children's total sugar intake by country



Adapted from Azaïs-Braesco V et al. Nutrition Journal, 2017;16(1):6.

Table 1: Food group contribution to children's total sugar intakes by country

		CHILDREN						
Country		**France**		**Italy**		**Spain**	**The Netherlands**	
Age (years)		**3–17**		**10–18**		**13–17**	**7–18**	
Gender		**Girls**	**Boys**	**Girls**	**Boys**	**Both**	**Girls**	**Boys**
Dairy	**Total dairy**	**21**	**23**	**12**	**11**	**24**	**18**	**17**
	Milk, dairy drinks	9	9	9	9	13	10	8
	Dairy desserts	5	6	0	0	5	2	3
	Yogurt	7	8	2	1	6	6	6
	Cheese	0	0	1	1	0	0	0
Sweet products	**Total sweet** (Cake and cookies, syrups, sugar, honey, jam, confectionary, chocolate, ice cream	**32**	**31**	**36**	**38**	**24**	**35**	**32**
Drinks	**Total drinks** (F&V juices, soft drinks, hot drinks, alcoholic drinks)	**21**	**22**	**16**	**20**	**29**	**30**	**33**
Fruits and vegetables		**14**	**12**	**25**	**19**	**12**	**9**	**7**
Others		**11**	**12**	**11**	**12**	**11**	**10**	**11**

Adapted from Azaïs-Braesco V et al. Nutrition Journal, 2017;16(1):6.

- Sweet products (cakes and biscuits, sweets, chocolate, ice cream, and sugar, syrup, honey and jam) were major contributors to the intake of total sugars in all countries and across genders and age; other important contributors were fruit and vegetables, drinks and dairy products.
- In all countries, drinks contributed more to intakes of total sugars in children than in adults (+15 to +30% in children vs. adults).
- The dairy contribution to total sugar intakes was the lowest in Italy and highest in Spain and France; milk and dairy drinks were major contributors within dairy products especially in children, accounting for 8–13% of total sugar intake.
- Yogurt accounted for only a small proportion of the sugars eaten by children and adults across the European countries that had surveys. Hence among children and adolescents, yogurt contributed only 1–8% of their intake of total sugars, the lowest being in Italy and the highest in France. Intakes from yogurt were similar for boys and girls, and for adult groups.

Contributors to intake in added sugars and NMES

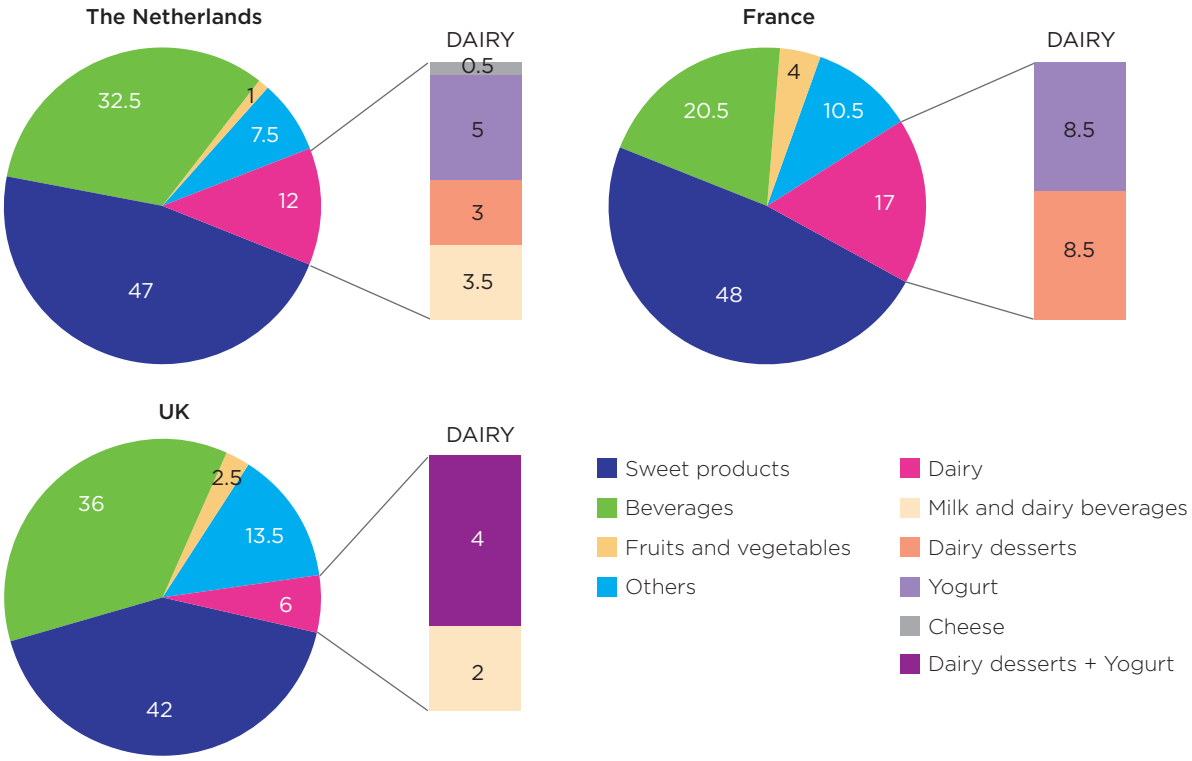
- The contribution of different children's food sources to added sugars or NMES is shown in Table 2 and Figure 2.

Table 2: Food contributions to children's intake of added sugars or NMES by country*

		CHILDREN					
Country		The Netherlands		France		UK	
Type of sugars		Added		Added		NMES	
Age (years)		7–18		3–17		4–18	
Gender		Girls	Boys	Girls	Boys	Girls	Boys
Dairy	**Total dairy**	**12**	**12**	**16**	**18**	**6**	**6**
	Milk, dairy drinks	4	3	0	0	2	2
	Dairy desserts	3	3	8	9	4	4
	Yogurt	5	5	8	9		
	Cheese	0	1	0	0	NA	NA
Sweet products	**Total sweet** (Cake and cookies, syrups, sugar, honey, jam, confectionary, chocolate, ice cream	**49**	**45**	**50**	**46**	**44**	**40**
Drinks	**Total drinks** F&V juices, soft drinks, hot drinks, alcoholic drinks	**31**	**34**	**20**	**21**	**35**	**37**
Fruits and vegetables		**1**	**1**	**4**	**4**	**2**	**3**
Others		**7**	**8**	**10**	**11**	**13**	**14**

*In % of daily intake of added sugars. NA, not available. Adapted from Azaïs-Braesco V et al. Nutrition Journal, 2017;26(1):6.

Figure 2. Percent contribution of food groups to children's added sugar and NMES intakes by country



Adapted from Azaïs-Braesco V et al. Nutrition Journal, 2017;26(1):6.

- Sweet products provide the highest contribution to added sugar and NMES intake (47–61% in adults and 40–50% in children).
- Drinks were the second highest contributor; in the UK where NMES were considered rather than added sugar, fruit juices were significant contributors to added sugar. Alcoholic drinks added a small contribution to adult intakes of added sugars or NMES, while in children the greatest contribution was from soft drinks.
- The contribution of dairy products to added sugars or NMES was 4 to 16% in adults and 6 to 18% in children, with the highest contribution observed in France.
- Dairy drinks provided 20 to 33% of dairy added sugars (except in France where dairy drinks were included as 'hot beverages')
- Yogurt contributed 4–9% of added or NME sugar intakes for children and 3–6% among adults. Yogurt had approximately the same contribution as dairy desserts.

Educational level

- In The Netherlands, total sugar intake did not alter according to educational level; although added sugar intake did decrease with higher educational level in adolescents and adults.
- In France, total sugar intake decreased with higher educational level in children and adolescents, although the trend appeared to reverse in adults; no trend was detected for added sugar.

Yogurt accounted for only a small proportion of the sugars eaten by children and adults across the European countries surveyed

CONCLUSION

- Surveys conducted in Europe show that total sugars make a significant contribution to total energy intake in all countries, genders and age groups, ranging from 15% to 21% in adults and 16% to 26% in children.
- For added sugars or NMES the difference between adults and children appears larger: these contribute to 7–11% of energy intake in adults and 11-17% of energy intake in children.
- Hence many Europeans, especially children, are exceeding the 10% of energy from free sugars threshold set by the WHO.
- Sweet products and drinks provide more than two-thirds of added sugars or NMES, while the contribution from dairy products is 6–18%.
- Yogurt contributes less than 10% of the total and added sugars eaten by children and adults.
- Reformulation simulations suggest that reducing the sugar content of soft drinks by half would reduce the sugar intake of adolescents by 14.4%, while a similar decrease in yogurt and dairy desserts would reduce it by only 1.2%[3].

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2. AFSSA. Étude Individuelle Nationale des Consommations Alimentaires 2 (INCA 2) 2006-2007. 2009 Available from: https://www.anses.fr/fr/system/files/PASER-Ra-INCA2.pdf Accessed 04 February 2017.
3. Tedstone A, et al. 2015. Available from: https://www.gov.uk/government/publications/sugar-reduction-from-evidence-into-action Accessed 31 May 2016.

STUDY 3.1

Keast DR, Hill Gallant KM, Albertson AM, Gugger CK, Holschuh NM.

Associations between yogurt, dairy, calcium, and vitamin D intake and obesity among US children aged 8–18 years: NHANES, 2005–2008

Nutrients 2015;7:1577–93.

AIM

The study investigated associations between yogurt and dairy consumption and indicators of overweight/obesity among US children in the National Health and Nutrition Examination Survey (NHANES 2005–2008). Several cross-sectional studies have shown an inverse relationship between body mass index (BMI) or adiposity and dairy intake in children, but this is not consistent across studies[1].

> ***"Consumption of yogurt and higher intake of dairy, calcium, and vitamin D intake were all independently associated with lower body fat in children."***

Study methodology

Data collected from children aged 8-18 years who participated in the 2005-2006 and 2007-2008 National Health and Nutrition Examination Survey (NHANES) cross-sectional survey were combined for this analysis.

Outcome measures

- Participants were classified to dairy and yogurt consumption groups using two 24-hour dietary recall interviews.
- Waist circumference, skinfold thickness measurements (triceps and subscapular), weight and height were measured.
- BMI was calculated as body weight (kg) divided by height (m) squared.
- The percentile of BMI-for-age was calculated using Centers for Disease Control and Prevention (CDC) 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 age and gender were used to determine abdominal obesity defined as a waist circumference ≥85th percentile.

RESULTS

Participant characteristics

- See Study 1.2, page 8, for details.

Association between dairy consumption and nutrient intake

- See Study 1.2, page 8, for details.

Compared with non-consumers, children who ate yogurt:

- ✔ Were less likely to be overweight
- ✔ Had smaller waist circumference and subcutaneous fat
- ✔ Had lower BMIs

Association between yogurt and dairy and body weight or adiposity

- Yogurt consumers were less likely to be overweight or obese, had lower BMI-for-age, smaller waist circumference, and smaller subscapular skinfold than non-yogurt consumers, after adjusting for demographic and energy intake differences (Model 1).

- The differences in BMI-for-age, waist circumference, and subscapular skinfold persisted in the fully-adjusted Model 2 ($p < 0.05$) which took into account other lifestyle issues such as physical activity and computer/TV use, and household income (Table 1).

Table 1: Association between yogurt consumption and obesity or adiposity indicator among children (8–18 years; N=3786)

Indicator of obesity or adiposity[1]	Non-yogurt consumer (n=3506) Mean ± SE	Yogurt consumer (n=280) Mean ± SE
Anthropometric indicators weight (kg)		
Model 1	56.1 ± 0.6	54.2 ± 0.9
Model 2	56.1 ± 0.5	54.4 ± 0.9
Waist circumference (cms)		
Model 1	76.9 ± 0.5	74.5 ± 1.0*
Model 2	77.0 ± 0.5	74.5 ± 1.0*
Subscapular skinfold (mm)		
Model 1	12.9 ± 0.3	11.1 ± 0.5*
Model 2	12.9 ± 0.3	11.3 ± 0.6*
Calculated indicators body mass index (kg/m^2)		
Model 1	22.0 ± 0.2	21.3 ± 0.3*
Model 2	22.0 ± 0.2	21.3 ± 0.3*
Percentile of BMI-for-age (%)		
Model 1	64.8 ± 1.2	60.4 ± 2.9
Model 2	64.7 ± 1.2	61.3 ± 2.7
Overweight/obesity prevalence (%)		
Model 1	36.2 ± 1.9	27.0 ± 4.0*
Model 2	35.7 ± 1.8	27.6 ± 4.6

[1] Model 1 covariates include energy (kcal) intake, gender, years of age, race-ethnicity; and alcohol use (days/year), and tobacco use in last 5 days (yes/no) and Model 2 covariates include energy (kcal) intake, gender, years of age, race-ethnicity, poverty income level, physical activity level, TV/video/computer use (h/day), alcohol use (days/year), and tobacco use in last 5 days (yes/no); *$p < 0.05$ significant difference between yogurt consumer and non-yogurt consumer.
Adapted from Keast DR et al. Nutrients 2015;7:1577–93.

Children and teenagers who ate yogurt tended to be slimmer, have a lower BMI and less body fat than those who did not

- For the dairy consumption analysis, subscapular skinfold thickness was the only indicator of obesity or adiposity that was inversely associated: children who consumed more dairy food (2+ servings/day) had less body fat here than those who had <1 serving/day ($p < 0.05$).
- High intake of calcium and vitamin D was associated with smaller subscapular skinfold than lower intake ($p < 0.05$).

CONCLUSION

- In this large cross-sectional survey of the US population, among children aged 8–18 years higher yogurt consumption, was independently associated with lower BMI, lower waist circumference and lower body fat, as was dairy consumption, calcium and vitamin D.
- The long-term impact of yogurt and dairy consumption in the diets of US children on weight and adiposity remains to be investigated by intervention studies.
- The mechanism by which dairy/yogurt impacts on weight and adiposity is yet to be determined.

Reference

1. Spence LA, et al. Current Nutrition & Food Science 2011;7:40–49.

STUDY 3.2

Zhu Y,
Wang H,
Hollis JH,
Jacques PF.

The associations between yogurt consumption, diet quality, and metabolic profiles in children in the USA

European Journal of Nutrition 2015;54(4):543–50.

AIM

This study investigated whether yogurt consumption in children is linked to healthier diet and metabolic profile. Such an association has previously been shown in studies of adults, including the Framingham Heart Study[1].

> ***"Our findings suggest that increasing yogurt consumption, as part of a healthy dietary pattern, might be an effective dietary strategy for improving the diet quality and, at least, the insulin profile among children."***

Study methodology

The study was based on the large-scale National Health and Nutrition Examination Survey (NHANES) in the USA. Data were analysed from 5124 children and teenagers aged 2–18 years who participated in NHANES between 2003 and 2006.

The researchers used a food frequency questionnaire (FFQ) with a 24-hour dietary recall to determine how often the children ate yogurt.

Outcome measures

- Healthy Eating Index 2005 (HEI-2005) to measure diet quality. (see details in study 1.1, page 6)
- Weight, height and waist circumference.
- Metabolic profiles were obtained from the NHANES laboratory data including fasting glucose, serum insulin, and lipid profiles.
- Homeostatic model assessment of insulin resistance (HOMA-IR).
- Quantitative insulin sensitivity check index (QUICKI).

RESULTS

Participant characteristics

- See Study 1.1, page 6.

Diet quality

- See Study 1.1, page 6

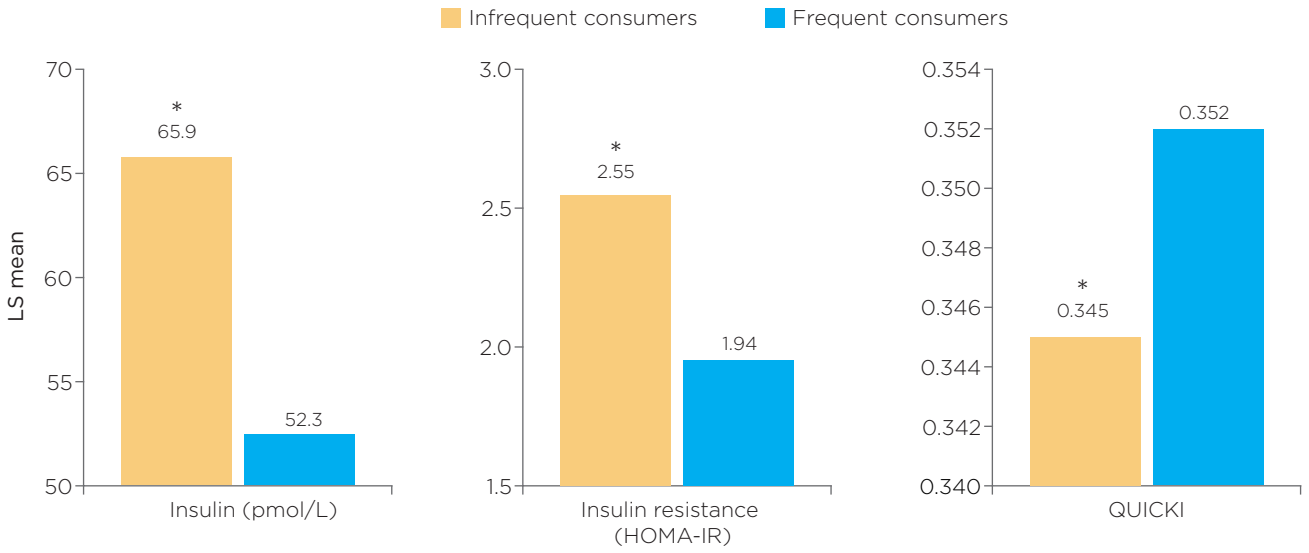
Metabolic profiles

Frequent yogurt consumers (at least once per week) had:

- ✔ Lower fasting insulin levels
- ✔ Lower insulin resistance
- ✔ Higher insulin sensitivity
- ✔ Similar body weight to infrequent yogurt consumers (1–6 times per year)

- Compared with infrequent consumers, children who often had yogurt had improved insulin profiles (Figure 1). They had:
  - 21% lower fasting insulin level ($p < 0.0001$)
  - 24% lower HOMA-IR score ($p < 0.0001$)
  - 2% QUICKI ($p = 0.03$).
- These differences were seen even when milk was excluded from the analysis.
- Yogurt consumption was not associated with C-reactive protein, serum lipid profiles, blood pressure, or fasting glucose ($p > 0.05$).
- Energy intake and body weight were similar for frequent and infrequent consumers.

Figure 1: Insulin profiles of frequent and infrequent yogurt consumer



Shown as least square mean +/- SE, adjusted for age, gender, race, income-to-poverty level, physical activity level, energy intake, and HEI-2005 total score
HOMA-IR = Homeostatic model assessment of insulin resistance
QUICKI = Quantitative insulin sensitivity check index
*Statistically signficant. Adapted from Zhu Y et al. European Journal of Nutrition 2015;54(4):543–50.

- Significant differences between the two groups in insulin resistance and sensitivity scores were still seen after excluding data from the children aged under 12 years, those receiving Food Stamps (associated with a higher milk component score on the HEI-2005) or when milk was excluded from the HEI-2005 score.

Frequent yogurt consumption was associated with an improved insulin profile in children and teenagers, but was not associated with differences in weight

CONCLUSION

- In this nationally representative population of US children, eating yogurt more than once a week was associated with improved insulin profiles as shown by lower levels of fasting insulin, reduced insulin resistance, and improved insulin sensitivity.
- In contrast, yogurt consumption was not associated with weight, blood pressure, fasting glucose or lipid profiles.
- The authors suggest that further studies are warranted on the potential health benefits of increasing yogurt consumption as part of a healthy diet in this age group.

Reference

1. Wang H, et al. International Journal of Obesity 2014;38(2):299–305.

STUDY 3.3

Gopinath B, Flood VM, Burlutsky G, Louie JCY, Baur LA, Mitchell P

Dairy food consumption and health-related quality of life in boys: preliminary findings from a 5-year cohort study

The Journal of the American College of Nutrition 2016;35(6):552–58.

AIM

This study examined whether dairy and yogurt intake affects quality of life (QOL) scores during adolescence. Prior studies in adults have shown an association between dairy product consumption and greater social functioning[1] and an inverse relationship with depression[2–4].

> ***"Yogurt consumption might be associated with higher psychosocial health and school functioning domains in adolescent boys."***

Study methodology

This observational study was based upon the Sydney Childhood Eye Study, a population-based cohort of schoolchildren living within the Sydney Metropolitan Area, Australia. Data were analysed from the 12-year old cohort during 2004–2005 and again 5 years later (2009–2011) for 1216 participants.

Outcome measures

- Dairy intake: dietary data were collected using a 120-item self-administered food frequency questionnaire (FFQ) with a recall period of the last 6 months.
  - Types of dairy food – cheese milk and yogurt – consumption were analysed separately, as was total dairy intake.
  - Servings were calculated using Australian Dietary Guidelines: milk (258g/250ml), any type of cheese (40g), and yogurt (200g).
- Health-related QOL was assessed using the self-reported Pediatric Quality of Life Inventory (PedsQL) 4.0, a 23-item questionnaire for children. It includes 4 subscale scores (physical, emotional, social and school functioning), a total score (average of all items in the questionnaire), a physical health summary score, and a psychosocial health summary score (average of the items from the emotional, social and school functioning subscales).
- The association between dairy intake and QOL at age 17–18 years was determined, as was the relationship between dairy intake and QOL over the 5 year period.
- Data were adjusted for age, gender, race, body mass index (BMI), parental education, and time spent in activity behaviours.

RESULTS

Participant characteristics

- Among these Australian children followed from the age of 12 to 17 years, 858 had complete data on dietary intakes and PedsQL scores.
- More of the boys were Caucasian vs other ethnicities (67% vs. 53%) and more boys than girls had parents with education beyond high school (52% vs. 45%).
- Boys spent more time than girls in both physical activity (0.9 vs. 0.7 hours/day) and screen viewing activities (3.6 vs. 3.1 hours/day).

Association between yogurt consumption and QOL

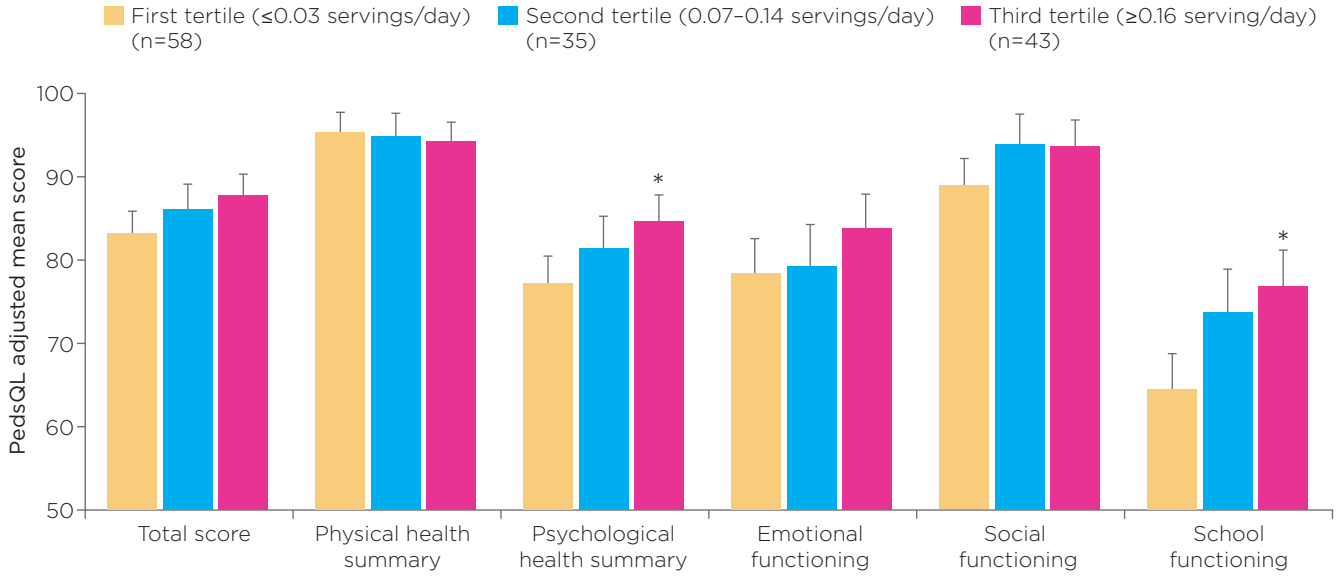
Boys who ate the most yogurt had:

- ✔ Higher quality of life
- ✔ Better psychosocial health
- ✔ Better school functioning

- Among boys aged 17–18 years, those who ate the most yogurt had higher total PedsQL scores (p-trend = 0.03), and higher psychosocial health summary scores (p-trend = 0.02) and school functioning scores (p-trend = 0.01) than those who ate the least yogurt. These were the findings after the data were adjusted for multiple variables.

- However, among girls aged 17–18 years, no significant associations were found between yogurt or other dairy food intakes and QOL.
- Over the 5-year period from age 12 to 17 years, boys who remained high yogurt consumers had higher psychosocial health summary scores (p-trend = 0.04) and higher school functioning scores (p-trend = 0.02) compared with those who remained low yogurt consumers.
- Moreover, boys who remained in a high tertile of yogurt consumption had higher school functioning scores than those who reduced their yogurt consumption (p = 0.01) (Figure 1).
- Boys who increased their yogurt consumption over the 5 years did not show an appreciable improvement in QOL.
- Total dairy, milk, and cheese consumption did not show any independent associations with QOL.

Figure 1: Temporal associations between yogurt consumption and QOL among adolescent boys over 5 years (12–17 years; n=131)



Adapted from Gopinath B et al. The Journal of the American College of Nutrition 2016;35(6):552–58.

Boys who ate the most yogurt had better well-being and school functioning scores than those who ate the least yogurt

CONCLUSION

- In this exploratory cohort study, a possible link was found between yogurt consumption and higher psychosocial health and school functioning in adolescent boys, independent of potential confounding factors.
- Similar findings were not established for adolescent girls, neither for total dairy, milk and cheese consumption.
- A causal nature between yogurt and QOL could not be established due to the observational nature of this study.
- Hence, larger community-based studies and randomised controlled trials may be warranted.

References

1. Crichton GE, et al. Asia Pacific Journal of Clinical Nutrition 2010;19(6):171.
2. Miyake Y, et al. BJOG, An International Journal of Obstetrics & Gynaecology 2014;122:336–43.
3. Bae YJ, et al. Nutrition Research and Practice 2012;6:527–33.
4. Aihara Y, et al. Community Mental Health Journal 2011;47:186–93.

STUDY 4.1

Moreno LA, Bel-Serrat S, Santaliestra-Pasias A, Bueno G.

Dairy products, yogurt consumption, and cardiometabolic risk in children and adolescents

Nutrition Reviews 2015;73(S1):8–14.

AIM

The authors reviewed the available information on an association between dairy product intake, especially yogurt, and cardiometabolic risk factors in children and adolescents. They focused on results from the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study[1].

> ***"In the HELENA study of adolescents in Europe, an inverse association was observed between consumption of yogurt and of milk- and yogurt-based beverages and some cardiovascular disease (CVD) risk factors, especially total and abdominal excess body fat."***

Study methodology

The authors examined observational and intervention studies of the association between dairy/yogurt intake and adiposity in children and adolescents. They also reviewed results from adolescents participating in the HELENA study in which:

- Measurements were obtained for CVD risk factors and cardiorespiratory fitness in 511 of the HELENA participants
- Dietary intakes were assessed using the HELENA dietary assessment tool including two 24-hour recalls
- Time spent on sedentary behaviours, such as TV-watching, and being physically active was assessed.

RESULTS

Dairy consumption, obesity and cardiometabolic risk

- A review found the evidence (34 of 35 observational and intervention studies conducted in children and adolescents) overwhelmingly supports no or inverse associations between milk or dairy product intake and indicators of adiposity (BMI, body fat)[2] and thus do not support the concern that energy from dairy products may contribute to childhood obesity.
- Dairy products have antihypertensive effects, and children who consume more dairy products in early life have lower blood pressure in middle childhood and adolescence.
- Milk fat increases high-density lipoproteins (HDLs), which are thought to protect against CVD.

HELENA results: findings for yogurt

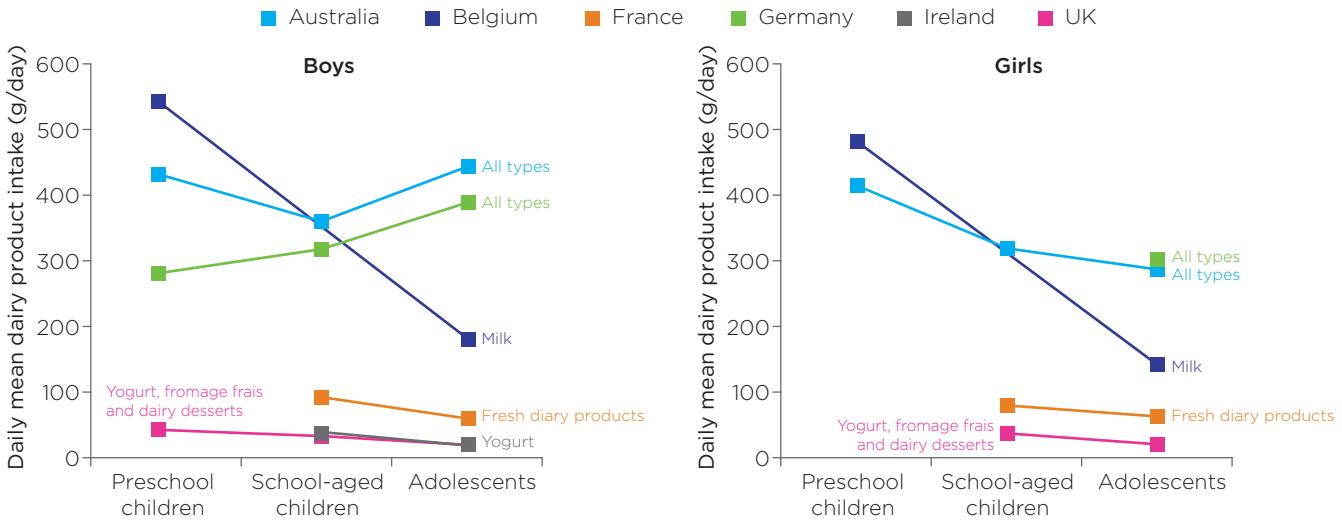
Higher consumption of yogurt and milk was associated with:

- ✔ Less body fat
- ✔ Lower risk for CVD

Higher cardiorespiratory fitness

- Overall, dairy was the food group that best identified adolescents at low CVD risk.
- Higher consumption of milk, yogurt, and milk- and yogurt-based drinks was linked with less body fat and higher cardiorespiratory fitness compared with lower dairy intake.
- Additional analysis in 1422 adolescents on measures of body composition revealed that those who consumed more dairy overall had lower BMIs, reduced skinfold thickness and smaller waists.
- Despite evidence suggesting dairy helps prevent overweight/obesity, children and adolescents in many countries are consuming less and less dairy food; many fail to meet the minimum recommendation for dairy intake especially as they move through the teenage years (Figure 1).

Figure 1: Daily mean dairy product intake (g/day) by country[2]



Adapted from Dror DK, et al. Nutrient Reviews 2014;72:68–81.

Possible mechanisms

Several mechanisms have been proposed for the link between dairy and yogurt consumption and the reduced indictors of risk of CVD:

- As young people are drinking less milk there is evidence they may be replacing it with sugary drinks and this may be partly responsible for an inverse relationship seen between dairy intake and obesity in children and adolescents.
- Several components naturally occurring in dairy foods, such as calcium, play a protective role in weight management (dairy sources of calcium exert greater effects in accelerating fat loss compared with other food sources).
- Other compounds in the whey fraction of dairy, such as angiotensin-converting enzyme (ACE) inhibitory peptides, may act synergistically with calcium to reduce weight and fat gain.
- Dairy proteins support better muscle protein synthesis than plant proteins, while conjugated linoleic acid, present in dairy foods, may reduce the accumulation of adipose tissue.
- Yogurt consumption may benefit the balance and metabolic activities of the indigenous microbiota in the gut. Evidence suggests that abnormal development of gut microbiota may contribute to childhood obesity.

Higher yogurt consumption was associated with reduced risk of certain CVD risk factors including less body fat

CONCLUSION

- The HELENA study of European adolescents found an inverse association between consumption of yogurt and of milk- and yogurt-based beverages and some CVD risk factors, especially total and abdominal excess body fat. This may be partly because young people are choosing sugary drinks in preference to dairy products.
- Randomised controlled trials are needed to provide evidence to support the HELENA findings, and to understand further the mechanisms underlying associations between dairy (especially yogurt) intake and CVD risk factors including obesity and diabetes.
- More studies are needed in which yogurt is considered as an individual food category, which typically has not been the case to date.

References

1. Bel-Serrat S, et al. Pediatric Obesity 2014;9(5):401.
2. Dror DK, et al. Nutrient Reviews 2014;72:68–81.

STUDY 4.2

Marette A, Picard-Deland E

Yogurt consumption and impact on health: focus on children and cardiometabolic risk

American Journal of Clinical Nutrition 2014;99(5):1243S–7S.

AIM

The paper reviewed the accumulating body of epidemiological data, clinical trials and mechanistic studies suggesting that yogurt consumption as part of a healthy diet may be beneficial to cardiometabolic health, with particular focus on children and adolescents.

> ***"Yogurt is an accessible, easy-to-digest, and tasty food that provides important nutrients to children and adolescents and thus forms part of a balanced nutrient-rich diet during development and growth."***

CONCLUSIONS

Yogurt has high nutrient density

Yogurt contributes to diet quality by providing:

- ✔ Protein, fatty acids, lactose
- ✔ Essential micronutrients – minerals and vitamins

- Yogurt contributes to diet quality in children by providing substantial amounts of macronutrients (protein, fatty acids, lactose) and essential micronutrients (e.g., calcium, potassium, zinc, phosphorus, magnesium, vitamin A, riboflavin, vitamin B5, vitamin B12).
- Yogurt is a rich source of calcium: 100 g of plain whole milk yogurt provides approximately 10% of the Recommended Dietary Allowance (RDA) for calcium in children.
- Few studies have assessed the effect of yogurt on weight variables and cardiovascular risk in children and adolescents.
  - The Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) project found that waist circumference and skinfold thickness were inversely associated with the consumption of yogurt and milk in adolescents, and dairy consumption was inversely associated with cardiovascular disease risk score in girls only[1].

Yogurt provides high-quality protein and amino acids

- The fermentation of yogurt generates bioactive peptides and amino acids with potential health benefits.
- Whey – which forms about 20% of milk proteins - is an inexpensive source of branched-chain amino acids (BCAA), for which conflicting reports of an association with insulin resistance have been reported.
- Larger, well-controlled trials are needed to determine whether elevated BCAA concentrations found in obese children contribute to insulin resistance or represent a biomarker of the development of insulin resistance in obesity.

Yogurt as a modulator of gut microbiota

- Modulation of the gut microbiota is shown to impact on energy storage, obesity and insulin resistance.
- There is evidence that gut microbiota differ between obese/overweight children and children with a BMI within the normal range.
- Yogurt consumption may lead to changes in the balance and metabolic activities of indigenous microbiota.
- Yogurt contains probiotics, which could have a hypocholesterolemic effect and potential benefit on body weight.
- Beneficial effects of *Lactobacillus* spp. and *Bifidobacterium* spp. on weight management and cardiometabolic risk factors have been shown in children aged 6–18 years of age.
- The mechanisms by which probiotics act on weight management are yet to be clearly established.

Yogurt is easy to digest

- Yogurt is easy to digest and delivers essential nutrients to children with lactose intolerance and diarrhoea.
- Children are advised to continue having yogurt and dairy products even if they have lactose intolerance or lactose maldigestion. Most people with lactose intolerance or maldigestion can tolerate up to 12g of lactose in a single dose and even higher amounts if intake is spread throughout the day (20–24g).
- A cause-and-effect relationship has been established between the consumption of live yogurt cultures and improved lactose digestion in people with lactose maldigestion.

Yogurt has a unique matrix

- Multiple nutritional properties may explain the beneficial effects of the matrix interaction on health in dairy products, and particularly in fermented products such as yogurt.
- Yogurt has a unique microstructure and texture, and future research might discriminate between types of dairy products and explore the synergy provided by the food matrix.

Yogurt is a tasty and satiating snack

- High-protein snacks and meals induce a greater reduction in appetite than do isoenergetic high-fat or high-carbohydrate foods.
- Yogurt has a superior effect on satiety compared with other foods, beverages, and snacks.
  - A study performed in healthy women showed that a 160-kcal afternoon Greek yogurt snack, containing 24 g protein, led to reduced hunger, increased fullness, and delayed subsequent eating compared with snacks containing lower protein amounts[2].
- Further studies are warranted to explain the effect of yogurt and its micro- and macronutrients on satiety and body weight regulation.

More research is warranted into the potential role of yogurt in helping to prevent obesity and cardiometabolic diseases

CONCLUSION

- Yogurt provides important nutrients to children and adolescents and forms a valuable part of a balanced nutrient-rich diet during development and growth.
- Yogurt consumption may have a beneficial role on body weight regulation and cardiovascular health; however, limited evidence exists in children and adolescents.
- More studies are needed to evaluate the health effect of specific peptides and amino acids such as BCAAs in youth.
- Further epidemiological studies and clinical trials are warranted to evaluate the effect of yogurt on modulation of the gut microbiota and the prevention of obesity and cardiometabolic diseases.

References

1. Bel-Serrat S, et al. Pediatric Obesity 2014;9(5):401–10.
2. Douglas SM, et al. Appetite 2013;60:117–22.

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YOGURT IN NUTRITION

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