Department of Animal Sciences
Institute for Food, Nutrition and Health

University of Reading

NUTRIENT COMPOSITION OF MILK, DAIRY AND PLANT-BASED ALTERNATIVES AND IMPLICATIONS FOR CONSUMERS' DIETS

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MILK IN HUMAN NUTRITION

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General

As a part of human nutrition, milk shows profound characteristics:

- Milk has been traditionally considered as a basic food in many diets, mainly due to its **nutrient-dense character**
- It is the **most complete single food** available
- It contains **numerous beneficial compounds** for human health
- It can be transformed to a wide range of dairy products

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MILK IN HUMAN NUTRITION

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Macronutrients

Percentage (%) contribution of milk and dairy products to average macronutrient intakes by years and age

	Children 1.5-3	Children 4-10	Adolescents 11-18	Adults 19-64	Adults 65-74	Adults 75+
Energy	23.8	13.7	9.6	9.1	10.8	12.8
Protein	31.0	19.5	13.3	13.1	15.0	18.5
Fat	32.2	17.7	13.1	12.6	15.1	17.2
• SFA	44.7	28.4	21.2	20.7	24.3	26.0
• trans	51.4	38.8	29.4	29.7	34.2	35.3
• MUFA	24.3	11.6	8.6	8.6	10.5	12.2
• n-3 PUFA	11.5	5.1	3.9	3.7	4.2	5.1
• n-6 PUFA	10.0	4.1	3.4	3.1	3.6	4.4
Carbohydrates	15.6	9.4	6.4	6.0	7.0	8.4
Free Sugars	19.8	13.6	8.6	7.5	9.5	8.0
Fibre	3.2	1.9	2.1	1.8	1.6	1.6

National Diet and Nutrition Survey (NDNS). Results from Years 9-11 (combined) of the Rolling Programme (2016/17 to 2018/19)

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Minerals and vitamins

Percentage (%) contribution of milk and dairy products to average micronutrient intakes by years and age

	Children 1.5-3	Children 4-10	Adolescents 11-18	Adults 19-64	Adults 65-74	Adults 75+
Iodine[1]	64.0	50.7	40.0	32.3	34.2	41.4
Calcium[1]	59.3	44.1	34.2	34.2	38.9	43.9
Phosphorus[2,3]		32.0	24.0	23.0		
Zinc[1]	34.6	21.3	15.2	14.7	16.4	20.1
Potassium[1]	29.7	18.5	13.0	10.7	11.6	15.9
Magnesium[1]	25.1	15.8	11.3	9.5	10.4	14.0
Sodium[1]	20.0	11.7	9.0	9.5	11.7	12.2
Selenium[1]	19.4	11.1	7.3	6.4	7.4	8.6
Iron[1]	5.7	2.8	2.7	2.2	1.9	2.3
Vitamin A[1]	35.5	23.0	19.3	14.8	14.8	16.5
Riboflavin (B2)[1]	54.0	39.4	29.1	26.6	29.6	35.7
Folic acid (B9)[1]	19.9	11.9	8.7	8.1	9.0	11.4
Vitamin D[1]	30.5	17.0	9.3	7.8	6.5	8.1

[1] National Diet and Nutrition Survey (NDNS). Results from Years 9-11 (combined) of the Rolling Programme (2016/17 to 2018/19)
[2] McAlister et al. 2020 Pediatr Nephrol 35:501-518 (results adapted from NDNS 1995 & 2000)
[3] Henderson et al. 2003. NDNS: adults aged 19 to 64 years, Volume 3 Vitamin and mineral intake and urinary analytes. London: TSO.

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WHY PEOPLE REDUCE MILK INTAKE

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Main drivers

- Cows' milk is the most common allergen in early childhood (2.2-3.5% children)[1]
- Lactose intolerance prevalence (8% in the UK)[2]
- Perceived opportunity for improved health, primarily originating from media information[3]
- 48% of British consumers view reducing consumption of animal products as a good way to lessen humans' impact on the environment[4]
- Beliefs for dairy farm practices contributing to animal mistreatment and reduced animal care[5]

[1] Gray et al. 2014, South African Medical Journal 105:68-69; Villa et al. 2018, Comprehensive Reviews in Food Science and Food Safety 17:137-164. [2] Storghaus et al. 2017, The Lancet Gastroenterology & Hepatology 10:738-746. [3] Miki et al. 2020, Current Developments in Nutrition 4:nzaa013; Makinen et al. 2016, Critical Reviews in Food Science and Nutrition. [4] Mintel 2020. UK Meat-Free Foods Market Report. [5] McCarthy et al. 2017. Journal of Dairy Science 100:6125-6138.

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THE RISE OF PLANT-BASED ALTERNATIVES

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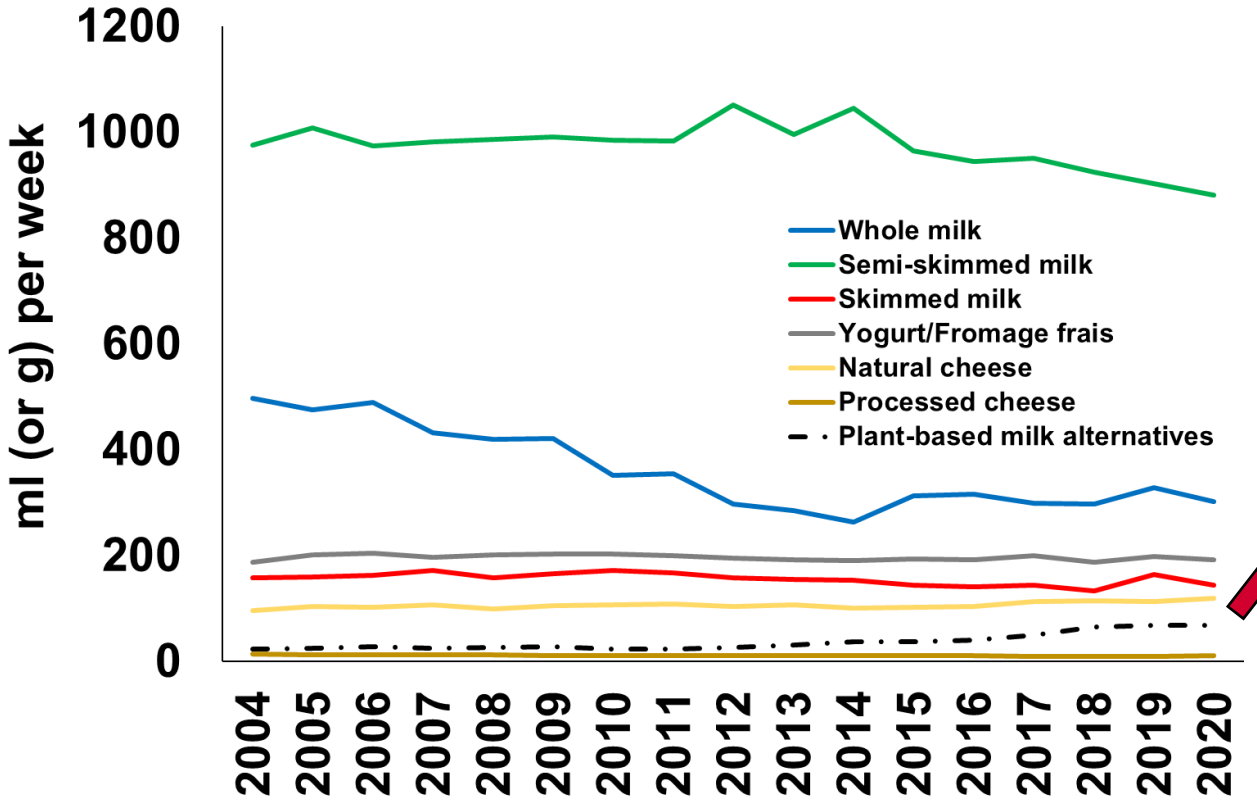
United Kingdom



From 2004 to 2020 UK consumption of PBDA[1]:

- Nearly ×3, from 23 to 68 ml/person/week
- From 1.4% to 5.2% compared to cow milk
- Relatively small market but steadily increasing

23% of people used PBDAs in Dec'18-Feb'19[2]

Photo from: pixabay

[1]DEFRA Family Food Statistics collection (updated 27/01/2022). Adjusted National Food Survey data 1974 to 2000, Expenditure and Food Survey 2001-02 to 2007 and Living Costs and Food Survey 2008 onwards. Food & Trade Statistics Branch.[2] Mintel. Added value in dairy drinks, milk and cream

THE RISE OF PLANT-BASED ALTERNATIVES

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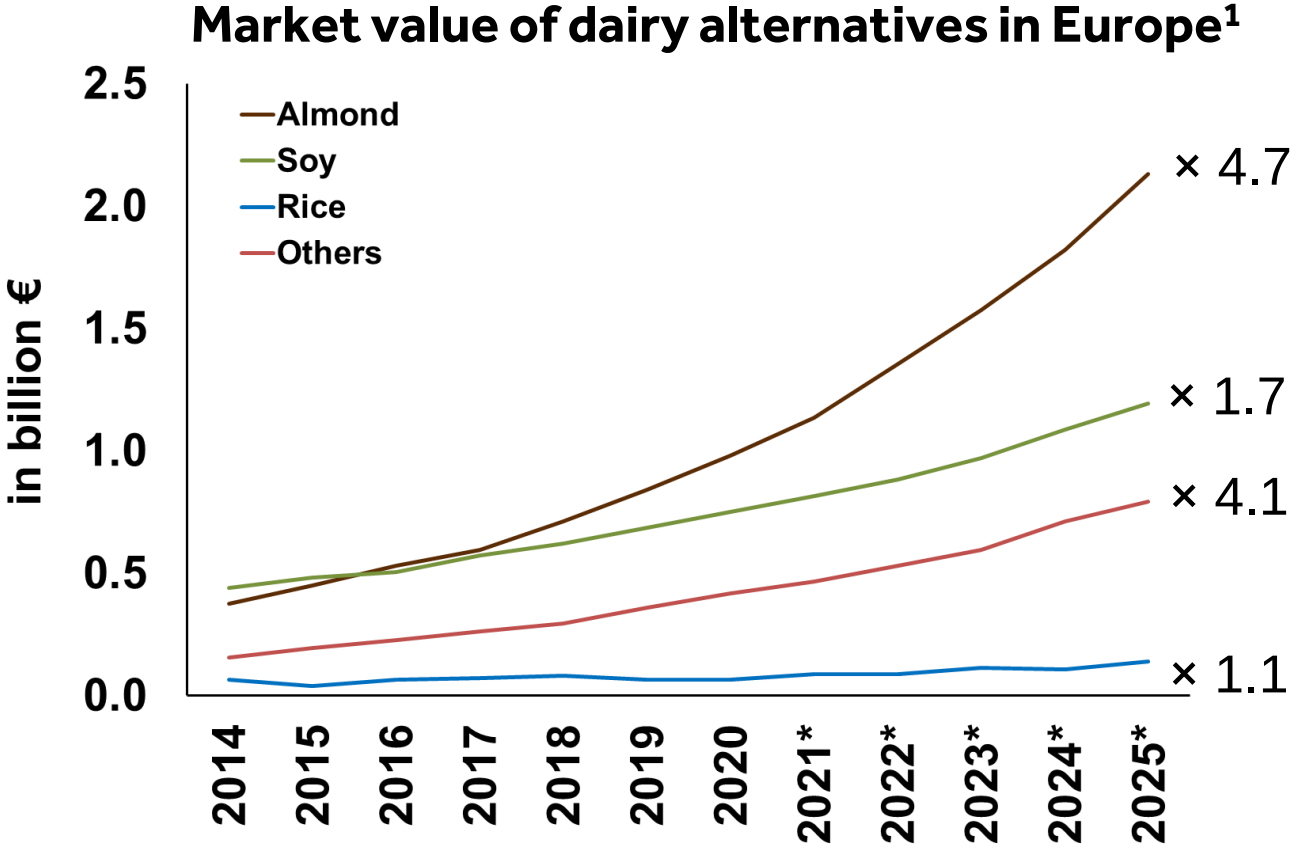
Europe



From 2014 to 2025 the market value:

- Increased up to ×4.7 for certain PBDA
- 1.5% compared to dairy in 2020
  dairy: 148 billion in 2020[2]
- 2.6% compared to dairy in 2026
  dairy: 173 billion in 2026[2]
- Relatively small market but steadily increasing

***BUT…** what happens to nutrient intakes when we replace the most nutrient dense single food in our diets?*

Photo from: Pexels

[1] *Statista estimates; The Vegan Society; Food ingredients Europe. Published by Statista (2021) ID1220817. https://www.statista.com/statistics/1220817/market-for-dairy-alternatives-in-europe/* [2] *EMR (2020) https://www.expertmarketresearch.com/reports/europe-dairy-market*

Department of Food & Nutritional Sciences
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A COMPARATIVE ASSESSMENT OF THE NUTRITIONAL COMPOSITION OF DAIRY AND PLANT-BASED DAIRY ALTERNATIVES AVAILABLE IN THE UK AND THE IMPLICATIONS FOR CONSUMERS' DIETARY INTAKES




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A comparative assessment of the nutritional composition of dairy and plant-based dairy alternatives available for sale in the UK and the implications for consumers' dietary intakes

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AIM

The objectives of the present study were to:

1. Compare the label nutrient composition of dairy products and equivalent PBDAs (milk, yogurt and cheese alternatives)
2. Model the impact on nutrient intakes from the consumption of dairy products or their substitution with PBDAs for the different age and gender consumer segments.

Photo from: pixabay

MATERIALS AND METHODS

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Product selection

- Online – 6 supermarkets - >73% of market share in 2020
- All available PBDA and the equivalent milk, cheese and yogurt products

Categorisation (according to primary ingredient)

- Milk: cow, coconut, grain, legumes, nuts & seeds, mixed
- Yogurt: cow, coconut, nuts, soya
- Cheese: cow, nuts & seeds, oils

Data collection (as in July 2020)

- Price (GBP per 100 g)
- Background info: primary ingredient, processing method, retailer, brand, description, URL
- Nutritional info: energy, macronutrients (fat, saturated fat, carbohydrate, sugar, fibre, protein), minerals (Ca, I, Fe, K), vitamins (B_2, B_{12}, D), salt

Statistical analysis

- ANOVA linear model (REML, GenStat 18th Edition): product type been the fixed effect
- Pairwise comparisons: Fisher's Least Significant Difference test ($P < 0.05$)

RESULTS

Price and composition - Milk

Price and contents of energy and nutrient of retail milk and plant-based alternatives

	Cow		Coconut		Grains		Legumes		Nuts/Seeds		Mixed			
Variable (per 100g)	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	SE	**P-value**
Price (£)	50	0.10^{c}	19	0.19^{ab}	34	0.18^{b}	26	0.18^{b}	43	0.20^{a}	10	0.19^{ab}	0.008	**<0.001**
Energy (Kcal)	51	50.3^{a}	21	33.7^{cd}	34	48.3^{ab}	26	41.2^{bc}	44	30.2^{d}	11	45.0^{ab}	2.47	**<0.001**
Protein (g)	51	3.49^{a}	21	0.28^{e}	34	0.56^{cd}	26	3.08^{b}	44	0.74^{c}	11	0.29^{de}	0.067	**<0.001**
Fat (g)	51	1.91	21	1.88	34	1.35	26	2.11	44	1.83	11	1.39	0.168	***0.062***
Saturates (g)	50	1.23^{b}	21	1.63^{a}	34	0.20^{d}	26	0.31^{cd}	44	0.20^{d}	11	0.68^{c}	0.077	**<0.001**
Carbohydrates (g	51	4.77^{b}	21	3.70^{bc}	34	8.21^{a}	26	2.19^{d}	44	2.61^{cd}	11	7.72^{a}	0.400	**<0.001**
Sugars (g)	50	4.75^{a}	21	2.28^{b}	34	4.74^{a}	26	1.42^{b}	44	1.56^{b}	11	5.00^{a}	0.273	**<0.001**
Fibre (g)	33	0.00^{c}	21	0.16^{bc}	33	0.56^{a}	26	0.52^{a}	43	0.27^{b}	10	0.09^{bc}	0.050	**<0.001**
Salt (g)	50	0.11	21	0.12	34	0.10	26	0.13	44	0.11	11	0.10	0.008	0.459
Calcium (mg)	30	124	13	108	18	120	22	111	23	115	5	120	5.1	0.547
Potassium (mg)	4	163	2	117	4	151							7.4	***0.056***
Iodine (µg)	4	31.3^{a}	1	13.0^{b}	*	*	5	26.3^{a}	*	*	*	*	1.11	**0.006**
Iron (g)	*	*	3	0.17	*	*	5	1.38	2	0.20	*	*	0.241	0.102
Vitamin B2 (mg)	4	0.24^{b}	1	0.50^{a}	11	0.21^{c}	16	0.21^{c}	13	0.21^{c}	3	0.21^{c}	0.000	**<0.001**
Vitamin B12 (µg)	15	0.79^{a}	10	0.39^{b}	16	0.38^{b}	18	0.44^{b}	19	0.38^{b}	5	0.38^{b}	0.023	**<0.001**
Vitamin D (µg)	*	*	10	0.75	16	1.03	18	0.91	19	0.83	5	0.90	0.077	0.150
Vitamin E (mg)	*	*	1	3.60	*	*	*	*	13	1.56	*	*	0.085	**<0.001**

Compared to most (when not all), cows' milk is:

- Higher in energy, protein, sugars, iodine, B_{12}, E
- Lower in fibre
- Cheaper

Grains: *oat, rice, rice/quinoa;* ***Legumes:*** *soya, pea;* ***Nuts/Seeds:*** *almond, hazelnut, cashew, tiger nut, walnut, almond/hazelnut;* ***Mixed:*** *any combination of the others*
Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)

Photos from: pixabay

RESULTS

Price and composition - Yogurt

Price and contents of energy and nutrient of retail yogurt and plant-based alternatives

	Cow		Coconut		Nuts		Soya			
Variable (per 100g)	n	Mean	n	Mean	n	Mean	n	Mean	SE	**P-value**
Price (£)	78	0.30^{d}	10	0.55^{b}	10	0.87^{a}	35	0.44^{c}	0.026	**<0.001**
Energy (Kcal)	78	83.3^{b}	10	111.7^{a}	10	96.8^{ab}	35	68.4^{c}	3.33	**<0.001**
Protein (g)	78	5.32^{a}	10	0.82^{c}	10	1.89^{c}	35	3.93^{b}	0.150	**<0.001**
Fat (g)	78	3.26^{b}	10	6.17^{a}	10	6.69^{a}	35	2.25^{b}	0.331	**<0.001**
Saturates (g)	78	2.14^{b}	10	6.14^{a}	10	1.17^{bc}	35	0.40^{c}	0.252	**<0.001**
Carbohydrates (g)	78	8.13^{b}	10	11.57^{a}	10	6.43^{b}	35	7.05^{b}	0.535	**0.003**
Sugars (g)	78	7.58^{a}	10	7.80^{a}	10	2.71^{b}	35	6.71^{a}	0.532	**<0.001**
Fibre (g)	45	0.10^{c}	8	0.35^{b}	8	0.13^{bc}	35	1.03^{a}	0.060	**<0.001**
Salt (g)	78	0.16^{b}	10	0.24^{a}	10	0.22^{a}	35	0.20^{a}	0.014	**0.003**
Calcium (mg)	44	154^{a}	6	128^{ab}	0		32	111^{b}	5.3	**<0.001**
Vitamin D (µg)	0		6	0.75	0		26	0.76	0.026	**0.932**
Vitamin B12 (µg)	0		6	0.38	0		25	0.37	0.005	**0.310**

Compared to most (when not all), cows' yogurt is:

- Higher in protein, sugars, Ca
- Lower in fat, fibre, salt
- Cheaper

Nuts: *almond, cashew. Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)*

Photos from: pixabay

RESULTS

Price and composition - Cheese

Price and contents of energy and nutrient of retail cheese and plant-based alternatives

	Cow		Nuts/Seeds		Oils		
Variable (per 100g)	n	Mean	n	Mean	n	Mean	SE	**P-value**
Price (£)	38	0.76^{c}	7	2.52^{a}	102	1.29^{b}	0.072	<0.001
Energy (Kcal)	38	313^{a}	6	241^{c}	102	284^{b}	5.9	<0.001
Protein (g)	38	16.6^{a}	6	6.5^{b}	102	1.1^{c}	0.48	<0.001
Fat (g)	38	26.0^{a}	6	21.0^{b}	102	22.9^{b}	0.63	0.003
Saturates (g)	37	17.4^{b}	6	2.1^{c}	102	19.2^{a}	0.42	<0.001
Carbohydrates (g)	38	1.80^{b}	6	5.42^{b}	102	17.58^{a}	0.668	<0.001
Sugars (g)	37	1.52^{a}	6	2.48^{a}	102	0.62^{b}	0.206	<0.001
Fibre (g)	25	0.25^{b}	3	2.47^{a}	46	3.17^{a}	0.222	<0.001
Salt (g)	37	1.10^{b}	6	1.25^{ab}	102	1.77^{b}	0.077	<0.001
Calcium (mg)	7	652^{a}	0		21	353^{b}	64.7	0.027

Compared to most (when not all), cows' cheese is:

- Higher in energy, protein, fat, Ca
- Lower in carbohydrates and fibre
- Cheaper

Nuts/Seeds: *almond, sunflower, cashew;* ***Oils:*** *coconut, soybean, palm.*
Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)

Photos from: pixabay

RESULTS

Implications to UK consumers

Official Statistics

NDNS: results from years 7 and 8 (combined)

Results of the National Diet and Nutrition Survey (NDNS) rolling programme for 2014 to 2015 and 2015 to 2016.

From: Public Health England and Food Standards Agency
Published: 16 March 2018
Last updated: 11 April 2018, see all updates

Documents

NDNS results from years 7 and 8 (combined)

Ref: PHE publication gateway reference 2017851
PDF, 436KB, 29 pages

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Milk/dairy intakes (g/d) for the different UK consumer demographics from NDNS

×

Mean nutrient concentrations (mg/kg milk) as described in product label

Photo from: pixabay

Nutrient intakes (mg/d) for the different UK consumer demographics

% contribution of milk/dairy vs PBDA in reference nutrient intakes (RNI)

RESULTS

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Implications to protein intakes in consumers

Impact on consumers' protein intakes when MILK is replaced by plant-based alternatives (P<0.001)

	Cow[a]		Coconut[e]		Grains[c]		Legumes[b]		Nuts & Seeds[c]		Mixed[d]	
Age (years)	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI
Children 1.5-3	8.4	58.0	0.7	4.7	1.3	9.2	7.4	51.2	1.8	12.3	0.7	4.8
Children 4-10	5.9	24.5	0.5	2.0	0.9	3.9	5.2	21.6	1.2	5.2	0.5	2.0
Children 11-18	4.6	10.0	0.4	0.8	0.7	1.6	4.1	8.8	1.0	2.1	0.4	0.8
Adults 19-64	4.7	9.3	0.4	0.8	0.7	1.5	4.1	8.2	1.0	2.0	0.4	0.8
Adults 65-74	5.3	7.2	0.4	0.6	0.8	1.1	4.7	6.3	1.1	1.5	0.4	0.6
Adults 75+	6.0	8.2	0.5	0.7	1.0	1.3	5.3	7.2	1.3	1.7	0.5	0.7

- Based on average population intakes based on the National Diet and Nutrition Survey (Years 7-8)

Impact on consumers' protein intakes when YOGURT is replaced by plant-based alternatives (P<0.001)

	Cow[a]		Coconut[b]		Nuts[b]		Soya[b]	
Age (years)	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI
Children 1.5-3	2.32	16.0	0.36	2.5	0.82	5.7	1.71	11.8
Children 4-10	2.23	9.3	0.34	1.4	0.79	3.3	1.65	6.9

Impact on consumers' protein intakes when CHEESE is replaced by plant-based alternatives (P<0.001)

	Cow[a]		Nuts & Seeds[b]		Oils[b]	
Age (years)	g/d	%RNI	g/d	%RNI	g/d	%RNI
Children 1.5-3	0.81	5.6	0.23	1.6	0.04	0.3
Children 4-10	0.75	3.1	0.24	1.0	0.04	0.2

MILK - Grains: *oat, rice, rice/quinoa;* ***Legumes:*** *soya, pea;* ***Nuts/Seeds:*** *almond, hazelnut, cashew, tiger nut, walnut, almond/hazelnut;* ***Mixed:*** *any combination of the others.* ***YOGURT - Nuts:*** *almond, cashew.* ***CHEESE - Nuts/Seeds:*** *almond, sunflower, cashew;* ***Oils:*** *coconut, soybean, palm. Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)*

Photos from: pixabay

RESULTS

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Implications to saturated fat intakes in adults

Impact on consumers' saturated fat intakes when MILK is replaced by plant-based alternatives (P<0.001)

	Cow[b]		Coconut[a]		Grains[d]		Legumes[c]		Nuts & Seeds[d]		Mixed[c]	
Age (years)	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI
Adults 19-64	1.6	**5.7**	2.2	7.5	0.3	0.9	0.4	1.4	0.3	0.9	0.9	3.2
Adults 65-74	1.9	**7.4**	2.6	9.9	0.3	1.2	0.5	1.9	0.3	1.2	1.0	4.0
Adults 75+	2.1	**8.4**	2.8	11.1	0.4	1.4	0.5	2.1	0.3	1.2	1.1	4.1

- Based on average population intakes based on the National Diet and Nutrition Survey (Years 7-8)

Impact on consumers' saturated fat intakes when YOGURT is replaced by plant-based alternatives (P<0.001)

	Cow[b]		Coconut[a]		Nuts[b]		Soya[b]	
Age (years)	g/d	%RNI	g/d	%RNI	g/d	%RNI	g/d	%RNI
Adults 19-64	0.6	**2.0**	1.6	5.7	0.3	1.1	0.1	0.4
Adults 65-74	0.9	**3.4**	2.5	9.7	0.5	1.9	0.2	0.7
Adults 75+	0.7	**2.6**	1.9	7.5	0.4	1.4	0.1	0.5

Impact on consumers' saturated fat intakes when CHEESE is replaced by plant-based alternatives (P<0.001)

	Cow[b]		Nuts & Seeds[a]		Oils[b]	
Age (years)	g/d	%RNI	g/d	%RNI	g/d	%RNI
Adults 19-64	0.08	**0.28**	0.13	0.45	0.04	0.14
Adults 65-74	0.07	**0.27**	0.12	0.46	0.03	0.12
Adults 75+	0.09	**0.36**	0.14	0.55	0.04	0.16

MILK - Grains: *oat, rice, rice/quinoa;* ***Legumes:*** *soya, pea;* ***Nuts/Seeds:*** *almond, hazelnut, cashew, tiger nut, walnut, almond/hazelnut;* ***Mixed:*** *any combination of the others.* ***YOGURT - Nuts:*** *almond, cashew.* ***CHEESE - Nuts/Seeds:*** *almond, sunflower, cashew;* ***Oils:*** *coconut, soybean, palm. Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)*

Photos from: pixabay

RESULTS

Implications to iodine intakes in consumers

- Based on average population intakes based on the National Diet and Nutrition Survey (Years 7-8)

Impact on consumers' iodine intakes when milk is replaced by plant-based alternatives (P=0.006)

	Cow[a]		Coconut[b]		Legumes[a]	
Age (years)	µg/d	%RNI	µg/d	%RNI	µg/d	%RNI
Children 1.5-3	75.4	107.7	31.4	44.8	63.4	90.5
Children 4-10	52.6	50.1	21.9	20.9	44.2	42.1
Children 11-18	41.1	30.4	17.1	12.7	34.6	25.6
Adults 19-64	41.7	29.8	17.3	12.4	35.0	25.0
Adults 65-74	49.1	35.0	20.4	14.6	41.3	29.5
Adults 75+	53.8	38.5	22.4	16.0	45.3	32.3

In the UK population, I deficiency occurs in:

- 23% of women 11-18 years of age
- 10% of women 19+ years of age

(Miller et al., 2016, Nutrition Bulletin 41:14)

- *14-15 years of age schoolgirls*
  51% mild, 16% moderate, 1% severe

(Vanderpump, 2011, The Lancet, 377:2007)

Those replacing milk, are likely to replace other I sources (fish, shellfish)

- *I-fortified foods and PBDAs*
- *supplements only after consultation with health professional*

Legumes: *soya, pea; Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)*

Photos from: pixabay

RESULTS

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Implications to vitamin B_{12} intakes in consumers

- Based on average population intakes based on the National Diet and Nutrition Survey (Years 7-8)

Impact on consumers' vitamin B_{12} when milk is replaced by plant-based alternatives (P<0.001)

	Cow[a]		Coconut[e]		Grains[c]		Legumes[b]		Nuts & Seeds[c]		Mixed[d]	
Age (years)	µg/d	%RNI	µg/d	%RNI	µg/d	%RNI	µg/d	%RNI	µg/d	%RNI	µg/d	%RNI
Children 1.5-3	1.9	**382**	0.9	188	0.9	184	1.1	214	0.9	184	0.9	184
Children 4-10	1.3	**148**	0.7	73	0.6	71	0.8	83	0.6	71	0.6	71
Children 11-18	1.0	**77**	0.5	38	0.5	37	0.6	43	0.5	37	0.5	37
Adults 19-64	1.1	**70**	0.5	35	0.5	34	0.6	39	0.5	34	0.5	34
Adults 65-74	1.2	**83**	0.6	41	0.6	40	0.7	46	0.6	40	0.6	40
Adults 75+	1.4	**91**	0.7	45	0.7	44	0.8	51	0.7	44	0.7	44

Those replacing milk, are likely to replace other B_{12} sources (meat, salmon, cod, eggs)

→ *Yeast extract, fortified cereals and supplements are recommended*

Grains: *oat, rice, rice/quinoa;* ***Legumes:*** *soya, pea;* ***Nuts/Seeds:*** *almond, hazelnut, cashew, tiger nut, walnut, almond/hazelnut;* ***Mixed:*** *any combination of the others.*
Different lower-case letters within a row indicate significant differences (Fisher's Least Significant Difference test; P < 0.05)

Photos from: pixabay

RESULTS

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Implications to household expenditure

Assumptions

- Family of four with two young children
- Based on average population intakes based on the National Diet and Nutrition Survey (Years 7-8)
- Switching to the most available alternative (nuts & seeds for milk, soya for yogurt, oils for cheese)

Increase in annual household expenditure by replacing milk with plant-based alternatives (prices in 2021)

	Cost (£) - Cows			Cost (£) - PBDA		
Age (years)	Milk	Yogurt	Cheese	Milk	Yogurt	Cheese
Child 1.5-3.0	88	48	14	176	70	21
Child 4-10	61	46	12	123	67	20
Adult 18-65	49	29	18	97	43	29
Adult 18-65	49	29	18	97	43	29

Substitution	**Milk**	**Yogurt**	**Cheese**	**Total**
Cost	+£247	+£71	+£38	+£356

→ ≈ £30 per month → ≈ €420 per year

Photos from: pixabay

CONCLUSIONS & IMPLICATIONS

- Consumers purchase plant-based dairy alternatives (PBDA) either by choice or necessity
- PBDA are not a nutritional replacement of cows' products
- Substitution of milk with PBDA may increase risk of nutrient deficiencies (esp. in nutritionally vulnerable groups)
- High price and exclusion from support schemes may make it unavailable in consumer fragments that need PBDA
- Fortification provides a potential route for targeted improvement of nutritional value
  - Bioavailability to be considered
  - Production regulations barriers (e.g. organic)
  - Price barriers

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A comparative assessment of the nutritional composition of dairy and plant-based dairy alternatives available for sale in the UK and the implications for consumers' dietary intakes

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