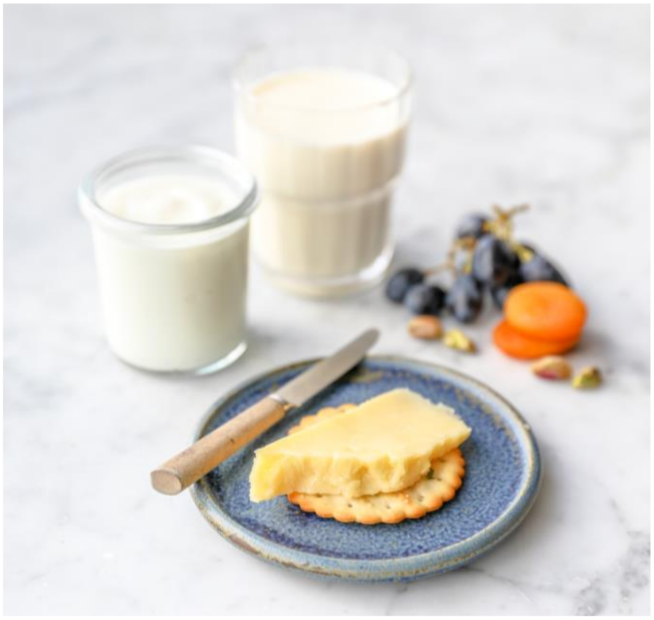
Evaluation of the Contribution of Dairy Foods to the Nutritional Quality of Irish Adolescents Diets Based on data from the National Teens Food Survey II



Report prepared for the National Dairy Council by the Irish Universities Nutrition Alliance

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The Irish Universities Nutrition Alliance (IUNA) is a formal alliance bringing together the nutrition expertise of University College Dublin, University College Cork, Munster Technological University and Technological University Dublin. A key focus of IUNA since its foundation has been the development of the Irish national dietary intake databases through national nutrition surveys of the population from age 1 to 90 years. More information on these surveys along with reports can be accessed at www.iuna.net.

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Contact Details

Dr Breige McNulty
Associate Professor in Human Nutrition

UCD Institute of Food and Health
School of Agriculture and Food Science
Room 2.08, Science Centre (South)
University College Dublin
Belfield, Dublin 4
Ireland

Email: breige.mcnulty@ucd.ie

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Key Points

This report describes dairy consumption by Irish adolescents aged 13-18 years.

- For the total population mean daily total dairy consumption (all milk, cheese and yogurt) was 245g/day, with intakes higher in males (319g/day) compared with females (171g/day).

- Overall, 98% of Irish adolescents were consumers of dairy with a mean daily intake of 250g/day. Within this, 91% were milk consumers (228g/day), 76% cheese consumers (24g/day) and 32% were consumers of yogurt (59g/day).

- The dairy subtype whole milk had the highest consumer rates of all dairy foods for both males and females (64%) and across age groups (13-15y - 66%; 16-18y - 61%). The proportion of consumers across all dairy subtypes were broadly similar between males and females; however, there were slightly higher intakes of all dairy subtypes by males.

- The mean daily number of dairy servings was 1.9 with the majority coming from milk (1.0 servings per day). Within the total population, 4% met the recommended 5 servings of dairy per day, with a largest majority being classified as under consumers, having less than 5 servings per day (94%). Slightly higher numbers of males compared to females (6.6% versus 0.5%) were consumers of 5 servings of dairy per day.

- Dairy provides 9.0% of energy (kcal) in the total population and was a major contributor to protein, total fat, saturated fat, vitamin A, vitamin B12, riboflavin, pantothenic acid, calcium, iodine, zinc and phosphorous intakes. Of the dairy subtypes, whole milk contributed the most to all highlighted nutrients.

- Intakes of micronutrients investigated were typically adequate with the exception of vitamin D and calcium where 94% and 51% respectively of adolescents were not achieving recommendations.

- High consumers of dairy had significantly higher intakes of energy (kcal), and higher percentage energy from total sugar, the B-vitamins and calcium (per 10MJ) when compared to low consumers. They also had lower intakes of energy from total fat, monounsaturated fat and polyunsaturated fat and sodium (per 10MJ).

- Higher consumers of dairy had an overall higher diet quality compared to low consumers. No differences were noted in weight, body mass index, percentage body fat or waist and hip circumference across tertiles of dairy consumption.

Introduction

The IUNA have conducted several nationally representative surveys among specific sub-groups of the Irish population, from preschool children to older adults. These data are used to underpin national dietary surveys, support epidemiological and experimental research and are essential in the development of regulations and dietary guidelines. Existing nationally representative databases on food consumption consist of the National Preschool Nutrition Survey - NPNS (2011-12; *n*500; ages 1-4 years), the National Children's Food Survey II - NCFS II (2017-18; *n*600; ages 5-12 years), the National Teens' Food Survey II - NTFS II (2019-20; *n*428; ages 13-18 years) and the National Adult Nutrition Survey - NANS (2008-09; *n*1500; ages 18-90 years). Within each survey semi-weighed, four-day food diaries were used to assess habitual food and beverage consumption.

The National Teens' Food Survey II was a cross-sectional survey designed to assess the food and nutrient intakes of teenagers aged 13 to 18 years, representative of this age group in the population of the Republic of Ireland. The NTFS II was designed to provide detailed data on food and beverage consumption and is suitable for a wide range of applications related to food safety and nutrition. Findings from the NTFS II may be compared with those from the National Teens' Food Survey (NTFS) of 441 Irish teenagers aged 13-17 years carried out by IUNA researchers in 2005-06 which used similar methodology (1-2).

Two previous reports using data from the Irish National food Consumption Databases, commissioned by the National Dairy Council examined the dairy intakes of 18-64 year olds and over 65 year olds in National Adult Nutrition Survey (3-4). The present report builds on this previous work by exploring the dairy intakes in Irish adolescents.

Methodology

A sample of 428 teenagers (212 boys, 216 girls) aged 13 to 18 years from across the Republic of Ireland took part in the NTFS II. Ethical approval for the study was obtained from the Clinical Research Ethics Committee of the Cork Teaching Hospitals and the Human Ethics Research Committee of University College Dublin.

Parents/guardians of teenagers who were randomly selected from the school roll were contacted with information on the survey and participation was invited. Where families opted in, a researcher visited the home to explain the survey in more detail and to obtain consent from both parents/guardians and the teenager. Fieldwork was carried out from March 2019 to March 2020, giving a seasonal balance. The overall response rate for the survey was 57%. Participants were asked to record detailed information on the amount and type of all foods, drinks and food supplements consumed over four consecutive days (including at least one weekend day) in a food diary. Participants were provided with a digital food scale and asked to weigh as many foods and beverages as possible, including leftovers. Eighty-seven per cent of foods consumed were weighed directly or assigned a manufacturer's weight. Where foods were not weighed, researchers used age-appropriate photographic food atlas, standard portion sizes and household measures at subsequent visits to aid with quantifying the amount of food consumed. Participants were encouraged to keep food packaging to provide further detail on the foods consumed. Nutrient intakes were estimated from food intakes using tables of food composition. Physical measurements (height, weight, % body fat and waist and hip circumference) of the teenagers and at least one parent/guardian were obtained by fieldworkers. Participants and their parents/guardians completed questionnaires on general health and lifestyle and determinants of food choice and eating behaviours.

Demographic analysis of the sample showed it to be representative of teenagers in Ireland with respect to gender and urban/rural divide when compared to Census

2016 data. However, the sample contained a higher proportion of teenagers of professional workers and a lower proportion of teenagers of semi-skilled and unskilled workers than the national population and all data in this report have been weighted to account for these differences. More detailed information on the methods of NTFSII can be found at www.iuna.net.

Defining Dairy Intakes

In order to consider intakes against the Food Pyramid recommendations for the 'milk, yogurt and cheese food groups', calcium fortified non-dairy alternatives were included in this analysis. As a result, the word 'dairy' throughout this report encompasses milk, yogurt and cheese, and calcium fortified non-dairy alternatives to these products, which were consumed by a low percentage of the population. The contribution of mixed dishes containing these dairy foods was also included in mean daily intakes (g/day). Similar to previous analysis (3), dairy containing foods were identified and assigned a dairy content percentage per 100g as described below.

All foods and beverages consumed by participants in the NTFSII were allocated to one of 68 IUNA food groups. For the purpose of the present analysis, these food groups were reduced to 11 groups (Supplement Table 1a). Furthermore, to investigate dairy consumption in greater detail, the 'dairy' food group was broken down into 12 subtypes of dairy foods (Supplement Table 1b).

Milk

Milk intakes were calculated in two steps. The first step considered milk consumed as beverages, milk added to tea/coffee, milk on breakfast cereal and milk in a milk based drink. The second step included milk used in mixed composite dishes. In order to include milk from the composite dishes, all milk-containing dishes/recipes which had been eaten by participants were identified, and the milk content of each dish was calculated. Only recipes where the milk content was greater than 5% were considered. Milk intakes from dishes containing 5% milk or more, and milk consumed as a beverage were then summed. From these values, mean daily milk intakes from all sources were calculated (g/day), both for the total population, and for consumers only. Examples of milk-containing dishes identified include milk based sauces, egg dishes and desserts and other miscellaneous sources. To fully investigate the type of milk consumed, all milks identified were further categorised into one of the following: whole milk, semi-skimmed milk, skimmed milk and non-dairy milk alternatives (calcium fortified). Mean daily milk intakes from all sources for each subtype were calculated (g/day). To calculate the percentage nutrient contribution from milk, milk intakes from all sources were used.

Cheese

Similarly, cheese intakes were calculated in a two-step approach. The first step identified cheese eaten outside of mixed dishes or retail products, e.g., cheese in sandwiches or cheese in salads. The second step aimed to further include cheese from mixed dishes. To do this, all cheese-containing dishes/recipes recorded by respondents were identified. A wide variety of composite foods contained cheese, including pasta dishes, omelettes, meat dishes, savouries and vegetable dishes. Retail products containing cheese were also identified based on ingredients labels and the Irish National Food Ingredient Database [5]. The cheese content of other retail products (e.g., pizza, lasagne) was estimated from recipes in McCance and Widdowson's 'The Composition of Foods'. Cheese intakes from mixed dishes and retail products containing 5% or more cheese were calculated and combined with cheese intakes from above to calculate mean daily cheese intakes (g/day) from all sources of cheese. All cheese consumed were categorised into the following types: hard cheese, soft cheese, cottage cheese or processed cheese. Mean daily cheese intake (g/day) are presented for the total population and for consumers only. The contribution of total cheese to nutrient intakes was calculated.

Yogurt

Yogurt intakes from potted yogurt and yogurt drinks were calculated for the total population. All yogurt eaten was categorised into one of the following subtypes:

yogurt, drinking yogurt, fromage frais and non-dairy yogurt alternatives (calcium fortified). The brand names of products were recorded by the respondents, which allowed yogurts to be distinguished from potted desserts. The yogurt content of mixed dishes was identified and included e.g., a small number of dishes/recipes contained yogurt, e.g., curries. Yogurt intakes from mixed dishes containing 5% yogurt or more were calculated and combined with the yogurt intakes eaten outside of mixed dishes to calculate total mean daily yogurt intakes (g/day) from all sources of yogurt. These results are presented for the total population and for consumers only. The contribution of total yogurt to nutrient intakes was calculated.

Dairy Analysis

The contribution of milk, cheese and yogurt from all food sources to total nutrient intakes is presented for the total population (excluding supplementation). The number of dairy servings, milk servings, cheese servings and yogurt servings were also calculated using recommendations for various serving sizes from the Department of Health Food pyramid (6): 1 serving equates to: 200 ml milk, fortified milk and yogurt drinks, 25g hard and semi-hard cheese, 125g whole yogurt, or equivalent calcium-fortified non-dairy alternatives.

Anthropometric and Lifestyle Factors

Anthropometric measurements were taken by the researcher in the participant's home. Where possible, height, weight, body composition, and waist and hip circumference were measured for the teenager. Height was measured to the nearest 0.1cm using the Leicester portable height measure (Seca, Birmingham, UK). Weight and body composition were measured (in duplicate) to the nearest 0.1kg using a Tanita body composition analyser BC-420MA (Tanita Ltd, GB). Participants were weighed after having voided, wearing light clothing and without shoes. Waist and hip circumference were measured (in duplicate) to the nearest 0.1cm using a Seca 201 Measuring Tape (Seca, Birmingham, UK).

Defining overweight and obesity

Body Mass Index (BMI) was calculated as weight (kg) divided by height squared (m2). The 'LMS growth' Microsoft Excel Add-in was used to establish BMI z-scores based on reference values for weight and height (7). SPSS© (SPSS Inc. Chicago, IL, USA) was used to convert z scores to percentiles. The International Obesity Task Force (IOTF) age- and gender-specific BMI cut-offs were used to define thinness, normal weight, overweight and obesity. (8).

Diet Quality Assessment

Diet quality was assessed via the application of the DQI-A score developed and validated for use amongst European adolescents by Vyncke and colleagues (9). DQI-A scores are calculated using actual daily intakes of nine recommended food groups specified in the Flemish food-based dietary guidelines; (i) water, (ii) bread and cereal, (iii) potatoes and grains, (iv) vegetables, (v) fruits, (vi) milk products, (vii) cheese, (viii) meat, fish and substitutes, (ix) fats and oils, and two non-recommended food groups; (i) snacks and sweets, and (ii) sugared drinks and fruit juice, with these food groups similar to those contained within the Irish FDBG (10). PANDiet scores are calculated for individuals based on usual intakes, with a higher score indicating a higher probability of meeting nutrient recommendations, and thus a better diet quality. The methodology for calculating the PANDiet scores was adapted from a previous publication (11) and was expanded to include free sugars, iodine, pantothenic acid, biotin, and total energy to provide a more comprehensive scoring system for the Irish population. PANDiet scores assess the probability that an individual will achieve nutrient recommendations for 29 nutrients (7 macronutrients, 12 micronutrients, 9 minerals and total energy) and incorporate age, sex, height, and weight values into calculations.

Data Analysis

Data analysis was carried out using IBM SPSS Statistics software package version 27 (SPSS Inc. Chicago, IL, USA). As the NTFS II 2020 contained a higher proportion of adolescents of professional workers and a lower proportion of adolescents of semi-skilled and unskilled workers than the national population. A statistical weighting factor was applied to the data to adjust and account for the under-representation of adolescents from the lower social class groups. Descriptive statistics, including means, medians, standard deviation and 97.5 percentiles were calculated for the daily intake of total dairy and for each dairy sub-types, for the total population and for consumers only, and are presented by sex and by age group (13-15 years, 16-18 years,). In this analysis, all sources of nutrients from foods are included, however supplements are excluded, apart from when reporting adequacy of intakes. Covariate-adjusted univariate general linear models were used to test for statistically significant differences ($p<0.05$) in mean daily intakes of total energy and macronutrients (g/day), percentage energy from macro and micronutrients and fibre per 10MJ per day, across tertiles of total dairy, total milk, total cheese and total yogurt consumption. Trend analysis was conducted across the tertiles of dairy, milk, cheese and yogurt intake, to identify statistically significant patterns in macro and micronutrient intakes using the linear polynomial contrast function.

Results

Section 1: Dairy Intakes

1.1 Dairy food group consumption

Overall, mean daily total dairy consumption, which included all milk, cheese and yogurt reported during the 4-day reporting period, including dairy from composite dishes, was 245g/day for the total population (*n*428) rising to 935g/day at the 97.5th percentile (Table 1a). Milk and milk products were the main source of dairy intake (208g), followed equal by total yogurt (19g) and total cheese (18g). When consumers only were considered (i.e., only those individuals who reported consuming dairy in the 4-day reporting period) (98%), mean daily total dairy intake rose to 250g/day (Table 1b). Mean daily total milk intakes for consumers only were 228g/day (91% consumers), total cheese intakes were 24g/day (76% consumers), and total yogurt intakes were 59g/day (32% consumers).

1.2 Dairy intakes by Sex

Table 1c presents the mean daily dairy intakes across sex for both the total population and consumer only data. In the total population, mean daily intakes of total dairy were 319g/day for males and 171g/day for females. For both males and females, whole milk was the main contributor to dairy intakes within the total population data: 175g/day for males and 85g/day for females, followed by semi-skimmed milk: 66g/day for males and 29g/day for females. Males had greater mean daily intakes of total yogurt at a total population level compared to females, (23g versus 15g /day) which was also similar for cheese intakes (21g versus 16g /day). With females tending to have lower intakes across all dairy sub-types.

For dairy consumers, 91% of males and females consumed milk with overall mean daily intakes of 305g/day in males and 154g/d in females. In addition, 64% of males and females were consumers of whole milk, with of intakes of 274g/day and

132g/day, respectively, while 31% and 24% of males and females respectively were consumers of semi-skimmed milk (211g/day in males and 121g/day in females). For cheese, 75% and 78% of males and females were consumers, 28g/day and 20g/day, respectively. For yogurt, 33% and 32% of males and females were consumers of yogurt, with mean daily intakes of 69g/day and 47g/day respectively.

1.3 Dairy intakes by age

Intakes of dairy foods were similar across age groups, with adolescents aged 13-15y in the total population consuming 240g/day of total dairy, and those aged 16-18y consumed 250g/day. Intakes of total milk, cheese and yogurt were also similar across age groups (13-15y; milk 204g/day, cheese 19g/day and yogurt, 18g/day; and 16-18y; milk 212g/day, cheese 18g/day and yogurt, 21g/day (Table 1d).

In dairy consumers, 98% of those aged 13-15y and 97% of those aged 16-18y were consumers of dairy, with mean intakes of 245g/day and 256g/day respectively. The percentage consumers were similar across age groups, for 13-15y, 92% consumed milk (221g/day), 76% consumed cheese (24g/day) and 33% consumed yogurt (54g/day). And for 16-18y, 89% consumed milk (238g/day), 77% consumed cheese (23g/day) and 31% consumed yogurt (66g/day).

Table 1a: Mean and median daily intakes (g/day) of dairy foods for Irish adolescents in the total population

Total Population	Adolescents 13-18 years, *n* 428			
	Mean	SD	Median	97.5
Total Dairy	244.6	226.6	194.2	935.3
Total milk	207.5	222.7	153.1	908.9
Whole milk	129.2	201.0	50.5	693.5
Semi-skimmed milk	46.9	132.0	0.0	464.6
Skimmed milk	23.0	68.8	0.0	249.6
ND milk alternatives	8.4	40.9	0.0	132.8
Total cheese	18.2	20.9	11.1	74.1
Hard Cheese	9.6	15.8	1.5	53.9
Soft cheese	7.1	11.5	0.0	41.8
Cottage cheese	0.1	0.9	0.0	0.0
Processed cheese	1.5	5.2	0.0	15.9
Total Yogurt	18.9	37.7	0.0	133.9
Yogurt	15.7	34.8	0.0	113.2
Drinking yogurt	2.6	14.0	0.0	46.2
Fromage Frais	0.3	3.0	0.0	0.0
ND yogurt alternatives	0.3	3.6	0.0	0.0

n - number; SD - standard deviation; 97.5 - 97.5th percentile; ND Non dairy

Table 1b: Mean and median daily intakes (g/day) of dairy foods for dairy consumers in Irish adolescents

Dairy consumers only	Adolescents 13-18 years, n 428					
	n	% Cons	Mean	SD	Median	97.5
Total Dairy	419	97.9	249.8	226.1	196.3	938.7
Total milk	389	90.9	228.3	223.2	173.5	914.3
Whole milk	273	63.8	202.6	220.2	143.0	920.4
Semi-skimmed milk	117	27.3	171.5	206.2	101.1	908.1
Skimmed milk	73	17.1	134.9	113.0	105.0	457.3
ND milk alternatives	29	6.8	123.3	103.8	92.0	-
Total cheese	327	76.4	23.8	21.0	16.7	78.5
Hard Cheese	219	51.2	18.7	17.8	12.5	61.6
Soft cheese	199	46.5	15.2	12.8	11.2	50.4
Cottage cheese	2	0.5	11.4	8.0	11.4	-
Processed cheese	59	13.8	10.8	9.6	8.7	48.1
Total Yogurt	138	32.2	58.7	45.6	43.0	185.4
Yogurt	116	27.1	57.9	44.9	40.1	191.5
Drinking yogurt	21	4.9	53.9	35.8	45.0	-
Fromage Frais	6	1.4	21.4	15.8	15.5	-
ND yogurt alternatives	3	0.7	40.1	21.2	31.3	-

% Cons - % consumers, n - number; SD - standard deviation; 97.5 - 97.5th percentile; ND Non dairy

Table 1c: Mean and median daily intakes (g/day) of dairy foods for Irish adolescents spilt by sex

	Total Population				Consumers only					
	Mean	SD	Median	97.5	*n*	% cons	Mean	SD	Median	97.5
***Males** (n 212)*										
Total Dairy	319.3	272.2	255.8	1082	208	98.1	325.4	271.1	262.5	1091
Total milk	275.8	270.8	221.1	1054	192	90.6	304.5	268.7	236.6	1080
Whole milk	174.7	255.7	77.2	967.7	135	63.7	274.4	274.6	207.0	1041
Semi-skimmed milk	65.6	166.6	0.0	695.3	66	31.1	210.7	243.1	115.4	981.4
Skimmed milk	31.7	87.1	0.0	333.7	39	18.4	172.3	131.5	155.3	-
ND milk alternatives	3.8	32.3	0.0	16.9	5	2.4	160.9	153.5	84.6	-
Total cheese	20.9	22.0	15.1	77.2	159	75.0	27.8	21.2	23.0	86.9
Hard Cheese	10.6	16.2	0.0	56.6	105	49.5	21.4	17.3	17.8	67.6
Soft cheese	8.1	12.3	0.0	44.7	101	47.6	17.0	12.9	14.7	60.1
Cottage cheese	0.0	0.4	0.0	0.0	1	0.5	5.8	-	5.8	5.8
Processed cheese	2.1	6.8	0.0	27.6	33	15.6	13.8	11.8	9.0	-
Total Yogurt	22.6	44.7	0.0	162.6	70	33.0	68.5	54.1	49.8	242.2
Yogurt	18.1	41.2	0.0	151.7	56	26.4	68.5	54.8	52.6	245.2
Drinking yogurt	4.3	18.5	0.0	75.0	15	7.1	60.5	38.8	49.5	-
Fromage Frais	0.2	2.3	0.0	0.0	2	0.9	23.5	7.1	23.5	-
ND yogurt alternatives	0.0	0.0	0.0	0.0	0	0.0	-	-	-	-
***Females** (n216)*										
Total Dairy	171.3	135.5	152.4	486.0	211	97.7	175.3	134.5	153.3	501.1
Total milk	140.4	132.0	111.9	469.3	197	91.2	153.9	130.4	124.0	521.6
Whole milk	84.5	109.6	41.3	390.2	138	63.9	132.3	111.7	110.8	413.0
Semi-skimmed milk	28.5	81.6	0.0	311.7	51	23.6	120.8	131.3	71.8	539.7
Skimmed milk	14.5	42.5	0.0	154.8	34	15.7	92.1	66.4	81.3	-
ND milk alternatives	12.8	47.4	0.0	170.2	24	11.1	115.5	92.9	93.5	-
Total cheese	15.6	19.5	9.5	73.4	168	77.8	20.0	20.0	12.5	76.4
Hard Cheese	8.5	15.3	2.1	50.0	114	52.8	16.1	17.9	10.8	56.6
Soft cheese	6.1	10.7	0.0	40.5	98	45.4	13.4	12.4	10.0	49.7
Cottage cheese	0.1	1.2	0.0	0.0	1	0.5	17.0	-	17.0	17.0
Processed cheese	0.9	2.6	0.0	9.6	26	12.0	7.1	3.4	5.5	-
Total Yogurt	15.3	28.9	0.0	92.2	68	31.5	48.6	32.1	37.5	137.3
Yogurt	13.3	26.8	0.0	90.0	60	27.8	48.0	30.6	37.5	130.3
Drinking yogurt	1.0	7.0	0.0	25.0	6	2.8	37.5	20.9	25.0	-
Fromage Frais	0.4	3.6	0.0	0.0	4	1.9	20.3	19.8	11.0	-
ND yogurt alternatives	0.6	5.1	0.0	0.0	3	1.4	40.1	21.2	31.3	-

% Cons - % consumers, n - number; SD - standard deviation; 97.5 - 97.5th percentile; ND Non dairy

Table 1d: Mean and median daily intakes (g/day) of dairy foods for Irish adolescents spilt by age

	Total Population				Consumers only					
	Mean	SD	Median	97.5	*n*	% cons	Mean	SD	Median	97.5
13-15 Years (n236)										
Total Dairy	240.4	206.8	194.5	930	232	98.3	244.5	206.1	195.0	930
Total milk	204.2	200.1	154.2	892	218	92.4	221.0	199.0	176.4	899
Whole milk	124.7	175.7	57.1	641.2	156	66.1	188.6	186.1	132.1	888
Semi-skimmed milk	48.9	140.5	0.0	458.2	60	25.4	192.3	224.8	118.3	1010
Skimmed milk	23.9	72.6	0.0	245.0	39	16.5	144.4	121.5	125.0	-
ND milk alternatives	6.7	37.7	0.0	98.0	12	5.1	132.5	110.4	93.5	-
Total cheese	18.6	21.4	11.2	79.5	180	76.3	24.3	21.4	17.1	86.3
Hard Cheese	9.6	15.2	1.8	54.6	119	50.4	19.0	16.7	12.5	64.2
Soft cheese	7.4	11.3	0.0	41.3	116	49.2	15.0	12.1	11.7	51.2
Cottage cheese	0.1	1.2	0.0	0.0	2	0.8	11.4	8.0	11.4	-
Processed cheese	1.5	5.3	0.0	15.8	31	13.1	11.4	10.2	9.0	-
Total Yogurt	17.7	33.9	0.0	133.8	78	33.1	53.5	39.6	40.1	167.9
Yogurt	14.0	29.7	0.0	103.8	63	26.7	52.3	36.3	37.5	158.5
Drinking yogurt	3.4	15.9	0.0	51.9	15	6.4	54.2	36.1	45.0	-
Fromage Frais	0.1	1.2	0.0	0.0	3	1.3	10.4	1.8	9.5	-
ND yogurt alternatives	0.1	2.0	0.0	0.0	1	0.4	31.3	-	31.3	31.3
16-18 Years (n192)										
Total Dairy	249.7	249.3	191.3	1020	187	97.4	256.4	249.2	197.2	1021
Total milk	211.5	248.2	151.9	1001	171	89.1	237.5	251.0	173.3	1011
Whole milk	134.8	228.6	41.6	965.0	117	60.9	221.2	258.5	153.3	1021
Semi-skimmed milk	44.4	121.0	0.0	551.9	57	29.7	149.5	184.2	87.5	762.5
Skimmed milk	22.0	64.0	0.0	309.3	34	17.7	124.1	103.1	92.1	-
ND milk alternatives	10.3	44.4	0.0	138.0	17	8.9	116.8	101.8	84.6	-
Total cheese	17.7	20.4	10.9	73.1	147	76.6	23.2	20.5	16.6	74.5
Hard Cheese	9.5	16.5	1.3	53.9	100	52.1	18.3	19.1	12.6	60.7
Soft cheese	6.7	11.8	0.0	47.1	83	43.2	15.6	13.7	10.7	58.7
Cottage cheese	0.0	0.0	0.0	0.0	0	0.0	-	-	-	-
Processed cheese	1.5	5.0	0.0	17.8	28	14.6	10.3	9.1	8.6	-
Total Yogurt	20.5	41.9	0.0	139.7	60	31.3	65.5	51.9	51.0	244.3
Yogurt	17.8	40.1	0.0	139.7	53	27.6	64.6	53.0	43.8	245.8
Drinking yogurt	1.7	11.2	0.0	25.0	6	3.1	53.2	38.2	37.3	-
Fromage Frais	0.5	4.3	0.0	0.0	3	1.6	32.3	16.1	28.5	-
ND yogurt alternatives	0.5	5.0	0.0	0.0	2	1.0	44.5	27.9	44.5	-

% Cons - % consumers, n - number; SD - standard deviation; 97.5 - 97.5th percentile; ND Non dairy

Section 2: Dairy Servings

2.1 Dairy Servings in the total population

The overall mean servings are 1.9 per day, the majority of the servings were contributed from milk, contributing 1.0 servings per day. Whereby cheese contributed 0.7 servings and yogurt contributed 0.1 servings (Table 2a).

Males had a significantly higher number of servings per day with an average of 2.4 servings and females consumed an average of 1.4 servings of total dairy. Similar to the total population, milk contribute the most towards daily dairy servings (males: 1.4 servings; females: 0.7 servings). To a lesser degree cheese and yogurt contributed towards dairy servings for both males and females (cheese servings contributing 0.8 and 0.6 respectively, and yogurt contributing 0.2 and 0.1 respectively).

Comparison of mean daily servings of dairy across the age groups (13-15y & 16-18y) show similarities, with both the younger and older adolescents consuming 1.9 mean daily dairy servings. Milk contributed 1.0 dairy servings in the younger age groups and 1.1 dairy servings in the older age group. The number of total yogurt dairy servings (0.1 and 0.2) and cheese dairy servings (0.8 for both age groups) was similar across age groups.

2.2 Percentage meeting dairy serving recommendations

For the total population (13-18y), 6.3% consumed 5 servings daily or more of dairy. Whilst 5.6% consumed between 3.5-4.4 servings of dairy daily, 26% consumed 2.0-4.9 servings of dairy daily and 62% consumed ≥1.9 servings of dairy daily. A higher proportion of males met or exceed the dairy servings recommendation compared to females, 11% versus 1.4%, respectively. And 33% of males and 19% of females had 2.0-3.4 servings on a daily basis, whereas 76% of females and 48% of males had 1.9 or less servings daily. Across age groups, similar proportions met recommendations, with 5.5% of 13-15y adolescents and 7.2% of 16-18y adolescents having 5 or more servings of dairy per day (Table 2b).

Table 2a: Mean daily servings of dairy for Irish adolescents (13-18yrs) spilt by sex and age

	Total population (*n* 428)		Males (*n* 212)		Females (n216)		13-15yrs (*n* 236)		16-18yrs (n192)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total Dairy	1.9	1.4	2.4	1.6	1.4	1.1	1.9	1.4	1.9	1.5
Total milk	1.0	1.1	1.4	1.4	0.7	0.7	1.0	1.0	1.1	1.2
Whole milk	0.6	1.0	0.9	1.3	0.4	0.5	0.6	0.9	0.7	1.1
Semi-skimmed milk	0.2	0.7	0.3	0.8	0.1	0.4	0.2	0.7	0.2	0.6
Skimmed milk	0.1	0.3	0.2	0.4	0.1	0.2	0.1	0.4	0.1	0.3
ND milk alternatives	0.0	0.2	0.0	0.2	0.1	0.2	0.0	0.2	0.1	0.2
Total cheese	0.7	0.8	0.8	0.9	0.6	0.8	0.7	0.8	0.7	0.8
Hard Cheese	0.4	0.6	0.4	0.6	0.3	0.6	0.4	0.6	0.4	0.7
Soft cheese	0.3	0.5	0.3	0.5	0.2	0.4	0.3	0.5	0.3	0.5
Cottage cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processed cheese	0.1	0.2	0.1	0.3	0.0	0.1	0.1	0.2	0.1	0.2
Total Yogurt	0.1	0.3	0.2	0.3	0.1	0.2	0.1	0.3	0.2	0.3
Yogurt	0.1	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.3
Drinking yogurt	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
Fromage Frais	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ND yogurt alternatives	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

n - number; SD - standard deviation; 97.5 - 97.5th percentile; ND, Non dairy

Table 2b: Proportion of Irish adolescents (13-18yrs) achieving the recommended servings of total dairy per day (spilt by sex and age)

		Dairy Servings per Day									
		0-1.9 Servings		2.0-3.4 servings		3.5-4.4 servings		4.5-5.4 servings		≥5.0 servings	
	Total (n)	*n*	%	n	%	n	%	n	%	n	%
Total population	428	267	62.4	110	25.7	24	5.6	15	3.5	12	2.8
Sex:											
Males	212	102	48.1	69	32.5	17	8	14	6.6	10	4.7
Females	216	165	76.4	41	19	7	3.2	1	0.5	2	0.9
Age group:											
13-15 years	236	147	62.3	63	26.7	13	5.5	8	3.4	5	2.1
16-18 years	192	120	62.5	47	24.5	11	5.7	7	3.6	7	3.6

*Based on recommendations from the Department of Health [6]
n - number, % - percent of total population

Section 3: Contribution of Dairy foods to Energy and Nutrient Intakes

The percentage contribution of food groups, including milk, cheese and yogurt to energy and to various macronutrients and micronutrients are shown in Table 3a – f.

3.1 Energy and Macronutrients

Table 3a presents the percentage energy and macronutrients intake from the 11 different food groups, and the contribution of the 12 dairy subtypes are presented in Table 3b for the total population of Irish adolescents. The food group 'rice, grains, breads & cereals' made the greatest contribution to overall energy (kcal) intake at 26.5 %. The contribution of dairy to energy (kcal) was 9.0%, within this whole milk was the highest contributing dairy subtype at 3.5%. For protein, 'Meat, fish and their dishes' made the greatest contribution to protein intake at 40.5%. With dairy foods contributing 12.9% to protein intake, and within this whole milk was the highest contributing dairy subtype contributing 5.0%.

Similar to that of energy intakes, 'rice, grains, breads and cereals' made the greatest contribution to carbohydrate intakes at 40.7%. The contribution of dairy foods to carbohydrate intake was 5.2%, within this whole milk was the highest contributing dairy subtype with 2.3%. For total sugar, 'savoury, snacks & confectionary' made the greatest contribution to intakes at 18.4%. The contribution of dairy foods to total sugar intakes was 15.0%, within this whole milk was the main contributing dairy subtype by 6.9%. It should be noted that within total sugar, free sugars are included, and they account for 18% of the total sugars contributed from dairy foods. For fibre, 'rice, grains, breads and cereals' provide the largest contribution to intakes at 39.9%. The contribution of dairy foods to fibre intakes was 0.7%, within this yogurt was the main contributing dairy subtype contributing 0.4%.

'Meat, fish and their dishes' made the greatest contribution to total fat intakes at 25.0%. The contribution of dairy foods to total fat intake was 12.9%, within this whole milk was the highest contributing dairy subtype at 5.0%. Similarly, 'meat, fish and their dishes' made the greatest contribution to saturated fat intake at 22.1%. The contribution of dairy foods to saturated fat intake was 20.3%, within this whole milk was the highest contributing dairy subtype at 8.0%. For polyunsaturated fat intake, ‘meat, fish and their dishes’ were also the biggest contributed, providing 28.2%. The contribution of dairy foods to polyunsaturated fat intake was 9.4%, within this whole milk was the highest contributing dairy subtype at 3.4%. And for monounsaturated fat intake, ‘meat, fish and their dishes’ also made the greatest contribution to intakes at 25.7%. The contribution of dairy foods to polyunsaturated fat intake was 3.1%, within this whole milk was the highest contributing dairy subtype with 1.2%.

3.2 Vitamins

Table 3c presents the vitamin intake from the 11 different food groups, and the contribution of the 12 dairy subtypes are presented in Table 3d for the total population of Irish adolescents. The food group, ‘fruit and vegetable’ made the greatest contribution to vitamin A intakes at 23.4%. The contribution of dairy foods to vitamin A intake was 19.5%, within this whole milk was the highest contributing dairy subtype with 7.9%. Meat, fish and their dishes made the greatest contribution to vitamin D intakes at 35.0%. The contribution of dairy foods to vitamin D intake was 12.5%, within this whole milk was the highest contributing dairy subtype with 5.1%. It should be noted that a large proportion of this vitamin D is contributed by the fortified milks and yogurts included in this analysis. The greatest contribution to vitamin E intakes came from ‘meat, fish and their dishes’, at 21.0%. The contribution of dairy foods to vitamin E intake was 4.8%, within this whole milk was the highest contributing dairy subtype with 1.9%. ‘Rice, grains, breads and cereals’ made the greatest contribution to folate intake at 35.3%. The contribution of dairy foods to folate intake was 9.7%, within this whole milk was the highest contributing dairy subtype with 4.1%. The food group ‘meat, fish and their dishes’ made the greatest contribution to vitamin B12 intake at 33.0%. The contribution of dairy foods to vitamin B12 intake was 31.0%, within this whole milk was the highest contributing dairy subtype with 14.3%. Dairy made the greatest contribution to riboflavin intakes at 25.8%. Within this, whole milk was the highest contributing dairy subtype with 11.8%. For pantothenic acid intake, 'meat, fish and their dishes' made the greatest contribution to pantothenic acid intake at 24.9%. The contribution of dairy foods to pantothenic acid intake was 17.1%, within this whole milk was the highest contributing dairy subtype with 8.5%.

3.3 Minerals

Table 3e presents the vitamin intake from the 11 different food groups, and the contribution of the 12 dairy subtypes are presented in Table 3f for the total population of Irish adolescents. Dairy made the greatest contribution to calcium intakes with 36.2%. Whole milk was the highest contributing dairy subtype with 14.4%. Similarly, dairy made the greatest contribution to iodine intake at 49.3%, with whole milk being the highest contributing dairy subtype with 24.4%. For selenium, 'meat, fish and their dishes, made the greatest contribution to intakes at 39.6%. The contribution of dairy foods to selenium intake was 8.6%, within this whole milk was the highest contributing dairy subtype with 3.7%. 'Meat, fish and their dishes' also made the greatest contribution to zinc intake at 28.6%. The contribution of dairy foods to zinc intake was 16.0%, within this whole milk was the highest contributing dairy subtype with 6.3%. For magnesium, 'rice, grains, breads and cereals' made the greatest contribution to intakes at 24.9%. The contribution of dairy foods to magnesium intake was 10.8%, within this whole milk was the highest contributing dairy subtype with 4.8%. For sodium, the food group 'meat, fish and their dishes' made the greatest contribution to sodium intakes at 29.5%. The contribution of dairy foods to sodium intake was 8.4%, within this whole milk was the highest contributing dairy subtype with 2.8%. Similarly, 'meat, fish and their dishes' made the greatest contribution to potassium intake at 22.6%. The contribution of dairy foods to potassium intake was 12.8%, within this whole milk was the highest contributing dairy subtype with 6.1%. For phosphorous, 'meat, fish and their dishes' made the greatest contribution to phosphorus intakes at 26.7%. The contribution of dairy foods to phosphorus intake was 19.4%, within this whole milk was the highest contributing dairy subtype with 7.9%.

3.3 Nutrient Adequacy in Irish adolescents

Table 3g presents the current Estimated Average Requirements (EAR) for micronutrients as published by the European Safety Authority [12]. Mean daily intakes of these micronutrients for the NTFSII total population are presented. Mean daily intakes of vitamin A, B12, riboflavin and folate were typically adequate with the majority of the population meeting the EAR. However, it was noted that a high proportion of the population had inadequate intakes for vitamin D (94%) and calcium (51%).

Table 3a: Percentage contribution of dairy to mean daily energy and macronutrient intakes

Food Groups	Nutrient Contribution (%)								
	Energy	Protein	CHO	Total Sugars	Total Fat	SFA	PUFA	MUFA	Fibre
Rice, grains, breads, & cereals	26.5	20.3	40.7	11.7	9.3	7.2	8.3	17.6	39.9
Biscuits, cakes & pastries	6.8	2.6	7.1	9.5	8.6	10.1	7.8	6.9	4.4
Savoury snacks & confectionary	9.2	3.4	10.1	18.4	10.7	10.1	12.6	7.7	7.4
Beverages	3.2	0.9	5.5	14.3	0.4	0.4	0.3	0.8	1.3
Potato & potato products	7.1	3.1	9.0	1.1	6.8	4.3	7.2	10.6	12.0
Fruit & Vegetables	4.1	2.9	6.1	15.1	2.2	1.3	2.1	4.0	15.3
Meat, fish & their dishes	18.4	40.5	5.8	3.9	25.0	22.1	28.2	25.7	9.4
Other foods	5.6	3.5	2.2	4.4	11.0	7.4	12.6	14.2	2.6
Dairy	9.0	12.9	5.2	15.0	12.9	20.3	9.4	3.1	0.7
Composite foods including dairy	7.8	9.2	7.0	3.7	8.8	9.7	8.3	8.2	6.7
Other dairy foods	2.3	0.6	1.3	3.0	4.4	6.9	3.0	1.1	0.3

CHO, carbohydrates; SFA, saturated fat; PUFA, polyunsaturated fat; MUFA, monounsaturated fat

Table 3b: Percentage contribution of dairy subtypes to mean daily energy and macronutrient intakes

Total Population	Nutrient Contribution (%)								
	Energy	Protein	CHO	Total Sugars	Total Fat	SFA	PUFA	MUFA	Fibre
Total Dairy	9.0	12.9	5.2	15.0	12.9	20.3	9.4	3.1	0.7
Milk	3.5	5.0	2.3	6.9	5.0	8.0	3.4	1.2	0.1
Whole milk	3.5	5.0	2.3	6.9	5.0	8.0	3.4	1.2	0.1
Semi-skimmed milk	1.1	1.6	0.8	2.3	1.3	2.1	0.8	0.3	0.0
Skimmed milk	0.7	1.1	0.6	1.7	0.8	1.2	0.7	0.2	0.0
ND milk alternatives	0.3	0.3	0.2	0.5	0.4	0.4	0.4	0.1	0.1
Cheese									
Hard Cheese	1.8	2.7	0.2	0.6	3.3	5.2	2.4	0.8	0.0
Soft cheese	0.3	0.4	0.1	0.2	0.5	0.8	0.4	0.1	0.0
Cottage cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processed cheese	0.3	0.4	0.1	0.2	0.5	0.8	0.4	0.1	0.0
Yogurt									
Yogurt	0.9	1.2	0.8	2.2	1.1	1.7	0.8	0.2	0.4
Drinking yogurt	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0
Fromage Frais	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
ND yogurt alternatives	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0

CHO, carbohydrates; SFA, saturated fat; PUFA, polyunsaturated fat; MUFA, monounsaturated fat; ND, Non dairy

Table 3c: Percentage contribution of dairy to mean daily vitamin intakes

Total Population	Percentage Contribution						
	Vitamin A	Vitamin D	Vitamin E	Total Folate	Vitamin B12	Riboflavin	Pantothenic Acid
Rice, grains, breads, & cereals	2.5	22.3	9.8	35.3	8.2	22.7	19.0
Biscuits, cakes & pastries	4.1	1.7	7.6	2.3	1.1	1.9	2.6
Savoury snacks & confectionary	2.0	0.9	11.7	3.5	3.3	5.5	3.1
Beverages	3.9	1.0	1.5	5.4	3.0	2.1	4.4
Potato & potato products	1.5	0.4	7.0	8.3	0.4	2.4	5.1
Fruit & Vegetables	23.4	0.1	7.2	11.9	0.1	3.7	5.5
Meat, fish & their dishes	13.1	35.0	21.0	10.9	33.0	17.1	24.9
Other foods	12.7	12.0	17.3	4.3	5.5	4.6	3.8
Dairy	19.5	12.5	4.8	9.7	31.0	25.8	17.1
Composite foods including dairy	7.7	7.6	7.9	5.3	10.6	8.6	10.4
Other dairy foods	7.6	1.9	1.5	0.3	1.0	2.1	1.1

Table 3d: Percentage contribution of dairy subtypes to mean daily vitamin intakes

Total Population	Nutrient Contribution (%)						
	Vitamin A	Vitamin D	Vitamin E	Folate	Vitamin B12	Riboflavin	Pantothenic Acid
Total Dairy	19.5	12.5	4.8	9.7	31.0	25.8	17.1
Milk							
Whole milk	7.9	5.1	1.9	4.1	14.3	11.8	8.5
Semi-skimmed milk	2.2	1.6	0.6	1.4	4.7	4.0	3.0
Skimmed milk	1.2	1.1	0.3	1.0	3.1	2.7	1.9
ND milk alternatives	0.0	0.7	0.2	0.2	1.1	1.0	0.0
Cheese							
Hard Cheese	5.3	2.0	1.1	1.6	5.0	3.1	1.8
Soft cheese	0.9	0.3	0.1	0.3	0.7	0.6	0.4
Cottage cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processed cheese	0.9	0.1	0.2	0.2	0.6	0.4	0.3
Yogurt							
Yogurt	1.0	1.2	0.4	0.9	1.4	1.8	1.1
Drinking yogurt	0.0	0.3	0.0	0.1	0.1	0.2	0.1
Fromage Frais	0.1	0.1	0.0	0.0	0.1	0.1	0.0
ND yogurt alternatives	0.0	0.0	0.0	0.0	0.0	0.0	0.1

ND, Non dairy

Table 3e: Percentage contribution of dairy to mean daily mineral intakes

Total Population	Nutrient Contribution (%)							
	Calcium	Iodine	Selenium	Zinc	Magnesium	Sodium	Potassium	Phosphorous
Rice, grains, breads, & cereals	22.7	4.4	17.3	23.0	24.9	25.8	11.9	20.4
Biscuits, cakes & pastries	3.5	2.5	1.9	3.0	4.3	4.5	2.7	3.7
Savoury snacks & confectionary	5.1	6.5	2.0	4.5	7.0	5.2	5.7	4.5
Beverages	2.4	5.4	7.7	2.0	4.9	1.7	5.3	2.6
Potato & potato products	1.7	1.0	4.6	3.7	8.8	2.5	16.3	4.9
Fruit & Vegetables	3.7	1.5	2.2	3.7	7.8	2.1	11.0	3.6
Meat, fish & their dishes	7.2	6.4	39.6	28.6	18.4	29.5	22.6	26.7
Other foods	2.6	6.7	6.6	3.4	4.1	10.0	4.3	3.7
Dairy	36.2	49.3	8.6	16.0	10.8	8.4	12.8	19.4
Composite foods including dairy	12.8	12.3	7.5	9.2	7.0	8.9	6.6	9.3
Other dairy foods	1.5	2.4	0.6	0.7	1.0	1.2	1.0	1.0

Table 3f: Percentage contribution of dairy subtypes to mean daily mineral intakes

Total Population	Nutrient Contribution (%)							
	Calcium	Iodine	Selenium	Zinc	Magnesiu m	Sodium	Potassiu m	Phosphorou s
Total Dairy	36.2	49.3	8.6	16.0	10.8	8.4	12.8	19.4
Milk								
Whole milk	14.4	24.4	3.7	6.3	4.8	2.8	6.1	7.9
Semi-skimmed milk	4.7	8.0	0.7	2.0	1.6	0.9	2.1	2.6
Skimmed milk	3.2	5.5	0.5	1.4	1.1	0.6	1.4	1.8
ND milk alternatives	1.3	1.2	0.2	0.3	0.2	0.3	0.2	0.3
Cheese								
Hard Cheese	7.1	4.5	2.2	3.6	1.6	2.2	1.1	3.8
Soft cheese	0.8	1.0	0.3	0.5	0.2	0.3	0.2	0.5
Cottage cheese	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processed cheese	1.2	0.7	0.2	0.5	0.3	0.5	0.2	0.9
Yogurt								
Yogurt	3.1	3.6	0.7	1.3	0.9	0.7	1.2	1.5
Drinking yogurt	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Fromage Frais	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
ND yogurt alternatives	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0

ND, Non dairy

Table 3g: The adequacy of nutrient intakes within the total population from food sources and supplements (13-18 years)

	Adolescents 13-18 years, *n* 428			
Micronutrient	EAR[27,29]	Mean	SD	% not meeting EAR
Vitamin A (μg/day)	480-570	635	368	28
Vitamin D (μg/day)	10	3.7	3.0	94
Folate (μg/day)	210-250	239	107	33
Vitamin B12 (μg/day)	1.2-1.4	5.5	2.7	1
Riboflavin (mg/day)	1.1-1.4	1.8	1.1	20
Calcium (mg/day)	750-960	812	331	51
Iodine (μg/day)	120-150	112	175	45

n - number; SD - standard deviation; % - percentage; EAR, Estimated average requirement

Section 4: Consumers versus non-consumers of dairy, and dairy tertiles

Tables 4a-d, show a comparison of nutrient intakes between non-consumers and consumers of dairy intake, total milk, total cheese and total yogurt, and across tertiles of dairy intake for adolescents. It is important to note although in this section low, medium and high consumers are referred to, overall consumption of dairy is low in this population group. Therefore, the high tertile includes the highest consumers in this Irish adolescent population and therefore some of these consumers may still be below dietary recommendations for dairy. Data are compared as a % total energy (macronutrients) or per 10MJ to avoid the confounding effect of energy intakes.

4.1 Total Dairy

As 98% of the population were consumers of dairy, this table does not include non-consumers. Mean daily intakes of energy (kcal) and percentage energy from total sugar and saturated fat, folate, vitamin B12, pantothenic acid, calcium, iodine, zinc, magnesium, potassium and phosphorous (per 10MJ) were significantly higher in the highest tertile of dairy consumers when compared to lowest tertile. However, percentage energy from total fat, polyunsaturated, monounsaturated fat and sodium (per 10MJ) were significantly lower in the highest tertile of dairy. Assessment of diet quality, using the DQI-A and PANDIET scores indicated a significantly higher score and overall diet quality in the highest dairy consumers versus the lowest dairy consumers (Table 4a).

4.2 Total milk

Similar to tertiles in total dairy, the mean daily intakes of percentage energy from total sugar and saturated fat, folate, vitamin B12, pantothenic acid, calcium, iodine, zinc, magnesium, potassium and phosphorous (per 10MJ) were significantly higher in the highest tertile of milk consumers when compared to lowest tertile. However, percentage energy from polyunsaturated, monounsaturated fat and sodium (per 10MJ) were lower in the highest milk consumers. Vitamin D was significantly higher in the highest milk consumers compared to non-consumers. Assessment of diet quality using the DQI-A and PANDIET scores indicated a higher score and overall diet quality in the highest versus non/lowest milk consumers (Table 4b).

4.3 Total cheese

There was no difference in percentage energy from total fat across tertiles of cheese consumption. Consumers in the highest tertile of cheese consumption had a higher percentage energy from saturated fat and phosphorous (10MJ) when compared to non-consumers. Whereas non consumers of cheese had significantly high percentage energy from sugar compared to high cheese consumers. Mean daily intakes of magnesium and potassium per 10MJ were significantly lower in the highest tertile of total cheese consumption compared to non-consumers. Whereas calcium intakes were significantly higher in highest consumers of cheese compared to all other groups. Assessment of diet quality using the PANDIET scores should a significantly higher score and overall diet quality in the high/medium versus low cheese consumers. No significant difference was noted in the DQI-A scores (Table 4c).

4.4 Total Yogurt

There were no significant differences in energy between consumers and non-consumers of yogurts. The highest consumers of yogurt had significantly higher percentage energy of saturated fat compared to non-consumers of yogurt. The lowest consumers of yogurt had significantly higher iodine, magnesium and phosphorus intakes per 10MJ versus non consumers. Assessment of diet quality using the DQI-A scores should a higher score and overall diet quality in the lowest yogurt consumers versus non consumers. No significant difference was noted in the PANDIET scores across consumers groups (Table 4d).

4.5 Anthropometric measures across dairy tertiles

Table 4e shows the relationship across tertiles of dairy consumers with anthropometric measures. No significant difference or trends were observed across low, medium and high consumers of dairy for weight, BMI, body fat, hip circumference, waist circumferences or hip/waist ratio.

Table 4a: Comparison of daily nutrient intakes across tertiles (low, medium and high) of total dairy intake for Irish adolescents aged 13-18 years

	Tertiles of mean daily intake of total dairy							
	Low (n=142)		Medium (n=143)		High (n=143)		GLM	Trend
Male/Female (%)	35/65		42/58		71/29			
	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Age (yrs)	15.3	1.5	15.0	1.6	15.3	1.5	0.130	0.931
Daily Dairy Intake (g/day)	65.8[a]	42.4	193.1[b]	38.6	473.6[c]	252.4	<0.001	<0.001
Daily Dairy Servings	0.8[a]	0.6	1.7[b]	0.8	3.2[c]	1.5	<0.001	<0.001
Macronutrients								
Energy (kcal)	1599[a]	521.5	1690[a]	473.4	2174[b]	630.9	0.019	0.010
Protein (g)	64.2[a]	25.0	67.8[a]	21.4	93.3[b]	34.4	<0.001	<0.001
Protein (% En)	16.2	3.8	16.3	3.8	17.1	3.3	0.059	0.019
Carbohydrate (g)	200.9[a]	72.1	217.3[a]	64.4	274.9[b]	83.4	0.047	0.016
Carbohydrate (% En)	47.1	6.4	48.3	5.6	47.6	5.4	0.568	0.674
Total sugar (g)	61.6[a]	33.2	73.7[b]	32.4	94.7[b]	36.2	<0.001	<0.001
Total sugar (% En)	14.4[a]	5.4	16.1[b]	4.7	16.4[b]	4.4	<0.001	<0.001
Total Fat (g)	64.2	23.7	65.6	23.8	82.9	28.6	0.581	0.639
Total Fat (% En)	36.0[a]	5.8	34.6[ab]	5.1	34.2[b]	5.4	0.013	0.004
Saturated fat (g)	24.1[a]	9.9	26.8[a]	9.9	36.4[b]	13.8	<0.001	<0.001
Saturated fat (% En)	13.5[a]	3.0	14.2[ab]	3.2	15.0[b]	3.4	0.003	<0.001
Monounsaturated fat (g)	27.7	10.8	27.0	11.4	32.9	12.0	0.139	0.114
Monounsaturated fat (%En)	15.6[a]	3.1	14.2[b]	2.7	13.5[b]	2.6	<0.001	<0.001
Polyunsaturated fat (g)	12.0	4.9	11.5	4.4	13.3	5.4	0.010	0.003
Polyunsaturated fat (% En)	6.8[a]	1.8	6.1[b]	1.5	5.5[c]	1.5	<0.001	<0.001
Trans fat (g)	0.7[a]	0.5	0.9[a]	0.4	1.3[b]	0.6	<0.001	<0.001
Trans fat (% En)	0.4[a]	0.2	0.5[a]	0.2	0.6[b]	0.2	<0.001	<0.001
Fibre (g/10MJ)	22.9	5.6	22.8	5.3	22.5	6.2	0.846	0.784

Table 4a: Continued

	Low (n=142)		Medium (n=143)		High (n=143)		GLM	Trend
Male/Female (%)	35/65		42/58		71/29			
	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Micronutrients								
Vitamin A (μg/10MJ)	794.2	591.6	827.5	497.1	917.1	694.2	0.212	0.081
Vitamin D (μg/10MJ)	4.2	5.7	5.3	5.4	5.8	5.3	0.081	0.039
Vitamin E (mg/10MJ)	12.0	5.3	11.6	9.0	10.7	9.1	0.523	0.279
Folate (μg/10MJ)	277.2[a]	143.6	327.8[b]	150.9	362.6[c]	151.1	<0.001	<0.001
Vitamin B12 (μg/10MJ)	6.0[a]	5.4	7.0[b]	3.4	8.5[c]	3.0	<0.001	<0.001
Riboflavin (mg/10MJ)	2.5	8.7	2.4	1.3	3.0	1.5	0.331	0.146
Pantothenic acid (mg/10MJ)	8.1[a]	9.2	8.6[ab]	5.1	9.5[b]	3.2	0.031	0.008
Calcium (mg/10MJ)	834.8[a]	221.4	1056[b]	270.6	1302[c]	287.9	<0.001	<0.001
Iodine (μg/10MJ)	111.7[a]	162.8	163.8[b]	55.8	270.0[c]	171.1	<0.001	<0.001
Selenium (μg/10MJ)	72.5	20.3	70.9	26.6	68.4	19.0	0.693	0.418
Zinc (μg/10MJ)	10.5[a]	3.5	11.0[ab]	3.7	11.9[b]	2.7	0.006	0.002
Magnesium (mg/10MJ)	293.5[a]	60.6	313.2[b]	76.6	330.2[b]	69.8	<0.001	<0.001
Sodium (mg/10MJ)	2910[a]	773.2	2773[ab]	612.7	2604[b]	610.3	0.008	0.002
Potassium (mg/10MJ)	3065[a]	591.7	3108[a]	689.7	3380[b]	597.0	<0.001	<0.001
Phosphorous (mg/10MJ)	1411[a]	221.3	1541[a]	280.3	1711[b]	268.6	<0.001	<0.001
Dietary Quality								
DQI-A score (%)	39.4[a]	13.1	43.4[b]	12.7	48.0[b]	12.3	<0.001	<0.001
PANDiet Score	50.9[a]	8.1	53.5[ab]	8.4	58.8[b]	10.0	<0.001	<0.001

n - number; SD - standard deviation; 10MJ – nutrients per 10MJ. Statistical test used general linear modelling (GLM) univariate analysis controlling for age, gender and underreporting with Bonferroni post-hoc test. Different superscript letters indicate significant differences as determined by post-hoc tests (P>0.05). In the case that p=significant, but letters are not shown, differences were no longer significant following post-hoc testing. Total Diet Quality Index for Adolescents (DQI-A) score percentage.

Table 4b: Comparison of daily nutrient intakes across tertiles (low, medium and high) of total milk intake for Irish adolescents aged 13-18 years

	Tertiles of mean daily intake of Total Milk									
	Non-Consumers (n=39)		Low (n=129)		Medium (n=130)		High (n=143)		GLM	Trend
Male/Female (%)	54/46		29/71		46/54		71/29			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Age (yrs)	15.5	1.4	15.1	1.6	15.1	1.6	15.2	1.5	0.538	0.367
Daily Milk Intake (g/day)	0.0^{a}	0.0	60.1^{b}	32.9	172.2^{c}	37.8	451.3^{d}	256.4	<0.001	<0.001
Daily Milk Servings	0.0^{a}	0.0	0.3^{b}	0.2	0.9^{c}	0.2	2.3^{d}	1.3	<0.001	<0.001
Macronutrients										
Energy (kcal)	1654.9	556.9	1633.0	537.9	1728.0	514.6	2152.1	622.1	0.181	0.096
Protein (g)	67.1^{a}	30.1	66.5^{a}	23.4	69.3^{a}	28.2	91.8^{b}	32.1	0.032	0.038
Protein (% En)	16.5	5.7	16.5	3.6	16.0	3.2	17.1	3.2	0.149	0.336
Carbohydrate (g)	208.2	78.5	204.3	74.8	222.6	64.4	273.0	83.8	0.252	0.105
Carbohydrate (% En)	47.1	7.9	46.8	5.7	48.6	5.5	47.6	5.3	0.246	0.551
Total sugar (g)	63.1^{a}	33.2	65.2^{ab}	34.6	74.3^{bc}	33.1	94.7^{c}	35.9	0.020	<0.001
Total sugar (% En)	14.8^{a}	6.3	14.7^{ab}	5.0	16.0^{ac}	4.6	16.6^{c}	4.4	0.040	0.030
Total Fat (g)	66.2	27.1	65.6	25.1	66.7	24.1	81.9	28.0	0.810	0.812
Total Fat (% En)	35.7	6.6	36.1	5.5	34.4	5.1	34.1	5.3	0.062	0.045
Saturated fat (g)	25.5^{a}	11.6	24.7^{a}	10.1	27.5^{a}	10.5	36.1^{a}	13.9	0.007	0.010
Saturated fat (% En)	13.6^{ab}	3.2	13.5^{a}	3.1	14.2^{ab}	3.1	15.0^{b}	3.4	0.024	0.023
Monounsaturated fat (g)	28.4	11.6	28.2	12.4	27.2	10.5	32.4	11.6	0.172	0.252
Monounsaturated fat (%En)	15.4^{a}	3.5	15.4^{a}	3.1	14.0^{b}	2.6	13.5^{b}	2.6	<0.001	<0.001
Polyunsaturated fat (g)	12.1^{ab}	5.2	12.1^{a}	4.6	11.7^{ab}	5.0	13.0^{b}	5.1	0.018	0.048
Polyunsaturated fat (% En)	6.5^{ab}	1.6	6.8^{a}	1.8	6.0^{b}	1.5	5.4^{c}	1.5	<0.001	<0.001
Trans fat (g)	0.7^{a}	0.6	0.8^{a}	0.4	0.9^{a}	0.4	1.4^{b}	0.7	<0.001	<0.001
Trans fat (% En)	0.4^{a}	0.3	0.4^{ab}	0.2	0.5^{b}	0.2	0.6^{c}	0.2	<0.001	<0.001
Fibre (g/10MJ)	22.3	6.0	23.2	5.3	22.6	5.3	22.5	6.3	0.977	0.965

Table 4b cont.

	Non-Consumers (n=39)		Low (n=129)		Medium (n=130)		High (n=143)		GLM	Trend
Male/Female (%)	54/46		29/71		46/54		71/29			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Vitamin A (μg/10MJ)	600.1	350.4	849.8	577.0	844.7	545.9	918.6	711.3	0.059	0.006
Vitamin D (μg/10MJ)	2.9[a]	2.0	5.1[b]	7.0	4.9[ab]	4.2	5.9[b]	5.5	0.040	0.006
Vitamin E (mg/10MJ)	10.6	3.9	13.1	9.1	10.7	5.7	10.8	9.5	0.163	0.717
Folate (μg/10MJ)	218.8[a]	84.5	293.6[b]	156.6	336.2[c]	141.2	368.8[d]	154.8	<0.001	<0.001
Vitamin B12 (μg/10MJ)	4.8[a]	2.4	6.2[a]	5.6	7.3[b]	3.4	8.7[c]	3.0	<0.001	<0.001
Riboflavin (mg/10MJ)	1.3	0.4	2.7	9.1	2.5	1.3	3.0	1.5	0.290	0.058
Pantothenic acid (mg/10MJ)	6.4[a]	2.9	8.9[ab]	10.4	8.5[ab]	3.5	9.6[b]	3.1	0.035	0.005
Calcium (mg/10MJ)	789.2[a]	266.7	904.5[b]	245.5	1063[c]	275.4	1309[d]	284.6	<0.001	<0.001
Iodine (μg/10MJ)	73.5[a]	28.5	127.5[b]	169.9	170.6[b]	53.3	280.0[c]	175.9	<0.001	<0.001
Selenium (μg/10MJ)	72.5	25.2	75.8	25.2	67.9	20.5	67.5	18.9	0.079	0.235
Zinc (μg/10MJ)	10.2[a]	3.3	10.9[a]	4.2	10.9[a]	2.9	11.9[b]	2.7	0.011	0.003
Magnesium (mg/10MJ)	263.7[a]	43.7	306.1[b]	66.0	312.7[b]	76.6	332.7[c]	68.2	<0.001	<0.001
Sodium (mg/10MJ)	2925[a]	773.4	2870[a]	754.0	2792[a]	592.8	2576[c]	617.8	0.002	0.003
Potassium (mg/10MJ)	2998[a]	723.2	3101[a]	618.6	3093[a]	637.9	3416[b]	585.2	<0.001	<0.001
Phosphorous (mg/10MJ)	1349[a]	293.9	1473[b]	237.1	1531[b]	259.7	1721[c]	269.6	<0.001	<0.001
Dietary Quality										
DQI-A score (%)	38.2[a]	14.0	41.8[a]	12.8	42.9[a]	12.8	47.6[b]	12.6	0.003	<0.001
PANDiet Score	48.7[a]	7.5	52.0[ab]	8.3	54.5[bc]	8.5	58.7[c]	10.2	<0.001	<0.001

n - number; SD - standard deviation; 10MJ – nutrients per 10MJ. Statistical test used general linear modelling (GLM) univariate analysis controlling for age, gender and underreporting with Bonferroni post-hoc test. Different superscript letters indicate significant differences as determined by post-hoc tests (P>0.05). In the case that p=significant, but letters are not shown, differences were no longer significant following post-hoc testing. Total Diet Quality Index for Adolescents (DQI-A) score percentage.

Table 4c: Comparison of daily nutrient intakes across tertiles (low, medium and high) of total cheese intake for Irish adolescents aged 13-18 years

	Tertiles of mean daily intake of total dairy									
	Non-Consumers (n=101)		Low (n=109)		Medium (n=110)		High (n=108)		GLM	Trend
Male/Female (%)	53/47		35/65		49/51		59/41			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Age (yrs)	15.2	1.6	15.2	1.5	15.2	1.6	15.2	1.6	0.792	0.526
Daily Dairy Intake (g/day)	0.0[a]	0.0	6.6[b]	2.7	17.3[c]	4.4	47.8[d]	19.7	<0.001	<0.001
Daily Dairy Servings	0.0[a]	0.0	0.3[b]	0.1	0.7[c]	0.2	1.9[d]	0.8	<0.001	<0.001
Macronutrients										
Energy (kcal)	1754	627.2	1639	529.5	1802	516.3	2089	636.7	0.210	0.500
Protein (g)	75.5	36.8	66.5	26.7	72.8	24.2	85.7	29.9	0.130	0.179
Protein (% En)	17.2	4.9	16.3	3.1	16.2	3.1	16.6	3.1	0.030	0.915
Carbohydrate (g)	225.3	82.8	208.2	70.7	229.0	69.0	261.7	88.2	0.486	0.188
Carbohydrate (% En)	48.3	6.3	47.7	5.5	47.7	5.4	46.9	5.9	0.663	0.268
Total sugar (g)	76.0	39.5	68.9	32.8	78.5	35.5	83.5	37.2	0.345	0.467
Total sugar (% En)	16.1[ab]	5.2	15.7[ab]	5.1	16.1[a]	4.8	14.8[b]	4.5	0.035	0.018
Total Fat (g)	65.4	27.0	64.0	23.1	71.1	23.6	83.0	29.2	0.116	0.034
Total Fat (%)	33.5	6.0	35.1	5.4	35.4	4.8	35.7	5.5	0.274	0.191
Saturated fat (g)	25.9[a]	12.5	25.8[ab]	10.7	28.9[ab]	11.7	35.5[a]	12.7	0.017	0.002
Saturated fat (% En)	13.1[a]	3.2	14.1[ab]	3.3	14.2[ab]	3.1	15.4[b]	3.1	0.024	0.004
Monounsaturated fat (g)	27.5	11.8	26.3	9.6	29.3	10.0	33.6	13.7	0.255	0.168
Monounsaturated fat (%En)	14.1	3.3	14.5	2.7	14.7	2.6	14.4	3.1	0.364	0.909
Polyunsaturated fat (g)	11.6	5.0	11.6	4.9	12.4	4.3	13.3	5.4	0.663	0.684
Polyunsaturated fat (% En)	6.1	1.8	6.3	1.7	6.3	1.6	5.7	1.6	0.363	0.319
Trans fat (g)	0.8[a]	0.6	0.8[a]	0.5	1.0[ab]	0.5	1.3[b]	0.6	0.001	<0.001
Trans fat (% En)	0.4[a]	0.2	0.5[a]	0.2	0.5[a]	0.2	0.6[b]	0.2	0.005	<0.001
Fibre (g/10MJ)	23.4	6.3	22.6	5.6	23.3	6.1	21.8	4.7	0.381	0.459

Table 4c. Cont.

	Non-Consumers (n=101)		Low (n=109)		Medium (n=110)		High (n=108)		GLM	Trend
Male/Female (%)	53/47		35/65		49/51		59/41			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Micronutrients										
Vitamin A (μg/10MJ)	908.2	696.1	767.1	533.5	852.1	687.8	862.9	455.1	0.111	0.323
Vitamin D (μg/10MJ)	5.4	4.1	5.2	5.3	4.7	6.1	5.0	6.2	0.804	0.853
Vitamin E (mg/10MJ)	12.5	10.9	11.0	5.9	11.1	4.4	11.3	9.4	0.602	0.521
Folate (μg/10MJ)	352.8	156.8	324.6	163.7	312.7	132.5	302.3	152.5	0.387	0.139
Vitamin B12 (μg/10MJ)	7.4	3.4	7.5	5.9	6.8	3.8	7.0	3.1	0.457	0.466
Riboflavin (mg/10MJ)	2.6	1.8	3.2	9.8	2.3	1.2	2.3	1.6	0.813	0.621
Pantothenic acid (mg/10MJ)	9.1	3.9	9.1	10.2	8.2	3.1	8.6	5.6	0.930	0.665
Calcium (mg/10MJ)	965.1[a]	327.2	975.0[a]	297.0	1063.2[a]	300.4	1252[b]	289.3	<0.001	<0.001
Iodine (μg/10MJ)	176.0	113.3	171.8	100.9	185.1	169.5	194.7	208.4	0.638	0.230
Selenium (μg/10MJ)	74.3	24.1	72.4	21.5	67.7	18.2	68.3	24.5	0.279	0.180
Zinc (μg/10MJ)	11.3[ab]	3.3	11.2[ab]	3.6	10.5[a]	2.8	11.7[b]	3.8	0.039	0.569
Magnesium (mg/10MJ)	332.2[a]	84.3	314.6[ab]	66.4	306.1[b]	60.2	297.8[b]	67.6	0.006	0.001
Sodium (mg/10MJ)	2542[a]	739.6	2798[b]	708.4	2784[b]	665.3	2910[b]	552.3	<0.001	<0.001
Potassium (mg/10MJ)	3388[a]	655.7	3247[a]	637.0	3192[a]	619.0	2926[b]	575.6	<0.001	<0.001
Phosphorous (mg/10MJ)	1559[ab]	325.6	1515[a]	275.3	1550[ab]	272.1	1595[b]	265.1	0.041	0.023
Dietary Quality										
DQI-A score (%)	41.6	12.5	40.2	13.4	44.9	13.4	45.9	13.4	0.101	0.636
PANDiet Score	55.8[ab]	9.5	51.9[a]	8.8	54.0[b]	8.8	56.8[b]	9.9	0.011	0.015

n - number; SD - standard deviation; 10MJ – nutrients per 10MJ. Statistical test used general linear modelling (GLM) univariate analysis controlling for age, gender and underreporting with Bonferroni post-hoc test. Different superscript letters indicate significant differences as determined by post-hoc tests (P>0.05). In the case that p=significant, but letters are not shown, differences were no longer significant following post-hoc testing. Total Diet Quality Index for Adolescents (DQI-A) score percentage.

Table 4d: Comparison of daily nutrient intakes across tertiles (low, medium and high) of total yogurt intake for Irish adolescents aged 13-18 years

	Tertiles of mean daily intake of total dairy									
	Non-Consumers (n=290)		Low (n=45)		Medium (n=46)		High (n=47)		GLM	Trend
Male/Female (%)	48/52		45/55		50/50		57/43			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Age (yrs)	15.2	1.5	15.0	1.5	15.0	1.6	15.4	1.8	0.422	0.284
Daily Dairy Intake (g/day)	0.0[a]	0.0	20.2[b]	9.1	45.8[c]	11.9	108.1[d]	43.2	<0.001	<0.001
Daily Dairy Servings	0.0[a]	0.0	0.2[b]	0.1	0.4[c]	0.1	0.8[d]	0.4	<0.001	<0.001
Macronutrient										
Energy (kcal)	1795.1	603.3	1700.0	506.8	1853.0	574.3	2070.0	638.9	0.731	0.355
Protein (g)	73.5	30.3	70.3	22.5	73.0	23.4	91.6	37.7	0.225	0.600
Protein (% En)	16.4	3.5	16.8	3.4	16.1	3.3	17.8	4.6	0.082	0.062
Carbohydrate (g)	227.1	79.3	214.3	74.8	239.0	72.6	264.2	89.5	0.476	0.211
Carbohydrate (% En)	47.6	6.0	46.9	5.5	48.6	4.8	47.7	5.6	0.604	0.565
Total sugar (g)	72.6[a]	35.0	76.2[ab]	35.9	80.4[ab]	32.7	99.0[b]	42.3	0.025	0.010
Total sugar (% En)	15.1[a]	5.0	16.3[ab]	4.8	16.2[ab]	4.1	17.8[b]	4.8	0.012	0.007
Total Fat (g)	70.3[a]	27.5	67.6[ab]	21.3	72.2[ab]	27.8	76.9	26.0	0.891	0.670
Total Fat (% En)	35.0	5.6	35.9	5.3	34.6	4.8	33.6	5.3	0.325	0.700
Saturated fat (g)	28.4	12.6	28.8	12.1	30.3	12.7	32.2	12.1	0.678	0.898
Saturated fat (% En)	14.1	3.3	15.0	3.0	14.5	2.9	14.1	3.4	0.287	0.433
Monounsaturated fat (g)	29.3	12.3	26.9	7.9	29.0	11.9	30.9	10.7	0.550	0.455
Monounsaturated fat (%En)	14.6	3.0	14.4	3.1	13.9	2.5	13.5	2.4	0.110	0.500
Polyunsaturated fat (g)	12.1	5.0	11.5	4.2	12.5	4.9	13.4	5.2	0.881	0.930
Polyunsaturated fat (% En)	6.1	1.7	6.3	1.9	6.1	1.6	5.8	1.4	0.810	0.341
Trans fat (g)	1.0	0.6	1.0	0.5	1.0	0.5	1.0	0.5	0.877	0.499
Trans fat (% En)	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.797	0.546
Fibre (g/10MJ)	22.6	5.9	23.6	5.5	23.2	4.7	22.3	5.9	0.510	0.968

Table 4d. Cont.

	Non-Consumers (n=290)		Low (n=45)		Medium (n=46)		High (n=47)		GLM	Trend
Male/Female (%)	48/52		45/55		50/50		57/43			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Micronutrient										
Vitamin A (μg/10MJ)	826.7	574.3	990.8	639.8	810.4	460.8	865.2	807.9	0.249	0.277
Vitamin D (μg/10MJ)	5.0	5.4	4.9	4.1	5.2	6.6	5.5	6.0	0.974	0.665
Vitamin E (mg/10MJ)	11.4	7.6	10.9	4.5	11.5	7.0	11.9	12.7	0.909	0.907
Folate (μg/10MJ)	320.9	155.0	329.7	118.0	311.0	111.4	337.1	196.1	0.806	0.684
Vitamin B12 (μg/10MJ)	7.4	4.6	6.8	3.1	6.5	2.5	7.1	3.7	0.620	0.475
Riboflavin (mg/10MJ)	2.7	6.2	2.3	1.0	2.3	1.0	2.6	1.8	0.967	0.760
Pantothenic acid (mg/10MJ)	8.8	6.9	8.3	2.8	8.0	2.8	9.7	7.7	0.810	0.556
Calcium (mg/10MJ)	1035.4	326.4	1149.3	356.3	1104.3	275.7	1129.5	296.2	0.070	0.383
Iodine (μg/10MJ)	171.7[a]	111.1	264.0[b]	352.1	173.6[a]	90.1	175.2[a]	100.5	<0.001	0.147
Selenium (μg/10MJ)	69.7	20.9	68.1	18.3	70.9	20.1	78.2	32.6	0.358	0.074
Zinc (μg/10MJ)	11.1	3.4	11.5	2.4	10.6	2.6	11.8	4.6	0.307	0.502
Magnesium (mg/10MJ)	305.6[a]	66.7	349.5[b]	92.8	306.5[a]	61.4	323.8[ab]	69.5	<0.001	0.779
Sodium (mg/10MJ)	2825.8	711.1	2638.1	556.5	2578.7	548.3	2666.7	660.2	0.079	0.521
Potassium (mg/10MJ)	3146.8	610.2	3366.1	616.2	3106.1	663.0	3323.2	789.4	0.066	0.407
Phosphorous (mg/10MJ)	1531[a]	272.9	1653[b]	311.8	1516[ab]	283.2	1643[ab]	305.4	0.004	0.147
Dietary Quality										
DQI-A score (%)	42.0[a]	13.4	47.5[b]	11.7	44.8[ab]	10.6	44.8[ab]	15.9	0.048	0.679
PANDiet Score	53.7	9.0	57.9	10.4	53.8	9.4	56.8	9.9	0.064	0.828

n - number; SD - standard deviation; 10MJ – nutrients per 10MJ. Statistical test used general linear modelling (GLM) univariate analysis controlling for age, gender and underreporting with Bonferroni post-hoc test. Different superscript letters indicate significant differences as determined by post-hoc tests (P>0.05). In the case that p=significant, but letters are not shown, differences were no longer significant following post-hoc testing. Total Diet Quality Index for Adolescents (DQI-A) score percentage.

Table 4e: Comparison of daily nutrient intakes across tertiles (low, medium and high) of total dairy intake for Irish adolescents aged 13-18 years

	Tertiles of mean daily intake of total dairy							
	Low (n=142)		Medium (n=143)		High (n=143)		GLM	Trend
Male/Female (%)	35/65		42/58		71/29			
	Mean	SD	Mean	SD	Mean	SD	*p*	*p*
Mean age (yrs)	15.3	1.5	15.0	1.6	15.3	1.5	0.13	0.931
Weight (kg)	63.2	14.9	60.1	13.0	63.8	12.9	0.159	0.963
Body Mass Index (m2)	22.9	4.3	21.7	4.0	22.0	3.7	0.148	0.676
Body Fat (%)	22.9	9.7	21.6	8.8	17.9	8.3	0.855	0.970
Hip Circumference (cm)	95.3	9.2	92.6	8.2	93.7	8.2	0.059	0.872
Waist Circumference (cm)	72.5	9.7	72.4	9.8	74.2	8.7	0.835	0.717
Hip/Waist Circumference	0.4	0.1	0.4	0.1	0.4	0.0	0.111	0.599

n - number; SD - standard deviation; 10MJ – nutrients per 10MJ. Statistical test used general linear modelling (GLM) univariate analysis controlling for age, gender and underreporting with Bonferroni post-hoc test. Different superscript letters indicate significant differences as determined by post-hoc tests (P>0.05). In the case that p=significant, but letters are not shown, differences were no longer significant following post-hoc testing. Total Diet Quality Index for Adolescents (DQI-A) score percentage.

Summary

Overall, 98% of Irish adolescents aged 13-18years were consumers of dairy with a mean daily intake of 245g/day; 91% were consumers of milk (228g/day), 76% consumers of cheese (24g/day) and 32% were consumers of yogurt (59g/day). The dairy group 'whole milk' had the highest consumer rates of all dairy foods for both males and females (64%) and across age groups (13-15y ; 66%, 16-18y; 61%,). Consumers across the dairy subtypes were broadly similar between males and females; however, there was a slightly higher amounts being consumed by males overall.

The mean daily number of dairy servings for the total population was 1.9. Total milk contributed 1.0 servings per day, total cheese 0.7 servings per day and total yogurt 0.1 servings per day. The greatest number of servings for any individual dairy type was for whole milk and hard cheese servings at 0.6 and 0.4 servings per day respectively. Within the total population, 4% of the population met the recommended 5 servings of dairy per day, and 94% population did not meet the recommendation, consuming less than 5 servings a day. Slightly higher numbers of males compared to females (7.0% and 0.5% respectively) were consumers of 5 servings of dairy per day. Whereas similar proportions of those aged 13-15 years (3%) and 16-18 year olds (4%) consumed the recommended 5 servings of dairy per day, albeit the proportion was very low.

Dairy provides 9.0% of energy (kcal) in the total population and was a major contributor to protein, total fat, saturated fat, vitamin A, vitamin B12, riboflavin, pantothenic acid, calcium, iodine, zinc and phosphorus intakes. Of the dairy subtypes, whole milk contributed most to all nutrients. Intakes of micronutrients were typically adequate except for vitamin D and calcium, where only 94% and 51% respectively did not satisfied the EAR.

Mean daily intakes of energy (kcal) and the percentage energy from total sugar, saturated fat the B-vitamins, iodine, calcium, zinc ,magnesium, potassium and phosphorus per 10MJ were significantly higher in the highest consumers of dairy when compared to lowest consumers, and percentage energy from total fat, polyunsaturated, monounsaturated and sodium intakes (per 10MJ) were lower in the highest consumers of dairy. A similar pattern emerged for total milk. Consumers of cheese had significantly higher mean daily intakes of energy from saturated fat, calcium and

sodium (per 10MJ), however there was no difference in intakes of total fat intakes. Consumers of total yogurt had a significantly higher mean daily intake of energy from sugar when compared to non-consumers. When the dietary quality was examined across dairy consumption, the highest consumers of dairy had significantly higher dietary scores indicating a better diet quality.

Data for the above analysis is derived from a large nationally representative study of Irish adolescents. The extensive information collected in this survey is one of the most comprehensive of its kind in Europe, making it a valuable resource for agencies involved in public health promotion, regulation, consumer protection and the food industry. However, the following must be considered: these surveys are 'one off' or cross sectional in nature and therefore represent a 'snapshot' of the diet at any one time.

In conclusion, this report describes the contribution of dairy produce (milk, cheese and yogurt) to the Irish diet of Irish adolescents aged 13-18 years.

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Annex

Table S1a: Description of the foods included in each of the 11 food groups*

Food group	Foods included
1. Rice, grains, breads & cereals	Rice, pasta, flours, grains and starches, white and wholemeal breads and rolls, scones, bagels and pittas, ready-to-eat breakfast cereals, other breakfast cereals
2. Biscuits, cakes & pastries	Biscuits, cakes, pastries and buns
3. Savoury snacks & confectionary	Savoury snacks (including crisps, pretzels, prawn crackers, bread sticks, nuts), chocolate and non-chocolate confectionary, sugars, syrups, preserves and sweeteners
4. Beverages	Carbonated beverages, diet carbonated beverages, fruit juice, bottled water, squash/still drinks with sugar, squash/still drinks without sugar, dilutables with sugar, dilutables without sugar, sports drinks, energy drinks, functional shots, teas, coffees, tap water, alcoholic beverages
5. Potato & potato products	Potatoes boiled, processed and homemade potato products, chipped, fried and roasted potatoes
6. Fruit & vegetables	Vegetable and pulse dishes, peas, beans and lentils, green vegetables, carrots, salad vegetables, other vegetables, tinned or jarred vegetables, bananas, other fruits, citrus fruits, tinned fruits
7. Meat fish & their dishes	Fish, fish products, bacon, ham, beef, veal, lamb, pork, chicken, turkey, game, offal, and their dishes, burgers (beef and pork), sausages, meat pies
8. Other foods	Soups, sauces and miscellaneous foods, savouries, eggs and egg dishes, low fat spreads, other spreading fats, oils, hard cooking fats, nuts, seeds, herbs and spices
9. Dairy	Whole, semi-skimmed, skimmed and fortified milks, non-dairy milk alternatives, hard, soft, cottage and processed cheeses, yogurts, yogurt drinks, fromage frais and non-dairy yogurt alternatives
10. Composite foods containing dairy	Dairy containing recipes e.g., lasagne
11. Other dairy foods	Creams, ice creams, puddings & chilled desserts, butter

*Supplements excluded

Table S1b: Description of the dairy foods included in each of the 12 dairy subtypes

	Dairy Subtype	Example of foods included
Total Milk		
	1. Whole milk	Full fat milk (3.5% fat)
	2. Semi-skimmed milk	Low fat milk (1.5% fat)
	3. Skimmed milk	Fat free milk (0.5% fat)
	4. Non-dairy milk alternatives*	Oat drinks, soya drinks, rice drinks
Total cheese		
	5. Hard cheese	Cheddar, Cheshire, Double Gloucester, Edam, Emmental, Gouda, Gruyere, hard cheese, Leicester, Parmesan, Stilton blue, Stilton white
	6. Soft cheese	Brie, Camembert, cream cheese, Danish blue, feta, full fat soft cheese, goat's milk soft cheese, mozzarella, ricotta
	7. Cottage cheese	Soft unripen cottage cheese
	8. Processed cheese	Cheese spread, flavoured cheese spreads, processed cheese products, smoked processed cheese, spreadable cheese
Total Yogurt		
	9. Yogurt	Full fat yogurt, low fat yogurt, fat free yogurt, flavoured yogurt, fruit yogurt
	10. Drinking yogurts	Fortified yogurt drinks
	11. Fromage Frais	Fromage frais
	12. Non-dairy yogurt alternatives*	Soya yogurt alternative

*Fortified with calcium