National Pre-School Nutrition Survey

Summary Report

June 2012

Irish Universities Nutrition Alliance

Contact Details

University College Cork

School of Food and Nutritional Sciences
University College Cork
Cork
Ireland

Professor Albert Flynn
Tel: 353 (0)21 4901318
Fax: 353 (0)21 4270244
Email: a.flynn@ucc.ie

Dr Janette Walton
Tel: 353 (0)21 4903387
Fax: 353 (0)21 4270244
Email: janette.walton@ucc.ie

University College Dublin

UCD Institute of Food and Health
University College Dublin
Belfield
Dublin 4
Ireland

Professor Mike Gibney
Tel: 353 (0)1 7162824
Fax: 353 (0)1 7161147
Email: mike.gibney@ucd.ie

Dr Anne Nugent
Tel: 353 (0)1 7162812
Fax: 353 (0)1 7161147
Email: anne.nugent@ucd.ie

Dr Breige McNulty
Tel: 353 (0)1 7162426
Fax: 353 (0)1 7161147
Email: breige.mcnulty@ucd.ie

Printed by City Print Ltd., Victoria Cross, Cork, Ireland (www.cityprint.ie/).

Suggested reference: Irish Universities Nutrition Alliance (IUNA) (2012) National Pre-School Nutrition Survey. Summary Report. Available online at www.iuna.net

Irish Universities Nutrition Alliance (IUNA) 2012

www.iuna.net

IUNA 2012

National Pre-School Nutrition Survey

Summary Report on:

Food and Nutrient Intakes, Physical Measurements and Barriers to Healthy Eating

Summary Report edited by Dr Janette Walton

UCC
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

UCD DUBLIN

University of ULSTER

The research team

The fieldwork and the primary analysis of the survey presented in this report were carried out by the following teams from University College Cork and University College Dublin as part of the Irish Universities Nutrition Alliance (www.iuna.net):

University College Cork	Professor Albert Flynn, Professor of Nutrition
	Dr Janette Walton, Joint Project Co-ordinator
	Dr Laura Keyes, Research Nutritionist
	Dr Sinéad Bannon, Research Nutritionist
	Ms Fiona Browne, Research Nutritionist
	Ms Charlotte Cummins, Research Nutritionist
	Ms Katie Evans, Research Nutritionist
	Ms Miriam Giltinan, Research Nutritionist
	Ms Áine Hennessy, Research Nutritionist
	Dr Jacqueline Lyons, Research Nutritionist
	Dr Elaine Walsh, Research Nutritionist
University College Dublin	Professor Mike Gibney, Professor of Food and Health
	Dr Anne Nugent, Lecturer in Nutrition
	Dr Breige McNulty, Joint Project Co-ordinator
	Ms Elaine Boylan, Research Nutritionist
	Ms Una Devlin, Research Nutritionist
	Ms Sinéad Hopkins, Research Nutritionist
	Ms Danika Martyn, Research Nutritionist
	Ms Anne Marie Tierney, Research Nutritionist

Funding

The study was funded by the Department of Agriculture, Fisheries and Food, under the *"Food for Health Research Initiative"* (FHRI) which is also supported by the Department of Health and Children and the Health Research Board (HRB). The FHRI is supported by funds provided under the Strategy for Science, Technology and Innovation 2006-2013 for linked public sector research, the Food Institutional Research Measure and the HRB.

Acknowledgements

Many people kindly gave their time and advice at various stages throughout the survey, which was invaluable to the success of this project. We would especially like to thank and acknowledge the following people for their assistance and advice:

- Dr Mairéad Kiely, University College Cork for advice in relation to methodological aspects of the survey particularly in relation to the measurement of food fussiness and neophobia.
- Dr Brian Young, University of Exeter, Dr Mark Blades, University of Sheffield and Dr John Kearney, Dublin Institute of Technology for their assistance in devising the questionnaires.
- Dr Tracy McCrorie & Professor Barbara Livingstone, University of Ulster for advice in relation to measurement of physical activity.
- Ms Charlotte Johnson, Senior Community Dietitian, for her advice in relation to methodological aspects of the survey and Safefood for the provision of the Food Atlas of serving sizes of common foods for pre-school children (1-5 years).
- Professor Ashley Adamson and her colleagues at Newcastle University for their advice and the provision of the FSA Young Person's Food Atlas (Pre-School).
- Mr Anthony Johns, Tinuviel Software, Anglesey, UK, for continuing support with the nutrient analysis (WISP©, WISP-DES©) and questionnaire software (Q-BUILDER©, Q-BUILDER-DES©).
- Ms Rose Kervick and her team at *eumom* (www.eumom.ie) and the many childcare facilities, all who assisted in subject recruitment.
- Most importantly, sincerest thanks to all the families who volunteered to participate in this survey, who willingly gave up their time and welcomed us into their homes. Without them, this survey would not have been possible.

Main Outcomes

Body weight

Overall, the majority (77%) of 2-4 year old children were within the normal weight range as classified using UK-WHO criteria. However, 23% were defined as overweight or obese. Although higher levels of overweight and obesity were observed in children aged 2 (27%) and 3 years (32%), only 8% of 4 year olds were classified as overweight or obese. Such fluctuations reflect the rapid changes in BMI that occur during normal growth and development and indicate that by 4 years of age, most Irish children were within the normal weight ranges.

Foods and beverages

The six food groups which may be considered staples for pre-school children are milk, meat, bread, breakfast cereals, fruit and vegetables. Each of these was consumed by practically all children in amounts sufficient to make important nutritional contributions to the diet.

Milk was consumed mainly as a beverage or with breakfast cereal. Most milk was consumed as whole cow's milk, with a significant contribution from infant and growing up milk formula in 1 and 2 year olds. Overall milk consumption decreased with increasing age. Meat was consumed mostly as processed meats and meat dishes with intakes of both fresh and processed meats increasing with age. Poultry was the most widely consumed fresh meat across all ages. Bread consumption increased with age and at age 4 years intake of white bread exceeded that of brown/wholemeal. The percentage of children consuming cooked breakfast cereals decreased with age and at age 4 years most breakfast cereals were consumed as ready-to-eat breakfast cereal. Consumption of fruit, including fruit juice, and vegetables increased with increasing age. Consumption of soft drinks, both caloric and low calorie and water increased from age 1-4 years. About 20% of children were regular consumers of a nutritional supplement, mainly multivitamin/mineral preparations or multivitamins.

Energy and macronutrients

Average daily energy intakes increased with age from 1000 kcal in 1 year olds to approximately 1300 kcal at age 4 years. Milk/formula was the most important source of energy (29%) in 1 year olds and while the proportion of total energy intake from milk decreased with age, it remained an important contributor to energy (11%) at age 4 years. Other important sources of energy were meat, bread, breakfast cereals, fruit & fruit juices, biscuits & cakes and yoghurt. The proportion of energy from bread, meat and biscuits & cakes increased, and the proportion from yoghurt decreased, with increasing age. The contribution of confectionery to energy intake increased from 1% in 1 year olds to 4% in 3 and 4 year olds. For all ages, beverages (excluding fruit juices and milk/formula) contributed 1-2% to energy intakes.

Fat accounted for 32-34% and carbohydrate for 50-54% of total energy intake in children. The main sources of fat in the diet were milk and meat. The percentage of energy coming from both saturated fat and mono-unsaturated fat decreased from age 1 – 4 years while there was an increase in the percentage of energy coming from poly-unsaturated fats. The main sources of carbohydrates were fruit & fruit juices, bread, breakfast cereals, milk and biscuits & cakes. The main sources of protein in the diet were meat and milk.

Main Outcomes

Sugar

The proportion of energy coming from total sugars was about 25% for 1-4 year olds, with the proportion of energy derived from non-milk sugars increasing with age from 16% in 1 year olds to 20% in 4 year olds. Fruit & fruit juices were the main contributors to non-milk sugar intake at all ages. Intakes of sugar from biscuits & cakes, confectionery and beverages increased from age 1 to 4 years.

Dietary fibre

Intake of dietary fibre was generally adequate in this age group. Average dietary fibre intake was higher than the adequate intake established by the European Food Safety Authority (2g DF/MJ) and the fibre intakes of over 70% of children in all age groups exceeded this value. Fruit, bread, breakfast cereals, vegetables and potatoes were the main contributors to dietary fibre intake at ages 1 – 4 years.

Salt

Salt intakes increased with age and exceeded the FSAI daily salt intake targets of 2g for 1-3 year olds and 3g for 4 year olds. Meat, especially cured and processed meats, was the main contributor to salt intake accounting for 23-25% of total intake in 1-4 year olds. The contribution of cured/processed meats and bread to salt intake increased from age 1-4 years.

Vitamins and minerals

Intakes of most vitamins and minerals, including calcium and B-vitamins, were adequate. Almost a quarter (23%) of 1 year olds and about 10% of 2 and 3 year olds had inadequate intakes of iron. Intakes of vitamin D were generally low, indicating that a significant proportion of children may be at risk of inadequate intakes of vitamin D, particularly in winter.

Barriers to healthy eating

A large proportion of parents (60%) thought that the foods that their child was eating could be healthier. According to parents, the main barriers to providing a healthy diet for the child were the 'child's likes or dislikes' followed by convenience and other people minding the child.

Introduction

This Summary Report describes the methods used and the main findings with regard to food and beverage consumption, nutrient intakes and anthropometric data from the National Pre-School Nutrition Survey (NPNS). This survey investigated habitual food and beverage consumption in a sample of 500 children aged 12 to 59 months inclusive, in the Republic of Ireland. This is the first such study carried out in Ireland. Findings from this survey represent a very valuable resource which will be used to develop nutrition policies and health promotion campaigns for pre-school children in the future. The survey was carried out by the Irish Universities Nutrition Alliance (IUNA), a formal alliance of the academic nutrition centres at University College Cork, University College Dublin, Trinity College Dublin and the University of Ulster, Coleraine, which is committed to joint initiatives in research and teaching. It was funded by the Department of Agriculture, Food and the Marine under the Food for Health Research Initiative (FHRI), which is also supported by the Department of Health and the Health Research Board. A detailed description of the methodology used and the data obtained from the survey will be made available at www.iuna.net.

Background to the survey

In recent years, the Irish Universities Nutrition Alliance (IUNA) has completed a number of comprehensive national nutrition surveys. The information collected during these surveys is used to develop evidence-based nutrition policies and health promotion campaigns in Ireland and to assess the safety of the food supply. The surveys conducted to date are: The North/South Ireland Food Consumption Survey (2001) of adults aged 18-64 years; The National Children's Food Survey (2005) of children aged 5-12 years; The National Teen's Food Survey (2008) of teenagers aged 13-17 years and The National Adult Nutrition Survey (2011) of adults aged 18-90 years. All surveys are available at www.iuna.net.

The National Pre-School Nutrition Survey (NPNS) is the first nationally representative survey in the Republic of Ireland investigating the diets of children aged 1-4 years. The early years of life are a period of rapid growth and a healthy diet is critical for normal development. During this time, children establish their eating behaviours and food preferences. The NPNS is designed to provide up-to-date quantitative habitual food consumption data separately for all eating occasions over each of four days at the level of the individual and is suitable for a wide range of applications related to food safety and nutrition. These include assessment of exposure to chemical and biological hazards in foods, development and implementation of food and nutrition policy, and food product development and promotion.

Sampling and recruitment procedures and methods of data collection

A sample of 500 children (boys 251, girls 249), aged from 12 months to 59 months inclusive, from across the Republic of Ireland took part in the National Pre-School Nutrition Survey (NPNS). Individuals were selected for participation from a database of names and addresses compiled by 'eumom' (an Irish parenting resource (www.eumom.ie)) or from randomly chosen childcare facilities in select locations. An introductory information letter and brochure were sent to the parent/guardian of the individuals selected. In all cases, the onus was on the prospective participant to 'opt in'. For those participants that 'opted in', a researcher called to their home in the following days to further explain the survey. Eligible children (aged from 12 to 59 months inclusive, who had not yet started primary school) were invited to participate and a consent form was signed by their parent/guardian. Demographic analysis of the sample has shown it to be representative of young children in Ireland with respect to age, gender, and urban/rural location when compared to Census 2006. The sample was also generally representative of social class, although there were a higher proportion of children of professional workers. However, as there were no significant differences between social classes for food and nutrient intakes or body weight the data have not been adjusted for this.

Food intake was estimated using a four-day weighed food record. Parents/guardians were asked to record detailed information on the amount and type of all foods, drinks and nutritional supplements consumed by the child over four consecutive days in a food diary. To ensure accuracy of recording, a researcher visited participants in their homes three times during the recording period. Participants were provided with a food scales and were asked to weigh as many foods as possible. An age-appropriate photographic food atlas was also used to assign weights to foods. Participants were encouraged to keep food packaging to provide further detail on foods consumed.

Physical measurements such as weight, length/height of the child and mid-upper arm circumference were measured. Parents' weights and heights were also measured.

Parents/guardians were asked to complete five self-administered questionnaires to provide information relating to health and lifestyle of both themselves and the child. Questions relating to physical activity, food choice, eating behaviour, attitudes to food marketing and early childhood eating habits were included.

The fieldwork phase of the NPNS commenced in October 2010 and ended in September 2011, giving a seasonal balance to the data collection. A number of quality control procedures were implemented throughout the collection, processing and compilation of data. A more detailed description of the methodology used and further data obtained from the survey will be made available on the internet at www.iuna.net.

Chapter 1 Food Group Intakes

Quantities of foods consumed

Long-term dietary habits are shaped at an early age with many of them forming before the age of 5 years. This chapter focuses on the food intakes of Irish pre-school children and reports on the proportions of children who consumed different foods and the amounts that they were consuming. This information is derived from a four-day weighed food record in which caregivers were asked to record all food and drinks consumed by the child over a four-day period including at least one weekend day. Caregivers were provided with a digital weighing scales and encouraged to weigh as much of the child's food as possible. Leftovers were also weighed and the weight of the food consumed was calculated. For foods that were not weighed, other methods such as age-appropriate pictorial food atlases and household measures such as teaspoon and tablespoon, or estimated portion sizes, were used to assign weights to the foods. The percentage of foods quantified by each method are reported in **Figure 1**.

Figure 1: Methods used to quantify foods on the National Pre-School Nutrition Survey

Tables 1-7 (pages 7-13) report the mean daily intakes of selected foods by the total population and also by consumers only. It should be noted that the proportion of children consuming the various foods as shown in the tables is based on a four-day period and thus may be an underestimate for foods that are consumed less regularly.

Milk & dairy products

Milk is a staple food in the diets of Irish pre-school children, consumed by practically all children mainly as a beverage or with breakfast cereal. **Figure 2** shows the milk consumption of Irish pre-school children by type of milk consumed and age of child. Most milk was consumed as cow's milk (mainly whole with some reduced fat), with a significant contribution from infant and growing up milk formula in 1 and 2 year olds and from human milk in 1 year olds.

Figure 2: Milk consumption (g/d) by type of milk consumed and age of child (years)

Table 1 presents the mean daily intake of milk, dairy products and spreading fats in Irish pre-school children by age for the total population and by consumers only. The total average daily intake of milk was 455g in 1 year olds, decreasing with age to 238g in 4 year olds. In 1 year old children, whole cow's milk was consumed by 88% and reduced fat cow's milk by 14%, while by age 4 years, the proportions were 78% and 27%, respectively. Infant formula and growing up milk formula was consumed by 31% of 1 year olds and 18% of 2 year olds, decreasing to 6% and 2% of 3 and 4 year olds respectively.

Other dairy products such as cheese, yoghurt and fromage frais were regularly consumed by a majority of children of all ages. In 1 year old children, cheese was consumed by 64%, with an average daily intake of 12g. For 2, 3 and 4 year old children the percentage of consumers of cheese was 68, 56 and 59% respectively with an average daily intake of 13-14g per day among consumers.

Yoghurts were consumed by 54% of 1 year olds with an average daily intake of 59g among consumers. The average daily intake of yoghurt increased slightly in the older age-groups with 2, 3 and 4 year old consumers having an average intake of between 69 and 71g per day. The percentage of consumers of yoghurts also increased with age from 60% of 2 year olds to 65-66% of 3 and 4 year olds. In contrast, for fromage frais, the percentage of consumers and mean intake in consumers were higher in 1 year olds than in 2, 3 and 4 year olds.

Butter and spreading fats were consumed by 79% of 1 year olds with an average daily intake of 4g, with the percentage of consumers and mean daily intake increasing to 89-93% and 6-7g, respectively in 2-4 year olds. Dairy spreads (40-80% fat) were the most common type of spread used across all ages.

Breads & cereal products

Table 2 presents the mean daily intake of breads, breakfast cereals, rice, pasta, grains & savouries in Irish pre-school children by age for the total population and for consumers only. The percentage of children consuming bread increased with age, with 90% of 1 year olds consuming some type of bread, increasing to 98% of 4 year olds. Among consumers, the average daily intake of bread also increased with age from 29g in 1 year olds to 61g in 4 year olds. For white bread, the percentage consumers increased from 65% in 1 year olds to 86% in 4 year olds, while the mean daily intake in consumers increased from 20 to 34g. For brown/wholemeal bread, the percentage consumers (60-65%) and the average daily intake (32-33g) were higher in 2-4 year olds than in 1 year olds (53% and 20g). Ready-to-eat breakfast cereals (RTEBCs) were consumed by 86-92% of 1-4 year olds with the average daily intake increasing with age from 15g in 1 year olds to 27g in 4 year olds. The percentage of children consuming cooked breakfast cereals such as porridge or hot oatmeal cereal decreased with age from 44% of 1 year olds to 19% of 4 year olds. The average daily intake of these cooked breakfast cereals (including milk/water) increased from 52g in 1 year olds to 77g in 4 year olds. Commercial infant cereals were consumed by 18% of 1 year olds and 3% of 2 year olds with an average daily intake among consumers of 28-29g.

Meat, fish & eggs

Table 3 presents the mean daily intake of meat, fish and eggs in Irish pre-school children by age for the total population and by consumers only. Meat was widely consumed across all ages, increasing from 94% of 1 year olds to 98-99% of 2, 3 and 4 year olds. The percentage of children consuming meat as part of a composite dish decreased with age from 74% of 1 year olds to 60% of 4 year olds. The percentage of children consuming processed/cured meat increased with age from 69% of 1 year olds to 90% of 4 year olds with the average daily intake increasing with age from 23g in 1 year olds to 38g in 4 year olds. The percentage of consumers of discrete portions of fresh meat also increased with age from 55% of 1 year olds to 70% of 4 year olds with the average daily intake increasing from 12g in 1 year olds to 18g in 4 year olds. Poultry was the most widely consumed fresh meat across all ages. Commercial infant meat dishes were consumed by 16% of 1 year olds. With regard to fish consumption, there was no definite trend across age. The percentage of children consuming fish ranged from 44 to 59% with an average daily intake of 19-24g. Similarly, there was no trend observed in egg consumption across age. Eggs were consumed by 33-45% of children with average daily intakes of 19-24g.

Fruit & fruit juices

Fruit was consumed by practically all children either as discrete portions of fruit, fruit purées or as fruit juice and the overall intake of fruit, including fruit juice, increased with increasing age from 134g in 1 year olds to 202g in 4 year olds. Fruits such as apples and pears were consumed by 83-91% of children with average daily intakes of 52g in 1 year olds and 65-70g in 2-4 year olds. Bananas were more widely consumed in 1 year olds (79%) than in 2-4 year olds (66-72%), as were fruit purées (40% in 1 year olds and 27-30% in 2-4 year olds). In contrast, the percentage of children consuming fruit juices increased from 33% in 1 year olds to 65% in 4 year olds, with average daily intake among consumers increasing from 69g in 1 year olds to 118g in 4 year olds (**Table 4**).

Vegetables & potatoes

Vegetables were consumed by practically all children, regardless of age, as either discrete portions of vegetables or included in composite dishes or purées. The average daily intake of vegetables was 55-63g. For vegetables consumed as discrete portions, carrots, baked beans and green vegetables were the most widely consumed for all ages.

Potatoes were consumed by 90-95% of children with the average daily intake among consumers increasing with increasing age, from 40g in 1 year olds to 50g in 4 year olds. The percentage of children consuming boiled/mashed potatoes was 66-75% with an average daily intake of 36-42g. The percentage of children consuming chipped, fried & roasted potatoes increased from 37% in 1 year olds to 54% in 4 year olds with the average daily intake increasing from 18g to 26g (**Table 5**).

Biscuits, cakes, confectionery & savoury snacks

Consumption of biscuits, cakes, confectionery and savoury snacks all increased with age. Biscuits were consumed by 77-85% of children with the average daily intake increasing from 9g in 1 year olds to 15g in 4 year olds. Infant biscuits and rusks were consumed by 37% of 1 year olds and 17% of 2 year olds. The percentage of consumers of cakes, pastries and buns increased from 32% in 1 year olds to 52% in 4 year olds with the average daily intake increasing from 15g in 1 year olds to 20g in 4 year olds. The percentage consumers of confectionery increased with increasing age from 37% in 1 year olds to 81% in 4 year olds with the average daily intake increasing with age from 9g in 1 year olds to 17g in 4 year olds. The percentage of 1 and 2 year olds consuming savoury snacks was 40% increasing to 63% in 3 and 4 year olds with the average daily intake among consumers increasing from 5g in 1 year olds to 9-10g in 3 and 4 year olds (**Table 6**).

Beverages

Water was consumed as a beverage by 73-79% of children with the average daily intake increasing with increasing age from 145g in 1 year olds to 181g in 4 year olds. The percentage of children consuming fruit juice increased from 33% in 1 year olds to 65% in 4 year olds with average daily intake among consumers increasing from 69g in 1 year olds to 118g in 4 year olds. Consumption of soft drinks increased with increasing age. The percentage of children consuming low calorie soft drinks increased from 29% in 1 year olds to 50-52% in 3 and 4 year olds with average daily intake among consumers of 198-233g. For sugar-containing soft drinks, the percentage consumers increased from 21% in 1 year olds to 53% in 4 year olds with average daily intake among consumers increasing from 96 to 145g (**Table 7**).

Nutritional supplement use

Nutritional supplement use was recorded along with food consumption in the four-day food diary. One fifth (20%) of children consumed a nutritional supplement during the recording period. **Figure 3** shows the percentage of children consuming a nutritional supplement by age. Of the 60 supplements consumed, 24 were multivitamin/mineral preparations, 17 were multivitamins, 7 were single vitamins, 7 were fish oils, 3 were single minerals and 2 were multiminerals.

Figure 3: Percentage of children taking a nutritional supplement by age (years)

Table 1: Mean daily intakes of milk, dairy products and spreading fats (g/d) by age in total population and in consumers only

	1 y *(n=126)*					**2 y *(n=124)***					**3 y *(n=126)***					**4 y *(n=124)***				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Total milk	455	208	98	462	202	328	221	99	331	220	247	170	99	249	170	238	136	99	240	135
Of which is																				
Whole milk	283	228	88	321	216	232	226	86	269	222	195	171	87	225	164	173	148	78	222	131
Reduced fat milk	19	87	14	135	196	32	92	15	211	134	38	101	27	140	155	52	112	27	197	136
Soya/rice milk	4	33	2	163	172	5	30	4	124	100	2	12	2	99	6	6	43	3	175	190
Human milk	35	151	7	496	314	3	33	1	365	n/a	0	0	0	n/a	n/a	0	0	0	n/a	n/a
Infant /growing up milk formula	113	200	31	364	196	56	137	18	314	158	13	63	6	225	163	6	46	2	239	214
Dairy products																				
Cheese	8	10	64	12	10	9	10	68	13	10	8	11	56	14	10	10	12	69	14	12
Yoghurt	32	40	54	59	37	41	52	60	69	51	47	58	66	71	58	46	49	65	70	44
Fromage frais	31	36	62	50	35	19	31	46	42	33	18	27	50	36	28	18	23	53	34	20
Cream	0	2	4	5	9	0	1	2	7	3	0	4	5	10	14	0	2	5	7	4
Ice-cream	2	7	18	14	11	7	14	29	23	18	10	15	47	22	14	13	16	52	25	13
Butter and spreading fats	3	3	79	4	3	5	5	89	6	5	6	6	93	7	6	5	5	90	6	4
Of which is																				
Dairy spreads (40-80% fat)	2	2	52	3	2	3	4	65	5	4	3	4	67	5	4	3	4	62	5	4
Butter (>80% fat)	1	2	31	3	3	1	4	23	6	6	2	4	33	5	6	1	4	24	6	6
Low fat spreads (<40% fat)	0	2	9	4	4	1	2	14	5	4	1	5	15	8	11	1	2	19	5	3

Table 2: Mean daily intakes of bread, breakfast cereals and rice, pasta & savouries (g/d) by age in total population and in consumers only

	1 y *(n=126)*					**2 y** *(n=124)*					**3 y** *(n=126)*					**4 y** *(n=124)*				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Total bread	26	21	90	29	20	46	30	96	48	29	53	31	96	55	29	60	32	98	61	31
Of which is																				
White bread	13	17	65	21	17	21	25	65	32	25	29	26	78	37	24	34	28	86	39	26
Wholemeal brown bread	10	15	53	20	16	21	24	65	33	22	20	21	63	30	19	20	24	60	34	22
Scones, croissants, muffins etc.	2	5	25	9	8	4	9	23	16	12	5	12	26	20	16	6	15	27	22	22
Breakfast cereals																				
Ready-to-eat breakfast cereals	13	11	86	15	10	18	14	85	21	13	22	15	92	24	14	25	18	90	27	17
Porridge/instant hot oat cereals	23	39	44	52	44	22	41	34	66	45	21	47	35	61	63	15	36	19	77	43
Infant cereals	5	23	18	28	49	1	6	3	29	23	0	0	0	n/a	n/a	0	1	1	12	0
Rice, pasta & savouries	28	26	77	37	24	41	45	83	49	45	39	38	81	48	36	49	45	88	56	44
Of which is																				
Rice/pasta/grains/starch	18	19	68	27	17	24	28	67	36	26	22	30	63	35	30	28	35	67	42	36
Savouries including pizza	10	19	33	30	23	17	33	46	37	40	16	26	46	35	27	21	30	56	38	31

Table 3: Mean daily intakes of meat, fish and eggs (g/d) by age in total population and in consumers only

	1 y *(n=126)*					**2 y** *(n=124)*					**3 y** *(n=126)*					**4 y** *(n=124)*				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Total meats	77	55	94	81	53	75	51	99	76	51	76	48	99	76	48	83	74	98	86	51
Of which is																				
Meat dishes	*43*	*44*	*74*	*58*	*42*	*38*	*52*	*70*	*54*	*54*	*32*	*40*	*65*	*48*	*41*	*33*	*42*	*60*	*55*	*42*
Processed/cured meats	*16*	*22*	*69*	*23*	*23*	*25*	*23*	*82*	*30*	*22*	*30*	*23*	*90*	*33*	*22*	*34*	*29*	*90*	*38*	*28*
Bacon & ham	4	7	40	9	8	7	12	52	14	14	9	12	66	13	12	11	13	69	16	13
Burgers (beef & pork)	1	3	6	13	7	2	6	11	17	9	2	6	13	15	7	3	9	14	20	15
Sausages	6	12	38	16	14	8	10	51	16	9	8	11	45	18	10	8	13	46	18	13
Meat pies & pastries	1	6	5	22	20	0	2	2	10	3	1	5	5	19	10	2	7	9	22	10
Meat products	4	11	26	15	17	7	13	39	18	16	10	14	51	19	14	10	18	45	23	20
Fresh meat	*7*	*9*	*55*	*12*	*9*	*11*	*15*	*60*	*18*	*15*	*12*	*14*	*66*	*18*	*13*	*15*	*18*	*70*	*22*	*18*
Poultry	5	8	44	11	8	7	12	48	15	13	8	11	48	16	11	10	16	51	19	17
Beef & veal	1	3	12	9	6	2	6	18	12	9	3	6	20	13	8	2	5	15	12	7
Lamb	0	2	2	12	5	0	2	3	10	5	1	4	6	13	10	1	4	10	11	5
Pork	0	2	6	7	5	1	4	10	11	9	1	3	13	8	6	3	9	15	19	16
Infant meals, meat	*12*	*31*	*16*	*73*	*41*	*1*	*8*	*2*	*50*	*19*	*3*	*16*	*4*	*65*	*56*	*1*	*7*	*2*	*52*	*13*
Total fish	14	19	59	23	20	10	16	55	19	17	10	16	44	23	16	13	18	56	24	18
Of which is																				
Fish & fish products	8	11	51	15	11	7	11	47	15	13	8	12	40	19	12	10	15	52	20	15
Fish dishes	4	12	13	29	19	3	11	12	24	22	3	11	9	32	20	3	11	8	34	21
Infant meals, fish	2	9	5	40	20	0	4	1	50	0	0	0	0	n/a	n/a	0	4	1	50	0
Eggs & egg dishes	6	11	33	19	10	9	14	45	21	15	8	12	40	19	12	8	15	33	24	18

Table 4: Mean daily intakes of fruit & fruit juices (g/d) by age in total population and in consumers only

	1 y *(n=126)*					**2 y *(n=124)***					**3 y *(n=126)***					**4 y *(n=124)***				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Fruit & fruit juices	132	100	98	134	100	163	103	98	166	102	191	125	96	199	122	198	125	98	202	123
Of which is																				
Apples, pears, pineapples, berries etc.	43	39	83	52	38	56	55	83	67	53	59	57	85	70	56	59	50	91	65	49
Bananas	29	28	79	36	27	30	29	72	42	26	30	34	67	45	33	30	30	66	45	27
Fruit purées & smoothies (100% fruit)	25	45	40	61	54	23	45	30	76	52	21	43	29	75	50	19	43	27	70	58
Citrus fruits	8	17	33	26	20	12	22	40	30	25	12	27	36	34	35	11	24	35	32	31
Dried fruit	4	7	45	9	7	4	6	38	10	6	3	6	25	10	7	2	5	19	10	8
Tinned fruit	1	3	8	10	6	1	4	6	12	13	0	2	4	10	8	1	3	5	14	5
Fruit juices (100% juice)	23	50	33	69	68	38	61	47	81	66	65	82	62	105	81	77	99	65	118	100
Fruit in composite dishes*	19	40	98	19	40	22	44	97	23	44	18	41	98	18	42	15	16	99	15	16

* including all fruit in composite foods and dishes e.g. breakfast cereals, fruit pies and yoghurts

Table 5: Mean daily intakes of vegetables and potatoes (g/d) by age in total population and in consumers only

	1 y ***(n=126)***					**2 y** ***(n=124)***					**3 y** ***(n=126)***					**4 y** *(n=124)*				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Total vegetables	62	40.5	99	63	40	53	36	98	55	35	53	34	96	55	32	60	37	98	61	37
Discrete vegetables	30	33	92	32	34	28	28	88	32	27	31	28	87	36	27	38	30	91	41	29
Of which is																				
Peas, bean & lentils	7	11	52	14	12	8	12	55	14	12	8	12	48	16	12	10	16	51	20	18
Baked beans	*6*	*12*	*53*	*16*	*14*	*6*	*12*	*55*	*16*	*15*	*6*	*12*	*48*	*18*	*14*	*9*	*17*	*51*	*23*	*22*
Carrots	6	11	48	12	13	5	9	42	12	10	8	12	53	15	13	8	12	55	15	13
Green vegetables	5	9	42	11	12	4	8	30	12	11	5	11	40	13	15	6	10	45	14	10
Salad vegetables	2	5	14	12	8	3	8	21	14	12	2	6	14	14	10	3	8	25	14	11
Tinned & jarred vegetables	1	5	12	10	10	1	3	10	8	7	1	3	5	12	6	2	6	15	13	11
Sweet potatoes	1	8	5	25	31	1	4	4	17	11	1	9	2	55	16	0	2	1	25	n/a
Other vegetables (e.g. turnip)	8	14	53	14	16	7	13	46	16	16	6	10	51	12	11	8	12	48	16	13
Fresh herbs	0	0	2	2	1	0	0	2	1	1	0	0	2	1	1	0	0	0	n/a	n/a
Vegetables in composite dishes*	33	27	90	36	26	25	26	92	28	26	22	22	87	25	21	23	21	90	25	20
Total potatoes	36	36	90	40	36	39	33	90	43	31	43	30	93	46	29	47	35	95	50	34
Of which is																				
Mashed/boiled potatoes	28	33	75	37	33	25	31	66	36	31	26	27	71	36	25	28	31	67	42	29
Processed potato products	2	5	13	12	7	4	10	23	19	12	5	12	21	23	17	5	11	29	18	12
Chipped/fried/roast potatoes	7	15	37	18	20	10	17	41	23	20	12	15	58	21	13	14	22	54	26	25

* including vegetables in composite foods and dishes excluding tomato ketchup and dried vegetables in soups and sauces

Table 6: Mean daily intakes of biscuits, cakes, confectionery and savoury snacks (g/d) by age in total population and in consumers only

	1 y ***(n=126)***					**2 y** ***(n=124)***					**3 y** ***(n=126)***					**4 y** ***(n=124)***				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Biscuits including crackers	7	9	77	9	9	11	11	77	14	11	11	13	75	15	12	13	11	85	15	10
Infant biscuits/rusks	3	6	37	9	7	2	6	17	11	11	1	3	9	11	10	1	1	3	20	14
Cakes/pastries/buns	5	9	32	15	11	6	14	36	17	18	6	10	44	13	11	10	15	52	20	15
Confectionery	3	6	37	9	8	10	12	66	15	12	11	12	73	15	11	14	13	81	17	13
Savoury snacks	2	4	40	5	4	3	4	40	7	4	6	7	63	10	7	6	7	63	9	6
Desserts & milk puddings	11	29	31	36	42	13	23	35	36	27	9	24	25	37	37	12	25	33	37	31
Infant desserts	3	11	9	33	23	0	2	1	28	0	0	0	0	0	0	0	0	0	0	0

Table 7: Mean daily intakes of beverages (excluding milk) (g/d) by age in total population and in consumers only

	1 y *(n=126)*					**2 y** *(n=124)*					**3 y** *(n=126)*					**4 y** *(n=124)*				
	Population		Consumers only			Population		Consumers only			Population		Consumers only			Population		Consumers only		
	Mean	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**	**Mean**	**SD**	**%**	**Mean**	**SD**
Water (as a beverage)	126	145	75	167	144	164	207	75	219	213	135	133	79	172	127	131	142	73	181	138
Soft drinks, not low calorie	21	66	21	96	115	49	103	42	117	131	52	91	47	111	106	77	181	53	145	228
Soft drinks, low calorie	68	144	29	233	180	103	181	45	228	210	104	156	52	198	167	111	177	50	223	196
Fruit juices	23	50	33	69	68	38	61	47	81	66	65	82	62	105	81	77	99	65	118	100
Teas	4	23	6	80	61	2	12	3	61	37	2	16	7	35	50	9	33	11	76	71
Coffees	0	0	0	n/a	n/a	0	0	0	n/a	n/a	0	0	0	n/a	n/a	0	0	0	n/a	n/a

Chapter 2 Energy & Nutrient Intakes

Introduction

This chapter will focus on the energy and nutrient intakes of Irish pre-school children. For energy and selected macro- and micro- nutrients, the key sources of these nutrients are also shown. Energy and nutrient intakes were estimated using food composition tables, updated with current manufacturers' information, where applicable. Nutritional supplements and fortified foods were identified at data collection stage and estimates of nutrients include contributions from these sources also.

Energy and macronutrient intakes

Average energy and macronutrient intakes are reported in **Table 8** by age of child. On average, 1 year old children consume 4.2MJ (1000kcal) per day. This energy intake increases with age with 4 year olds consuming 5.3MJ (1260kcal) daily. **Table 8** shows that for Irish pre-school children, the percentage of energy in the diet coming from fat decreases with age from 34% in 1 year olds to 32% by age 3 and 4. The percentage of energy coming from both saturated fat and mono-unsaturated fat also decreased with age, while there was an increase in the percentage of energy coming from poly-unsaturated fats. The percentage of energy coming from total carbohydrate increased with age from 50% in 1 year olds to 54% in 3 and 4 year olds. There was little change with age in the proportion of energy coming from total sugars while the proportion of energy derived from non-milk sugars (all sugars except lactose) increased with age from 16% in 1 year olds to 20% in 4 year olds.

Sources of energy

Figure 4 illustrates the key sources of energy in the diets of Irish pre-school children. For 1 year olds, milk/formula was the most important source of energy accounting for 29% of the calories. While the proportion of total energy from milk/formula decreased with age, nevertheless it remained an important contributor to energy (11%) at age 4 years. Other important contributors to energy intake in 1-4 year olds were meat (10-13%), breakfast cereals (8-9%) fruit & fruit juices (8-9%), yoghurts (4-7%), bread (6-11%) and biscuits & cakes (6-8%). The proportion of energy from bread, meat and biscuits & cakes increased, and the proportion from yoghurt decreased, with increasing age. The contribution of confectionery (chocolate and non-chocolate) to energy intake increased from 1% in 1 year olds to 4- 5% in 3 and 4 year olds. For all ages, beverages (excluding fruit juices and milk/formula) contributed 1-2% to energy intakes.

Table 8: Mean and SD of energy and macronutrients and the % of total energy from macronutrients

		1y (n=126)		2y (n=124)		3y (n=126)		4y (n=124)	
		Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Energy	MJ	4.2	0.9	4.7	1.2	4.8	0.9	5.3	1.0
	kcal	1005	222	1122	281	1148	213	1264	240
Protein	(g)	39.2	10.3	42.6	11.7	42.7	9.9	47.0	10.5
	(%TE)	15.6	2.5	15.3	2.5	14.9	2.4	15.0	2.4
Total fat	(g)	38.1	11.0	41.5	14.4	41.2	11.1	44.9	11.5
	(%TE)	34.0	5.8	32.9	5.2	32.1	4.9	31.9	5.2
Saturated fat	(g)	17.7	5.8	18.8	7.2	18.9	5.9	20.0	6.1
	(%TE)	15.8	3.8	14.9	3.3	14.7	3.0	14.2	3.0
Monunsaturated fat	(g)	13.6	4.6	14.0	5.1	13.8	4.0	15.2	4.3
	(%TE)	12.1	2.9	11.1	2.1	10.7	2.0	10.8	2.4
Polyunsaturated fat	(g)	4.2	1.9	5.4	3.2	5.5	1.9	6.3	2.6
	(%TE)	3.7	1.4	4.3	2.6	4.4	1.5	4.5	1.5
Carbohydrate	(g)	126.3	31.7	146.2	36.0	153.7	29.9	170.6	38.0
	(%TE)	50.4	6.9	52.4	5.9	53.7	5.7	54.0	5.8
Total sugars	(g)	69.6	21.8	74.3	22.7	76.0	20.3	83.6	25.1
	(%TE)	26.1	5.7	25.1	5.9	24.9	5.4	24.8	4.9
Non-milk sugars	(g)	43.4	19.9	55.3	19.9	60.7	19.8	68.8	24.2
	(%TE)	16.3	6.3	18.7	6.2	20.0	5.9	20.4	5.2

TE, Total Energy

Figure 4: Key sources of energy intake

Sources of macronutrients

Figures 5-7 illustrate the key sources of macronutrients in Irish pre-school children by age. For all ages, the main sources of fat in the diet were milk/formula and meat. The contribution of milk/formula to fat intake decreased with age from 39% in 1 year olds to 16% for 4 year olds. Meat contributed relatively less to fat intake in 1 year olds (14%) compared to 2, 3 and 4 year olds (17-18%). The contribution of biscuits & cakes to fat intake increased with age from 6% in 1 year olds to 10% in 4 year olds. Spreads contributed 6% to fat intakes in 1 year olds and 8-9% in 2, 3 and 4 year olds. Cheese contributed 5-6% of fat intake across all ages. Confectionery (chocolate and non-chocolate) contributed 2% to fat intake in 1 year olds and 4-5% in 2, 3 and 4 year olds.

The main sources of carbohydrates in the diets of Irish pre-school children were fruit & fruit juices, bread, breakfast cereals, milk/formula and biscuits & cakes. The contribution of milk/formula to carbohydrate intake decreased with age from 20% in 1 year olds to 7% in 4 year olds. Fruit & fruit juices (14-16%), breakfast cereals (12-13%), bread (9-16%) and biscuits & cakes (7-9%) contributed significantly to carbohydrate intake. The contribution of bread to carbohydrate intake increased with age from 9% in 1 year olds to 16% in 4 year olds. The main sources of protein in the diets of Irish pre-school children were meat and milk, with a lesser contribution from bread, breakfast cereals and yoghurt. The contribution of milk/formula to protein intake decreased with age from 30% in 1 year olds to 16% for 4 year olds, while that from meat increased from 22% in 1 year olds to 29% in 4 year olds.

Figure 5: Key sources of fat intake

Figure 6: Key sources of carboyhdrate intake

Figure 7: Key sources of protein intake

Sugar

Figure 8 shows the main contributors to total sugar intake in pre-school children. Milk (14-34%), fruit & fruit juices (27-31%) and yoghurt (10-12%) were the main contributors to total sugar intake at all ages. The percent contribution of milk to sugar intake decreased with age from 34% in 1 year olds to 14% in 4 year olds. Fruit & fruit juices were the main contributors to non-milk sugar intake at all ages. Intakes of sugar increased with age from age 1 to 4 years from biscuit & cakes (5-8% of total sugar), confectionery (from 2-8%) and beverages (from 3-7%).

Figure 8: Key sources of sugar intake

Dietary Fibre

Dietary fibre is important in childhood for promoting normal bowel function. The average daily intake of dietary fibre increased with increasing age from 10.5g in 1 year olds to 11.6g, 12.0g, and 12.8g in 2, 3, and 4 year olds respectively. When intakes were adjusted for energy (g/MJ), the fibre-density of the diet was similar across ages (2.5 g/MJ in 1, 2 and 3 year olds and 2.4 g/MJ in 4 year olds), indicating that increasing intakes with age were due to older children consuming more food than younger children. Average dietary fibre intake (as fibre-density) was higher than the adequate intake established by the European Food Safety Authority (2g DF/MJ) and the fibre-density of the diets of over 70% of children of all ages exceeded this value, indicating that intake of dietary fibre is generally adequate in this age group. **Figure 9** shows the main food sources of dietary fibre among pre-school children. Fruit (17-19%), bread (10-18%), breakfast cereals (15-17%), vegetables (10-13%) and potatoes (7-9%) were the main contributors to dietary fibre intake at all ages. The proportion of total intake of dietary fibre from bread and potatoes increased with increasing age.

Figure 9: Key sources of dietary fibre intake

Salt

High intakes of dietary sodium (salt) are associated with an increased blood pressure. Salt intakes were estimated using the most up- to-date compositional data for sodium in foods available and estimates exclude discretionary salt added at the table and in cooking. Sodium (salt) intakes increased with age and mean daily sodium (salt) intake in 1, 2, 3 and 4 year olds was 918mg (2.3g), 1186mg (3.0g), 1250mg (3.1g) and 1421mg (3.6g) respectively, exceeding the salt intake target levels. The salt intakes exceed the target level for salt intake in children i.e. 2g/day for age 1-3 years and 3g/day for age 4-6 years.

Figure 10 shows the main contributors to sodium intake in pre-school children. Meat was the main contributor to sodium intake accounting for 23-25% of total sodium intake in 1-4 year olds. The contribution of cured/processed meats to sodium intake increased with age from 12% in 1 year olds to 19% in 4 year olds, while the contribution of fresh meat and meat dishes decreased with age from 10% in 1 year olds to 6-7% in 3-4 year olds. The contribution of bread to sodium intake increased with increasing age (from 9-13%) while the contribution of milk/formula decreased (from 19-7%) and the contribution of breakfast cereals remained the same (6-7%)

Figure 10: Key sources of sodium intake

Vitamins and Minerals

It is important that young children meet their micronutrient requirements in order to sustain their growth and development. **Table 9** shows the mean daily intakes of vitamins and minerals in Irish children aged 1 to 4 years. Figures **11 to 17** show the main food contributors to intakes of vitamins A, C, D, folate, calcium, iron and zinc in the Irish pre-school population. Overall, the main food contributors to vitamin intakes were milk/formula, fruit & fruit juices, breakfast cereals, bread and meat. The main food contributors to mineral intakes were milk/formula, breakfast cereals, bread, meat and yoghurt.

Adequacy of vitamins and minerals

Adequacy of intake of vitamins and minerals were assessed by determining the percentage of children with intakes below the UK Estimated Average Requirements (EAR) for the selected nutrient. The EAR is the amount of a nutrient required to meet the needs of half of the population. Some under-reporting of food consumption occurs in all dietary surveys and this may lead to an underestimation of the intake of some nutrients. To give a more accurate estimate of the proportion of children with inadequate intakes of vitamins and minerals, under-reporters were excluded when assessing adequacy.

For all ages, intakes of most vitamins and minerals were adequate as indicated by the low percentage of children with intakes below the EAR. For vitamin A, 14-22% of 2-4 year olds were estimated to have inadequate intakes. For iron, 23% of 1 year olds, 10% of 2 year olds, and 11% of 3 year olds were estimated to have inadequate intakes. In the absence of a general consensus on an EAR for vitamin D, the percentage of children with intakes of less than 5µg and 1µg were determined. Overall, the intakes of vitamin D were low with 70-84% of 1-4 year olds having intakes less than 5µg and 17-25% having intakes of less than 1µg. This indicates that a significant proportion of children may be at risk of inadequate intakes of vitamin D, particularly in winter.

Table 9: Mean and SD values of daily micronutrient intakes by age

	1y (n=126)		2y (n=124)		3y (n=126)		4y (n=124)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Vitamins*								
Total Vitamin A (µg)	757	481	649	605	696	450	650	434
Retinol (µg)	390	357	358	508	330	274	320	301
Carotene (µg)	2203	1977	1744	1673	2198	2283	1982	1806
Vitamin D (µg)	4.2	5.2	3.4	3.5	3.0	3.3	2.8	2.6
Thiamin (mg)	1.0	0.4	1.1	0.5	1.1	0.4	1.1	0.3
Riboflavin (mg)	1.6	0.7	1.6	0.6	1.5	0.5	1.5	0.5
Pre-formed Niacin (mg)	10.0	4.5	12.2	5.6	12.3	4.7	13.0	4.2
Total Niacin Equivalents (mg)	17.5	5.7	20.6	6.5	20.7	5.7	22.2	6.0
Vitamin B6 (mg)	1.2	0.6	1.4	0.6	1.5	0.6	1.5	0.6
Vitamin B12 (µg)	4.1	2.0	4.2	2.4	3.8	1.8	4.0	1.8
Folate (µg)	159	80	180	72	188	84	189	80
Biotin (µg)	20.6	8.1	21.8	13.5	26.5	24.3	22.5	14.3
Pantothenate (mg)	4.4	1.7	4.7	2.0	4.5	1.8	4.4	1.6
Vitamin C (mg)	75	44	85	64	85	45	94	53
Minerals*								
Calcium (mg)	840	297	786	280	718	264	748	233
Iron (mg)	7.0	3.0	7.6	3.2	7.2	3.5	7.8	2.7
Magnesium (mg)	143	38	154	43	154	37	167	44
Zinc (mg)	5.4	1.8	5.4	1.9	5.2	1.8	5.5	1.5
Copper (mg)	0.6	0.3	0.6	0.3	0.7	0.4	0.8	0.4
Phosphorus (mg)	815	237	839	256	814	217	868	212
Potassium (mg)	1716	435	1724	466	1732	408	1830	410

* All sources including dietary supplements

Figure 11: Key sources of vitamin A intake

Figure 12: Key sources of vitamin C intake

Figure 13: Key sources of vitamin D intake

Figure 14: Key sources of folate intake
%
35
30
25
20
15
10
5
0
30
20
14
13
19
21
21
22
9
10
14
13
6
10
10
11
7
5
6
6
6
6
5
5
Milk/formula
Breakfast cereals
Fruit/ fruit juices
Bread
Vegetables
Meat
1y
2y
3y
4y

Figure 15: Key sources of calcium intake
%
60
50
40
30
20
10
0
52
43
37
35
11
10
12
11
5
10
12
13
10
7
8
8
6
8
7
8
Milk/formula
Yoghurt
Bread
Breakfast cereals
Cheeses
1y
2y
3y
4y

Figure 16: Key sources of iron intake

Figure 17: Key sources of zinc intake

Chapter 3 Physical Measurements

Anthropometry

Anthropometric data including weight, height, mid upper arm circumference (MUAC) and body mass index (BMI; body weight in kilograms divided by body weight in metres squared) are shown in **Table 10.**

The assessment of overweight and obesity in pre-school children is complex as rapid changes in BMI occur during normal growth. Ideally, a child's growth and development is monitored over time; however, prevalence of overweight and obesity can also be assessed by applying cut-offs to age and gender specific BMI charts. These charts compare a child's BMI to the BMI distribution of a reference sample of children of the same age. Cut-offs are then used to define the weight status of the child. For the purposes of this report two different approaches are described. One year old children are excluded from this analysis as it is deemed inaccurate to apply these approaches to this age group[1, 2].

Overweight and obesity can also be defined using the UK WHO age-and-gender specific BMI charts[2]. These charts are a description of optimal rather than average observed growth and reflect an adaption by the UK Scientific Advisory Committee on Nutrition of growth charts developed by the WHO from a multi-country study of breastfed infants and young children from six geographically distinct sites[4,5]. The centile cut-offs typically used with these charts are as follows: overweight being a BMI > 91st and ≤98th percentile and obesity equalling a BMI >98th percentile. **Table 11** presents the proportion of Irish children aged 2-4 years classified as overweight or obese using this approach. Overall, 77% of 2-4 year old children were classified as normal weight using the UK-WHO criteria; 16% were defined as overweight and 7% as obese. A higher percentage of girls were classified as normal weight (89%) compared to boys (84%) and a higher percentage of boys were defined as overweight or obese (25%) compared to girls (21%). Only 1% of 4 year olds were classified as obese, whereas 7% and 11% of 2 and 3 year olds were classified as being obese.

Table 12 presents the proportion of Irish children aged 2-4 years classified as overweight and obese using the International Obesity Task Force (IOTF) age-and-gender specific BMI cut-offs. These cut-offs are used to define thinness, overweight and obesity in children aged between 2-18 years. IOTF cut-offs are based on pooled international data for BMI and are linked to the widely accepted adult definitions[1, 3]. Overall, 80% of 2-4 year old children were classified as normal weight using the IOTF criteria; 2% were defined as thin, whereas 15% were defined as overweight and 3% as obese. A similar percentage of girls were classified as normal weight (81%) compared to boys (80%) but a slightly higher percentage of girls were defined as overweight or obese (19%) compared to boys (16%). Only 10% of 4 year olds were classified as overweight and none were classified as being obese, whereas 13% and 22% of 2 and 3 year olds were classified as being overweight respectively, and a further 4% were classified as obese. Such fluctuations in prevalence reflect the rapid changes in BMI that occur during normal growth and development.

1. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. *Establishing a standard definition for child overweight and obesity worldwide: international survey.* BMJ 2000; 320: 1240-1243.
2. Royal College of Paediatrics and Child Health World Health Organisation. *The UK_WHO Growth Charts: Early Years.* London: RCPCH, 2009.
3. Cole TJ, Flegal KM, Nicholls D, Jackson, AA. *Body mass index cut offs to define thinness in children and adolescents: international survey.* BMJ 2007; 335: 166-170.
4. Wright CM, Williams AF, Elliman D, et al. *Using the new UK–WHO growth charts.* BMJ 2010;340:c1140.
5. SACN/RCPCH Expert Group. Application of WHO Growth Standards in the UK. 2007. http://www.sacn.gov.uk/pdfs/report_growth_standards_2007_08_10.pdf . (accessed 7 Jun 2011).

Table 10: Mean, SD, median and percentile values of anthropometric measuremnets by age

	1y (n=126)					2y (n=124)					3y (n=126)					4y (n=124)				
				Percentile					Percentile					Percentile					Percentile	
	n	Mean	SD	5th	95th	*n*	Mean	SD	5th	95th	*n*	Mean	SD	5th	95th	*n*	Mean	SD	5th	95th
Weight (kg)	*126*	11.9	1.7	9.5	14.8	*122*	14.2	1.9	11.3	17.6	*126*	16.7	2.2	13.2	20.6	*123*	18.0	2.0	14.6	21.2
Height (cm)	*124*	82.5	4.6	74.8	90.0	*122*	91.1	5.2	82.6	99.7	*126*	99.2	4.7	92.6	108.1	*123*	104.7	4.9	95.6	112.3
MUAC (cm)	*115*	16.5	1.3	14.5	18.6	*115*	17.0	1.3	15.0	19.5	*122*	17.8	1.5	15.7	20.2	*119*	17.7	1.1	15.6	19.5
BMI*	*124*	17.4	1.8	14.4	20.7	*122*	17.1	1.3	15.0	19.6	*126*	16.9	1.3	14.8	19.4	*123*	16.4	0.9	14.8	17.8

* Body Mass Index (BMI) = Weight (Kg)/ Height $(m)^2$

Table 11: Prevalence of overweight and obesity in Irish children aged 2-4 years using UK/WHO age-and-gender specific BMI charts*

	2y	3y	4y	Total
All (n)	***(122)***	***(126)***	***(123)***	***(371)***
Over 91st, ≤98th (% overweight)	20	21	7	16
Over 98th (% Obese)	7	11	1	7
Over 91st (%Overweight, including obese)	27	32	8	23
Boys (n)	***(62)***	***(61)***	***(63)***	***(186)***
Over 91st, ≤98th (% overweight)	19	25	6	17
Over 98th (% Obese)	10	13	2	8
Over 91st (%Overweight, including obese)	29	38	8	25
Girls (n)	***(60)***	***(65)***	***(60)***	***(185)***
Over 91st, ≤98th (% overweight)	20	19	8	16
Over 98th (% Obese)	5	9	2	5
Over 91st (%Overweight, including obese)	25	28	10	21

*Data only included for valid measurements.
A child was classified as obese if BMI was >98th centile for gender and age; and as overweight of BMI was

Table 12: The proportion of Irish children aged 2-4 years defined as normal, overweight and obese using IOTF cut-offs by age*

	2y	3y	4y	Total
All (n)	***122***	***126***	***123***	***371***
Thinness	4	1	1	2
Normal	79	73	89	80
Overweight	13	22	10	15
Obese	4	4	0	3
Overweight & Obese	17	26	10	18
Boys (n)	***62***	***61***	***63***	***186***
Thinness	8	2	2	4
Normal	74	72	92	80
Overweight	13	21	6	13
Obese	5	5	0	3
Overweight & Obese	18	26	6	16
Girls (n)	***60***	***65***	***60***	***185***
Thinness	0	0	0	0
Normal	83	74	87	81
Overweight	13	23	13	17
Obese	4	3	0	2
Overweight & Obese	17	26	13	19

*Data only included for valid measurements

Chapter 4 Barriers to Healthy Eating

Barriers to Healthy Eating

Parents influence several aspects of their child's food intake, from what they eat to when they eat it and even the amount of food they eat. As they age, children have more control, but parents still influence their food choices. External factors can create barriers for parents in providing the diet for their child that they wish to. The NPNS examined parents' attitudes to providing a healthy diet for their children and the barriers they encounter, using a questionnaire.

Parents rated their level of interest in providing a healthy diet for their children as 9 out of 10. In total, 60% of parents thought that what their children were eating could be healthier; this percentage increased from 44% in parents of 1 year olds to 65% in parents of 4 year olds.

Parents' opinions on whether it is difficult to provide a healthy diet for their child are presented in **Figure 18** split by age of child. A small proportion of parents (12%) said that they thought it was difficult to provide a healthy diet for their children, however, over half (53%) thought that it was sometimes difficult. Parents of older children were more likely to say that they thought it was difficult to provide a healthy diet than parents of younger children (15% of parents of 4 year olds, 7% of parents of 1 year olds).

Figure 18: Is it difficult to provide a healthy diet for your child?

Parents were asked about factors that make it difficult for them to provide a healthy diet for their child. The factors presented were; cost, convenience, availability, child's likes or dislikes, allergies, food advertising, other people minding your child and other. The percentage of parents that agreed with each factor as being a barrier in providing a healthy diet for their child are displayed in **Figure 19**. Overall, the greatest barriers to providing a healthy diet for children were the child's own likes and dislikes, followed by convenience and other people minding the child. These factors varied with the age of the child. As children grew older, the cost of food, food advertising and children's own likes and dislikes became greater barriers, while convenience and other people minding their child became less important.

Figure 19: Do the following factors make it difficult to provide a healthy diet for your child?

Notes