An approach to the development of food-based dietary guidelines for Ireland

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The aim of the present study was to analyse the different food and nutrient intakes of the adult Irish population from the lowest and highest quartiles of intake for total fat (%energy) dietary fibre (g/MJ) and fruit and vegetables (g/day). Data on Irish adults (n = 715) from the Irish National Nutrition Survey conducted in 1989 were used for the analyses and showed that the average diet is low in dietary fibre, with fruit and vegetables being only half the recommended level of 400 g. Comparisons of people with low or high intakes (from lowest and highest quartiles) of total fat (%energy), dietary fibre (g/MJ) and fruit and vegetables (g/day) show patterns of food intake differing in both the percentage of consumers and in the mean intakes among consumers only. This analysis provides data which may be useful as a first step towards the development of food-based dietary guidelines for Ireland. In particular, the low intake of fruit and vegetables in the adult Irish population deserves special attention.

Dietary guidelines: Food intakes: Ireland

The role of nutrition in public health in Ireland was first documented in 1984 with the publication of dietary guidelines on healthy eating to prevent cardiovascular disease and cancer (Food Advisory Committee, 1984). These initial guidelines were based on international scientific reports and were mainly quantitative, recommending, for example, that the diet should provide no more than 35 % of energy as fat. Considering the overall relationship between nutrition and health, together with the lack of availability of more recent data on Irish dietary intakes, qualitative food-based dietary guidelines were formulated for Ireland in 1995 (Nutrition Advisory Group, 1995). A summary of these recommendations, with reasons given in italics, is outlined as follows:

(1) Eat a wide variety of foods *to reduce risk of micronutrient inadequacy*.
(2) Balance energy intake with physical activity *to avoid overweight and obesity and achieve the health benefits of physical activity*.
(3) Eat plenty of fruit and vegetables (four servings or more a day) *because high intakes of these foods are associated with a lower risk of cardiovascular disease and cancer*.
(4) Eat starchy foods every day *to replace the energy deficit caused by fat intake reduction*.
(5) Avoid frequent intakes throughout the day of foods containing sugar *for better dental health – particularly relevant for children*.
(6) Reduce fat intakes especially saturated fats – while trans unsaturated fatty acid intakes should not increase further – and, finally, oily fish is recommended as a good source of unsaturated and essential fatty acids *to reduce the risk of cardiovascular disease*.

Further qualitative guidelines were formulated for specific sub-groups of the Irish population; for example, breast-feeding is recommended during the first months of life and an overall breast-feeding initiative of 50 % by the year 2000 has been set as a target for increasing rates of breast-feeding.

Quantitative guidelines on macronutrient intakes were not established for Ireland due to the lack of adequate information on nutrient intakes or on the rate of dietary change in recent years. In addition, the difficulty many people have in interpreting numeric targets and in estimating the extent of proposed change was another factor that led the Nutrition Advisory Group (1995) to favour qualitative guidelines. However, when more detailed information on nutritional intakes in Ireland becomes available, the setting of such quantitative targets for macronutrient intakes will be reconsidered because of their usefulness in the evaluation of dietary intake data (Nutrition Advisory Group, 1995).

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Table 1. Daily intakes of energy, fat, fibre, and fruit and vegetables by Irish men and women, aged 18–65 years (n = 715), plus healthy eating goals*

	Mean	SD	Median	Percentile 10th	Percentile 90th	Healthy eating goals
Nutrients and foods						
Total fat (%energy)	32·2	4·5	32·8	26·5	37·2	33
Fibre (total g)	18·8	9·1	16·8	9·3	29·7	≥ 25
Fibre MJ energy (g/MJ)	2·1	0·9	1·9	1·2	3·4	≥ 3
Fruit and vegetables (g)	199	157	164	50	389	≥ 400
Energy (kcals)	2244	868	2114	1230	3459	
Protein (%energy)	14·8	2·9	14·4	11·5	118·6	
Carbohydrate (%energy)	47·8	6·3	47·9	39·4	55·6	
Alcohol (%energy)	1·9	4·0	0	0	6·4	

* Typical goals for healthy eating derived from the dietary reference values for nutrients from the Department of Health, UK (1991) and the Netherlands Nutrition Council (1986).

The recent FAO/WHO consultation on food-based dietary guidelines (FBDG) recommends that dietary guidelines be based on, and aim to improve, current dietary practices and prevailing diet-related public health problems (Food and Agriculture Organization/World Health Organization 1996). This approach recognizes the diverse needs of sub-groups in the population, where advice on key food sources of nutrients in the overall national diet can have different outcomes in the sub-groups. For example, a low iron intake is prevalent among Irish women (Lee & Cunningham, 1990) – particularly those from socially disadvantaged backgrounds (Gibney & Lee, 1993). Advice to reduce fatty meat consumption to effect a reduction in fat intakes may be counter-productive for groups where this type of meat

Table 2. Mean daily nutrient and food intake of Irish adults, aged 18 years and above, with low (n = 178) and high (n = 179) relative fat intakes (% fat energy)

	Total population Low < 29·7% Mean	Total population High > 34·9% Mean	P	Consumers only Low < 29·7% % Cons	Consumers only Low < 29·7% Mean	Consumers only High > 34·9% % Cons	Consumers only High > 34·9% Mean	P
Energy (Kcals)	1959	2321	***					
Protein (%energy)	14·5	14·7	NS					
Carbohydrate (%energy)	57·9	48·5	NS					
Alcohol (%energy)	3·1	1·5	NS					
Total fat (%energy)	26·3	37·3	***					
Fibre (g/d)	18·0	18·2	NS					
Fibre (g/MJ)	2·3	1·9	*					
g/d								
Brown bread	59	54	NS	39	151	42	127	NS
White bread	61	87	***	59	104	79	109	NS
Potatoes	271	166	***	94	288	97	171	***
Rice	6	5	NS	13	47	14	37	NS
Pasta	1	4	*	7	17	15	26	NS
Porridge	21	15	NS	18	114	17	88	*
Breakfast cereals	41	37	NS	66	63	74	49	**
Whole milk	255	418	***	81	313	94	445	**
Semi-skimmed milk	47	30	*	13	345	6	482	NS
Cheese	4	6	**	22	20	38	16	NS
Margarine	4	5	NS	25	17	28	16	NS
Butter	8	12	*	49	16	60	20	NS
Yogurt	16	20	*	22	69	37	54	NS
Red meat	35	45	**	82	43	91	49	*
Meat products (bacon)	16	16	NS	70	23	75	21	NS
Sausages	5	7	*	36	14	64	11	*
Poultry	24	24	NS	58	41	62	38	NS
Offal	1	2	*	4	17	9	26	NS
Eggs	19	26	**	54	34	71	36	NS
Fish	15	18	NS	61	25	61	29	NS
Savoury snacks	2	5	*	18	12	34	14	NS
Sweets	14	5	**	18	75	28	19	*
Biscuits	9	23	***	39	22	64	36	**
Fruit	84	76	NS	70	120	74	103	NS
Vegetables	103	88	NS	99	104	98	90	NS

* P < 0·05, ** P < 0·01, *** P < 0·001.

Table 3. Mean daily nutrient and food intake of Irish adults, aged 18 years and above, with low ($n = 180$) and high ($n = 178$) fibre intakes (g/MJ)

	Total population			Consumers only				
	Low < 1·48 g/MJ	High > 2·48 g/MJ		Low < 1·48 g/MJ		High > 2·48 g/MJ		
	Mean	Mean	P	% Cons	Mean	% Cons	Mean	P
Energy (Kcals)	2480	1955	***					
Protein (%energy)	14·6	14·5	NS					
Carbohydrate (%energy)	47·2	48·5	*					
Alcohol (%energy)	3·3	1·6	NS					
Total fat (%energy)	32·6	31·4	*					
Fibre (g/d)	12·5	26·6	***					
Fibre (g/MJ)	1·2	3·4	***					
g/d								
Brown bread	21	123	***	25	85	67	184	***
White bread	93	40	***	83	113	47	85	***
Potatoes	203	201	NS	94	217	97	207	NS
Rice	6	3	NS	14	41	9	35	NS
Pasta	2	2	NS	7	22	9	19	NS
Porridge	14	16	NS	16	87	17	95	NS
Breakfast cereals	29	33	NS	53	55	61	54	NS
Whole milk	393	255	***	92	426	82	310	***
Semi-skimmed milk	38	61	**	7	528	17	362	NS
Cheese	3	6	***	21	13	39	16	NS
Margarine	5	4	NS	26	19	28	15	NS
Butter	11	7	**	61	18	46	15	NS
Yogurt	19	17	NS	26	51	27	64	NS
Red meat	39	42	NS	88	45	89	47	NS
Meat products (bacon)	18	13	NS	73	24	69	19	NS
Sausages	12	7	**	60	20	43	17	NS
Poultry	21	28	**	59	37	71	39	NS
Offal	3	2	NS	10	29	9	18	NS
Eggs	23	19	NS	60	39	60	31	NS
Fish	16	11	*	61	26	55	20	**
Savoury snacks	5	3	**	33	16	20	13	NS
Sweets	15	5	NS	27	58	21	21	*
Biscuits	21	14	NS	57	36	53	26	**
Fruit	53	114	***	61	86	83	136	***
Vegetables	73	117	***	96	76	98	119	***

*$P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

represents an important source of iron and leaner cuts are economically out of reach. Some of the difficulties in formulating specific FBDG therefore relate to the ultimate need for detailed information on dietary intakes – especially of vulnerable sub-groups in the population who may be under-represented in national nutrition surveys.

In this paper, nutrient intakes for the adult Irish population are compared to recommended intakes (guidelines) derived from dietary reference values for nutrients from the Department of Health, UK (1991) and the Netherlands Nutrition Council (1986). In addition, nutrient and food intake patterns are examined in sub-groups of the population at the lower and upper ends of the distribution for the intake of specific nutrients and foods.

Methods

The first Irish national food consumption (INNS) survey was conducted in 1989 (Lee & Cunningham, 1990). A second survey, the North-South food consumption survey, began in 1997 and data is currently being collected. The first results from this survey are expected at the end of 1999. Data from the 1989 survey will be used in this report.

The sample consisted of a probability sample from the population, of eight year olds and upwards, divided into three separate groups: adults, secondary and primary (junior) school students. Sampling of the adult population was through the electoral register while the school children were sampled from secondary and primary (national) schools. The three samples were selected independently of each other.

The 7 d diet history method was used to collect information on food consumption. This method, through an extensive interview, attempts to give a full picture of an individual's habitual intake in a typical week. Such a method depends on a person's ability to recall their usual meals and usual serving sizes. A food photographic atlas consisting of 120 foods commonly eaten in Ireland was used to help people quantify usual portion sizes. The actual amounts eaten were reported as fractions of the size of the food portion shown in the photograph. Individuals were also asked to describe where they ate their meals, at home or outside the home. To convert the food consumption data into dietary intake data, a computerized version of the McCance & Widdowson food tables (Holland et al. 1991) was used.

For this paper, analysis of the database was restricted to the adult population (≥ 18 years; n = 715). Subjects were

Table 4. Mean daily nutrient and food intake of Irish adults, aged 18 years and above, with low (n = 181) and high (n = 179) fruit and vegetable intakes

| | Total population | | | Consumers only | | | | |
| | Low < 81 g/d | High > 218 g/d | | Low < 81 g/d | | High > 218 g/d | | |
	Mean	Mean	P	% Cons	Mean	% Cons	Mean	P
Energy (Kcals)	2178	2293	NS					
Protein (%energy)	14·2	13·5	NS					
Carbohydrate (%energy)	48·6	49·9	NS					
Alcohol (%energy)	3·2	1·5	NS					
Total fat (%energy)	32·2	31·7	NS					
Fibre (g/d)	15·5	22·9	***					
Fibre (g/MJ)	1·7	2·6	***					
g/d								
Brown bread	36	87	***	29	124	58	150	*
White bread	88	70	**	82	107	58	121	NS
Potatoes	183	240	**	94	194	97	247	**
Rice	4	5	*	12	30	14	36	NS
Pasta	2	3	NS	9	17	11	26	**
Porridge	16	18	NS	15	101	18	102	NS
Breakfast cereals	7	40	**	53	57	63	63	NS
Whole milk	325	359	NS	94	346	85	420	*
Semi-skimmed milk	22	61	**	4	502	14	437	NS
Cheese	4	1	***	20	10	49	16	NS
Margarine	5	4	NS	33	15	22	16	NS
Butter	9	10	NS	55	17	56	19	NS
Yogurt	12	27	***	18	69	39	69	NS
Red meat	30	53	***	82	37	93	57	***
Meat products (bacon)	14	14	NS	73	19	69	21	NS
Sausages	10	5	**	57	17	37	16	NS
Poultry	19	29	***	57	33	69	43	**
Offal	2	2	NS	9	24	12	19	NS
Eggs	21	19	NS	64	33	56	33	NS
Fish	17	15	NS	64	27	57	26	NS
Savoury snacks	5	3	NS	36	15	25	13	NS
Sweets	8	7	NS	28	4	25	29	*
Biscuits	18	17	NS	57	31	58	30	NS
Fruit	7	195	***	32	21	97	201	***
Vegetables	44	138	***	94	46	99	139	***

* P < 0·05, ** P < 0·01, *** P < 0·001.

classified into quartiles, where such classification was based on the subject's intake compared to the intake levels of the rest of the study population. This was done for the nutrients: total fat (%energy) and dietary fibre (g/MJ) and the aggregated food group 'fruit and vegetables' (g/day). Then, in the lower and upper quartiles, the averaged population intake of energy and nutrients and the average consumption of different foods was calculated. Also, for the various foods, the percentage of consumers was calculated as well as the average consumption among consumers. Non-parametric statistical tests (Mann-Whitney Test) were used to determine differences between the lowest and highest quartile fractions of the population in nutrient and food intake, for both the total population and consumers only.

Results

Table 1 shows the energy and nutrient intakes and recommended intakes of adults in Ireland. The total contribution of fat to energy intake was just within the recommended level of 33 % in the adult Irish population as a whole. Fibre intake was about two-thirds of the recommended intake whether expressed as g/d or g/MJ. Fruit and vegetable intake was about half of the recommended intake. Dietary habits in Ireland result in nutrient and food intakes which differ considerably from the recommendations.

Table 2 compares nutrient and selected food intake in the lowest and highest quartiles of total fat intake (as a % of energy) for the total population and, in the case of foods, for consumers only. People from the lowest quartile had a lower intake of energy (MJ) and a higher intake of fibre (g/MJ) compared to those from the highest quartile. Alcohol intake (in %energy) was twice as high in those from the lowest quartile compared to the highest quartile. People in the lowest quartile of total fat intake (as %energy) had significantly lower mean intakes of white bread, pasta, red meat, sausages, offal, eggs, whole milk, butter, yogurt, cheese, savoury snacks and biscuits, and higher intakes of potatoes, semi-skimmed milk and sweets compared to people in the highest quartile.

The proportion of subjects consuming selected foods from the lowest and highest quartiles of total fat intake (as %energy) was also examined. In the lowest quartile there were fewer consumers of white bread, pasta, cheese, butter, yogurt, sausages, eggs, sweets and biscuits compared to the highest quartile. Among consumers only of specific foods in

the lowest quartile of percentage fat energy, intakes of potatoes, breakfast cereals, porridge, sweets and sausages were significantly higher while intakes of whole milk, red meat and biscuits were significantly lower compared to those in the highest quartile of percentage fat energy.

Table 3 shows the mean daily nutrient and food intakes of Irish adults with low and high fibre (g/MJ) intakes (lowest and highest quartiles of intakes) for the total population and, in the case of foods, for consumers only. People from the lowest quartile of fibre intake (g/MJ) had a higher energy and alcohol intake, with significantly more energy derived from fat and less from carbohydrate. People from the highest quartile had significantly higher intakes of brown bread, semi-skimmed milk, cheese, poultry, fruit and vegetables, and significantly lower intakes of white bread, whole milk, sausages, poultry and savoury snacks compared to those from the lowest quartile. In the highest quartile of fibre intake, a higher percentage of consumers was found for brown bread, semi-skimmed milk, cheese and fruit, and a lower percentage of consumers for white bread, butter, sausages and savoury snacks. Among consumers only from the lowest quartile of fibre intake (g/MJ), significantly lower intakes of brown bread, fruit and vegetables and higher intakes of white bread, whole milk, fish, sweets and biscuits were observed compared to those in the highest quartile.

Table 4 compares nutrient and selected food intake in the lowest and highest quartiles of fruit and vegetable intake (g/d) and in the case of foods, consumer only intakes are also shown. Mean macronutrient intakes (as %energy) were similar in both quartiles of fruit and vegetable intake. A lower fibre intake was observed in people from the lowest quartile of fruit and vegetable intake (g/d) compared to those from the highest. People in the highest quartile of fruit and vegetable intake had significantly higher mean intakes of brown bread, potatoes, rice, breakfast cereals, semi-skimmed milk, yogurt, red meat, poultry, fruit and vegetables and significantly lower intakes of white bread, cheese and sausages, compared to those in the lowest quartile. From the highest quartile of fruit and vegetable intake, a higher percentage of consumers of brown bread, breakfast cereals, semi-skimmed milk, yogurt, cheese, red meat, poultry and fruit and a lower percentage of consumers of sausages, eggs, fish and savoury snacks was observed compared to the lowest quartile. Among consumers only from the highest quartile of fruit and vegetable intake (g/d), higher intakes of brown bread, potatoes, whole milk, red meat, poultry, sweets, fruit and vegetables was observed compared to those in the lowest quartile.

Discussion

The most striking gap in the comparison between population intake and dietary recommendations in the Irish population was seen for the combined food group 'fruit and vegetables', where the mean intake was only 50 % of the recommended level of 400 g/d. The fruit and vegetable category included all fruits plus fruit juice and all vegetables excluding potatoes. When fruit juice was excluded from the category, the percentage of people achieving the goal of 400 g/d falls to just 5 %. These results suggest that efforts to

increase the level of fruit and vegetable consumption in Ireland should be a priority. While total population intakes and consumer only intakes of both the fruit group and the vegetable group were higher for people from the highest quartile of fruit and vegetable intake, the percentage consumers of fruit was three times higher, while the percentage consumers of vegetables was the same, in the highest quartile compared to the lowest. Thus, these data suggest that in order to increase consumption levels of fruit and vegetables, an emphasis on increasing the proportion of people consuming fruit is required. Further research, however, is required to determine the food patterns of particular population sub-groups before developing food-based dietary guidelines for these groups. Increased fibre intakes in this population are marked by a higher mean intake of brown bread, fruit and vegetables. To increase levels of dietary fibre, more people need to consume brown bread and fruit, and people who do consume brown bread, fruit and vegetables also need to consume more of them. Regarding fat intake, there are few foods which are consumed more frequently by those in the lowest quartile than by those in the highest quartile. This may represent a barrier to change, as it limits the scope for positive messages.

Food patterns associated with the lowest quartile of total fat intake (%energy) and the highest quartiles of dietary fibre (g/MJ) and fruit and vegetables (g/d) all differ with respect to the mean population intakes, consumer only intakes and the proportion of people consuming different foods, highlighting not only the complexity of different eating patterns but the possible difficulties that may arise when guidelines for several nutrients are considered together.

In using this database to examine patterns of food and nutrient intake among Irish people from the lowest and highest quartiles of intake for the nutrients, fat, dietary fibre and the food group 'fruit and vegetables' it is important to consider the methodology used and the quality of the data. Food habits can be expected to change rapidly – especially in industrialized countries where several new food products are launched every month. Therefore if FBDG were adopted, the need for evaluation and update of recommendations has to be considered. The database for this analysis is now almost 10 years old. Thus, it may not be an accurate reflection of the current pattern of nutrient and food intakes. This may be particularly true of certain food items which have increased in availability in the last decade.

Other shortcomings of this database which need to be considered are the lack of any data on fat composition, precluding any exploration of the relationship of fat composition to a change in total fat intake (%energy). Such information would be useful when developing food-based dietary guidelines. In addition, further breakdown of certain food groups would also be useful in this regard by providing further insight into the patterns of food intake among those achieving the guideline versus those who are not. In this database for example, margarine was an aggregated food group made up of full- and low-fat spreads.

One of the main limitations of the methodology used in the present study is that by using a comparison of the extremes of intake in relation to particular guidelines as a

basis for formulating FBDG, it primarily represents a high-risk approach. Interventions that are only directed at the individuals in high-risk quartiles can be expected to have less of an impact on the overall population due to the lower numbers involved at the extremes of intake. Thus, the applicability of FBDG that are developed using this high-risk approach to all individuals in the population may be questionable.

Nevertheless, in spite of these limitations, an analysis of the food consumption patterns for people from the lowest and highest quartiles of intake for selected nutrients and foods provides us with some clues which may be useful as a first step in the development of food-based dietary guidelines. Considerable differences emerged in the food patterns indicated for the three guidelines examined, which indicates why the simultaneous achievement of all guidelines may not be feasible. The analysis undertaken in the present study emphasizes the complex nature of how an enormous variety of foods can add up to form the whole diet.

In conclusion, the possibility of formulating food-based dietary guidelines from prevailing dietary intake patterns using total population and consumer only data represents a new and exciting opportunity for developing interim dietary guidelines on healthy eating. The advantage of issuing dietary advice in food terms is that it is more likely to result in being understood by the general public and health professionals. However, several methodological aspects of food pattern analysis remain to be developed first.

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