

Clues for the development of food-based dietary guidelines: how are dietary targets being achieved by UK consumers?

Steven J. Wearne* and Michael J. L. Day

Joint Food Safety and Standards Group, Ministry of Agriculture, Fisheries and Food, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR, United Kingdom

Expert scientific advice to the UK Government has been translated into eight general dietary guidelines, which form the core of population-based dietary advice in the UK and are supplemented by a food selection guide showing the types and proportions of foods needed for a balanced and healthy diet. Data from the Dietary and Nutritional Survey of British Adults were used to identify statistically significant differences between subgroups of the study population that met, or failed to meet, population nutritional goals for intakes of total fat, saturated fat and dietary fibre. Several eating habits – including greater consumption of starchy foods (particularly wholemeal varieties), greater consumption of fruit and the substitution of reduced-fat milk for whole-fat milk – were shared by the subgroups that met each of the nutritional goals. This analysis provides clues for any future refinement of food-based dietary guidelines.

Dietary fat: Dietary fibre: Dietary patterns: Food-based dietary guidelines: Saturated fat

Dietary guidelines, however they are presented and communicated, need to be based on a robust assessment of the available scientific information on diet and the maintenance of good health. This assessment needs to include an evaluation of the prevailing diet and nutrient intake compared to any recommended optimum. Any dietary guidelines developed as a result need then to be pragmatic – a stepwise approach may be needed to address any large disparities between actual and ideal dietary habits.

In the UK, scientific assessments are undertaken by the Committee on Medical Aspects of Food and Nutrition Policy (COMA), a committee of independent experts, which advises the Department of Health. COMA completed an extensive appraisal of the relevant science in 1991 with the publication of its report recommending Dietary Reference Values (DRVs) for a wide range of macro- and micronutrients (Department of Health, 1991). For fruits and vegetables, the World Health Organization recommendation of 400 g/d is roughly equivalent to the consumption of five portions per day, which is advised as a minimum target for UK consumers (World Health Organization, 1990; Health Education Authority, 1997).

The DRVs for total fat and saturated fat were formalized into nutritional goals by the 1992 'Health of the Nation' policy paper (Department of Health, 1992) and formed part of overall strategies to reduce the incidence of cardiovascular

disease. In each case, the target was for population averages to match the DRVs by 2005: 'to reduce the average percentage of food energy derived by the population from saturated fatty acids by at least 35 % by 2005 (from 17 % in 1990 to no more than 11 %)' and 'to reduce the average percentage of food energy derived by the population from total fat by at least 12 % by 2005 (from about 40 % in 1990 to no more than 35 %)'. Diet continues to be a part of the focus for action in meeting the new targets for reductions in cancer and cardiovascular disease proposed in the 1998 consultation paper 'Our Healthier Nation' (Department of Health, 1998).

Advice from COMA, including that on DRVs, has been translated into the following eight guidelines, which are disseminated through a guide for nutrition educators (Health Education Authority, 1997) and a series of posters and booklets aimed at the general public: (i) enjoy your food; (ii) eat a variety of different foods; (iii) eat the right amount to be a healthy weight; (iv) eat plenty of foods rich in starch and fibre; (v) eat plenty of fruit and vegetables; (vi) don't eat too many foods that contain a lot of fat; (vii) don't have sugary foods and drinks too often; and (viii) if you drink alcohol, drink sensibly. In order to make healthy eating easier to understand, the guideline 'eat a variety of different foods' is supplemented by a food selection guide, entitled *The Balance of Good Health*, which is in the form of a tilted plate and shows the types and proportions of foods needed

* **Corresponding author:** Steven Wearne, Ministry of Agriculture, Fisheries and Food, Room 429B, Ergon House, c/o Nobel House, 17 Smith Square, London SW1P 3JR. fax +44 (0)171 238 5778, email s.wearne@jfssg.maff.gov.uk

for a balanced and healthy diet. The following five categories of foods are represented: fruit and vegetables (33 % of the area of the plate); bread, other cereals and potatoes (33 %); milk and dairy foods (15 %); meat, fish and alternatives (12 %); and foods containing fat, foods containing sugar (8 %). Research has shown that exposure to such a food selection guide, even if only briefly, can have a significant effect on people's understanding of healthy eating messages – particularly on how foods can be divided into groups, and the proportion of foods from the different groups that should be consumed (Hunt *et al.* 1995). The food selection guide was introduced in July 1994 and, although not the only model of its kind (World Health Organization, 1998), it has become widely accepted and used, mainly as a result of an active ongoing promotion to health professionals and educators by the Health Education Authority (Research and Auditing Services Ltd, 1997).

The UK national healthy eating guidelines are similar to those proposed for many other Northern European countries. However, there are also some marked differences between national guidelines. This is unsurprising, as the variations in dietary habits across Europe are such that it is more appropriate and effective to address these issues at a national or even sub-national level (World Health Organization, 1998). For example, in the UK the emphasis put on the need to reduce consumption of fat and saturated fat, and to increase consumption of fruit and vegetables, would be inappropriate in Mediterranean countries where consumption of these nutrients and foods by large subgroups of the population is much closer to what is considered to be ideal. Therefore, the materials produced in the UK and the way in which the message is disseminated reflect not only the particular nutritional needs and status of various population groups, on which there is a large degree of international consensus, but also the particular cultural and other circumstances of the UK.

Recently, proposals have been made for international collaboration in the setting of food-based dietary guidelines (World Health Organization, 1998). This paper gives an insight into the dietary habits adopted by UK consumers who are successful in meeting current nutritional benchmarks, thereby providing clues for the development of future food-based dietary guidelines that would be relevant to the UK.

Experimental methods

Source of dietary intakes data

Dietary intakes data used in this paper are taken from the Dietary and Nutritional Survey of British Adults aged 16 to 64 years (Gregory *et al.* 1990). Although this is now somewhat dated, the field work having been conducted in 1986–1987, the 7 d weighed diary record methodology used in the survey and the relatively large sample size of 2197 British adults provide robust data on dietary habits at that time. An assessment of the quality of the data from the survey in terms of recorded energy intakes concluded that these were broadly consistent with those from other surveys of the general population. Although there was evidence that the recorded intake under-represented habitual intakes, there was no evidence from the data that under-reporting or

modification of habitual diets were confined to particular subgroups of the sample (Gregory *et al.* 1990).

Sources of nutritional goals

The goals for total fat and saturated fat used in this paper are those recommended by COMA (Department of Health, 1991). For dietary fibre, there is the complication of the DRV being expressed in terms of non-starch polysaccharide and the dietary survey data being based on fibre measured by the Southgate method (Southgate, 1969). For the purposes of this paper, we have assumed that the DRV is equivalent to 50 g/d of Southgate fibre.

Definition of food intake patterns

The objective of this paper is the identification of dietary habits adopted by groups of UK consumers who are successful in meeting current recommended nutrient intakes. The first step in this process is the identification of groups in the study population who (i) met the relevant nutritional goal(s) over the study period (these are termed 'compliers'), and (ii) did not meet the nutritional goal(s) (these are termed 'non-compliers').

The approach taken has been described elsewhere (MAFF, 1994). In summary, the intakes of total fat or saturated fat by each of the individuals in the study group were ranked from lowest and highest. Starting from the lowest intake, successive individuals were added until the addition of one more subject caused the average of the group to exceed the DRV. The approach taken for dietary fibre was the same, except intakes were ranked from highest to lowest and successive individuals added until addition of one more subject caused the average intake to fall below the DRV. This approach gave, in each case, the maximum size of subgroup of 'compliers' who met the population target, although some of the individuals in the group of 'compliers' for fat or saturated fat would have intakes that exceeded the nutritional goal, and some of the individuals in the group of 'compliers' for dietary fibre would have intakes that fell short of this nutritional goal.

T-tests were used to compare the consumption of each food type by the subgroup of 'compliers' to consumption by the subgroup of 'non-compliers' and statistically significant differences ($P < 0.05$) were noted. These comparisons are indicative of where the most significant differences lie, but should be interpreted with some caution as they do not take into account the correlations that result from the inherent causative nature of, for example, increased high-fibre breakfast cereal consumption on overall intakes of dietary fibre. This approach has two advantages over the use of set quantiles of the study population to address the objective of this paper: (i) the division of the study population into subgroups is not arbitrary, instead it explicitly uses the DRV to differentiate between the subgroups; and (ii) the approach is consistent with the theoretical derivation of DRVs for total fat, saturated fat and dietary fibre, which are population averages, *not* targets for individuals (Department of Health, 1991).

Table 1 characterizes the study population in terms of average intakes of total fat, saturated fat, fibre and consumption of fruit and vegetables (Gregory *et al.* 1990). It

Table 1. Measures of intakes of total fat, saturated fat and fibre and of consumption of fruit and vegetables by the study population, and their comparison to Dietary Reference Values and nutritional goals for these nutrients and foods

	Total fat	Saturated fat	Dietary fibre	Fruit and vegetables
Nutritional goal	33%energy	10%energy	30 g/d fibre by Southgate	400 g/d
Men				
Mean intake or consumption	38%energy	15%energy	25 g/d	253 g/d
Proportion of individuals in the study group who met the goal	17%	3.3%	25%	ND
Proportion of individuals in 'compliers' group	41%	9.4%	55%	ND
Women				
Mean intake or consumption	39%energy	17%energy	19 g/d	242 g/d
Proportion of individuals in the study group who met the goal	11%	2.3%	5.6%	ND
Proportion of individuals in 'compliers' group	31%	4.9%	23%	ND

ND: not determined.

also provides details of the number of individuals who met the DRVs, and the numbers in the 'compliers' and 'non-compliers' subgroups that were generated for each nutrient by application of the above methodology.

Results

Total fat intakes

There were statistically significant ($P < 0.05$) differences in consumption of a number of food groups between 'compliers' and 'non-compliers' (Table 2). In general, the subgroup complying with the dietary target on total fat tended, unsurprisingly, to follow the general healthy eating advice disseminated by Government and health education agencies.

Both men and women 'compliers' consumed significantly more reduced-fat milk (in terms of both the proportion of consumers and their mean intake) and less whole milk than 'non-compliers'. 'Compliers' who consumed less of other animal products (meat, poultry and eggs), more fruit, fewer biscuits, cakes, pastries and savoury snacks, and more alcoholic drinks than 'non-compliers'. Women 'compliers' (but not men) ate significantly more starchy foods and sugary foods than 'non-compliers'. With the exception of milk and alcoholic drinks, these differences in absolute terms are relatively small; for example the mean consumption of meat, poultry and eggs by 'non-compliers' was just 15% higher than the mean consumption of these foods by 'compliers'.

Saturated fat intakes

Dietary patterns of 'compliers' and 'non-compliers' are compared in Table 3. Statistically significant differences in habits between the two subgroups, defined in terms of saturated fat intakes, were similar to those observed when the subgroups were defined in terms of total fat intakes.

Both men and women 'compliers' consumed significantly less whole milk, in terms of both the mean intake and proportion of consumers and their mean intake, than 'non-compliers'. Women 'compliers' (but not men) consumed significantly more reduced-fat milk than 'non-compliers'. As a result, the consumption of all dairy products was significantly higher in men 'non-compliers' than in men 'compliers'.

'Compliers' of both sexes ate significantly less meat and alternatives than 'non-compliers', with the greatest part of this difference being due to differences in consumption of meat and poultry between the groups. They also ate significantly fewer biscuits, cakes and pastries.

Women 'compliers' (but not men) ate significantly fewer savoury snacks and chips than 'non-compliers'. Men 'compliers' (but not women) consumed significantly more alcoholic drinks than 'non-compliers', with the greatest part of this difference due to differences in consumption of beverages in the 'beer, cider and perry' group.

Dietary fibre intakes

Table 4 compares the dietary habits of subgroups of men and women which as a whole met or did not meet the target of at least 30 g/d of dietary fibre (measured by the Southgate method). Although the overall food groups used in this analysis are the same as those used for comparisons between groups based on total fat and saturated fat intakes, these food groups have been split into different subgroups that are more informative for this particular analysis (e.g. splitting breakfast cereals into high-fibre and other varieties). A number of statistically significant differences were again observed between 'compliers' and 'non-compliers'.

'Compliers' of both sexes ate significantly more starchy foods than 'non-compliers'. Within this group of foods, there were significantly higher levels of consumption by 'compliers', both in terms of the proportion of consumers and their mean intake, for wholemeal bread and high-fibre breakfast cereals. For women 'compliers', the analysis was consistent with these higher levels of consumption of wholemeal bread being caused by substitution for white bread. Significantly higher consumption of other breads and potatoes (other than fried) by men and women 'compliers', when compared to 'non-compliers', also contributed to the observed differences in levels of consumption of starchy foods between the two groups. The proportion of consumers and their mean intakes also contributed to significantly higher levels of consumption of fruit and of nuts and pulses by both men and women 'compliers'. Although there were no differences in the proportion of 'compliers' and 'non-compliers' who consumed vegetables during the 7 d study

Table 2. Dietary patterns of subgroups of men and women that as a whole met the population target ('compliers') or did not meet the population target ('non-compliers') of no more than 33% energy from total fat. Mean food intake is given in grams per day. Figures in italics indicate a significant difference in consumption of that food by 'compliers' and 'non-compliers' ($P < 0.05$)

	Men												Women											
	Compliers (n = 446)						Non-compliers (n = 641)						Compliers (n = 345)						Non-compliers (n = 765)					
	Mean food intake			% who consumed in 7 days			Mean food intake			% who consumed in 7 days			Mean food intake			% who consumed in 7 days			Mean food intake			% who consumed in 7 days		
	Consumers only	Consumers	All compliers	Consumers only	Consumers	All non-compliers	Consumers only	Consumers	All compliers	Consumers only	Consumers	All non-compliers	Consumers only	Consumers	All compliers	Consumers only	Consumers	All non-compliers	Consumers only	Consumers	All non-compliers	Consumers only	Consumers	All non-compliers
Bread	137	190	136	100	132	132	132	132	100	132	132	132	100	86	85	85	99	85	85	85	99	85	85	84
Breakfast cereals	48	37	37	76	45	34	34	34	76	45	34	34	77	38	29	33	76	33	33	33	76	33	33	25
Potatoes (not fried)	97	87	87	90	88	80	80	80	90	88	80	80	91	65	59	61	91	61	61	61	91	61	61	55
Pasta and rice	56	27	27	49	56	28	28	28	49	56	28	28	48	43	21	39	46	39	39	39	46	39	39	18
All starchy foods	288	287	287	100	274	274	274	274	100	274	274	274	100	194	194	183	100	183	183	183	100	183	183	183
Whole milk	190	163	163	91	216	197	197	197	91	216	197	197	82	136	112	179	90	179	179	179	90	179	179	161
Reduced-fat milk	205	82	82	29	165	48	48	48	29	165	48	48	52	179	92	136	36	136	136	136	36	136	136	49
Cheese and dairy desserts	32	26	26	84	34	29	29	29	84	34	29	29	83	41	34	33	85	33	33	33	85	33	33	28
All dairy products	273	270	270	99	276	274	274	274	99	276	274	274	98	243	238	240	99	240	240	240	99	240	240	238
Meat and poultry	170	169	169	99	195	193	193	193	99	195	193	193	98	109	107	125	98	125	125	125	98	125	125	122
Eggs	30	24	24	84	34	29	29	29	84	34	29	29	76	22	17	26	79	26	26	26	79	26	26	20
Fish and shellfish	40	30	30	76	41	31	31	31	76	41	31	31	75	30	23	30	77	30	30	30	77	30	30	23
Nuts and pulses	35	21	21	56	32	18	18	18	56	32	18	18	53	26	13	22	52	22	22	22	52	22	22	11
All meat and alternatives	244	243	243	100	270	270	270	270	100	270	270	270	100	160	160	178	99	178	178	178	99	178	178	177
Vegetables	132	131	131	98	133	131	131	131	98	133	131	131	100	116	116	113	99	113	113	113	99	113	113	112
Fruit	143	115	115	81	116	93	93	93	81	116	93	93	89	162	144	121	87	121	121	121	87	121	121	105
All vegetables and fruit	248	246	246	100	225	225	225	225	100	225	225	225	100	260	260	218	100	218	218	218	100	218	218	217
Biscuits, cakes, etc.	85	77	77	93	101	95	95	95	93	101	95	95	91	69	63	79	95	79	79	79	95	79	79	76
Sugary foods	127	120	120	97	125	121	121	121	97	125	121	121	92	113	104	88	93	88	88	88	93	88	88	82
Savoury snacks and chips	79	72	72	95	87	83	83	83	95	87	83	83	85	50	43	55	90	55	55	55	90	55	55	49
Fats and beverages	671	670	670	100	707	707	707	707	100	707	707	707	100	602	602	630	100	630	630	630	100	630	630	630
Diet soft drinks	106	11	11	12	98	12	12	12	12	98	12	12	24	113	27	16	18	89	89	89	18	89	89	16
Cream and sweetened milk	19	7	7	45	17	8	8	8	45	17	8	8	39	28	11	16	47	16	16	16	47	16	16	8
All occasional foods	957	957	957	100	1025	1025	1025	1025	100	1025	1025	1025	100	849	849	860	100	860	860	860	100	860	860	860
Spirits and liqueurs	31	9	9	22	19	4	4	4	22	19	4	4	26	21	5	14	25	14	14	14	25	14	14	3
Wine	92	28	28	30	72	22	22	22	30	72	22	22	39	72	29	68	34	68	68	68	34	68	68	23
Fortified wine	48	5	5	9	31	3	3	3	9	31	3	3	22	30	7	24	18	24	24	18	24	24	24	4
Beer, cider and perry	1066	796	796	61	452	273	273	273	61	452	273	273	33	252	82	156	25	156	156	156	25	156	156	40
All alcoholic drinks	1013	838	838	72	420	302	302	302	72	420	302	302	66	185	123	121	59	121	121	121	66	121	121	71

Table 3. Dietary patterns of subgroups of men and women that as a whole met the population target ('compliers') or did not meet the population target ('non-compliers') of no more than 10% energy from saturated fat. Mean food intake is given in grams per day. Figures in italics indicate a significant difference in consumption of that food by 'compliers' and 'non-compliers' ($P < 0.05$)

	Men						Women					
	Compliers (n=446)			Non-compliers (n=641)			Compliers (n=345)			Non-compliers (n=765)		
	Mean food intake		% who consumed in 7 days	Mean food intake		% who consumed in 7 days	Mean food intake		% who consumed in 7 days	Mean food intake		% who consumed in 7 days
	Consumers only	All compliers		Consumers only	All non-compliers		Consumers only	All compliers		Consumers only	All non-compliers	
Bread	139	135	100	134	133	98	77	76	99	86	85	
Breakfast cereals	50	37	76	46	35	74	54	40	77	34	26	
Potatoes (not fried)	108	90	91	90	82	85	59	50	91	62	57	
Pasta and rice	66	35	49	55	26	52	55	29	47	40	18	
All starchy foods	301	298	100	278	278	100	194	194	100	186	186	
Whole milk	111	81	91	214	193	67	58	39	88	171	151	
Reduced-fat milk	214	103	32	180	58	65	196	127	40	149	59	
Cheese and dairy desserts	28	20	84	34	28	76	49	38	85	35	30	
All dairy products	212	204	99	281	280	91	224	203	99	242	240	
Meat and poultry	169	163	99	186	185	94	98	92	98	121	119	
Eggs	32	24	83	33	27	72	20	15	78	25	19	
Fish and shellfish	45	34	76	40	30	74	36	27	76	30	23	
Nuts and pulses	34	19	58	34	19	50	32	16	52	23	12	
All meat and alternatives	242	240	100	261	261	96	155	150	100	173	173	
Vegetables	155	151	99	131	129	100	134	134	99	113	112	
Fruit	155	117	81	124	101	93	202	187	87	130	114	
All vegetables and fruit	276	268	100	230	230	100	321	321	100	226	226	
Biscuits, cakes, etc.	78	63	93	96	90	85	54	46	94	77	73	
Sugary foods	128	118	96	126	121	89	108	96	93	95	89	
Savoury snacks and chips	78	71	94	84	79	76	39	30	89	54	48	
Fats and beverages	613	607	100	701	701	100	540	540	100	625	625	
Diet soft drinks	116	16	11	100	11	31	103	32	19	98	19	
Cream and sweetened milk	35	10	42	17	7	41	54	22	45	18	8	
All occasional foods	885	885	100	1009	1009	100	766	766	100	861	861	
Spirits and liqueurs	37	8	25	24	6	28	14	4	25	16	4	
Wine	133	33	31	76	24	41	101	41	36	67	24	
Fortified wine	93	6	10	35	4	28	26	7	19	26	5	
Beer, cider and perry	1677	1167	66	633	417	30	269	80	28	187	52	
All alcoholic drinks	1566	1213	76	591	451	61	216	132	61	138	85	

Table 4. Dietary patterns of subgroups of men and women that as a whole met the population target ('compliers') or did not meet the population target ('non-compliers') of at least 30 grams per day of dietary fibre (measured by the Southgate method). Mean food intake is given in grams per day. Figures in italics indicate a significant difference in consumption of that food by 'compliers' and 'non-compliers' ($P < 0.05$)

	Men						Women					
	Compliers (n=446)			Non-compliers (n=641)			Compliers (n=345)			Non-compliers (n=765)		
	Mean food intake		% who consumed in 7 days	Mean food intake		% who consumed in 7 days	Mean food intake		% who consumed in 7 days	Mean food intake		% who consumed in 7 days
	Consumers only	All compliers		Consumers only	All non-compliers		Consumers only	All compliers		Consumers only	All non-compliers	
White bread	101	85	94	89	83	73	45	33	57	51		
Wholemeal bread	91	56	33	33	11	82	65	53	33	16		
Other bread	41	18	31	26	8	56	32	18	25	12		
Pasta and rice	57	42	70	53	37	75	43	32	39	27		
High-fibre breakfast cereals	47	24	25	47	8	69	40	28	33	9		
Other breakfast cereals	25	8	28	19	5	25	17	4	16	5		
Potatoes (not fried)	104	96	87	76	67	93	73	68	59	53		
All starchy foods	330	330	100	219	218	100	236	236	171	171		
Whole milk	217	192	90	192	172	85	164	140	167	147		
Reduced-fat milk	195	78	26	163	42	53	140	101	137	51		
Cheese and dairy desserts	38	33	78	27	21	89	47	42	31	26		
All dairy products	305	303	99	237	235	99	285	283	228	224		
Meat and poultry	191	189	100	176	176	96	122	117	120	117		
Eggs	34	28	81	31	25	78	26	20	24	19		
Fish and shellfish	40	32	71	40	28	80	33	27	29	22		
Nuts and pulses	38	25	49	26	13	63	28	18	21	10		
All meat and alternatives	274	274	100	242	242	100	182	181	169	168		
Vegetables	156	155	98	104	102	100	163	163	99	99		
Fresh fruit	83	62	48	47	23	93	100	92	56	38		
Canned fruit and other fruit	98	70	57	77	44	87	119	103	81	57		
All vegetables and fruit	287	287	99	170	168	100	358	358	193	193		
Biscuits, cakes, etc.	112	107	87	72	63	98	105	103	67	62		
Savoury snacks and chips	87	83	92	79	73	83	49	41	54	49		
Beverages & sugary foods	869	869	100	743	744	100	771	771	692	692		
Diet soft drinks	97	12	10	108	11	20	104	21	97	19		
Cream and sweetened milk	19	9	34	17	6	59	24	14	18	7		
All occasional foods	1079	1079	100	897	897	100	950	950	829	829		
Spirits and liqueurs	20	5	26	30	8	23	14	3	17	4		
Wine	72	25	26	94	24	44	70	31	69	23		
Fortified wine	31	4	8	52	4	25	27	7	26	5		
Beer, cider and perry	659	441	66	830	545	27	148	40	204	57		
All alcoholic drinks	603	473	74	789	581	67	120	80	150	89		

period, mean intakes of vegetables by 'compliers' were significantly higher.

There was also some evidence that people with higher fibre intakes also have healthier dietary habits in general. The proportion of the subgroup that consumed reduced-fat milks and the mean intakes of these products by the people who consumed them were both significantly higher for 'compliers' than for 'non-compliers'.

The analysis may have been in part confounded by the observation that fibre 'compliers' consumed significantly more food and drink overall than fibre 'non-compliers' (4275 g/d vs. 3797 g/d for men; 3078 g/d vs 2562 g/d for women). Indeed, there were significantly higher levels of consumption of beverages and sugary foods amongst 'compliers' when compared to 'non-compliers', which would not have been expected *a priori*. If these differences in overall food and drink consumption were to be mirrored by differences in total energy intake between 'compliers' and 'non-compliers', this confounding effect might then be reduced by conducting the analysis not in terms of absolute intakes of dietary fibre, but in terms of intakes of dietary fibre per unit of energy. This and other potential confounders, such as differential under-reporting of foods, are discussed in other papers in this volume.

Discussion

Dietary habits consistent with the attainment of nutritional goals

Comparing the above initial analyses of the dietary habits of the different subgroups who meet different nutritional goals allows certain achievable dietary behaviours to be distinguished that are consistent with all three goals – a lower intake of total fat and saturated fat, and a higher intake of dietary fibre. These suggest themselves as natural targets for any refinement of food-based dietary guidelines relevant to the UK population, and may be summarized as: eat more starchy foods (particularly wholemeal varieties), more fruit, and substitute reduced-fat milk for full-fat milk. This is consistent with existing evidence that such a pattern of dietary behaviour is consistent with improved patterns of nutrient intake.

The above analysis also indicates that, for men, a relatively higher consumption of alcoholic beverages is consistent with attainment of the nutritional benchmarks. In terms of dietary fibre goals, analysed here in terms of absolute intakes, this is consistent with the observation that fibre 'compliers' consumed significantly more food and drink overall than fibre 'non-compliers', discussed above. For total and saturated fat targets, which have been analysed in terms of the percentage contribution these nutrients make to total energy intake, the result is unsurprising as alcohol is energy dense and the consumption of alcohol with, say, a meal is likely to significantly increase the overall energy intake from that meal thus significantly decreasing the proportion of the energy intake from nutrients other than alcohol. In terms of alcohol and health, the effects of unwise alcohol consumption have been well documented and, increasingly, the potentially beneficial effects of moderate alcohol consumption for some sectors of the population are

being described. These, together with an acknowledgement of the particular social and cultural associations of alcohol consumption, have led to specific public health advice on alcohol consumption being considered in a wider context, taking into account the extensive and disparate evidence on alcohol and health (Department of Health, 1995).

The role of food-based dietary guidelines in campaigns to promote dietary change

It is increasingly asked whether population-based campaigns promoting dietary change have actual effects on dietary habits. Although there is a wealth of information from intensive individual or small-group interventions in a clinical setting, these do not provide information that is applicable to large-scale community or population-based interventions.

Recent cross-sectional studies have indicated that increased activity in promulgating population-based health promotion programmes has coincided in time with large-scale changes in population behaviours (Turrell, 1997). Evidence from the UK is consistent with these findings. Data from the annual National Food Survey (MAFF, 1997) allows year-on-year changes in average population intakes to be assessed. These show that the average percentages of food energy derived from total fat and saturated fat have declined steadily in the decade since 1986, when fieldwork for the Dietary and Nutritional Survey of British Adults described in this paper was conducted, from 42.6 % to 39.7 % for total fat and 17.7 % to 15.4 % for saturated fat. We would therefore expect considerably larger proportions of the population than the proportions given in Table 1 now to be meeting nutritional goals. In addition to these temporal associations, there is also a large degree of consistency in cross-sectional studies that associate healthy dietary behaviours with a knowledge of dietary guidelines.

Together, these studies are insufficient to establish whether health promotion programmes are causally linked to positive changes in dietary behaviour. Evidence from a recent large-scale longitudinal study (Patterson *et al.* 1996) suggests that different types of information may lead to positive changes in dietary behaviour at different stages in individuals' receptivity to the information. Interventions presenting information on the connection between diet and chronic disease may aid the initiation of dietary change in adults contemplating such a change, whereas information on food composition (such as is provided in food-based dietary guidelines like *The Balance of Good Health*) may help adults already making dietary changes to achieve their nutritional goals. Although considerable caution would need to be exercised in extrapolating these findings to different national and cultural groups, they provide some reassurance that food-based dietary guidelines have a role to play in effective population-based health promotion.

Acknowledgements

The authors would like to acknowledge the help provided by Gillian Smithers (MAFF) in checking the definitions of food groups used in this paper, and also other colleagues in MAFF and the Department of Health for their critical evaluation of the manuscript.

References

- Department of Health (1991) *Report on Health and Social Subjects 41: Dietary Reference Values for Food Energy and Nutrients for the United Kingdom*. Report of the Panel on Dietary Reference Values of the Committee on Medical Aspects of Food Policy. London: HM Stationery Office.
- Department of Health (1992) *The Health of the Nation: A Strategy for Health in England*. Cm1986. London: HM Stationery Office.
- Department of Health (1995) *Sensible Drinking: The Report of an Inter-Departmental Working Group*. London: Department of Health.
- Department of Health (1998) *Our Healthier Nation: A Contract for Health*. Cm3852. London: The Stationery Office.
- Gregory J, Foster K, Tyler H & Wiseman H (1990) *The Dietary and Nutritional Survey of British Adults*. London: HM Stationery Office.
- Health Education Authority (1997) *Eight Guidelines for a Healthy Diet: A Guide for Nutrition Educators*. Abingdon: Health Education Authority (in association with the Ministry of Agriculture, Fisheries and Food and the Department of Health).
- Hunt P, Gatenby S & Rayner M (1995) The format for the National Food Guide: performance and preference studies. *Journal of Human Nutrition and Dietetics* **8**, 335–352.
- MAFF (Ministry of Agriculture, Fisheries and Food) (1994) *The Dietary and Nutritional Survey of British Adults: Further Analysis*. London: HM Stationery Office.
- MAFF (Ministry of Agriculture, Fisheries and Food) (1997) *National Food Survey 1996*. London: The Stationery Office.
- Patterson RE, Kristal AR & White E (1996) Do beliefs, knowledge and perceived norms about diet and cancer predict dietary change? *American Journal of Public Health* **86**, 1394–1400.
- Research and Auditing Services Ltd (1997) *Balance of Good Health comparative research: final report*. Unpublished report prepared for the Health Education Authority.
- Southgate DAT (1969) Determination of carbohydrates in foods. II. Unavailable carbohydrates. *Journal of the Science of Food and Agriculture* **20**, 331–335.
- Turrell G (1997) Compliance with the Australian dietary guidelines in the early 1990s: have population-based health promotion programs been effective? *Nutrition and Health* **11**, 271–288.
- World Health Organization (1990) *Diet, nutrition and the prevention of chronic diseases: report of a WHO Study Group*. Technical Report Series no. 797. Geneva: WHO.
- World Health Organization (1998) *Preparation and use of food-based dietary guidelines: report of a joint FAO/WHO consultation*. Technical Report Series no. 880. Geneva: WHO.