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Nutrient intakes in socially disadvantaged groups in Ireland

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Social disadvantage is a major risk factor for ill health, in terms of both morbidity and mortality, at all ages (Syme & Berkman, 1976; Morris, 1979; Department of Health and Social Security, 1980; Holme *et al.* 1980; Whitehead, 1988).

In general children from the lower social classes tend to have lower birth weights (Alberman, 1981; Dowding, 1982), to be shorter and lighter than children from higher social classes (National Nutrition Survey, 1953; Owen *et al.* 1974; Department of Health and Social Security, 1975; Garn & Clark, 1975; Nelson & Naismith, 1979; Donnet *et al.* 1981; Hoey *et al.* 1987), and to have a higher caries experience (Hausen *et al.* 1982; Fergusson & Horwood, 1986; Mansbridge & Brown, 1986; Truin *et al.* 1986). There are indications in some countries that social class differences in height have diminished with improvements in socio-economic circumstances (Lindgren, 1976; Jones *et al.* 1985). However, recent growth data in Ireland show that in the lower socio-economic groups, children are still shorter at all ages than in the higher socio-economic groups (Hoey *et al.* 1987).

Examples of the social class gradient in disease incidence and mortality rates, at all ages, were seen in the Black report published in Britain in 1980 (Department of Health and Social Security, 1980) and in a follow-up report in 1988 (Whitehead, 1988). Both these reports also highlighted the fact that despite general improvements in living conditions in recent decades there has been a widening in health inequalities between social groups, especially in adults.

Several researchers have attempted to explain this social gradient in health by examining the relative exposure of socially disadvantaged groups to known risk factors, such as, smoking, alcohol intake, stress, and poor diet, but findings have rarely indicated simple relationships between the variables, particularly in the case of diet. For example, elevated levels of blood pressure and blood cholesterol are both risk factors for coronary heart disease and both these are associated with diet. But, when Cade *et al.* (1988) investigated the social class differences found in adult mortality rates from coronary heart disease, they found that differences in diet in middle age, in particular consumption of energy or fat, did not account for the difference in disease incidence. They suggest that the explanation may lie more in the differences in health and development of children in the past than in the quality of adult diets at present.

In general, findings from studies investigating differences in nutrient intakes between social classes have not been consistent. Some studies have shown no differences (Cook *et al.* 1973), while in the United States it was found that the absolute intakes of all nutrients decreased with decreasing income (Ten State Nutrition Survey (TSNS), 1973; Owen *et al.* 1974; Owen & Owen, 1982). When the nutrient densities of these diets were calculated, it was discovered that the dietary problems of the lower socio-economic groups were related more to low food intakes rather than to the quality of their food. On the other hand, studies in Britain in the 1970s found that children from lower

socio-economic groups consumed approximately 418–544 kJ (100–130 kcal)/d more than their more affluent peers (Bransby & Fothergill, 1954; Department of Health and Social Security, 1975; Black *et al.* 1976; Donnet *et al.* 1981). The inverse relationship in energy intakes has been attributed, in part, to the differences in energy expenditure associated with differences in social environment (Black *et al.* 1976). Nelson & Paul (1981) suggested that the social and physical environment may act as a limiting factor on the effectiveness of diet in promoting growth and health, and that as a result more food may be necessary to sustain normal growth.

A number of recent Irish dietary studies have focused on low socio-economic groups or have included these groups in their study sample (McSweeney & Kevany, 1982; Health Education Bureau, 1987; County Dublin Vocational Educational Committee, 1988; Lee, 1988; Lee & Gibney, 1988; McLoughlin, 1988; Van Leishout, 1988). The purpose of the present review is to examine the findings of these studies, as they relate to different age-groups, and try to highlight the dietary problems which have been found to be associated with social disadvantage in this country.

INFANTS

Although there has been a general resurgence in breast-feeding in developed countries over the past 10–20 years, a distinct social class gradient has been observed with a significantly higher rate found among better-educated mothers from higher social groups (Martinez & Nalezienski, 1979, 1981; Wharton, 1981; Black, 1983; Tanaka *et al.* 1987). In the national survey of infant feeding practices in Ireland (McSweeney & Kevany, 1982) 32% of mothers were breast-feeding on discharge from hospital but the value for social groups 5 and 6 (non-skilled manual and unemployed) was only 17%. A follow-up survey in 1985 (Health Education Bureau, 1987) indicated that the situation had not improved since the earlier study. Similar findings were reported from a Dublin Maternity Hospital (Joyce *et al.* 1984). Results from a recent study (Lee, 1988) show that in the most disadvantaged areas of Dublin, breast-feeding is practically non-existent, with only three of the 193 infants studied being breast-fed. Studies of infant feeding practices in lower socio-economic groups in Glasgow have shown similar findings (Donnet *et al.* 1981; McKillop & Durnin, 1982; Angove, 1984).

Social class differences were also evident in the age at which cow's milk replaced formula milk and also the age at which solid foods were first introduced. In a lower socio-economic group studied by Lee (1988) 37% of infants had been weaned to cow's milk before 8 weeks and 49% before 12 weeks, whereas, in the national survey of mixed socio-economic-group infants (McSweeney & Kevany, 1982) only 17% had been weaned to cow's milk by 8 weeks, rising to 30% at 16 weeks. A similar pattern was observed, in these studies, in the age at which solid foods were introduced; 47% of the low-socio-economic-group infants had been given solid food before 3 months compared with only 26% of the mixed socio-economic group. Another disturbing fact to emerge was that only 9% of the low socio-economic-group infants, who had been transferred to cow's milk at an early age, had received vitamin supplements. Most of these infants had been given rusks or sometimes baby rice in the milk feeds presenting them with a very high solute load. Overall more than 70% of children in the study sample were having rusks at 10 months, although the consumption of other commercial baby foods was low, probably due to the high cost of these foods (Lee, 1988).

From a nutritional point of view the diets of low-socio-economic-group infants appeared to be adequate to meet the needs of the majority of children and this was in agreement with most other comparable studies (Department of Health and Social Security, 1975; Black *et al.* 1976; Morgan & Mumford, 1976; Donnet *et al.* 1981; McKillop & Durnin, 1982; Owen & Owen, 1982; Yeung *et al.* 1982). The widespread use of rusks had the effect of bridging some of the gap in micro-nutrient content between cow's milk given without vitamin or mineral supplements and formula or breast milk. In general low micro-nutrient intakes were found in children who were drinking doorstep milk but were not receiving either vitamin and mineral supplements or fortified baby foods (Lee, 1988).

OTHER PRESCHOOL CHILDREN

In a study of diets of preschool children living in disadvantaged areas of Dublin (Lee, 1988), it was found that while macro-nutrient intakes increased with age, as expected, intakes of many micro-nutrients actually decreased as the children moved from fortified baby foods onto an adult type diet. This trend was also observed in other studies of preschool children (Table 1). Compared with the British groups, Irish disadvantaged children had similar intakes of energy and iron, higher intakes of protein and calcium, but lower intakes of vitamin C. From available data on food sources it would appear that the difference in protein and calcium intakes can be accounted for by a higher milk consumption in Irish children. A lower intake of carbohydrate, in the form of biscuits and cakes, had the effect of balancing energy intakes. The lower vitamin C intakes were largely due to the fact that few of the younger children and none of the older ones had received vitamin supplements, whereas for example, on average 31% of the vitamin C intakes in children in the Department of Health and Social Security (1975) study had come from supplements. Black *et al.* (1976) also noted the significant contribution of supplements to vitamin C intakes in their study (contributing between 27 and 52%). However, in the Department of Health and Social Security (1975) study, children from lower socio-economic groups did not continue to receive vitamin supplements as they got older and their average vitamin C intake at 32 mg/d, was very similar to the Irish value for the comparable group. The American low socio-economic group studied by Endozien *et al.* (1979) had higher intakes of all nutrients when compared with British or Irish children, this is possibly because they used a different assessment method. In other US studies of preschool children, vitamin C intakes were found to be correlated with socio-economic status (Owen *et al.* 1974).

Although the mean intakes of Fe in disadvantaged Irish children was similar to that in the British groups, an examination of the distribution of intakes showed that 61% of the older preschool children had intakes below 75% of recommended dietary allowance (RDA) of 8 mg/d (Kevany, 1983). This may be cause for concern because the preschool child is at a crucial stage of development, when neo-natal Fe reserves are depleted and the requirement is increasing rapidly. Furthermore, Fe absorption from the diet may have been poor because of the low vitamin C intakes (Rossander *et al.* 1979; Dallman *et al.* 1980); 68% of the older children were found to consume less than 75% RDA and one-third less than 50% of the RDA of 45 mg/d. Intakes of other micro-nutrients such as zinc, folate, and vitamin D were also low relative to the RDA. Relatively low Fe and vitamin C intakes were also observed in Irish preschool children who participated in the Tallaght Study of low-income families (Lee & Gibney, 1988).

Table 1. *Mean daily energy and nutrient intakes of preschool children*

Study . . .	Lee (1988)			DHSS (1975)				Black *et al.* (1976)			McKillop & Durnin (1982)				Endozien *et al.* (1979)			
Location . . .	Ireland			Britain				Britain			Britain				USA			
Socio-economic status . . .	Low			Mixed				Mixed			Mixed				Low			
Age (months) . . .	11	30	45	12	24	36	48	8	20	36	9	15	18	21	6	18	30	42
Energy (MJ)	3·9	5·3	5·9	4·4	5·3	5·9	6·1	3·7	5·0	5·8	3·7	4·6	—	4·7	4·3	5·4	5·9	6·1
Protein (g)	35	44	47	4	38	41	42	35	38	41	31	39	—	37	43	53	55	54
Carbohydrate (g)	116	162	178	141	164	186	197	112	149	180	109	132	—	142	—	—	—	—
Fat (g)	39	53	62	43	54	60	62	37	55	61	40	50	—	50	—	—	—	—
Iron (mg)	8	6	7	8	7	7	7	9	6	7	8	—	6	—	11	8	8	8
Calcium (mg)	952	809	809	771	691	658	661	974	705	682	690	—	717	—	1019	904	784	734
Vitamin C (mg)	39	33	31	47	40	37	38	44	50	37	—	—	—	—	60	64	73	76
Vitamin D (μg)	4	1	1	5	3	2	2	8	1	2	—	—	—	—	—	—	—	—

DHSS, Department of Health and Social Security.

Table 2. *Daily energy, iron and vitamin C intakes of children aged 4–12 years*

Study . . .	Lee & Gibney (1988)		Connolly *et al.* (1980)	Black *et al.* (1976)	Dutch National Food Survey (1988)	
Location . . .	Ireland (Dublin)		Ireland (Co. Cork)	Britain	Netherlands	
Socio-economic status . . .	Low		Mixed	Mixed	Mixed	
Age-range . . .	4–7 years (*n* 20)	7–12 years (*n* 47)	3–9 years (*n* 56)	5 years (*n* 26)	4–6 years (*n* 254)	7–9 years (*n* 246)
Energy (MJ)	8·5	9·7	7·9	6·7	7·2	8·2
Iron (mg/10 MJ energy)	10·3	10·2	10·6	11·9	10·3	10·5
Vitamin C (mg/10 MJ energy)	50	52	61	81	82	70

While it is difficult to draw any definitive conclusions about the extent of micronutrient inadequacies in the lower social-class Irish children, the combination of low Fe, vitamin C and folate intakes are likely to increase the risk of anaemia for these children.

CHILDREN AGED 4–12 YEARS

Table 2 compares the intakes of energy, Fe and vitamin C, in a socially disadvantaged group of Irish children with data from other studies. As can be seen energy intakes were higher in the lower-social-class children. This could be because these children ate more, but it is more likely to be due to differences in dietary assessment techniques. The diet-history method was used in the Tallaght Study (Lee & Gibney, 1988) of low-income families, whereas most other studies used the weighed-intakes method over periods of 3–7 d. The history method has been found, in many cases, to give higher mean values than the weighed-intakes method (Jain *et al.* 1980), but it has not been established which method gives more accurate assessment of actual habitual dietary intakes. It is interesting to note that in a study of children in France where the dietary-history method was also used (Rolland-Cachera & Bellisle, 1986), energy intakes were similar to those recorded in the Tallaght Study (Lee & Gibney, 1988). To facilitate comparisons between the different study groups, vitamin C and Fe consumption are expressed in terms of intakes per 10 MJ energy. Results show that the Fe densities of diets in the lower-social-class Irish children tended toward the bottom end of the range and vitamin C densities were below those recorded in other studies. A study which examined the nutritional quality of packed lunches in Dublin schools (McLoughlin, 1988) also showed that lower-social-class children had poorer quality lunches than the higher-social-class children.

Despite the poorer quality diets, however, an examination of the mean and distribution intakes in the Tallaght Study (Lee & Gibney, 1988) showed that for most nutrients, the majority of study children consumed more than 75% of the RDA, indicating that they were reasonably well nourished.

Table 3. *Daily energy, iron and vitamin C intakes of adolescents*

Study . . .	Lee & Gibney (1988)		County Dublin VEC (1988)		Connolly *et al.* (1980)		Darke *et al.* (1980)		Dutch National Food Survey (1988)			
Location . . .	Ireland (Dublin)		Ireland (Dublin)		Ireland (Cork)		Britain		Netherlands			
Socio-economic status . . .	Low		Mixed		Mixed		Mixed		Mixed		Mixed	
Age (years) . . .	11–18		11–18		10–19		14–15		10–15		16–21	
Sex . . .	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
n . . .	16	11	77	45	28	26	92	85	294	275	312	325
Energy (MJ)	13·4	10·0	9·1	7·9	12·8	8·4	11·2	8·6	10·6	9·5	12·7	—
Iron (mg/10 MJ energy)	10·5	10·1	11·6	13·2	11·2	12·1	12·0	11·6	10·4	10·7	10·4	11·6
Vitamin C (mg/10 MJ energy)	42	45	54	68	54	63	52	55	56	64	56	82

VEC, Vocational Educational Committee.

ADOLESCENTS

Table 3 shows the intakes of energy, Fe and vitamin C in a socially disadvantaged group of Irish adolescents compared with similar values from other studies. As in the younger age-group, energy intakes were higher in the lower-social-class children, probably because of the dietary assessment method used. Also, the Fe densities of the diets tended toward the bottom end of the range, while vitamin C densities were lower than those recorded in other studies. An examination of the distribution of Fe and vitamin C intakes showed that many lower-social-class adolescent girls may have inadequate intakes; 45% had Fe intakes below 75% of their RDA, and 55% had vitamin C intakes below this level. These findings are not in agreement with those of the County Dublin Vocational Educational Committee (1988) study which showed no significant difference in nutrient intakes between socio-economic groups. However, the data were only analysed for the combined groups of males and females and no information was given on the distribution of intakes, making it difficult to evaluate the differences in findings between the two studies.

From the available data, and with the possible exception of Fe and vitamin C intakes in girls, it appears that disadvantaged adolescents are adequately nourished, in spite of the fact that meeting their dietary needs puts the low-income family under severe financial pressure. Our social welfare system does not make any allowance for the additional dietary requirements of the older child when making social welfare payments. Families with several older children receive the same allowance as do families with the same number of younger children. In the study of low-income families in Tallaght it was calculated that the cost of feeding a 12-year-old child consuming 10·5 kJ (2·5 kcal)/d was IR£11·90 (Lee & Gibney, 1988) which is well above the social welfare allowances made for that child (IR£8·00–9·50).

ADULTS >18 YEARS

In Table 4 mean nutrient intakes of adult males in the Tallaght Study of low-income families (Lee & Gibney, 1988) are compared with similar data recorded for adult males of mixed social classes studied in the Kilkenny Health Project (Gibney *et al.* 1989). As can be seen the intakes of energy, protein, fat, fibre and Fe are very similar, Ca intakes are higher in the Tallaght group (Lee & Gibney, 1988), due to a higher milk consumption, but intakes of other micro-nutrients are lower. In the case of vitamin A, the lower intakes are of no concern because in both studies intakes were well above the RDA of 750 μg. Similarly, while the average intake of vitamin C in Tallaght males (Lee & Gibney, 1988) was 30 mg below the Kilkenny males (Gibney *et al.* 1989), this lower intake was in line with the RDA and an examination of the distribution of intakes showed that only 19% had intakes below 75% RDA.

Unfortunately the diets of Tallaght women (Lee & Gibney, 1988) did not compare so favourably with the Kilkenny group (Gibney *et al.* 1989) (Table 5). While energy intakes were again similar for the two groups and Ca intakes were higher in the Tallaght group, protein, fibre, and a number of micro-nutrient intakes were considerably lower in Tallaght women (Lee & Gibney, 1988). Of particular concern were the relatively lower intakes of fibre, Fe and vitamin C. An average fibre intake of 14 mg was well below the minimum 25 g/d recommended by the Food Advisory Committee (1984). The distribution of Fe and vitamin C intakes showed that 31% of Tallaght females consumed less

Table 4. *Mean daily intakes of selected nutrients for adult males from low-income families in Tallaght compared with similar data from the Kilkenny Health Project*

Socio-economic status . . .	Tallaght study* (*n* 42) Low		Kilkenny study† (*n* 30) Mixed	
	Mean	SD	Mean	SD
Energy (MJ)	13·1	3·0	12·5	2·6
Protein (g)	100	25	107	22
Fat (g)	128	33	119	35
Carbohydrate (g)	409	128	344	88
Fibre (g)	22	6	24	6
% Protein energy	13·0	1·7	16·0	2·6
% Fat energy	38·2	7·3	38·8	6·3
% Carbohydrate energy	48·7	8·4	45·7	7·8
Iron (mg)	13·5	3·2	13·1	6·5
Calcium (mg)	1233	434	1026	364
Zinc (mg)	12·9	3·6	15·1	3·9
Vitamin A (μg RE)	1507	1299	1180	677
Vitamin C (mg)	60	21	89	25
Vitamin B_6 (mg)	1·5	0·3	1·9	0·4
Folate (μg)	211	96	237	60

RE, retinol equivalent.
* Lee & Gibney (1988).
† Gibney *et al.* (1989).

than 50% of the RDA for Fe (14 mg/d) and 18% consumed less than 50% of the RDA for vitamin C (60 mg/d). A low intake of Fe among women is not uncommon (Barber *et al.* 1985) but levels recorded in low-income Dublin women were a particular cause for concern.

Zn and folate intakes were also lower in Tallaght men and women (Lee & Gibney, 1988) compared with the Kilkenny adults (Gibney *et al.* 1989). However, the uncertainty about actual requirements of these nutrients makes it impossible to evaluate the adequacy of intakes. Some studies have shown that despite low levels of these nutrients being recorded, few clinical signs of malnutrition were observed (Poh Tan *et al.* 1984; McNulty *et al.* 1987).

When a closer look was taken at various subgroups of women in Tallaght it was found that those at most risk of nutritional inadequacy were single mothers and deserted wives (Lee & Gibney, 1988). Intakes of energy and most nutrients were lower for this group when compared with the total sample of women. The main exception was vitamin C where mean intakes were similar. Fe consumption was particularly low averaging at 6·9 mg/d compared with 8·1 mg/d in the total sample of women, and 55% had Fe intakes below 50% RDA compared with 31% in the total sample. These low intakes were accounted for by very low meat consumption.

Because of the low nutrient intakes recorded in single mothers the diets of their children were compared with those of the total sample of children, but no differences were found indicating that these children did not share the nutritional disadvantage of their mothers.

In Table 6 the average daily intakes of selected nutrients for adults in low-income families in Tallaght (Lee & Gibney, 1988) are compared with similar data from other studies of mixed socio-economic groups. In general energy intakes are in agreement with those recorded in Kilkenny (Gibney *et al.* 1989), Orkney Islands (Barber *et al.* 1986), Moorpark (Connolly *et al.* 1980) and the Netherlands (Dutch National Food Survey, 1988). For males, protein and fat intakes were also similar in these groups, but females in the lower socio-economic group consumed less protein and fat than their counterparts in other study groups. Nevertheless, fat still contributed 37% to dietary energy in females, which is above the recommended value of 35%. Carbohydrate intakes were higher in both males and females in the Tallaght Study (Lee & Gibney, 1988) than in any of the other studies.

With the exception of males in the Netherlands (Dutch National Food Survey, 1988), mean fibre intakes in all study groups were below the minimum level of 25 g/d suggested by the Food Advisory Committee (1984). Fibre intakes were in general lower in women than in men being lowest in women in low-income families in Tallaght (Lee & Gibney, 1988). Males and females in the Tallaght Study (Lee & Gibney, 1988) also had very low vitamin C intakes in comparison with a number of other studies, and here again females appeared to be worst. Fe intakes were considerably lower in Tallaght females (Lee & Gibney, 1988) than in any of the other groups.

PREGNANT TRAVELLING WOMEN

A study by Van Leishout (1988) compared the daily intakes of selected nutrients in pregnant travelling (itinerant) women with similiar data for pregnant settled women of low socio-economic status. The aim of the study was to identify differences in behaviour due to contraints other than economic, that might account for higher infant morbidity and mortality rates found among the travelling community. However, it was found that intakes of energy and all nutrients were higher in the traveller women suggesting that differences in diet could not account for the differences in health of their infants.

FOOD INTAKE PATTERNS IN LOW SOCIO-ECONOMIC GROUPS

The diets of disadvantaged groups were characterized by a high consumption of milk and table sugar, and a low fresh meat, fruit and vegetable consumption. In general diets were very monotonous varying little from week to week. A limited range of foods was consumed with emphasis on cheaper staple foods which are high in energy such as potatoes and bread.

SUMMARY OF FINDINGS

In the present review three groups have been identified as being particularly vulnerable to nutritional inadequacies. These are preschool children, adolescent girls and women, especially single mothers.

Low Fe and vitamin C intakes were common in the three groups and fibre was particularly low in women. For a large proportion of preschool children Zn, folate and vitamin D intakes were also found to be well below the RDA, principally because of the high requirement for these nutrients at this rapid stage of growth. Zn and folate intakes

Table 5. *Mean daily intakes of selected nutrients for adult females from low-income families in Tallaght compared with similar data from the Kilkenny Health Project*

Socio-economic status . . .	Tallaght study* (*n* 55) Low		Kilkenny study† (*n* 30) Mixed	
	Mean	SD	Mean	SD
Energy (MJ)	8·5	2·8	8·4	2·2
Protein (g)	64	18	77	22
Fat (g)	81	24	87	28
Carbohydrate (g)	275	131	232	67
Fibre (g)	14	5	20	9
% Protein energy	13·5	3·7	15·8	3·4
% Fat energy	37·0	7·5	39·6	4·9
% Carbohydrate energy	49·6	9·8	44·4	5·5
Iron (mg)	8·1	2·3	10·3	4·2
Calcium (mg)	905	355	761	252
Zinc (mg)	8·3	2·5	11·8	4·5
Vitamin A (μg RE)	1070	1032	1088	1030
Vitamin C (mg)	45	18	73	32
Vitamin B_6 (mg)	1·0	0·3	1·3	0·4
Folate (μg)	137	42	166	60

RE, retinol equivalent.
* Lee & Gibney (1988).
† Gibney *et al.* (1989).

were lower in the lower social classes for other age-groups as well, but it is difficult to evaluate the adequacy of these intakes because of the uncertainty about the actual requirements. In addition to these socially related dietary problems, and in common with the rest of the Irish population, fat intakes exceeded the recommended value of 35% of energy, and fibre intakes were below the recommended minimum of 25 g/d.

The findings of low Fe and vitamin C intakes in a number of disadvantaged groups would indicate an urgent need for a community-based programme to establish the true incidence of clinical anaemia.

SUGGESTED INTERVENTION STRATEGY

To achieve optimum nutrition for socially disadvantaged groups in this country a number of approaches may be necessary.

Obviously it would help if poverty were alleviated by increasing the payments made to social welfare recipients, particularly to families where there are a number of older children. Indications are, however, that it is unlikely that any major changes in the social welfare system will occur in the near future. There is a commonly held belief that much of the poverty in the lower social classes is due to mismanagement of funds. However, this theory is not supported by data from recent studies of disadvantaged groups which indicate that the majority of families were having a reasonably balanced diet despite very low incomes. Presumably this was through careful budgeting.

Table 6. *Average daily intakes of selected nutrients in Irish adults of low socio-economic status compared with similar data for adults of mixed socio-economic status*

			Men			Women		
Study	Location	Socio-economic status	Energy (MJ)	Fe (mg)	Vitamin C (mg)	Energy MJ	Fe (mg)	Vitamin C (mg)
Lee & Gibney (1988)	Dublin	Low	13·1	13·5	60	8·5	8·1	45
Gibney *et al.* (1989)	Kilkenny	Mixed	12·5	13·1	89	8·4	10·3	73
Connolly *et al.* (1980)	Cork	Mixed	11·8	14·8	96	9·2	12·1	72
Barker *et al.* (1988)	N. Ireland	Mixed	10·6	14·2	—	7·1	10·5	—
Bingham *et al.* (1981)	Cambridge	Mixed	10·0	13·0	70	8·2	12·3	75
Barber *et al.* (1986)	Orkneys	Mixed	13·0	15·3	57	8·3	10·9	45
Fehily *et al.* (1984, 1986)	Wales	Mixed	10·1	12·7	48	6·7	10·0	46
Dutch National Food Survey (1988)	Netherlands	Mixed	11·9	13·8	74	8·8	11·5	71

Other possible ways to improve the levels of nutrient intakes are dietary supplementation or nutrition education, or both. Dietary supplementation may be necessary on the basis that it may not be possible, because of lack of money, for some families to provide the type of diet that would ensure optimum nutrition. For preschool children up to the age of 5 years, this could take the form of multi-vitamin and multi-mineral drops which could be provided free of charge to medical card holders. The main problem with this solution is that as was seen from the data on early infant feeding habits of disadvantaged children, the uptake of supplements in these groups is very poor. Something else which might be worth considering is Fe fortification of flour, as is done in Britain. This presumably would benefit all age-groups as bread consumption is generally very high in the lower social classes.

A nutrition education programme which was designed specifically for use in disadvantaged areas of Dublin has been shown to be effective in improving dietary intakes in preschool children (Lee, 1988). Much of the success of this programme has been attributed to the fact that the dietary recommendations were feasible and took into account the limitations of the disadvantaged environment. For a nutrition education programme to be effective with disadvantaged groups, the dietary advice given has to be realistic and be based on the current dietary habits and customs of the target group. While many of the dietary problems of the socially disadvantaged are similar to those of the population as a whole, such as low fibre and high fat intakes, they have to be tackled slightly differently. For example meat and dairy products are usually targeted when attempting to lower fat intake. But, considering the value of meat as a source of high-quality Fe, and the low Fe density of the diets in low-income families, a reduction of meat consumption is not desirable. It could be suggested that poor-quality meat and meat products be replaced with lean red meat, but this is not practical for families on limited incomes. Milk is another common target for reducing fat intakes, but because of its contribution to the adequate intakes of many nutrients such as Ca, high-quality proteins and many vitamins, any nutrition education campaign which caused milk consumption to fall would be counterproductive. Findings from the study of low-income families in Tallaght (Lee & Gibney, 1988) showed that about 60% of the difference in fat intake of high and low fat consumers could be accounted for by differences in butter consumption. Thus, butter would be a better target than meat for lowering fat intakes in disadvantaged groups (Lee & Gibney, 1988).

CONCLUSION

Many of the dietary problems of the socially disadvantaged are similar to those seen in the Irish population as a whole, such as low fibre, and high fat intakes. But there are also socially related problems such as low Fe and vitamin C intakes in young children, adolescent girls and women. These are due mainly to a low consumption of fresh meat, fruit and vegetables. Appropriate nutrition intervention with these groups may help improve their nutrient intakes, which in turn may improve their health and, thus, help redress some of the balance in health between the social classes.

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