Trends in food availability in the United Kingdom– the DAFNE III project

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1. Introduction

The findings presented in this report are based on data collected in the National Food Survey (NFS) of Great Britain (England, Wales and Scotland, and including Northern Ireland from 1996). For 50 years, this survey has annually collected data on home food acquisitions from a nationally representative sample of approximately 7000 households, reflecting a response rate of between 51% and 66% in selected samples of between 8,043 and 13,491. Each household keeps a record for one week of the prices and amounts of all food entering the household, including purchases, gifts, payments in kind, welfare foods, and food from farms and allotments. The value of foods not paid for is imputed by equating the value of free food to the average price paid for comparable purchases.

From 1992, information was collected on foods eaten away from home. Although Northern Ireland joined the survey in 1996, data on eating out was not collected. Information on confectionery and alcoholic beverage consumption was collected and reported for the first time in 1992. Information on soft drinks had been collected before that time, but because of concerns about the completeness of the data the findings were not included as part of the main report before 1992.

From April 2001, the collection of data for the National Food Survey has been merged with the Family Expenditure Survey (Rimmer D, 2001). The combined survey is known as the Expenditure and Food Survey (EFS) and is conducted annually by the Office for National Statistics (ONS). The introduction of the new survey followed a pilot study in 2000 and represents an improvement in quality. The EFS covers a nationally representative sample of about 10,000 households. Every household member is asked to record all expenditure for 14 consecutive days, and the amount of food consumed in the household (except for takeaway foods for which food weights are imputed). The number of occurrences of food eaten out of the home (consumption is estimated by the application of a portion size) is also collected. Although there is some discontinuity of data for food between the NFS and the EFS, the data are more complete, particularly with regard to foods which are purchased by individuals

rather than by the main food provider. In addition, the EFS collects more comprehensive data than the NFS on income, occupation and education, so analyses of food consumption in relation to socio-economic variables will be improved. The first NFS report based on EFS data should be published in Spring 2003.

The findings presented here form part of a continuing collaboration of the UK with DAFNE (DAta Food NEtwork), an EU funded project to develop a database of comparable food acquisition data from countries across Europe (Trichopoulou A and Lagiou P, 1998).

2. Trends in food availability 1985-1999

NFS food availability data at the household level from 1985 to 1999 were sent to the DAFNE centre for processing. The following analyses are based on the DAFNE compilation of the NFS data according to the aggregations agreed in the current project.

2.1 All households

Table 1 shows the mean availability per person per day of 15 food groups between 1985 and 1999. The data are summarized graphically in Figures 1 and 2.

The data shown are derived from NFS, but have been treated according to the DAFNE methodology. There are therefore some differences between the NFS published values and those shown in the present report. Extensive internal validation of the data has been carried out to ensure that the derived values correctly reflect the data collected in the NFS.

Figure 1a shows the trends in food availability for the eight food groups for which average availability is greater than 50g per person per day. There are clear decreases in the availability of milk and milk products, potatoes, and meat and meat products. In contrast, availability of fruits, juices and “Other beverages” (not including alcoholic beverages) have increased, although the increase in other beverages appears to have peaked around 1995 and is now declining. Note that the values for other beverages are in centilitres (cl). The availability of cereals and vegetables have remained relatively stable.

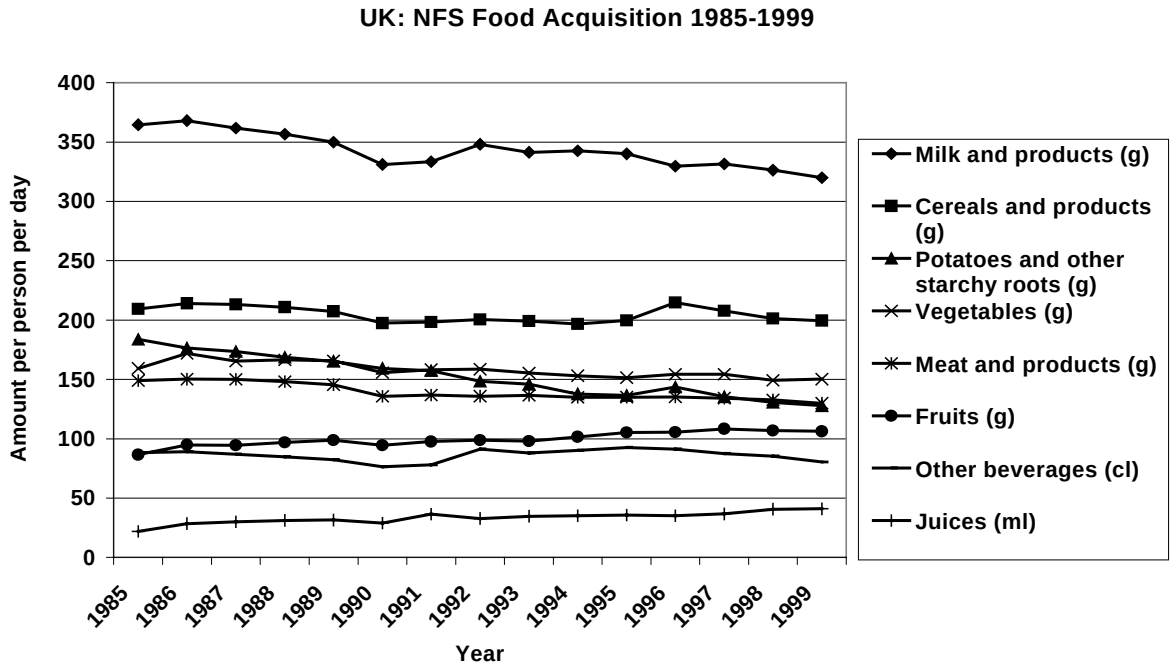


Figure 1a. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, eight food groups.

Figure 1b shows the trends in availability for the seven food groups consumed in smaller quantities (typically 50g or less per person per day). Sugar and sugar products, added lipids, and eggs all declined, although for sugar and sugar products there was an increase in the early 1990s that tailed off again. Availability of fish and seafood, nuts and pulses remained stable. Also shown in Figure 1b is the availability of alcohol. The apparent increase between 1992 and 1995 may represent methodological changes following the introduction of the measurement in 1992, although the rapid increase in 1995 may in fact reflect a genuine change in consumption habits with more continental beer, cider and wine being consumed at home.

It is important to recognize that the estimates of availability in the present report are for home food availability only and are likely to be under-recorded. Expenditure on alcoholic drinks in particular in the NFS is substantially below that reported in the FES for the same years (Pateraki S, 2000).

Table 1. Mean availability per person per day. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database (see text for details of methodology).

YEAR	Milk & products (g)	Cereals & products (g)	Potatoes & other starchy roots (g)	Vege-tables (g)	Meat & products (g)	Fruits (g)	Other beverages (cl)	Juices (ml)	Sugar & products (g)	Lipids, added (g)	Eggs (g)	Fish & seafood (g)	Nuts (g)	Pulses (g)	Alcoholic beverages (ml)
1985	365	209	184	159	149	86	89	22	44	40	25	20	1.7	1.2	-
1986	368	214	176	172	150	95	90	29	43	42	24	21	1.9	1.6	-
1987	362	213	173	165	150	94	88	30	41	40	23	21	2.4	1.3	-
1988	356	211	169	167	148	97	86	31	39	39	21	20	2.0	1.2	-
1989	350	207	165	166	146	99	84	32	36	38	18	21	1.9	1.3	-
1990	331	197	159	156	136	94	77	29	33	35	17	20	2.1	0.9	-
1991	333	198	157	158	137	98	79	36	34	35	18	20	2.1	0.9	-
1992	348	200	148	159	136	99	93	33	39	34	16	20	2.3	1.0	44
1993	341	199	146	155	137	98	89	35	38	32	15	21	2.5	0.8	45
1994	343	197	138	153	135	102	91	35	37	32	15	21	2.3	0.8	46
1995	340	200	136	151	135	105	94	36	36	30	15	21	2.0	0.7	52
1996	330	215	143	154	135	106	92	35	39	32	15	22	2.2	0.8	52
1997	332	208	135	154	134	108	88	37	35	29	14	20	2.0	0.8	51
1998	326	201	131	149	133	107	86	41	33	27	14	20	1.8	0.9	51
1999	320	199	128	150	130	106	81	41	31	26	13	20	1.7	1.0	51

- data not available

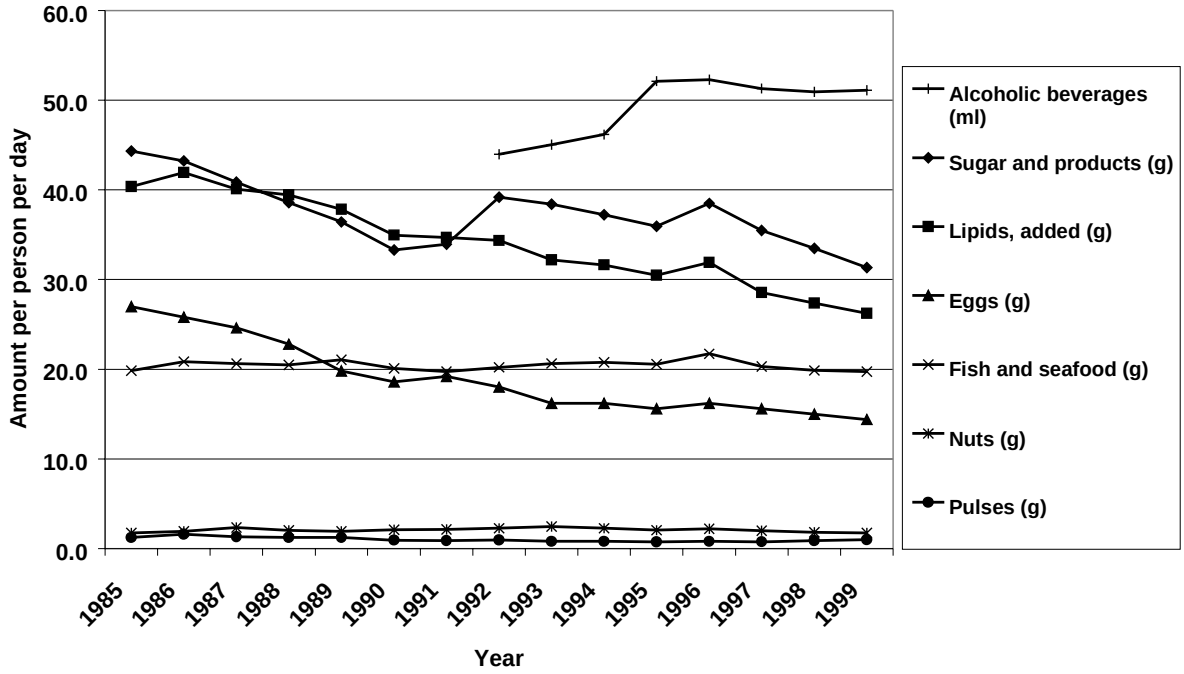
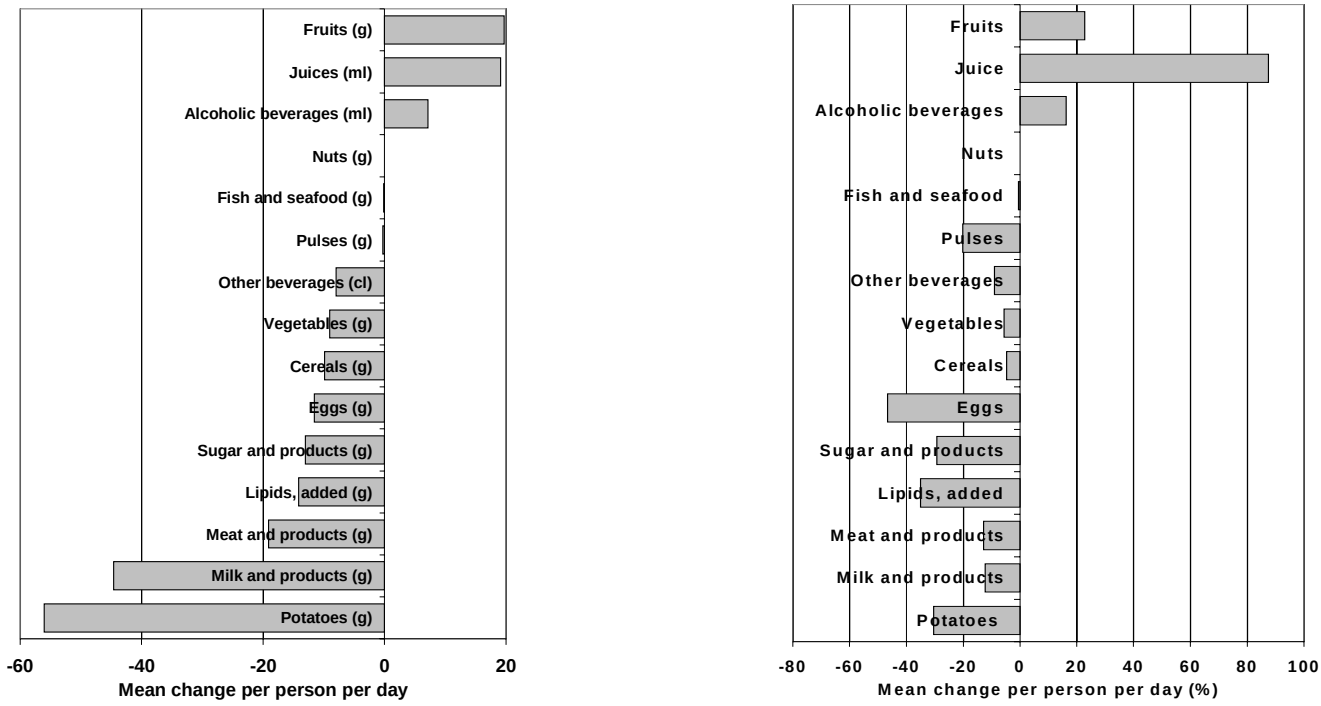


Figure 1b. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, seven food groups.

Figures 2a and 2b show the net changes in reported availability between 1985 and 1999 either in absolute amounts (2a) and as a percentage of the 1985 value (2b) (except for alcoholic beverages for which the starting year is 1992). The greatest increases in both absolute and percentage terms have been for juices and fruit. The greatest declines in absolute terms have been for meat and meat products, milk and milk products and potatoes. In percentage terms, the greatest declines have been for eggs, added lipids, potatoes and sugar and sugar products.

2.1 Trends by locality

Changes in availability by locality are summarized in Figures 3a and 3b. The trends over time described in Figures 1 and 2 are reflected in the graphs showing availability by locality. There are, however, some differences in availability between urban, semi-urban and rural areas, and some of the patterns of availability have changed over time. These are summarized in Table 2.



(a) Absolute change **(b) Percent change**

Figure 2: UK: Change in mean household food acquisitions, NFS-based Food Acquisition data 1985-1999. DAFNE database.

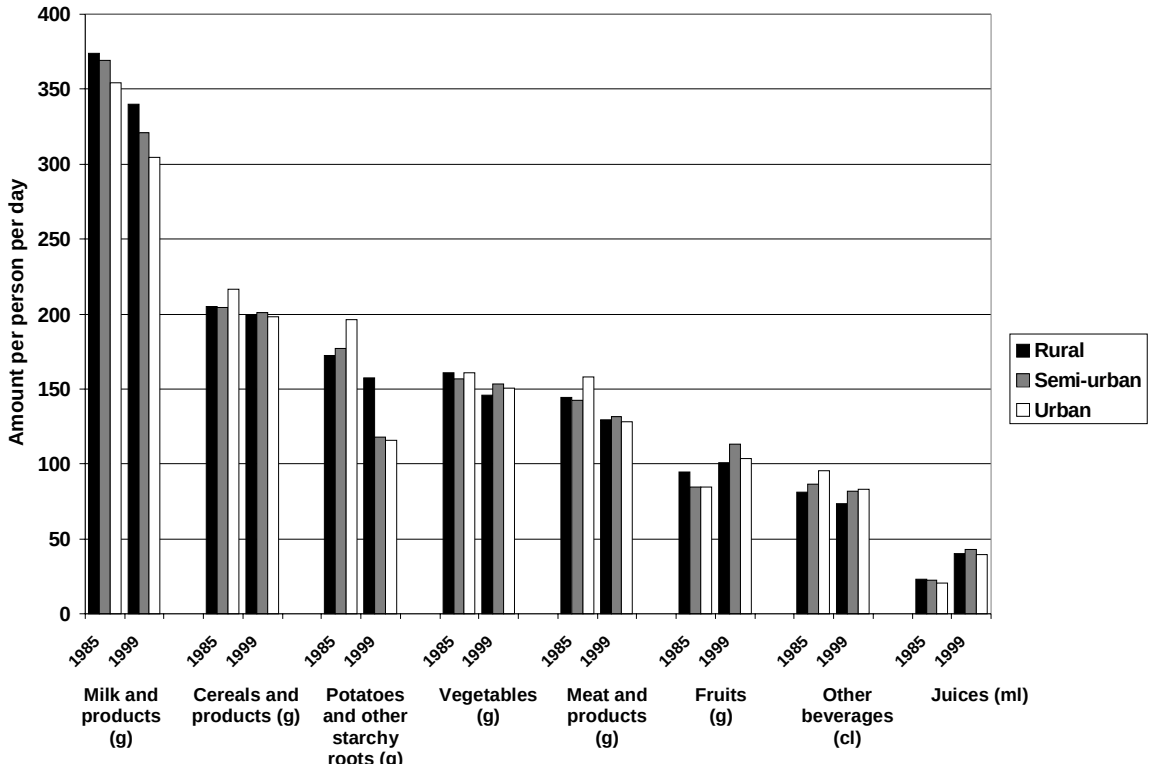


Figure 3a. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, for eight food groups, by locality.

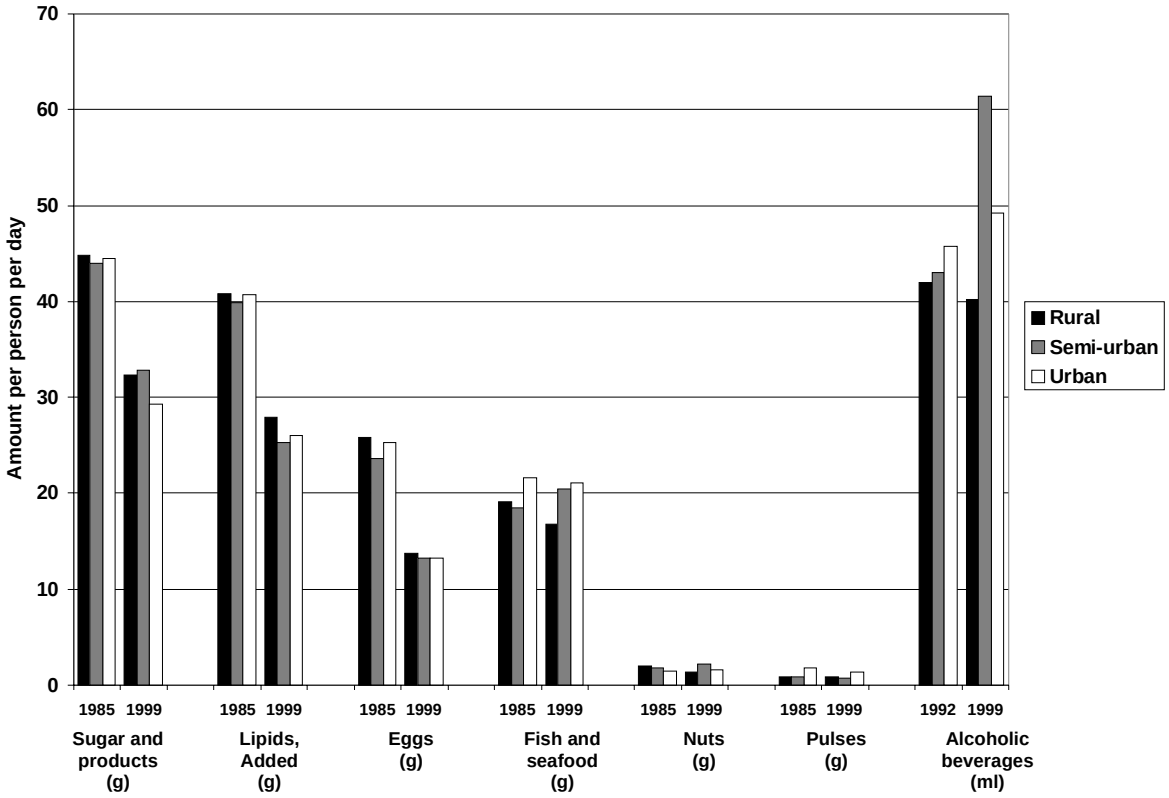


Figure 3b. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, for seven food groups, by locality.

Table 2. Summary of changes in availability of 15 food groups. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, according to locality.

	% Variation*		Highest	
Food group	**1985**	**1999**	**1985**	**1999**
Milk and products	5	11	Rural	Rural
Cereals and products	6	1	Urban	Semi-urban
Potatoes and other starchy rots	13	32	Urban	Rural
Vegetables	3	5	Urban	Semi-urban
Meat and products	10	3	Urban	Semi-urban
Fruits	12	12	Rural	Semi-urban
Other beverages	17	12	Urban	Urban
Juice	13	7	Rural	Semi-urban
Sugar and products	2	12	Rural	Semi-urban
Lipids, added	2	10	Rural	Rural
Eggs	9	6	Rural	Rural
Fish and seafood	16	22	Urban	Urban
Nuts	27	49	Rural	Semi-urban
Pulses	75	67	Urban	Urban
Alcoholic beverages**	9	41	Urban	Semi-urban

* $$\text{\% Variation} = \frac{\text{maximum-minimum}}{\text{Average across locality groups}} \times 100$$

** Alcoholic beverage consumption was first reported in the NFS in 1992.

As in 1985 availability of milk and milk products in 1999 was highest in rural areas. However, the difference between urban and rural areas was 11% in 1999 compared to 5% in 1985. The pattern of cereal availability between localities has changed relatively little. In contrast, potato availability was highest in urban areas in 1985 but fell dramatically, the highest availability now being in rural areas. Availability of vegetables and meat and meat products have fallen slightly, although differences between localities is small. Fruit and juices availability have risen more rapidly in semi-urban than urban or rural areas. Sugar and lipids availability have fallen faster in urban than in rural or semi-urban areas. Availability of eggs has fallen similarly in all groups. Patterns of availability of fish, nuts and pulses have changed relatively little. Finally, availability of alcoholic beverages has grown much more in semi-urban than in urban areas and apparently declined in rural areas, possibly because of changing demographic changes (increasingly older population) in rural areas and the changes in drinking habits amongst the suburban middle classes (especially increased wine consumption).

2.2 Trends by household composition

Changing trends in availability according to household composition are more difficult to characterize than for locality, in part because of the greater diversity of household types, and in part because of the changing nature of demographics (the growth of single person and lone parent households, for example). Nevertheless, it is possible to summarize some of the more striking changes.

Changes in availability per person per day between 1985 and 1999 were calculated for each of eight household types for 15 food groups. Within each food group, changes were ranked from 1 to 8 (largest positive change to largest negative change). Each rank was then subtracted from the number of positive changes (between 0 and 8) plus 0.5. The results produced the output in Figure 4, such that higher increases in availability are assigned large positive ranks and large decreases in availability are assigned large negative ranks. The most striking changes are summarized in Table 3.

Table 3. Summary of changes in availability of 15 food groups, UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, according to household composition.
(A-Adults, E-Elderly, C-Children)

Food group	Major changes
Milk and products	Decrease greatest in adults and elderly, least change in mixed households (A+E+C).
Cereals and products	Decrease greatest in mixed households (A+E+C) and **lone parents**, increase in elderly and mixed households (A+E).
Potatoes and other starchy roots	Decrease greatest in **younger households with children**, least in single person households (A or E).
Vegetables	Decrease greatest in **younger households with children** and single adults, increase in elderly couples and mixed households (A+E).
Meat and products	Decrease greatest in **lone parents**, least in single adults and mixed households (A+E+C).
Fruits	Decrease greatest in mixed households (A+E+C) and **lone parents**, increase greatest in elderly couples and mixed households (A+E).
Other beverages	Decrease greatest in single person households (A or E), increase in **lone parents**.
Juice	Increase greatest in households without children, least in **younger households with children** and mixed households (A+E+C).
Sugar and products	Decrease greatest in elderly and mixed households (A+E+C), least in couples with children and mixed households (A+E).
Lipids, added	Decrease greatest in elderly, least in **lone parents** and mixed households (A+E).
Eggs	Decrease greatest in mixed households (A+E and A+E+C), least in **younger households with children**.
Fish and seafood	Decrease greatest in **lone parents** and adult households, increase greatest in elderly couples and mixed households (A+E and A+E+C).
Nuts	Changes of the order of not more than 2g per person per day over 15 years.
Pulses	Changes of the order of not more than 2g per person per day over 15 years.
Alcoholic beverages	Increase greatest in elderly and single adult households, least in mixed households (A+E) and **lone parents**.

On balance, it appears that lone parents and younger households with children (2A+C) are doing least well in terms of following healthy eating guidelines, showing:

- the biggest decreases in cereals, potatoes, vegetables, meat (important for iron), fruit and fish
- the smallest decreases in added lipids and eggs
- the smallest increases in healthier food choices such as juices.

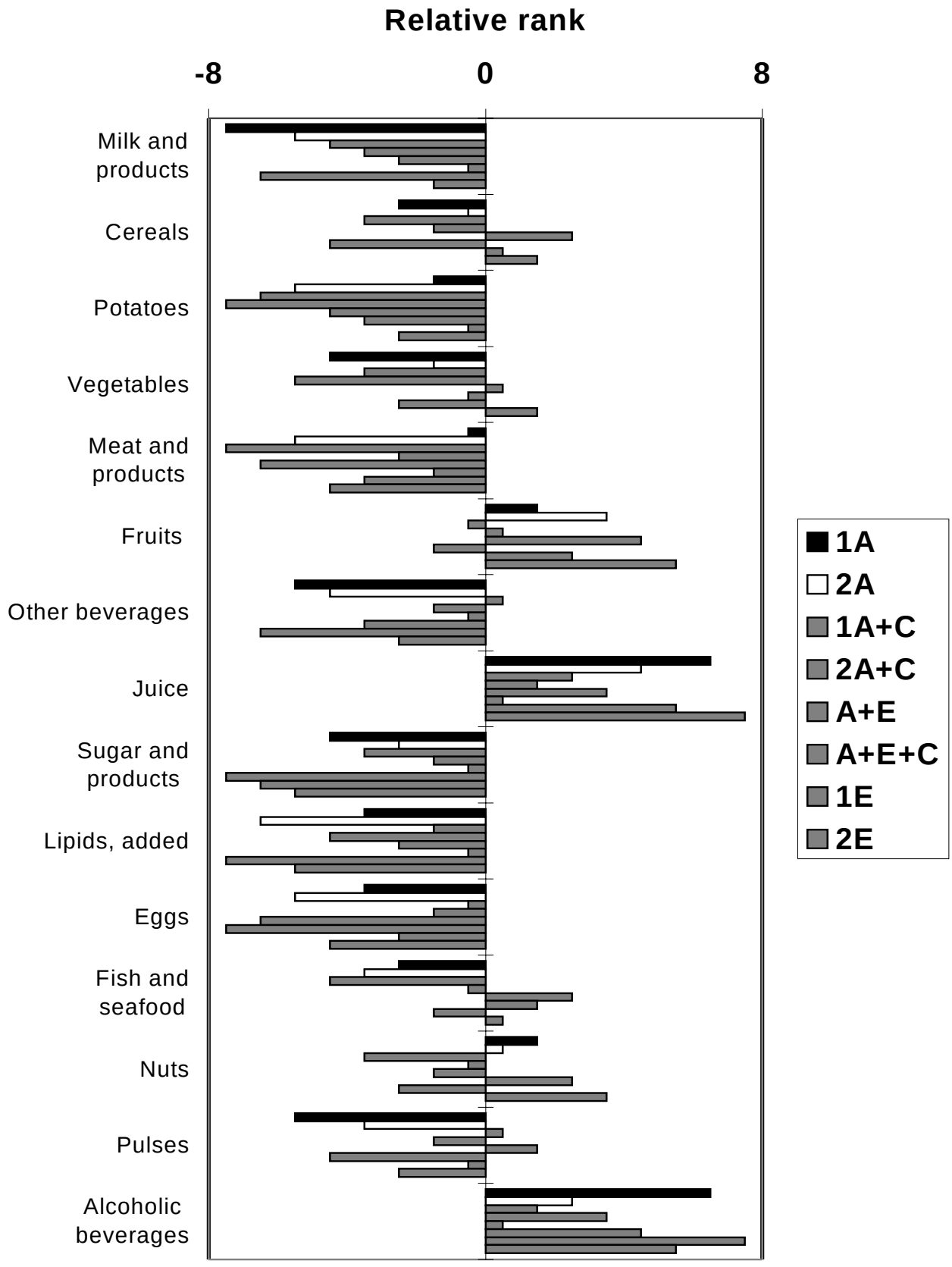


Figure 4. Relative changes in availability (based on amount per person per day), by household composition, UK: NFS-based Food Acquisition data 1985-1999, DAFNE database. 1A=1 adult; 2A=2 adults; 1A+C=lone parent; 2A+C=couple with children; A+E=adults plus elderly; A+E+C=adults plus elderly plus children; 1E=1 elderly person; 2E=elderly couple. (For method of ranking see text.)

2.3 Trends by occupation

The results for changes in availability 1985-1999 by occupation group are shown in Figures 5a and 5b and are summarized in Table 4. In general, the retired group appear to have the highest values for availability, consistently over the entire time span. This may be due to two effects:

1. Retired householders consume a higher proportion of their diets from the household food supply (MAFF, 1987-2000).
2. There is a tendency amongst retired householders, especially single older women, to purchase on average during the week of the NFS more food than they consume. In consequence, the estimates of consumption based on NFS data for this group may overstate their true average consumption.

For potatoes and other starchy roots, the highest availability was in the Manual group in 1985 and the Other group (students/housewives/unemployed/invalid persons) in 1999. For juice and alcoholic beverages, the highest availability was consistently in the non-manual group. In contrast, the non-manual group had the lowest availability of meat, sugar and sugar products, added lipids and (in1999 only) potatoes, other beverages and eggs. These findings accord with known patterns of consumption by income, consistent with the expectation that the non-manual occupation groups have the highest incomes. The lowest values for the other food groups were found either in the Manual or Other groups (with the exception of the Retired group's alcohol beverage availability in 1985). Without exception, the percent variation between occupation groups was greater in 1999 than in 1985.

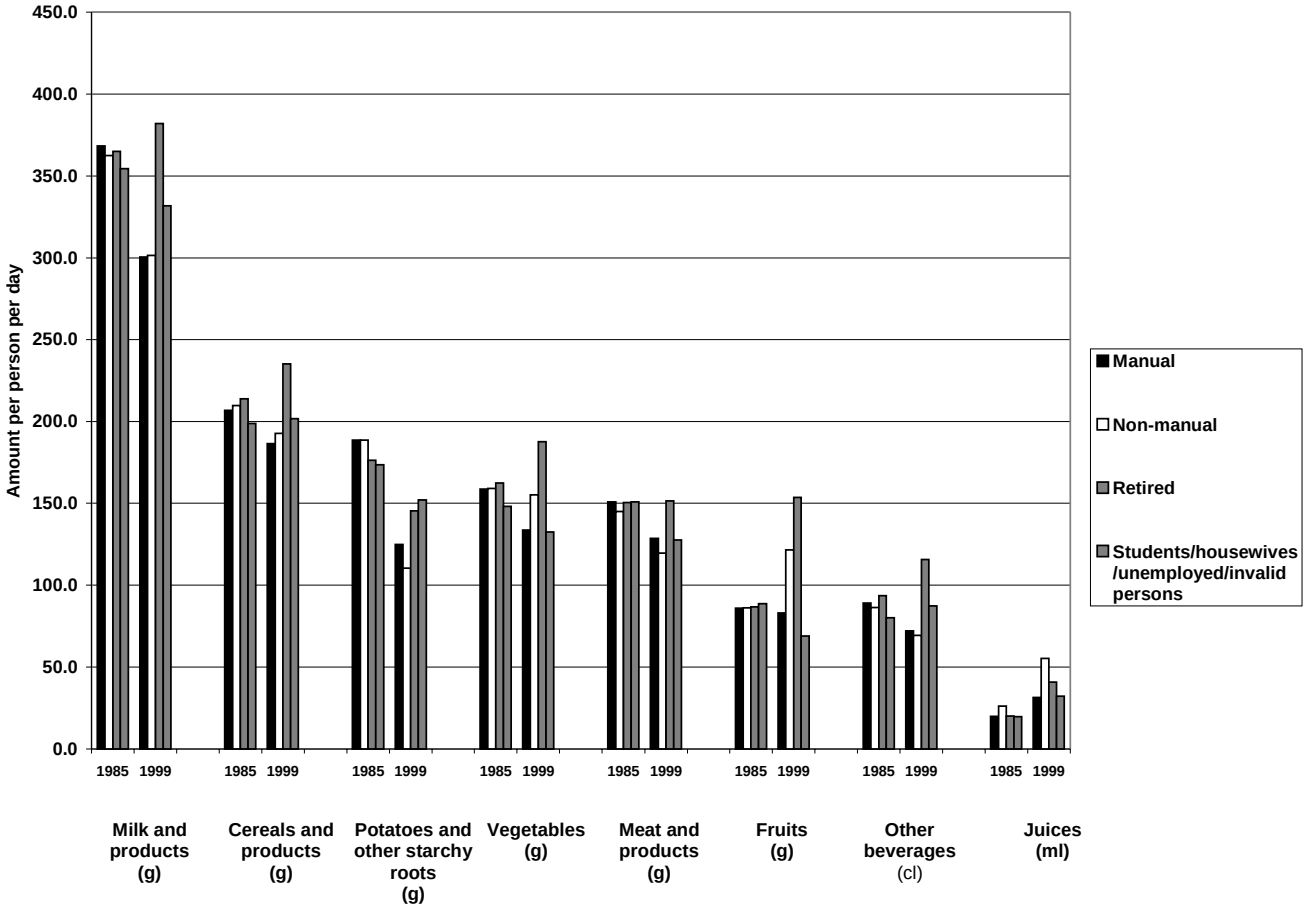


Figure 5a. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, for eight food groups, by occupation.

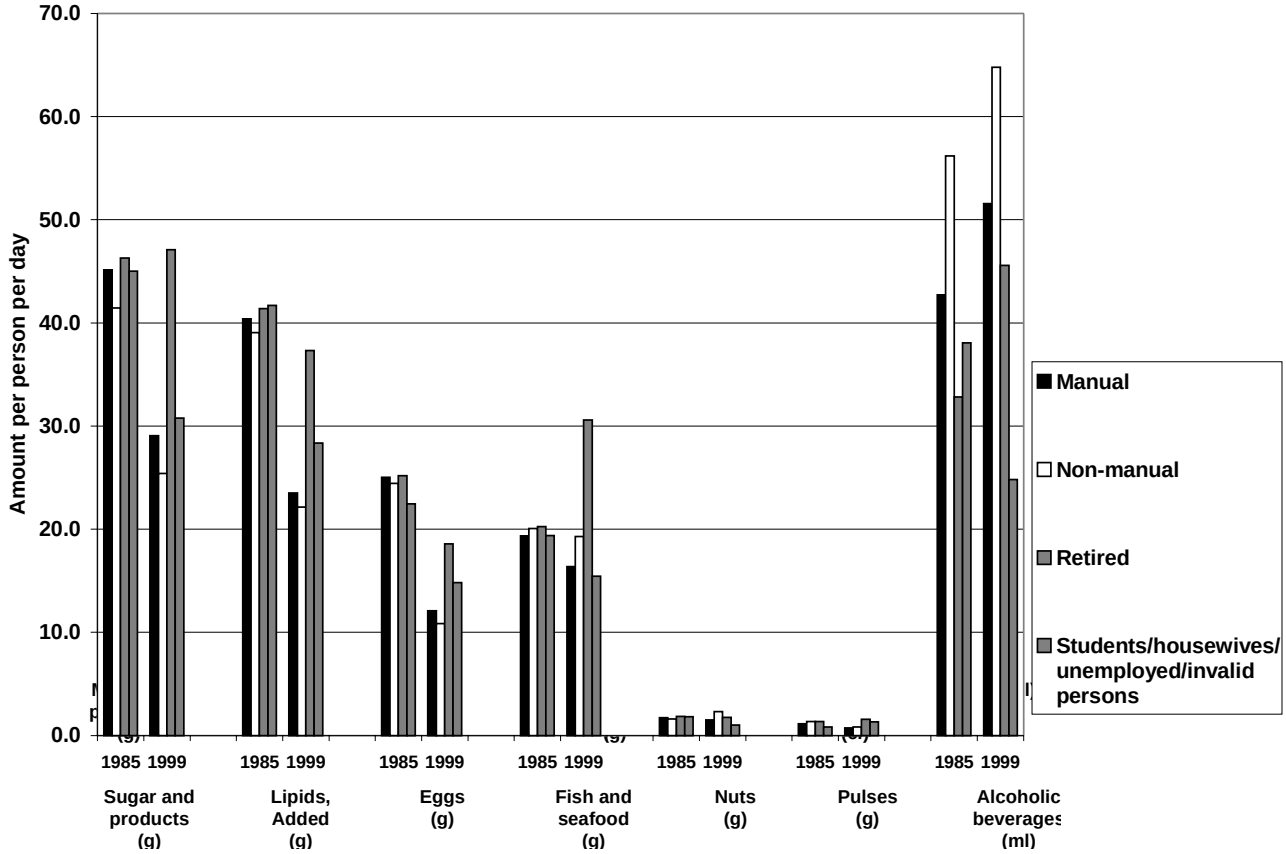


Figure 5b. UK: NFS-based Food Acquisition data 1985-1999, DAFNE database, for seven food groups, by occupation.

Table 4. Summary of changes in availability of 15 food groups. UK: NFS-based Food Acquisition data 1985-1999. DAFNE database, according to occupation.

	% Variation*		Highest		Lowest	
Food group	**1985**	**1999**	**1985**	**1999**	**1985**	**1999**
Milk and products	4	25	Retired	Retired	Manual	Manual
Cereals and products	7	24	Retired	Retired	Manual	Manual
Potatoes and other starchy roots	8	33	Manual	Other**	Other	Non-manual
Vegetables	9	37	Retired	Retired	Other	Other
Meat and products	4	24	Other	Retired	Non-manual	Non-manual
Fruits	3	80	Other	Retired	Manual	Other
Other beverages	15	57	Retired	Retired	Other	Non-manual
Juice	29	59	Non-manual	Non-manual	Other	Manual
Sugar and products	11	69	Retired	Retired	Non-manual	Non-manual
Lipids, added	7	58	Other	Retired	Non-manual	Non-manual
Eggs	11	58	Retired	Retired	Other	Non-manual
Fish and seafood	4	77	Retired	Retired	Other	Other
Nuts	15	76	Retired	Non-manual	Manual	Other
Pulses	44	86	Retired	Retired	Other	Manual
Alcoholic beverages* **	53	78	Non-manual	Non-manual	Retired	Other

* $\text{\% Variation} = \frac{\text{maximum-minimum}}{\text{average across occupation groups}} \times 100$

** Students/housewives/unemployed/invalid persons

*** Alcoholic beverage consumption was first reported in the NFS in 1992.

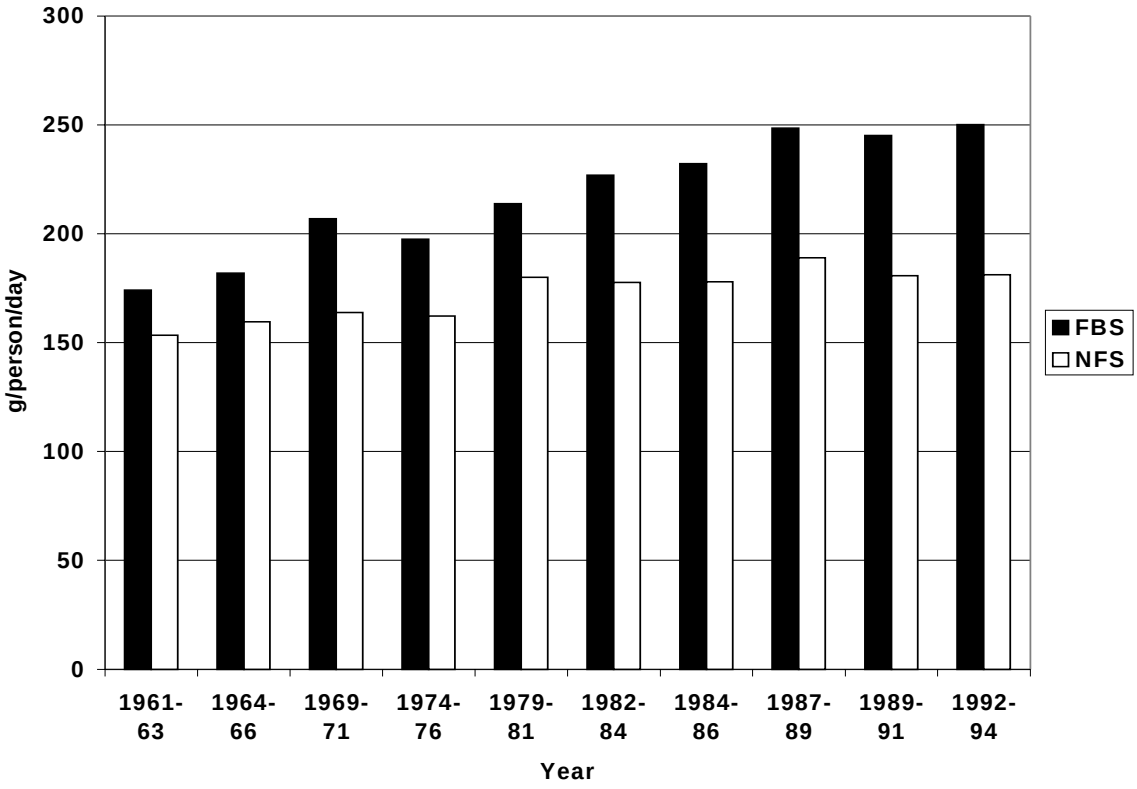
3. Validity of UK household budget survey measures

Recent work on the validity of UK NFS data on food consumption (Paterakis SE, Burr S, Nelson M, 2001) suggests that the agreement between household budget survey (NFS) and individual nutrition survey (NDNS) data is better for national averages and across age and gender groups for some foods (fish, “other” meat, cheese, potatoes, fruit) than for others (fats, carcass meat, milk and milk products, eggs, bread, other cereals, vegetables, sugar and sugar products, and hot beverages). These differences take into account preparation losses, use of foods in recipes, food wastage, eating out of home, and food given to pets and visitors. Part of the observed differences between methods may be explained by inexact modeling of these items.

Unfortunately, there is not sufficient data from individual nutrition surveys in the UK to be able to make comparisons over time. It is possible, however, to compare food balance sheet (FBS) data for the UK compiled by the Food and Agricultural Organization of the United Nations with the time trend data based on the NFS. While these two data sets are not exactly comparable – the FBS data shows average food availability for human consumption for the

UK, the NFS data shows home food consumption in Great Britain and excludes catering and institutional uses – it can be argued that the two data sets should show similar trends.

Figure 6 shows three year averages of NFS and FBS data from 1961 to 1994 for total vegetables. The trends shown are broadly in a similar direction and the correlation between the two data sets is 0.94 ($P<0.001$). The differences between consumption levels, however, is only 21g (13%) in 1961-64, rising steadily to 69g (32%) in 1992-94.

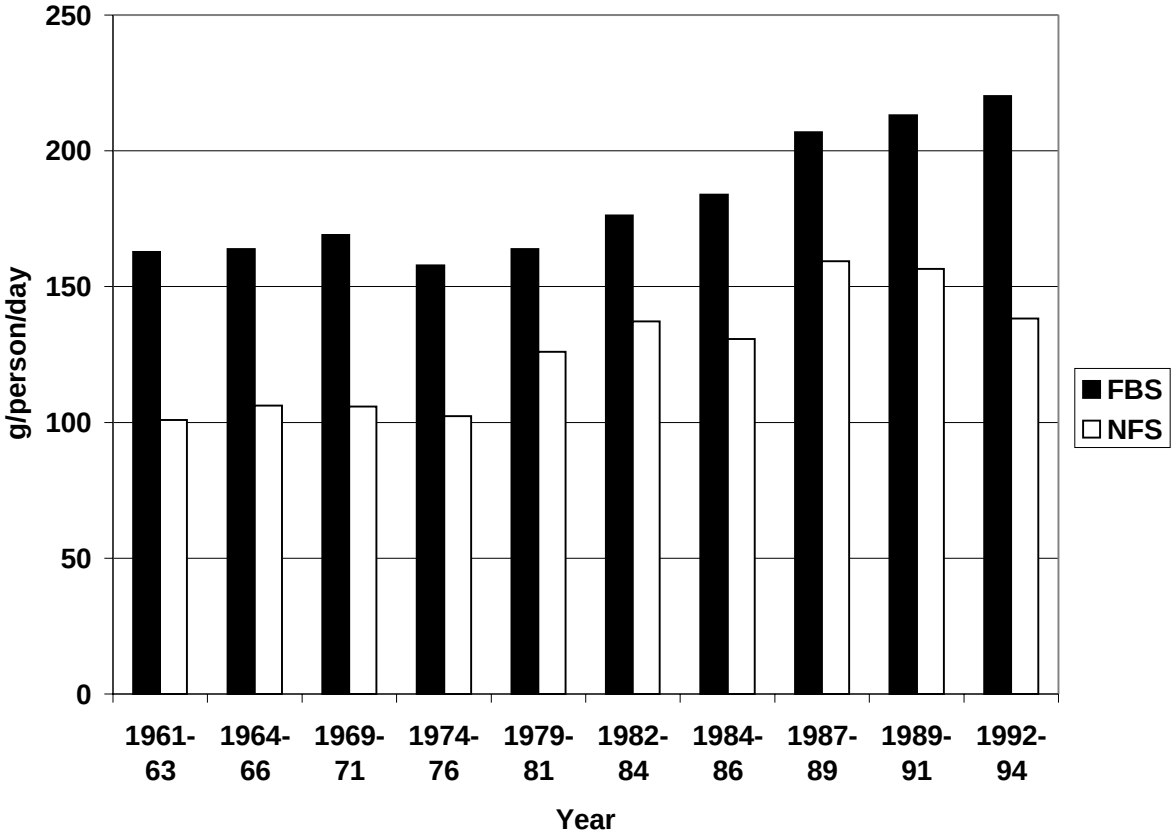


Difference (g)	**21**	**22**	**43**	**35**	**34**	**49**	**54**	**60**	**64**	**69**
Difference (%)	**13**	**13**	**23**	**20**	**17**	**24**	**26**	**27**	**30**	**32**

Figure 6. Availability of vegetables, Food Balance Sheets and National Food Survey data, 1961-1994, UK.

In contrast, the FBS trend for fruit shows one pattern (a plateau followed by an increase) while the NFS data show another (a plateau, an increase, and a decline) (Figure 7). The correlation coefficient between the two data sets is lower than for vegetables (0.84, $P=0.002$) and the size of the difference changes from 62g (47%) in 1961-64 to 38g (26%) in 1979-81 to 82g (46%) in 1991-94. It could be that these inconsistencies are due to changes in the types of fruit being consumed (e.g. more wastage in the type of fruit being consumed in more recent years) or changes in patterns of eating out. It is of concern, however, that the trends in the data in the years 1987-1994 are moving in opposite directions. Analysis of the possible

protective effect of fruit on disease based on the most recent data would yield one answer based on FBS data and the opposite answer based on NFS data.



Difference (g)	**62**	**58**	**63**	**55**	**38**	**39**	**53**	**47**	**57**	**82**
Difference (%)	**47**	**43**	**46**	**43**	**26**	**25**	**34**	**26**	**31**	**46**

Figure 7. Availability of fruit, Food Balance Sheets and National Food Survey data, 1961-1994, UK.

More striking still is the comparison of FBS and NFS data for estimated energy intake (Figure 8). The correlation in this case is not statistically significant (0.25, P=0.492). The marked decline in estimated energy intake based on NFS data is not reflected in the FBS data. Two recent articles (Harnack LJ, Jeffrey RW, Boutelle KN, 2000; French SA, Story M, Jeffrey RW, 2001) have contrasted the apparent increase in obesity in the United States with changes in estimates of availability of energy from food and drink and activity levels. They note that the trends based on household consumption data show a decline in energy intake and that the individual nutrition survey data are inconsistent, attributing some of the apparent inconsistency to changes in methodology. In contrast, US food balance sheet data show a rise in available energy. The rise in obesity is therefore attributed to the apparent increased energy intake coupled with the decline in activity levels. Neither paper, however, examines the levels

of intake based on FBS data with likely energy requirements in the population. In 1994, for example, mean energy availability is quoted by Harnack et al (2000) as being 15.9 MJ/day. This contrasts with the US estimated requirement for energy (National Research Council, 1989) for a sedentary adult male of 12.1 MJ/day, for a sedentary adult female of 9.2 MJ/day, and 8.4 MJ/day for a 10 year old child. The FBS data are clearly of a different order of magnitude, and their validity as a measure of likely energy intake needs to be questioned.

Part of the hypothesized reason for the apparent decline in the US HBS data is the dramatic increase in eating out, but it is unlikely that this provides the entire explanation. The same (but less dramatic) trend is apparent in the UK. Estimates of the proportion of food consumed away from home are 6% in 1961 and 14% in 1994 (Ministry of Agriculture, Fisheries and Food, 1995). This accounts for some of the apparent discrepancy between the UK FBS and NFS data shown in Figure 8. But even after allowing for the contribution of energy from food eaten way from home, the differences between the FBS and the NFS data increase from 418 kcal/d in 1961-63 to 1123 kcal/d in 1992-94. Part of the difference may be due to differences in the survey catchment (from 1961 to 1994 the NFS was GB based, whereas the FBS were UK based), although this would imply that levels of consumption in NI were radically different from those in the remainder of the UK, for which there is no evidence.

This is clearly an area of research that requires substantially more investigation before ecological analyses of diet-disease relationships over time can be undertaken with confidence.

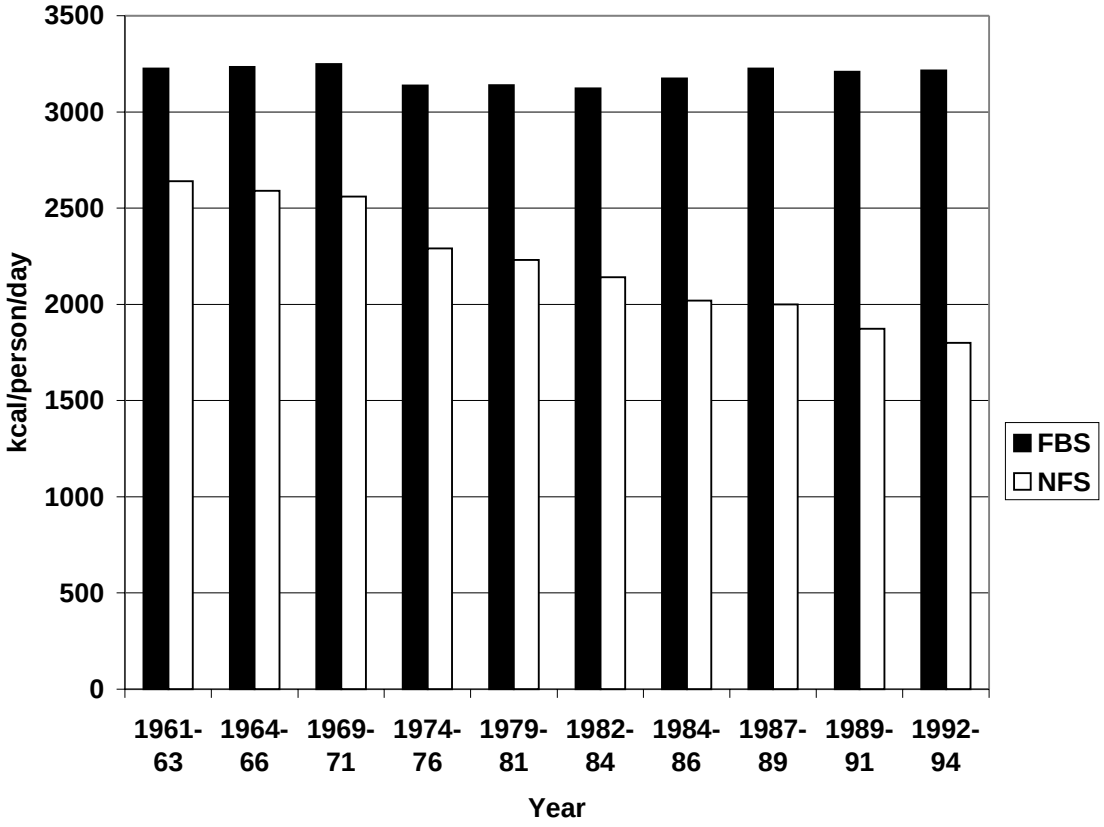


Figure 8. Energy intake (kcal/person/day), Food Balance Sheets and National Food Survey data, 1961-1994, UK.

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