

DIOXINS AND DIOXIN-LIKE PCBs IN THE UK DIET: 2001 TOTAL DIET STUDY SAMPLES

Key Facts

- Dioxins and dioxin-like polychlorinated biphenyls (PCBs) were analysed in samples of the food groups that made up the 2001 UK Total Diet Study.
- **The estimated total dietary intakes of dioxins and dioxin-like PCBs by all age groups fell by around 50 per cent between 1997 and 2001.**
- The estimated average intakes by adults of the sum of dioxins and dioxin-like PCBs from the UK diet have fallen from 1.8 pg WHO-TEQ/kg bodyweight/day in 1997 to 0.9 pg WHO-TEQ/kg bodyweight/day respectively in 2001. Average adult intakes are well within the new UK safety limit (Tolerable Daily Intake - TDI). The percentage of adults estimated to exceed the TDI from the whole diet fell from 35 per cent in 1997 to 1.1 per cent in 2001.
- The estimated average intakes by schoolchildren of the sum of dioxins and dioxin-like PCBs from the UK diet have fallen from 1.6-4.0 pg WHO-TEQ/kg bodyweight/day in 1997 to 0.7-1.8 pg WHO-TEQ/kg bodyweight/day respectively in 2001, with younger children being at the upper end of each of these ranges. The percentage of children estimated to exceed the TDI from the whole diet fell from 62 per cent in 1997 to 10 per cent in 2001.
- Intakes of dioxins and dioxin-like PCBs from the diets of toddlers have also fallen, and average intakes are estimated to be close to or slightly over the new UK safety guideline. The percentage of toddlers estimated to exceed the TDI from the whole diet fell from 97 per cent in 1997 to 37 per cent in 2001.
- The concentrations of dioxins found were all below relevant EU regulatory limits.

Background

What are dioxins and PCBs?

The term 'dioxins' refers to two groups of closely related compounds, individually referred to as congeners. There are 75 polychlorinated dibenzo-*p*-dioxins (PCDDs) and 135 polychlorinated dibenzofurans (PCDFs). Dioxins have developmental effects on young children, and are believed to disrupt the endocrine systems in humans and wildlife. Of the PCDD and PCDF groups, 17 have been shown to be toxic to certain species of laboratory animals (MAFF, 1992).¹ One of the compounds, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (2,3,7,8-TCDD), may also cause cancer in humans. Dioxins are unintentionally produced in small amounts during most combustion processes, both industrial and domestic, and may be formed as unwanted by-products in the manufacture of certain chemicals.

PCBs are another group of closely related organic chemicals. A few exhibit toxicity similar to those of the toxic dioxins and are therefore described as being 'dioxin-like'. Unlike dioxins, PCBs were manufactured and found a wide range of applications from the early 1930s, but they are no longer produced in the UK and have no significant uses.

Emissions of dioxins and PCBs into the environment have been reduced by about 70 per cent over the past ten years (Goodwin, 2002).² However, dioxins and PCBs do not degrade easily and so continue to be widespread in the environment. They tend to bioaccumulate and are generally present at low concentrations in most foods, especially fat-containing foods such as milk, meat, fish and eggs.

What are the controls on dioxins and PCBs?

Source-based controls

Strict controls on the emissions of dioxins and PCBs from industrial processes came into effect from 1992 under Integrated Pollution Control Regulations. Stringent regulation of these emissions has continued under the Pollution Prevention and Control Regulations 2000, which implemented Council Directive 96/61/EC (EU, 1996).³ In the past, incinerators were the main source of dioxins to the environment, but with the introduction of the controls above, uncontrolled diffuse sources have become increasingly significant (Anderson, 2002).⁴ The manufacture and general use of PCBs ceased in the mid 1970s and was banned under *The*

Control of Pollution (Supply and Use of Injurious Substances Regulations 1986 (S.I. 1986 No. 902), as amended. The only remaining use of PCBs in the UK is sealed inside some older electrical equipment but these PCBs must be phased out and destroyed under the UK PCB Regulations.⁵ PCBs must be disposed of in an environmentally sound manner and are generally destroyed by high temperature incineration or dechlorination processes.

Limits in food and animal feeding stuffs

In 2001 the European Union introduced limits and action levels for dioxins in fat containing foods (meat, fish, eggs, milk, milk products, fats and oils) (EC, 2001)⁶ and in animal feeding stuffs (EC, 2002).⁷ The aim of the limits is to keep grossly contaminated foods out of the market, and to prevent grossly contaminated feed being given to animals, thus contaminating animal food products. The action levels are concentrations that, if exceeded, should trigger action to identify and control the source of the dioxins. The limits and action levels for foods came into effect on 1 July 2002, and they are presented in Table 1. At present the limits and action levels apply only to dioxins, but shall be reviewed for the first time by 31 December 2004 at the latest in the light of new data on the presence of dioxins and dioxin-like PCBs, in particular with a view to the inclusion of dioxin-like PCBs in the levels to be set. There will be a further review by 31 December 2006 at the latest with the aim of significantly reducing the maximum limits.

In October 2002 the Government carried out a consultation regarding future measures that could be taken to further reduce environmental and human exposure (DEFRA, 2002),⁸ recognising that the most effective way to reduce levels in food is to further reduce environmental emissions of these substances. Under the Stockholm Convention (UNEP, 2001),⁹ the Department of Environment, Food and Rural Affairs (DEFRA) will be producing an action plan to reduce dioxins in the environment and consumer dietary exposure to these chemicals, taking into account responses from the consultation. DEFRA is currently investigating the cost effectiveness of potential measures to achieve these reductions.

What previous surveys have been carried out?

MAFF has carried out surveys for dioxins and PCBs in food since 1989 (MAFF, 1992).¹ In particular, samples of the composite food groups from the 1982 and 1992 Total Diet Studies (TDS) were analysed together (MAFF, 1997),¹⁰ followed by those from the 1997 TDS (FSA,

2000).¹¹ The design of the TDS, described more fully in the glossary, involves the preparation of twenty food group samples, each representing a major category of food, e.g. carcass meat, poultry, milk, fish, eggs, miscellaneous cereals, potatoes, etc.

Analysis for dioxins and PCBs is expensive and time consuming. Consequently, in the 1982 and 1992 TDS surveys, analysis was restricted to the eleven food groups considered likely to contribute most significantly to the estimated dietary exposure to dioxins and PCBs (MAFF, 1997).¹⁰ These eleven groups were selected either because they have significant fat contents (e.g. milk, meat, fish), and/or because they are consumed in large amounts by the majority of the population (e.g. milk, bread). Dietary intakes from the remaining food groups (fruit, vegetables, sugar and nuts) were estimated by assuming that each dioxin and PCB was present in each of those food groups at its limit of determination on a fresh weight basis. As samples from the 1982 and 1992 TDS were analysed concurrently, the same limits of determination were used for both years. In 1997 all the food groups except for beverages were analysed.¹¹ The estimated dietary intakes of both dioxins and dioxin-like PCBs by all age groups fell sharply between 1982 and 1992 (MAFF, 1997).¹⁰ The fall continued for dioxins in 1997, but for dioxin-like PCBs there was no significant change between 1992 and 1997 (FSA, 2000).¹¹

Toxic Equivalents

All analytical results for dioxins and dioxin-like PCBs in this report are expressed in terms of World Health Organization Toxic Equivalents (WHO-TEQs).¹² The use of Toxic Equivalents allows an assessment of the toxicological significance of the complex mixtures of dioxin and dioxin-like PCB congeners found in foods. The concept of Toxic Equivalents is explained in detail in the glossary. As the use of WHO-TEQs is relatively recent, dietary intake estimates for dioxins and PCBs are sometimes still being reported in the open literature in terms of the previously agreed International Toxic Equivalents (I-TEQs), as was the case when MAFF published the 1982, 1992 and 1997 TDS surveys (MAFF, 1997) (FSA, 2000).^{10,11}

Methodology

The current study involves analysis of the 2001 TDS food group samples and gives an up-to-date estimate of the dietary intake of dioxins and PCBs by UK consumers. In the current

survey, as in 1997, all food groups with the exception of the beverage food group, were analysed. For each food group, samples collected from 24 different locations in the UK were composited into a single sample for analysis, giving a total of 19 samples for analysis. Brand names are not available, as TDS samples are composites of a number of different foods (MAFF, 1997).¹³

The analytical methodology for determining dioxins and PCBs concentrations in food has been reported previously (Krokos, 1997).¹⁴ In the current survey, the 17 dioxins congeners of toxicological significance and the following dioxin-like PCB congeners were analysed: PCBs 77, 81, 126 and 169 (non-*ortho* PCBs); and 105, 114, 118, 123, 156, 157, 167 and 189 (*ortho* PCBs). All of the 17 dioxins and the 12 dioxin-like PCBs congeners to which a WHO-TEF has been assigned¹² are included.

All samples were analysed by high resolution gas chromatography coupled with high or low resolution mass spectrometry (GC-MS) at CSL. The laboratory has participated in inter-laboratory trials of measurement of dioxins and PCBs in human milk and human blood organised by the WHO and has recognised expertise in the analysis of foods for these compounds. The reporting limit for *ortho* PCBs in this survey was set to 0.05 microgram/kg fat. Analytical difficulties led to variation in the limits of determination (LODs) for dioxins and non-*ortho* PCBs, on a fat basis. In these cases the reporting limit was the LOD that instrumentation was able to achieve in that instance. All analytical data were assessed for compliance with published acceptance criteria (Ambidge, 1990).¹⁵ The concentrations reported for this survey and dietary intakes calculated from them are both *upper bound* and *lower bound* values (see glossary).

The coefficients of variation from analyses of reference materials, obtained by the laboratory over a long period of time, are approximately 10 per cent for dioxins and non-*ortho* PCBs and 5 per cent for *ortho* PCBs. The coefficients of variation for the analysis of the food group samples in the current study are likely to be of a similar order. This is considered to be acceptable.

Results

This report presents the results, expressed as WHO-TEQs, of the analysis for dioxins and dioxin-like PCBs in food groups from the 2001 TDS survey. The *upper bound* concentrations of dioxins and dioxin-like PCBs found in the samples are presented in Table 2a, and the corresponding *lower bound* concentrations are presented in Table 2b. For comparison, the concentrations found in the 1982, 1992 and 1997 TDS survey food group samples (MAFF, 1997) (FSA 2000),¹⁰⁻¹¹ are also shown. Full congener-specific concentrations on a fat basis, and concentrations as WHO-TEQs on both a fat basis and fresh weight basis, for the current survey are available in the contractor's final report (CSL, 2003).¹⁶

Comparisons of concentrations of dioxins and PCBs in 2001 with those found in 1997 show that **in all the food groups there was a fall in *upper bound* concentrations of both dioxins and dioxin-like PCBs**. This is most noticeable for dioxins in the bread, poultry, fats and oils, eggs and nuts food groups, and for PCBs in the miscellaneous cereals, carcass meat, fats and oils, and eggs food groups. The apparent increase in concentrations of dioxin-like PCBs in the green vegetables food group 2001 may not be real, as the concentrations of non-*ortho* PCBs had to be estimated in that food group in 1997 due to analytical difficulties. The fall in concentrations of dioxins and dioxin-like PCBs between 1997 and 2001 is in line with that found in fish oil dietary supplements (MAFF, 1997) (FSA, 2002).¹⁷⁻¹⁸

All the dioxins concentrations found in the current survey were within the EU regulatory limits, although the limits relate to individual foods and the samples analysed in this survey were composites and therefore represent only weighted averages.

Two types of dietary intakes were estimated from the results of the analysis of the 2001 TDS samples: (i) consumer intake and (ii) population intake.

Consumer intake

Dietary intakes of dioxins and dioxin-like PCBs by UK consumers were estimated from the fresh weight concentrations using consumption data from the National Diet and Nutrition Survey (NDNS) of People Aged 65 Years and Older (Finch, 1998),¹⁹ the NDNS of Adults Aged 19 to 64 Years (Henderson, 2002),²⁰ the NDNS of Young People Aged 4-18 Years (Gregory, 2000),²¹ and the NDNS of Children Aged 1½-4½ Years (Gregory, 1995).²² The

first of these has separate consumption data for senior citizens living at home and those living in old peoples' homes. When the 1997 TDS survey was published (FSA, 2000),¹¹ the intakes of adults and schoolchildren had to be estimated using food consumption data from the 1986 Dietary and Nutritional Survey of British Adults (Gregory, 1990)²³ and the 1983 Diets of British Schoolchildren (DH, 1989),²⁴ but they have now been re-calculated as for the 2001 TDS. Dietary intakes in 1982 and 1992 have not been re-calculated, as the earlier consumption data sets are more contemporaneous with those years.

Consumer dietary intake estimates via individual food groups are given for 1982, 1992, 1997 and 2001 in Tables 3a (average) and 3b (high level, i.e. 97.5th percentile) for adults. Similar calculations were undertaken for other population groups. Summaries of *upper bound* estimated average and high level total dietary intake estimates of all age groups are presented in Tables 4a and 4b respectively. Tables 5a and 5b present the corresponding estimated *lower bound* dietary intakes in 1997 and 2001. To assist with following time trends in the data, the total estimated *upper bound* average adult dietary intakes of dioxins and dioxin-like PCBs for each year are plotted in Figure 1.

The estimated total dietary intakes of dioxins and dioxin-like PCBs by each age group have fallen by around a half between 1997 and 2001.

Dioxins and PCBs are primarily found in the fat component of the diet, especially in the saturated fat in foods derived from animals. This is because animals accumulate dioxins and PCBs as a result of their environmental exposure. A fall in the amount of saturated fat in the diet, recorded between 1992 and 1997 (MAFF, 1984, 1994 and 1998),²⁵⁻²⁷ may have contributed to the observed decrease in average dietary intakes from the meat products and carcass meat food groups. Comparable data for 2001 are not yet available. The general switch towards eating more poultry and less red meats has probably also contributed to the overall decrease in dietary intakes. Red meat, represented by the carcass meat food group, contained higher fresh weight concentrations of total dioxins and dioxin-like PCBs than the poultry food group in both 1997 and 2001.

Population intake

Dietary intakes may also be estimated using information on foods purchased from the NFS (MAFF, 1984, 1994, 1998; 1999; and 2000).²⁵⁻²⁹ Multiplying the amounts of foods consumed (based on consumption data from the appropriate years of the NFS) by the corresponding mean concentrations of dioxins and dioxin-like PCBs detected in each TDS food group gives an estimate of population average intake (including adults of all ages and children) for that year. These estimates can be used to follow trends in intake as they take into account changes in both consumption of the various foods making up the general UK diet and in concentrations of dioxins and PCBs in these foods. However, the NFS does not provide information on who within a household actually eats the food purchased, and does not allow for estimates of high level dietary intake.

The population average dietary intakes of dioxins and dioxin-like PCBs, estimated using the NFS, are shown in the final rows of Tables 4a and 5a. The estimated *upper bound* population average dietary intakes of dioxins and dioxin-like PCBs through the total diet were 0.7 pg WHO-TEQ/kg bodyweight/day in 2001, compared to 1.7 pg WHO-TEQ/kg bodyweight/day in 1997.

When assessing any possible risk to human health, it is the consumer dietary intakes (Tables 3a-3b and 4a-4b) rather than population average dietary intakes that are compared against the TDI, as the former allow account to be taken of high level intakes.

Interpretation

In November 2001 the COT recommended that the UK Tolerable Daily Intake (TDI) for mixtures of dioxins and dioxin-like PCBs be reduced from 10 pg WHO-TEQ/kg bodyweight per day to 2 pg WHO-TEQ/kg bodyweight/day (DH, 2001).³⁰ This is equivalent to the Tolerable Weekly Intake (TWI) of 14 pg WHO-TEQ/kg bodyweight/week set by the Scientific Committee for Food (SCF) (SCF, 2000),³¹ and similar to the Provisional Tolerable Monthly Intake (PTMI) of 70 pg WHO-TEQ/kg bodyweight/month proposed by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) (JECFA, 2001).³²

The estimated average consumer dietary intakes by adults, children and all but the youngest age group of toddlers (1.5-2.5 years) of dioxins and dioxin-like PCBs via the total diet in 2001 are all within the UK TDI. The estimated high level consumer dietary intakes by adults and older children of dioxins and dioxin-like PCBs are also below the UK TDI, but those of younger children and all toddlers exceed the UK TDI. Overall, 1.1 per cent of adults, 10 per cent of children and 37 per cent of toddlers are estimated to exceed the UK TDI. By comparison, in 1997 it was estimated that 35 per cent of adults, 62 per cent per cent of children and 97 per cent of toddlers exceeded the UK TDI (Table 6).

However, despite the fact that some toddlers and children up to 10 years old may exceed the TDI, estimated intakes by all age groups have declined substantially since 1997 and may decline further still in the future as controls on releases of the chemicals to the environment continue to take effect.

The COT concluded that occasionally consuming more than the TDI would not significantly increase the body burden and would not be expected to result in harmful effects, providing that the average intake over a prolonged period is within the TDI. The Agency therefore is reaffirming its advice issued when the COT recommended the new UK TDI in November 2001, i.e. that consumers should continue to eat a balanced healthy diet.³³

Glossary of Terms

Dietary intake

Dietary intakes (also referred to as dietary exposures) are estimates of the amount of a contaminant which is present in a given combination of foods in the diet eaten during a given time period, usually a day. These estimates are compared with the Tolerable Daily Intake (TDI - see below). Dietary intakes may be expressed as a per person basis, or more usually as in this report, on a body weight basis. This is done by dividing the intakes per person by an appropriate (real or estimated) body weight. When expressed in this way it is easier to compare dietary intakes across different age groups.

Dietary survey

In dietary surveys, the amounts of all foods eaten by each of

a number of individual consumers during a given time period are recorded. From these surveys, the consumer average and the high level consumptions of a food or combination of foods can be estimated. These consumption data are used combined with information on the levels of contaminants in each food group to calculate dietary intakes of contaminants. The dietary surveys used in this report are the elderly survey (age 65+) (Finch, 1998),¹⁹ the new adults survey (age 19-64) (Henderson, 2002),²⁰ the young persons survey (ages 4-18) (Gregory, 2000)²¹ and the toddlers survey (age 1.5-4.5) (Gregory, 1995).²²

Fat basis concentration

This is the amount of a contaminant which is present in a given weight of the fat portion of a food. For chemicals such as dioxins and PCBs, which tend to be found mainly in the fat of foods, it is common practice in the UK and other countries to express concentrations in this way. It is easier to compare such concentrations in a given food in different surveys and to follow time trends. The amount of contaminant in the whole food as actually eaten (the fresh weight concentration – see below) may be relatively low compared with the fat basis concentration.

Fresh weight concentration

The amount of a contaminant which is present in a given weight of the whole food as it is actually eaten. It is the fresh weight concentrations and not fat basis concentrations given in Table 2 that are combined with dietary survey data to estimate the dietary intakes of dioxins and dioxin-like PCBs.

Limit of determination (LOD)

The lowest concentration of a chemical that is measurable with confidence by the analytical method used. For compounds such as dioxins that are present at very low levels and require very sensitive analysis, the LOD achieved can vary significantly between the individual compounds.

National Food Survey (NFS)

This is a continuous survey which provides information on the types and quantities of food purchased by households on

an annual basis. Since 1994, the NFS has also reported on food consumed outside the home.

Tolerable Daily Intake (TDI)

The maximum amount of a contaminant which can be eaten every day over a whole lifetime without incurring appreciable risk to health. Tolerable Daily Intakes may be expressed on a per person basis, or more usually as in this report, on a body weight basis. For example, the UK TDI for dioxins and dioxin-like PCBs is 2 pg WHO-TEQ/kg bodyweight/day (DH, 2001).³⁰

Total Diet Study

The Total Diet Study is a model of the average domestic diet in the UK (MAFF, 1994) (Peattie, 1983).^{34,35} A total of 121 categories of food and drink are specified for inclusion in the Total Diet. These are assigned to one of twenty broad food groups. Foods are grouped so that commodities known to be susceptible to contamination (e.g. offals and fish) are kept separate, as are foods which are consumed in large quantities, e.g. bread, potatoes, milk. The quantities and relative proportions of each food that make up the Total Diet are largely based on data from the National Food Survey (averages of the data from the previous three years) and are updated annually. For example, quantities of foods purchased for the 2001 TDS samples will have been determined by the average of the consumption data found in the NFS for 1998, 1999 and 2000. Food samples are purchased fortnightly from 24 randomly selected locations representative of the UK as a whole. The food samples are prepared and cooked according to normal consumer practice. The constituents of each food group are then homogenised and frozen. Samples are then analysed for a range of food constituents and contaminants.

Toxic Equivalent

Dioxins and dioxin-like PCBs in food occur as mixtures of a number of different individual chemicals that have different degrees of dioxin-like toxicity. The concentration of each

individual dioxin and dioxin-like PCB is multiplied by a weighting factor (referred to as a Toxic Equivalency Factor – TEF) which reflects its toxicity relative to that of the most toxic dioxin. The weighted concentrations are then added together to give the Toxic Equivalent (TEQ). The system of TEFs set by the World Health Organization in 1997 (WHO-TEFs) is used in this report (Van den Berg, 1998).¹² However, most results in the published literature, including the report of the MAFF survey of 1982 and 1992 TDS samples,¹⁰ are still in terms of the previous widely used International Toxic Equivalency Factors (I-TEFs) set in 1988 for dioxins and the TEFs recommended in 1994 for dioxin-like PCBs. Compared to concentrations expressed as I-TEQs, those expressed as WHO-TEQs are typically about 15 per cent higher for dioxins and marginally lower for dioxin-like PCBs, resulting in an apparent increase for total concentrations. The actual difference depends on the distribution of individual dioxins and PCBs in the sample.

Upper and lower bound

Upper bound concentrations (and dietary intakes estimated from them) assume that all individual dioxins and PCBs that are present at concentrations below the reporting limit are present at the reporting limit, and therefore may be an overestimate of the true concentrations. By contrast, *lower bound* concentrations assume that all individual dioxins and PCBs that are present at concentrations below the reporting limit are absent, and therefore underestimate the true concentrations. The true concentrations will lie somewhere between the *lower* and *upper bound* values.

In the current survey, for the animal product and fish food groups, there was little difference between the *lower* and *upper bound* values as most congeners were present at measurable concentrations.

Summary of Units

microgram	a microgram is one millionth of a gram (g)
kg	a kilogram (kg) is one thousand grams (g).
ng	a nanogram (ng) is one thousand millionth of a gram (g).
pg	a picogram (pg) is one million millionth of a gram (g).
ng WHO-TEQ/kg	nanograms of WHO Toxic Equivalents per kilogram; equivalent to parts per million million (parts per trillion) by weight
pg WHO-TEQ/kg	picograms of WHO Toxic Equivalents per kilogram; equivalent to parts per thousand million million (parts per quadrillion) by weight.

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A copy of the full report of this survey has been placed in the Library, Aviation House, 125 Kingsway, London, WC2B 6NH Tel. No. + 44 (0) 20 7276 8181/8282. If you wish to consult it please contact the library for an appointment giving at least 24 hours notice or alternatively copies can be obtained from the library: a charge will be made to cover photocopying and postage.

Table 1: Maximum limits and action levels (ng WHO-TEQ/kg) for dioxins in foods

Foods	MAXIMUM LEVELS APPLICABLE UNTIL 31.12.2005 (ng WHO-TEQ/kg fat except for fish)	ACTION LEVELS (ng WHO-TEQ/kg fat except except for fish)
Meat and meat products originating from - Ruminants (bovine animals, sheep) - Poultry and farmed game - Pigs - Liver	3 2 1 6	2 1.5 0.6 4
Fish and fishery products*	4 (fresh weight)	3 (fresh weight)
Milk and milk products, including butter fat	3	2
Eggs and egg products**	3	2
Oils and fats - Animal fat - From ruminants - From poultry and farmed game' - From pigs' - Mixed animal fat' - Vegetable oil - Fish oil intended for human consumption	3 2 1 2 0.75 2	2 1.5 0.6 1.5 0.5 1.5

Notes: * excluding brown meat of crab and cephalopods with viscera

** excluding free range and semi-intensive eggs until 1 January 2004

Table 2a: UPPER bound CONCENTRATIONS of dioxins and dioxin-like PCBs in TDS food group samples in 1982, 1992, 1997 and 2001

Food group	Upper bound concentrations (ng WHO-TEQ/kg fat basis)													
	1982			1992			1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins + PCBs		
Bread	1.38	0.95	2.33	1.35	0.69	2.04	0.74	0.28	1.02	0.20	0.15	0.35	±	0.11
Miscellaneous cereals	1.79	1.67	3.46	2.15	0.35	2.50	0.43	0.38	0.81	0.13	0.13	0.26	±	0.10
Carcase meat	3.16	1.88	5.04	1.15	0.86	2.01	0.80	1.07	1.87	0.42	0.31	0.73	±	0.11
Offals	15.76	3.29	19.05	10.33	2.88	13.21	6.29	2.47	8.76	5.88	1.44	7.32	±	0.57
Meat products	1.50	0.70	2.20	0.43	0.33	0.77	0.77	0.61	1.38	0.18	0.24	0.42	±	0.11
Poultry	5.89	2.29	8.18	1.85	0.89	2.74	1.01	1.31	2.32	0.18	0.53	0.71	±	0.13
Fish	5.83	11.24	17.07	3.14	4.60	7.75	2.40	4.53	6.93	1.06	3.57	4.63	±	0.29
Oils and fats	1.29	1.24	2.54	0.29	0.34	0.64	0.44	0.36	0.80	0.07	0.12	0.19	±	0.07
Eggs	8.93	2.20	11.12	1.97	0.94	2.91	0.77	0.64	1.41	0.24	0.20	0.44	±	0.10
Sugar and preserves	*	*	*	*	*	*	0.97	0.33	1.30	0.26	0.19	0.45	±	0.11
Green vegetables**	*	*	*	*	*	*	0.69	0.21	0.90	0.52	0.32	0.84	±	0.18
Potatoes	*	*	*	*	*	*	0.53	0.17	0.70	0.29	0.11	0.40	±	0.10
Other vegetables	*	*	*	*	*	*	0.50	0.20	0.70	0.22	0.15	0.37	±	0.12
Canned vegetables	*	*	*	*	*	*	0.77	0.27	1.04	0.22	0.23	0.45	±	0.11
Fresh fruit	*	*	*	*	*	*	9.66***	3.01***	12.67***	0.53	0.42	0.95	±	0.21
Fruit products	*	*	*	*	*	*	2.59***	0.49	3.08***	0.89	0.37	1.26	±	0.38
Milk	5.21	2.68	7.88	2.38	1.23	3.61	0.83	0.74	1.57	0.47	0.43	0.90	±	0.13
Milk products	4.08	1.69	5.77	0.89	0.56	1.44	1.12	0.88	2.00	0.48	0.41	0.89	±	0.14
Nuts	*	*	*	*	*	*	0.44	0.13	0.57	0.09	0.11	0.20	±	0.08

Notes: Concentrations in the 1982 and 1992 TDS samples are those from Food Surveillance Information Sheet No. 105,¹⁰ re-expressed as WHO-TEQs.

Concentration in the 1997 TDS samples were those reported in Food Surveillance Information Sheet No. 4/00.¹¹

Combined concentrations of dioxins and dioxin-like PCBs may not equal the sum of the concentrations due to rounding.

* These food groups were not analysed in the 1982 and 1992 TDS surveys. Dietary exposures were estimated by assuming each individual dioxin and dioxin-like PCB was present at their fresh weight limits of determination.

** The concentrations of non-ortho PCBs could not be determined in the 1997 sample due to analytical difficulties. Non-ortho PCBs were assumed to be present at the averages of their concentrations in the potatoes, other vegetables and canned vegetable food group samples.

*** These samples had very low fat contents. Therefore fresh weight concentrations were low.

Table 2b: LOWER bound CONCENTRATIONS of dioxins and dioxin-like PCBs in TDS food group samples in 1982, 1992, 1997 and 2001

Food group	Lower bound concentrations (ng WHO-TEQ/kg fat basis)													
	1982			1992			1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins + PCBs		
Bread	0.46	0.42	0.88	0.28	0.01	0.29	0.32	0.22	0.54	0.18	0.06	0.24	±	0.04
Miscellaneous cereals	1.49	1.56	3.05	0.43	0.21	0.64	0.43	0.30	0.73	0.04	0.04	0.08	±	<0.01
Carcase meat	2.72	1.85	4.57	1.00	0.80	1.80	0.74	1.04	1.78	0.41	0.25	0.66	±	0.09
Offals	15.69	3.18	18.87	10.31	2.73	13.04	6.22	2.41	8.63	5.87	1.38	7.25	±	0.50
Meat products	1.48	0.67	2.15	0.40	0.29	0.69	0.76	0.55	1.31	0.12	0.17	0.29	±	0.03
Poultry	5.88	2.23	8.11	1.34	0.77	2.11	0.99	1.25	2.24	0.13	0.47	0.60	±	0.04
Fish	5.82	11.20	17.02	2.90	4.52	7.42	2.12	4.53	6.65	1.06	3.57	4.63	±	0.29
Oils and fats	1.29	1.24	2.53	0.27	0.34	0.61	0.20	0.28	0.48	0.02	0.02	0.04	±	<0.01
Eggs	8.92	2.17	11.09	1.96	0.86	2.82	0.76	0.61	1.37	0.24	0.11	0.35	±	0.06
Sugar and preserves	*	*	*	*	*	*	0.47	0.28	0.75	0.26	0.10	0.36	±	0.06
Green vegetables**	*	*	*	*	*	*	0.45	0.05	0.50	0.50	0.29	0.79	±	0.10
Potatoes	*	*	*	*	*	*	0.01	0.11	0.12	0.29	0.03	0.32	±	0.05
Other vegetables	*	*	*	*	*	*	0.28	0.12	0.40	0.16	0.07	0.23	±	0.01
Canned vegetables	*	*	*	*	*	*	0.33	0.19	0.52	0.22	0.18	0.40	±	0.08
Fresh fruit***	*	*	*	*	*	*	2.47	2.98	5.45	0.43	0.36	0.79	±	0.09
Fruit products***	*	*	*	*	*	*	1.30	0.43	1.73	0.36	0.34	0.70	±	0.06
Milk	5.19	2.44	7.63	1.91	0.93	2.84	0.80	0.68	1.48	0.46	0.34	0.80	±	0.08
Milk products	4.08	1.67	5.75	0.89	0.51	1.40	1.11	0.82	1.93	0.47	0.33	0.80	±	0.09
Nuts	*	*	*	*	*	*	0.13	0.04	0.17	<0.01	<0.01	<0.01	±	<0.01

Notes: Lower bound concentrations in the 1982 and 1992 TDS samples are those used to estimate lower bound dietary intakes in Food Surveillance Information Sheet No. 105,¹⁰ re-expressed as WHO-TEQs.

Concentrations in the 1997 TDS samples correspond to upper bound concentrations reported in Food Surveillance Information Sheet No. 4/00.¹¹

Combined concentrations of dioxins and dioxin-like PCBs may not equal the sum of the concentrations due to rounding.

* These food groups were not analysed in the 1982 and 1992 TDS surveys, and lower bound concentrations were assumed to be zero.

** The concentrations of non-ortho PCBs could not be determined in the 1997 sample due to analytical difficulties. The lower bound concentrations were assumed to be zero.

*** These samples had very low fat contents. Therefore fresh weight concentrations were low in both 1997 and 2001.

Table 3a: Estimated *upper bound* AVERAGE dietary intake of ADULTS of dioxins and dioxin-like PCBs in 1982, 1992, 1997 and 2001 (pg WHO-TEQ/kg bodyweight/day)

Food group	Estimated average dietary intake (pg WHO-TEQ/kg bodyweight/day)													
	1982			1992			1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins + PCBs		
Bread	0.06	0.03	0.1	0.06	0.03	0.09	0.03	0.02	0.05	0.01	<0.01	0.02	±	<0.01
Miscellaneous cereals	0.3	0.3	0.5	0.3	0.1	0.4	0.07	0.07	0.1	0.02	0.02	0.04	±	0.02
Carcase meat	0.6	0.3	0.9	0.2	0.1	0.3	0.1	0.1	0.2	0.07	0.06	0.12	±	0.02
Offals	0.4	0.08	0.4	0.2	0.05	0.2	0.1	0.04	0.1	0.09	0.02	0.11	±	<0.01
Meat products	0.4	0.2	0.6	0.1	0.07	0.2	0.1	0.09	0.2	0.04	0.05	0.09	±	0.02
Poultry	0.30	0.1	0.5	0.09	0.04	0.1	0.06	0.08	0.1	0.02	0.04	0.06	±	0.01
Fish	0.3	0.5	0.8	0.1	0.2	0.4	0.1	0.3	0.4	0.07	0.2	0.3	±	0.02
Fats and oils	0.30	0.3	0.6	0.06	0.07	0.1	0.06	0.05	0.1	0.01	0.02	0.03	±	0.01
Eggs	0.50	0.1	0.6	0.09	0.0	0.1	0.03	0.03	0.06	0.01	<0.01	0.02	±	<0.01
Sugar and preserves*	0.02	0.01	0.03	0.02	0.01	0.03	0.06	0.02	0.08	0.02	0.01	0.03	±	<0.01
Green vegetables*	0.03	0.01	0.04	0.03	0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	±	<0.01
Potatoes*	0.08	0.03	0.10	0.08	0.03	0.1	0.04	0.02	0.08	0.02	<0.01	0.02	±	<0.01
Other vegetables*	0.04	0.02	0.06	0.04	0.02	0.06	0.01	<0.01	0.02	<0.01	<0.01	<0.01	±	<0.01
Canned vegetables*	0.03	0.01	0.04	0.03	0.01	0.04	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	±	<0.01
Fresh fruit*	0.05	0.02	0.07	0.05	0.02	0.07	0.02	0.01	0.03	<0.01	<0.01	<0.01	±	<0.01
Fruit products*	0.05	0.02	0.06	0.05	0.02	0.06	0.01	<0.01	0.02	<0.01	<0.01	<0.01	±	<0.01
Milk	0.7	0.4	1.1	0.3	0.1	0.4	0.07	0.1	0.2	0.03	0.03	0.06	±	<0.01
Milk products	1.4	0.6	1.9	0.2	0.1	0.3	0.2	0.2	0.4	0.12	0.10	0.22	±	0.03
Nuts*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.01	0.05	<0.01	<0.01	0.01	±	<0.01
Whole diet**	4.6	2.6	7.2	1.6	0.9	2.5	0.9	0.9	1.8	0.4	0.5	0.9	±	0.1

Notes: Combined dietary intakes of dioxins and dioxin-like PCBs may not equal the sum of the separate intakes due to rounding.

- * These food groups were not analysed in 1982 and 1992. Dietary intakes were estimated assuming each dioxin and dioxin-like PCB was present at the limits of determination (LOD) achievable in the mid 1990s. Lower LODs were achieved for the 1997 TDS survey. All estimated dietary intakes in 1982 and 1992 have been taken from Food Surveillance Information Sheet No. 105,¹⁰ re-expressed as WHO-TEQ. Intakes in 1997 have been re-estimated from the concentrations reported in Food Surveillance Information Sheet No. 4/00¹¹ using food consumption data from the new adults dietary survey.²⁰
- The dietary intakes in 2001 have been estimated using the same food consumption data as for the 1997.

** The intake of dioxins and dioxin-like PCBs by the average consumer for all foods combined is not equal to the sum of the intakes from the individual foods. It refers to the dietary intake by a consumer consuming one or any combination of the foods containing dioxins and dioxin-like PCBs. These values are derived from a distribution of the individual consumers' consumption patterns with regards to the individual foods.

Table 3b: Estimated *upper bound* HIGH LEVEL dietary intake of ADULTS of dioxins and dioxin-like PCBs in 1982, 1992, 1997 and 2001 (pg WHO-TEQ/kg bodyweight/day)

Food group	Estimated high level dietary intake (pg WHO-TEQ/kg bodyweight/day)													
	1982			1992			1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins + PCBs		
Bread	0.1	0.08	0.2	0.1	0.07	0.2	0.08	0.05	0.1	0.02	0.02	0.04	±	0.01
Miscellaneous cereals	0.8	0.7	1.5	0.9	0.1	1.0	0.2	0.2	0.4	0.05	0.05	0.10	±	0.04
Carcase meat	1.7	1.0	2.7	0.5	0.4	0.9	0.3	0.4	0.7	0.2	0.2	0.4	±	0.05
Offals	1.2	0.2	1.4	0.6	0.2	0.7	0.3	0.1	0.5	0.3	0.08	0.39	±	0.03
Meat products	1.1	0.5	1.7	0.3	0.2	0.5	0.4	0.3	0.7	0.1	0.2	0.3	±	0.07
Poultry	1.2	0.5	1.6	0.3	0.1	0.4	0.2	0.2	0.4	0.05	0.1	0.2	±	0.03
Fish	0.8	1.5	2.3	0.4	0.6	1.0	0.5	0.8	1.3	0.2	0.7	0.9	±	0.07
Fats and oils	1.0	0.9	1.9	0.2	0.2	0.4	0.2	0.2	0.4	0.03	0.06	0.10	±	0.04
Eggs	1.3	0.3	1.7	0.3	0.1	0.4	0.1	0.09	0.2	0.03	0.02	0.06	±	0.01
Sugar and preserves*	0.07	0.03	0.1	0.07	0.03	0.1	0.2	0.07	0.3	0.05	0.04	0.09	±	0.03
Green vegetables*	0.08	0.04	0.1	0.08	0.04	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	±	<0.01
Potatoes*	0.2	0.08	0.3	0.2	0.08	0.3	0.09	0.05	0.2	0.04	0.01	0.05	±	0.01
Other vegetables*	0.1	0.06	0.2	0.1	0.06	0.2	0.04	0.02	0.06	0.02	0.01	0.03	±	0.01
Canned vegetables*	0.09	0.04	0.1	0.09	0.04	0.1	0.03	0.01	0.04	<0.01	<0.01	<0.01	±	<0.01
Fresh fruit*	0.2	0.07	0.2	0.2	0.07	0.2	0.06	0.03	0.1	0.01	0.01	0.03	±	<0.01
Fruit products*	0.2	0.07	0.2	0.2	0.07	0.2	0.05	0.0	0.06	0.01	<0.01	<0.01	±	<0.01
Milk	1.9	1.0	2.8	0.7	0.4	1.1	0.2	0.3	0.5	0.09	0.08	0.17	±	0.02
Milk products	4.2	1.7	5.9	0.6	0.4	0.9	0.7	0.5	1.2	0.4	0.3	0.7	±	0.10
Nuts*	0.02	0.01	0.03	0.02	0.01	0.03	0.2	0.05	0.3	0.04	0.04	0.07	±	0.03
Whole diet**	8.3	4.6	12.8	2.8	1.6	4.3	1.7	1.7	3.3	0.7	1.0	1.7	±	0.3

Notes: Combined dietary intakes of dioxins and dioxin-like PCBs may not equal the sum of the separate intakes due to rounding.

- * These food groups were not analysed in 1982 and 1992. Dietary intakes were estimated assuming each dioxin and dioxin-like PCB was present at the limits of determination (LOD) achievable in the mid 1990s. Lower LODs were achieved for the 1997 TDS survey. All estimated dietary intakes in 1982 and 1992 have been taken from Food Surveillance Information Sheet No. 105,¹⁰ re-expressed as WHO-TEQ. Intakes in 1997 have been re-estimated from the concentrations reported in Food Surveillance Information Sheet No. 4/00¹¹ using food consumption data from the new adults dietary survey.²⁰ The dietary intakes in 2001 have been estimated using the same food consumption data as for the 1997 intakes.

** The intake of dioxins and dioxin-like PCBs by the high level consumer for all foods combined is not equal to the sum of the intakes from the individual foods. It refers to the dietary intake by a consumer consuming one or any combination of the foods containing dioxins and dioxin-like PCBs. These values are derived from a distribution of the individual consumers' consumption patterns with regards to the individual foods.

Table 4a: Summary of estimated upper bound AVERAGE dietary intakes of all age groups of dioxins and dioxin-like PCBs in 1982, 1992, 1997 and 2001 (pg WHO-TEQ/kg bodyweight/day)

Age group	Estimated upper bound average dietary intakes (pg WHO-TEQ/kg bodyweight/day)													
	1982			1992			1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins + PCBs		
Senior citizens* - living at home	n/e	n/e	n/e	n/e	n/e	n/e	0.8	0.8	1.5	0.3	0.4	0.7	±	0.1
Senior citizens* - in old peoples' homes	n/e	n/e	n/e	n/e	n/e	n/e	1.0	0.9	2.0	0.4	0.5	0.9	±	0.2
Adults*	4.6	2.6	7.2	1.6	0.9	2.5	0.9	0.9	1.8	0.4	0.5	0.9	±	0.1
Schoolchildren:*														
10-11 & 14-15 years**	5.6	3.0	8.6	2.0	1.0	3.0	1.2	1.0	2.2	n/e	n/e	n/e	±	n/e
4-6 years	n/e	n/e	n/e	n/e	n/e	n/e	2.1	1.9	4.0	0.9	0.9	1.8	±	0.3
7-10 years	n/e	n/e	n/e	n/e	n/e	n/e	1.6	1.4	3.0	0.7	0.7	1.4	±	0.2
11-14 years	n/e	n/e	n/e	n/e	n/e	n/e	1.1	1.0	2.0	0.4	0.5	0.9	±	0.2
15-18 years	n/e	n/e	n/e	n/e	n/e	n/e	0.8	0.7	1.6	0.3	0.4	0.7	±	0.1
Toddlers:*														
1.5-2.5 years	15	7.9	23	5.0	2.6	7.5	2.4	2.5	5.1	1.1	1.1	2.2	±	0.4
2.5-3.5 years	12	6.6	19	4.2	2.1	6.3	2.2	2.1	4.3	0.9	1.0	1.9	±	0.3
3.5-4.5 years	11	5.9	17	3.7	1.9	5.6	2.0	1.9	3.9	0.8	0.9	1.7	±	0.3
Population average***	4.7	2.7	7.5	1.5	0.9	2.4	1.0	0.8	1.7	0.3	0.4	0.7	±	0.1

Notes: Combined dietary intakes of dioxins and dioxin-like PCBs may not equal the sum of the separate intakes due to rounding. All dietary intakes in 1982 and 1992 have been estimated from the concentrations reported in Food Surveillance Information Sheet No. 105,¹⁰ re-expressed as WHO-TEQ. Those of the toddlers have additionally been re-estimated using food consumption data from the toddlers survey.²² Adult and schoolchild dietary intakes in 1997 have been re-estimated from the concentrations reported in Food Surveillance Information Sheet No. 4/00¹¹ using food consumption data from the new adults²⁰ and young persons²¹ dietary surveys. The dietary intakes in 2001 have been estimated using the same food consumption data as for the 1997 intakes.

* Consumer dietary intakes, estimated using food consumption data from the dietary surveys.¹⁹⁻²⁴

** Estimated using food consumption data from the Diets of British Schoolchildren.²⁴

*** Estimated using food consumption data from the National Food Survey.²⁵⁻²⁹ This method cannot estimate high level intakes.

n/e Not estimated.

Table 4b: Summary of estimated *upper bound* HIGH LEVEL dietary intake of all age groups of dioxins and dioxin-like PCBs in 1982, 1992, 1997 and 2001 (pg WHO-TEQ/kg bodyweight/day)

Age group	Estimated <i>upper bound</i> high level dietary intakes (pg WHO-TEQ/kg bodyweight/day)													
	1982			1992			1997			2001				
	Dioxins	PCBs	Dioxins+ PCBs	Dioxins	PCBs	Dioxins+ PCBs	Dioxins	PCBs	Dioxins+ PCBs	Dioxins	PCBs	Dioxins + PCBs		
Senior citizens - living at home	n/e	n/e	n/e	n/e	n/e	n/e	1.4	1.4	2.7	0.7	0.8	1.4	±	0.2
Senior citizens - in old peoples' homes	n/e	n/e	n/e	n/e	n/e	n/e	1.7	1.6	3.2	0.8	0.9	1.6	±	0.3
Adults*	8.3	4.6	13	2.8	1.6	4.3	1.7	1.7	3.3	0.7	1.0	1.7	±	0.3
<i>Schoolchildren:*</i>														
10-11 & 14-15 years**	10	5.2	15	3.2	1.6	4.7	1.9	1.7	3.5	n/e	n/e	n/e		
4-6 years	n/e	n/e	n/e	n/e	n/e	n/e	3.8	3.3	7.0	1.7	1.8	3.4	±	0.6
7-10 years	n/e	n/e	n/e	n/e	n/e	n/e	2.8	2.4	5.1	1.2	1.4	2.5	±	0.4
11-14 years	n/e	n/e	n/e	n/e	n/e	n/e	2.0	1.8	3.9	0.9	1.0	1.9	±	0.3
15-18 years	n/e	n/e	n/e	n/e	n/e	n/e	1.4	1.3	2.8	0.6	0.7	1.3	±	0.2
<i>Toddlers:*</i>														
1.5-2.5 years	34	16	49	8.9	5.0	14	5.1	4.7	9.9	2.5	2.5	4.8	±	0.8
2.5-3.5 years	27	14	41	7.5	4.0	11	4.2	4.0	8.3	1.9	2.1	4.0	±	0.7
3.5-4.5 years	24	11	34	6.0	3.3	9.4	3.5	3.4	6.9	1.7	1.8	3.4	±	0.5

Notes: Combined dietary intakes of dioxins and dioxin-like PCBs may not equal the sum of the separate intakes due to rounding.
 All dietary intakes in 1982 and 1992 have been estimated from the concentrations reported in Food Surveillance Information Sheet No. 105,¹⁰ re-expressed as WHO-TEQ.
 Those of the toddlers have additionally been re-estimated using food consumption data from the toddlers survey.
 Adult and schoolchild dietary intakes in 1997 have been re-estimated from the concentrations reported in Food Surveillance Information Sheet No. 4/00¹¹ using food consumption data from the new adults²⁰ and young persons²¹ dietary surveys.
 The dietary intakes in 2001 have been estimated using the same food consumption data as for the 1997 intakes.
 * Consumer dietary exposures, estimated using food consumption data from the dietary surveys.¹⁹⁻²⁴
 ** Estimated using food consumption data from the Diets of British Schoolchildren.²⁴
 n/e Not estimated.

Table 5a: Summary of estimated *LOWER bound* AVERAGE dietary intakes of all age groups of dioxins and dioxin-like PCBs in 1997 and 2001 (pg WHO-TEQ/kg bodyweight/day)

Age group	Estimated <i>lower bound</i> average dietary intakes (pg WHO-TEQ/kg bodyweight/day)							
	1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins+PCBs		
Senior citizens* - living at home	0.6	0.7	1.3	0.3	0.3	0.6	±	0.06
Senior citizens* - in old peoples' homes	0.9	0.8	1.7	0.4	0.4	0.8	±	0.08
Adults*	0.8	0.8	1.5	0.3	0.4	0.7	±	0.07
<i>Schoolchildren:*</i>								
4-6 years	1.7	1.6	3.3	0.7	0.7	1.5	±	0.2
7-10 years	1.3	1.2	2.5	0.6	0.5	1.1	±	0.1
11-14 years	0.9	0.8	1.7	0.4	0.4	0.7	±	0.08
15-18 years	0.6	0.6	1.3	0.3	0.3	0.6	±	0.06
<i>Toddlers:*</i>								
1.5-2.5 years	2.3	2.1	4.4	1.0	0.9	1.9	±	0.2
2.5-3.5 years	1.9	1.8	3.7	0.8	0.8	1.6	±	0.2
3.5-4.5 years	1.7	1.6	3.4	0.7	0.7	1.5	±	0.2
Population average**	0.7	0.7	1.4	0.3	0.3	0.5	±	0.06

Notes: Combined dietary intakes of dioxins and dioxin-like PCBs may not equal the sum of the separate intakes due to rounding.
 Adult and schoolchild dietary intakes in 1997 have been re-estimated from the concentrations reported in Food Surveillance Information Sheet No. 4/00¹¹ using food consumption data from the new adults²⁰ and young persons²¹ dietary surveys.
 The dietary intakes in 2001 have been estimated using the same food consumption data as for the 1997 intakes.
 * Consumer dietary intakes, estimated using food consumption data from the dietary surveys.¹⁹⁻²²
 ** Estimated using food consumption data from the National Food Survey.²⁷⁻²⁹ This method cannot estimate high level intakes.

Table 5b: Summary of estimated *LOWER bound* HIGH LEVEL dietary intake of all age groups of dioxins and dioxin-like PCBs in 1997 and 2001 (pg WHO-TEQ/kg bodyweight/day)

Age group	Estimated <i>lower bound</i> high level dietary intakes (pg WHO-TEQ/kg bodyweight/day)							
	1997			2001				
	Dioxins	PCBs	Dioxins +PCBs	Dioxins	PCBs	Dioxins+PCBs		
Senior citizens - living at home	1.2	1.2	2.4	0.6	0.7	1.2	±	0.1
Senior citizens - in old peoples' homes	1.5	1.4	2.7	0.6	0.8	1.4	±	0.1
Adults	1.5	1.5	3.0	0.6	0.9	1.5	±	0.1
<i>Schoolchildren:</i>								
4-6 years	3.3	2.9	6.2	1.5	1.5	2.9	±	0.3
7-10 years	2.4	2.2	4.4	1.0	1.1	2.1	±	0.2
11-14 years	1.7	1.6	3.3	0.8	0.8	1.6	±	0.2
15-18 years	1.2	1.1	2.3	0.5	0.6	1.1	±	0.1
<i>Toddlers:</i>								
1.5-2.5 years	4.9	4.4	9.4	2.4	2.2	4.4	±	0.5
2.5-3.5 years	4.0	3.5	7.5	1.8	1.8	3.6	±	0.4
3.5-4.5 years	3.4	3.0	6.4	1.5	1.6	3	±	0.3

Notes: Combined dietary intakes of dioxins and dioxin-like PCBs may not equal the sum of the separate intakes due to rounding. Adult and schoolchild dietary intakes in 1997 have been re-estimated from the concentrations reported in Food Surveillance Information Sheet No. 4/00¹¹ using food consumption data from the new adults²⁰ and young persons²¹ dietary surveys. The dietary intakes in 2001 have been estimated using the same food consumption data as for the 1997 intakes. All values are for consumer dietary intakes, estimated using food consumption data from the dietary surveys.¹⁹⁻²²

Table 6: Percentage of consumers of different age groups who are estimated to exceed the UK TDI for dioxins and dioxin-like PCBs from the whole diet in 1997 and 2001

Age group	Percentage of consumers exceeding TDI from whole diet	
	1997	2001
Senior citizens - living at home	17	0.1
Senior citizens - in old peoples' homes	46	0
Adults	35	1.1
<i>Schoolchildren:</i>		
4-6 years	98	35
7-10 years	88	10
11-14 years	48	1.7
15-18 years	21	0
all children	62	10
<i>Toddlers:</i>		
1.5-2.5 years	98	48
2.5-3.5 years	97	35
3.5-4.5 years	97	28
all toddlers	97	37

Figure 1: Estimated average *upper bound* adult dietary intakes of dioxins and dioxin-like PCBs in 1982, 1992, 1997 and 2001

