4 Food and nutrient intakes

4.1 Australian dietary surveys

Surveys that measure food consumed have been conducted sporadically since 1938, most of them since 1983. There have been four surveys of national population samples since 1983, and several recent surveys of subnational population samples. Table 4.1 lists the major recent dietary surveys and their characteristics. The quantity of data collected even in the last decade is too great to be considered fully here: this chapter discusses basic outcomes, particularly in terms of National Food and Nutrition Policy priorities, and the status of the information available. The discussion includes examples of ways in which dietary data from the existing collections could be used.

Although the methods used and the information available differ from survey to survey, all surveys examined foods consumed and the resultant nutrient intakes. The 1983 National Dietary Survey of Adults surveyed adults aged 25–64 years in capital cities and was linked to cardiovascular risk factor data including biochemical and anthropometric data (for example iron status, blood lipids) from the National Heart Foundation Risk Factor Prevalence Survey. The 1985 National Dietary Survey of Schoolchildren (aged 10–15 years) surveyed children in rural and urban schools and was linked to health and fitness data from the survey conducted by the Australian Council for Health, Physical Education and Recreation. The sample for the 1988 Australian Health and Nutrition Survey was taken from electoral rolls, and the 1989 Survey of the Elderly dealt with people aged 55–75 years. There have been two extensive surveys of Victorians, in 1985 and 1990, using similar methods. The first nutrition survey of a nationally representative sample is due to take place 1995.

Table 4.1: ***Characteristics of major Australian dietary intake surveys from 1983 to 1993***

Year / survey	Method	Population	Ref. no.
1983 National Dietary Survey of Adults	24–hour recall	6255 adults, aged 25–64 years, all capital cities	1–3
1985 National Dietary Survey of Schoolchildren	24–hour diary and interview	5224 schoolchildren, aged 10–15 years, urban and rural	4,5
1985 Victorian Nutrition Survey	Food frequency[(a)]	2862 Victorian adults aged 18+	6–9
1988 Australian Health and Nutrition Survey	Food frequency[(a)]	2196 adults, aged 18+, all States	10
1988 South Australian Nutrition Survey[(b)]	Food frequency[(a)]	901 South Australian adults	11,12
1989 CSIRO Survey of Elderly Australians	Food frequency[(a)]	1510 persons, aged 55–75, all States	10,13
1990 Victorian Nutrition Survey	Food frequency[(a)]	2687 Victorian adults	8,9,14
1990 South Australian State Survey	Food frequency[(a)]	1020 South Australian adults	10
1993 Australian Food Survey	Food frequency[(a)]	2039 adults	10

(a) A semi-quantitative food frequency questionnaire developed at the CSIRO Division of Human Nutrition
(b) Subsample of the Australian Health and Nutrition Survey

Surveys of food intakes, whatever the method employed, are limited to describing food consumption patterns and nutrient intakes. They can provide information on nutritional status or health measures only when linked to other data such as anthropometric data and (especially) biochemical data. The 1983 National Dietary Survey of Adults is an example: it was, as noted, linked to the National Heart Foundation's Risk Factor Prevalence Survey. Another important link for clarifying the relationship between nutrition and health would be a link between individual dietary intakes and prospective mortality records.

In addition to recent dietary surveys conducted at State level (for example, the 1985 and 1990 Victorian Nutrition Surveys—see Table 4.1), surveys conducted at the national level can provide some data at State level and at finer regional levels. This is important for monitoring purposes, particularly because national as well as State policies are administered at State level and often implemented at local or community level. Examples are the South Australian Nutrition Survey—a subset of the 1988 Australian Health and Nutrition Survey—and the first and third reports of the 1983 National Dietary Survey of Adults, which provided information on food nutrient intakes by capital city.[1,3]

Comparisons between dietary intake surveys

National dietary intake surveys have been carried out infrequently in Australia: apart from those listed in Table 4.1, there were national surveys conducted in 1938 and 1944. These two older surveys, while interesting, cannot readily be compared with recent data because of differences in the way data were collected, analysed and reported. The 1938 survey, for example, provided information 'per adult male'.[15] The 1944 survey surveyed households; it was conducted during a war and a severe drought, half the population sample was aged less than 17 years, 70 per cent of the households surveyed were rural, and data were reported per capita and per adult male.[16] The main interest in the 1944 survey is that it has been until recently the basis for some of the assumptions used to make estimates for the Australian Bureau of Statistics *Apparent consumption of foodstuffs and nutrients, Australia* series (catalogue number 4306.0).

The later surveys, conducted in the 1980s and 1990s, cover different age groups, and have used different food composition data and different methods to collect dietary intake data. Of the many dietary intake data collection methods available, three have been employed in the recent national Australian surveys: 24-hour recall, 24-hour record, and semi-quantitative food frequency questionnaire to assess usual intake. The issues of which methods may be useful in different circumstances, and which methods best approximate dietary intake have been actively debated for many years. For those who wish to gain insight into the complexities of dietary intake data collection methodology, Appendix B presents a bibliography of useful information on this topic.

From the practical viewpoint, there is little to be gained by comparing surveys using different methods as a means of monitoring trends in intake over time. In particular, data acquired using short-term recall or record methods, such as the 1983 and 1985 National Dietary Surveys, cannot generally be compared with data from surveys using one of the CSIRO semi-quantitative food frequency questionnaires. Given the small number of surveys, this has been a serious limitation. The discussions on methods to be used in the planned 1995 National Nutrition Survey have centred on providing a data base that can be compared with earlier surveys by incorporating more than a single method of data collection.

Comparing measured and apparent consumption

Data on secular trends in food intakes at the national level are fragmentary. The data from the *Apparent consumption* series, although affected to some extent by changes in methodology over the years, can be used to show trends in the available food supply at the national level (see Section 2.3) and have been used widely as a surrogate for intake data.[17–22] The data are, however, available only at the population level and cannot provide information at State or regional levels, that is, Australia has only one food supply.

By definition, apparent consumption data, if complete, must consistently overestimate food intakes. Comparisons between apparent consumption and measured intake data need to recognise the differences in what is measured and how it is measured. For example, flour intake in the 1983 National Dietary Survey of Adults was 4 g per day for men and 3 g per day for women, whereas the apparent consumption of flour for 1983 was around 192 g per day.[1,23] The inconsistency arises because flour incorporated in foods is measured as part of those foods in the Dietary Survey. This is an obvious example; other more subtle instances may prove difficult to trace.

Despite the inability of the *Apparent consumption* series to provide information on subgroups (even at the broad levels considered here), it is an appropriate general descriptor of food against which trends in measured consumption can be viewed. It should also provide a reasonable upper limit for what measured consumption might be. If apparent consumption data are accepted to show the broad direction of trends (and the data for the period 1983 to 1989 are consistent with the secular trends), some comment can be made about measured consumption data. Generally, the survey data illustrate the difficulties involved in extracting meaningful trend data when surveys have been conducted differently.

Dietary data for population subgroups

Apart from the primary function of regular national dietary surveillance—to identify dietary trends for the purpose of evaluating the nutritional status of the entire population—it is of great advantage if the data thus obtained can identify population subgroups whose diets differ from the population mean and so place them at relatively greater or lesser risk of nutrition-related problems. Comparisons between surveys that have used different data collection methods present problems of interpretation similar to those that arise when comparing older and more recent surveys. In theory, provided that means and standard errors of the means are available for a group, statistical comparisons are possible, but this may not be appropriate if the survey methods differ. Another difficulty in comparing data across surveys arises from the different food composition data bases used for the determination of nutrient intakes. This, combined with the inherent limitations of food composition data, means that assumptions must be examined carefully before conclusions are drawn.

4.2 Food intakes

Total quantity of food consumed

All dietary survey data demonstrate the difference in mean total consumption between adult males and females: the male population subgroup consumes more per capita than the female population subgroup. This is consistent with known physical and physiological differences between the sexes. Table 4.2 shows data for consumption of food and beverages (including milk) from four recent national surveys. The different age ranges and methodologies render comparisons across surveys of doubtful value, and no inferences about a time trend should be drawn from the data. They do, however, provide an indication of the overall amount consumed in large subsets of the population.

Table 4.2: ***Total amount of food and beverage consumed, by sex, four national surveys (g/day)***

Sex	1983 National Dietary Survey of Adults	1985 National Dietary Survey of Schoolchildren	1988 Australian Health and Nutrition Survey	1989 CSIRO Survey of Elderly Australians
Age range	*25 to 64*	*10 to 15*	*18 and over*	*55 to 75*
Males				
Food	1242	1414	1190	1039
Beverage[(a)]	1867	1447	1843	1780
Total	3109	2861	3033	2819
Females				
Food	936	898	1221	1072
Beverage[(a)]	1420	1199	1880	1742
Total	2356	2097	3101	2814

(a) Includes milk

Sources: 1983 National Dietary Survey of Adults;[1] 1985 National Dietary Survey of Schoolchildren;[4] CSIRO (unpublished data)

The difference between sexes was more pronounced in the 1983 and 1985 survey data (24-hour data) than in the 1988 and 1989 survey data (usual intake data). Males ate and drank more than females, except that, in the 1989 Survey of the Elderly, consumption was much the same for both sexes. The figures include water in all forms. Intakes follow what might be predicted from known average energy requirements: men greater than women, a decrease with age, and children's intake varying with age and stage of growth.

Mean consumption of foods

Although the total food consumption was generally higher for men than for women, the mean consumption of some foods or food groups did not always adhere to that pattern. Women's mean daily consumption of fruit and non-alcoholic beverages, for instance, exceeded that of men; women's vegetable consumption was found to be higher than men's in the 1988 and 1989 surveys (but not in the 1983 survey); and men consumed much greater quantities of alcoholic beverages at all ages.[1,10]

Within-population differences in food consumption patterns may be difficult to quantify when there are differences between survey methods. Nevertheless, differences in pattern can be discerned when sex, age, region of birth, and place of residence are considered. The patterns of intake observed in the 1985 National Dietary Survey of Schoolchildren were different from those of adults. Mean fruit consumption was slightly greater for boys than for girls.[4] The data from the 1985 survey show little difference in mean total consumption between 10-year-old boys and 10-year-old girls but, while the consumption for girls was little different for 11–15-year-olds, there was a gradual increase with age among boys.[4] Examples of within-population differences in the 1983 National Dietary Survey of Adults are the relatively low per capita consumption of fruit by women of southern European origin (less than for men of southern European origin) and their high consumption of non-alcoholic beverages. Also noteworthy are the relatively low fruit consumption by Melbourne women (the only city where men's consumption of fruit was greater) and the relatively high mean consumption of ice-cream by Hobart women.[1] Older people also show food consumption patterns particular to their age group (see Table 4.3).

Sex differences in intake at older ages tended to be less, and there were some reversals: for example, dairy product consumption of women was higher than that of men at age 55 years and over. Intakes of non-alcoholic beverages were similar for men and women in this age group. Despite the differences in data collection methods, there is reasonable correspondence between the consumption patterns for the 55–64 year age group for the 1983 survey and the 1988 survey; only the relative intakes of vegetables are reversed, with men consuming more vegetables than women in 1983. The 60 years and over subsamples of the 1988 and 1989 surveys (comparable method) show good correspondence.

Food intake patterns

Those 'consuming' or 'not consuming'

Some foods or groups of foods are not consumed at all by some of the population. There are a number of possible reasons for this: religion, individual taste, unfamiliarity, local inaccessibility, and so on. Such foods or groups of foods can be identified by surveys that assess 'usual' intake. For example, providing that the questions asked are appropriate for the group under study, food frequency methods can be expected to approximate the proportion of those who habitually do not eat specific foods. Short-term methods record only what individuals ate in the period in question and tend to underestimate the proportion consuming overall relative to the period surveyed. Many foods are consumed infrequently and so have a low probability of consumption in any single, short period. The aggregate data from 24-hour recall are more representative since they consider groups of foods that are often substitutable. For the 1983 and 1985 National Dietary Surveys, between 85 and 100 per cent of respondents consumed some cereal foods, vegetables, meat and dairy foods on the survey day.[1,4] These aggregate data are consistent with the 1985 Victorian Nutrition Survey sample (data obtained by food frequency questionnaire), which showed similarly high proportions for those usually consuming foods within these food groups.[24] The data support the expected lower value of the proportion consuming from the 24-hour method. Table 4.4 compares results for selected food items from the 1983 National Dietary Survey and the 1985 Victorian Nutrition Survey.

Table 4.3: ***Mean food consumption, by sex and food group, national surveys with comparable age ranges (g/day)***

Sex / food group	1983 National Dietary Survey of Adults	1989 CSIRO Survey of the Elderly	1988 Australian Health and Nutrition Survey	1989 CSIRO Survey of the Elderly
Age range	**55 to 64**	**54 to 64**	**60 and over**	**60 to 75**
Males				
Cereals group	245	201	199	196
Vegetables	290	322	319	326
Fruit (excl. juices)	185	237	270	252
Meat group[(a)]	215	188	154	192
Fish group	20	20	23	22
Eggs	22	17	15	18
Nuts	4	2	1	2
Dairy group	372	379	388	379
Non-alcoholic beverages[(b)]	1077	1034	847	970
Water	na	266	367	223
Alcoholic beverages	460	304	268	244
Females			159	
Cereals group	174	172	332	169
Vegetables	253	365	338	367
Fruit (excl. juices)	209	288	138	302
Meat group[(a)]	129	178	121	164
Fish group	14	22	13	21
Eggs	15	12	16	12
Nuts	3	2	2	2
Dairy group	380	347	360	360
Non-alcoholic beverages[(b)]	1080	1056	874	1021
Water	na	361	549	346
Alcoholic beverages	86	70	40	67

na Not available
(a) Includes mixed dishes
(b) Includes fruit juices
Sources: 1983 National Dietary Survey of Adults;[1] CSIRO (unpublished data)

Table 4.4: ***Per cent consuming various foods, by sex, Melbourne respondents to 1983 National Dietary Survey (on a given day) and 1985 Victorian Nutrition Survey (at least once per month)***

	1983		1985	
Food	**Males**	**Females**	**Males**	**Females**
	% consuming on day of survey		*% consuming at least once a month*	
Cereals				
Ready-to-eat	33	28	71	69
Other breakfast cereals	18	19	21	22
Vegetables				
Potatoes	55	54	98	95
Carrots	35	33	90	95
Tomatoes	37	39	85	89
Fruit				
Citrus	23	27	81	88
Meat and meat products				
Beef and veal	43	35	95	91
Lamb	18	20	89	83
Pork	30	25	72	68
Poultry	23	23	88	91
Seafood	18	23	81	78
Milk and milk products				
Whole milk	84	80	85	78
Cheese	46	53	91	94
Fats				
Butter	32	39	27	33
All margarines	48	48	63	59
Sugar	73	61	70	48
Alcoholic beverages				
Beer	27	6	61	17
Wine	30	25	57	59

– Zero

Sources: 1983 National Dietary Survey of Adults;[1] 1985 Victorian Nutrition Survey[6]

Ninety-two per cent of men and 82 per cent of women consumed at least one of the meat group of foods in 1983, although less than half the sample population was reported to have consumed any one item within the group. Similarly, 98 per cent of men and 94 per cent of women consumed some dairy foods on the survey day in 1983.

It is important to recognise the differences in what is being measured by different survey methods, and it must be reiterated that comparisons between surveys conducted differently cannot be used to identify time trends. This is particularly important because recommendations for several public health nutrition targets involve changes in the proportions of the population consuming particular groups of foods (see Chapter 7 and Appendix D). Since the baseline data are from the 1983 National Dietary Survey of Adults and the 1985 National Dietary Survey of Schoolchildren, progress towards the targets will need to be determined from surveys using comparable data collection methods.

In addition, recommended nutrition targets based on increasing the proportion consuming certain kinds of foods have varying expectations. For example, recommended increases in the proportions consuming fruit and vegetables require for women an increase of only 2.5 per cent consuming vegetables over a period of 18 years,[1] compared with a 38 per cent increase for some boys and men.[1,4] There were also differences when the population was differentiated by region of birth (or, for children, by parents' language) and by place of residence. An interesting finding from the 1983 survey was in the sample whose origins were 'other regions' (essentially Africa, the Americas and the Pacific islands), although absolute numbers were small: only 86 per cent of men (n=87) but 100 per cent of women (n=81) were reported to have consumed vegetables on the day of survey; the corresponding figures for all men and all women were 91.5 and 92.5 per cent.[1]

Patterns of intake differ with age and sex for several other foods. For example, more children in the 1985 National Dietary Survey of Schoolchildren reported consuming breakfast cereals than did adults in the 1983 National Dietary Survey of Adults, and the proportion of children consuming breakfast cereals decreased with age. The proportion of girls eating vegetables exceeded that of boys, although the reverse was the case for adults. Girls and women were more likely to have eaten fruit in each age group surveyed. Children ate fish less frequently than adults but drank orange juice and soft drinks more frequently, almost 30 per cent of 14- and 15-year-olds consuming soft drinks. Apart from alcohol, for which consumption by children is strictly limited, the outstanding difference between adults and children is that, while only 5 per cent of adults reported eating snack foods,[1] 27 per cent of boys aged 10–15 years and 34 per cent of girls of the same age did so.[4]

Ranges of food intakes

Apart from the proportion of people not consuming food items either 'usually' or within a survey period, there is a range of non-zero consumptions for any food or group of foods. Extreme intakes are important because they might lead to identification of population subgroups with food consumption habits that may lead to increased risk of malnutrition. Table 4.5 shows, for the 1983 National Dietary Survey sample, the mean and ninety-fifth percentile daily food intake for those consuming the food on the survey day (these amounts should not be summed—the sum has no meaning).

Referring to the mean total food consumption shown in Table 4.2, it can be seen that the ninety-fifth percentile intakes are each a substantial proportion; even if the total intake (and energy requirement) is above the mean for those consuming a food at the ninety-fifth percentile, there remains the likelihood that the overall intake may represent unusual, possibly inappropriate, dietary behaviour.

Regional variations in food intake patterns

The 1983 National Dietary Survey data revealed some differences between cities.[1] Hobart intakes differ most from the means and Sydney intakes least. Fruit intakes were variable, particularly for men. One unusual finding is that, while fish intakes for Hobart men were high, fish intakes for Hobart women were below average. As well, although overall vegetable intakes were high for Hobart men and women, their tomato intakes were below the average. Overall meat intakes for both sexes in the Brisbane sample were high, as were beef and pork intakes. Brisbane men had significantly lower lamb intakes and Brisbane women had lower poultry intakes. In terms of the major food groups, with one exception findings were similar for the sexes for each city. The means show the usual disparity between the intakes of men and women. There is a consistent pattern across surveys that men consume more than women consume, and this is particularly so for meats and alcoholic beverages. Women tended to eat more fruit and a broader range of food products.

Table 4.5: ***Levels of food consumption by those consuming on day of survey in comparison with sample mean, by sex, 1983 National Dietary Survey of Adults (g/day, unless stated)***

	Males			Females		
	Those consuming			Those consuming		
Food	95 percentile	Mean[(a)]	Mean[(a)]	95 percentile	Mean[(a)]	Mean
Cereals	655	281	275	457	194	190
Vegetables	758	325	298	587	259	239
Fruit	813	296	174	676	258	182
Meat	552	265	246	354	159	138
Seafood	289	108	21	215	88	17
Eggs	150	70	22	100	48	16
Nuts and seeds	116	32	7	73	21	5
Milk (mL)	815	296	269	669	246	221
Milk products	225	79	48	188	61	39
Fats	70	28	23	48	18	15
Sugars, jam, honey	96	34	28	69	25	18
Confectionery	109	37	7	99	32	7
Snack foods	76	28	2	75	21	1
Beverages						
Non-alcoholic, incl. water (mL)	2625	1342	1355	2389	1310	1308
Alcoholic (mL)	2662	866	457	833	296	101
Condiments, soups	555	141	90	528	107	69

(a) Per capita weighted mean

Source: 1983 National Dietary Survey of Adults (unpublished data)

Reported changes in dietary intakes

The 1989–90 National Health Survey included questions that were related to diet but did not measure food intakes. Persons aged 15 years and over were asked questions about sustained changes during the past two years in the kind or amount, or both, of food eaten or drunk and the reasons for the changes. Information was also sought about changes in the amount of selected foods eaten—vegetables, fresh fruit (including fruit juices), fish, bread, breakfast cereals, fat on meat, fried foods, butter and margarine, cheese and cream, salt, sugar, cakes, pastries and desserts. The survey found that more women than men had reported changing diets in the preceding two years: 37.9 per cent of males reported changing their diets compared with 43.3 per cent of females.[25]

The 1989 CSIRO Survey of the Elderly found that 92 per cent of men and 96 per cent of women had tried to change their diets. Most respondents felt that they had increased their fibre intake and reduced total food, fat, sugar and salt intakes in the previous few years.[10] This was consistent across the age groups, including respondents over 70 years. Data from the Longitudinal Study of Adolescents for 1992 showed that 22 per cent of 16-year-olds, 23 per cent of 17–18-year-olds and 27 per cent of 19–22-year-olds said that they were 'on a diet'.[26] 'Dieting' included slimming diets, but also eating less fat, or more fruit and vegetables, or less 'junk food' or chocolate, or simply less food. For the 16-year-olds, 13 per cent of boys and 30 per cent of girls were 'dieting'.[26]

Alcoholic beverages*

It should be noted that under-reporting of intake of alcoholic beverages is common, particularly for survey methods assessing 'usual' intake. This is one food group for which the apparent consumption datum can provide a view of changes uncomplicated by social values that may influence individual reporting of intake.

The difference in consumption of alcoholic beverages by men and women is striking (see Table 4.6). It would appear that for these beverages dietary behaviour is quite different for men and women. Mean intakes of beer for men in the 1988 Survey of the Elderly and the 1989 Australian Health and Nutrition Survey were five to 10 times greater than those of women, and there was a greater tendency for women to drink reduced-alcohol beer, particularly in the older age groups.[10] The 1983 National Dietary Survey showed that 53 per cent of men and 34 per cent of women consumed alcoholic beverages on the survey day.[1] Total alcoholic beverage consumption for women was, at most, one-quarter that of men (see Tables 4.3 and 4.4).

Data from the 1989 National Heart Foundation Risk Factor Prevalence Survey, for people aged 20–69 years, show very low numbers consuming at high or very high risk levels. Less than 1 per cent of women aged 20–64 years, and 1.2 per cent of women aged 65–69 years were classed as high-risk drinkers (the mean for all ages was 0.5 per cent); almost none were classed as very high risk. Less than 2 per cent of men were classed as high-risk drinkers (the mean for all ages was 1.0 per cent), except in the 40–44 year group (2.2 per cent); only 0.2 per cent were classed as very high risk.[27] High or very high risk drinking was defined by the National Heart Foundation as an average daily intake of five or more drinks or occasional, frequent or great occasional excess for women; for men it was defined as an average daily intake of nine or more drinks or frequent or great occasional excess. The 1983 National Dietary Survey showed ninety-fifth percentile intakes of alcohol on the survey day at 100 g per day for a male and 46 g per day for a woman, which correspond to 10 to 12 'standard drinks' for men and five to six 'standard drinks' for women.[1] These coincide with the National Heart Foundation's definitions for high-risk drinking.[27,28]

* The terms alcohol and alcoholic beverages are often used interchangeably to mean beer, wine and similar drinks. In this document such beverages are always referred to as alcoholic beverages. The term alcohol is used exclusively to indicate ethanol (CH_3–CH_2OH) content.

Table 4.6: ***Alcoholic beverage intake of women as percentage of men's intake, by age, 1988 and 1989***

Survey / age group	All beers	Standard beer	Low alcohol beer	Wine	Sherry, port, liqueurs	Spirits
1988 Australian Health and Nutrition Survey						
18 to 39	10	9	14	114	85	75
40 to 59	17	11	33	106	97	116
60 and over	8	6	14	55	65	41
All ages	11	9	20	96	81	78
1989 CSIRO Survey of the Elderly						
54 to 59	10	9	12	91	122	37
60 to 64	14	10	19	70	81	43
65 to 69	18	8	33	65	80	42
70 to 75	21	17	36	77	103	88
All ages	14	11	22	79	96	49

Sources: 1988 CSIRO Australian Health and Nutrition Survey (unpublished data); 1989 CSIRO Survey of Elderly Australians (unpublished data)

Intermediate-risk drinkers were defined as women drinking an average of four drinks daily or 9 to 12 drinks in any one day, and men with an average daily intake of five to eight drinks or occasional excess. Five per cent of men and 4 per cent of women were classified as intermediate-risk drinkers.[27]

As would be expected, the 1985 National Dietary Survey of Schoolchildren found a very small proportion reporting alcohol consumption.[4] Hill et al. examined alcohol consumption among Australian secondary school children and found that the prevalence of consumption increased with age, from under 20 per cent in 12-year-olds to approximately 50 per cent in 17-year-olds (see Table 4.7).

Table 4.7: ***Past and current consumption of alcohol by students,[(a)] by age and sex, 1987***

	Age (years)					
Sex	**12**	**13**	**14**	**15**	**16**	**17**
Males						
Sample size	*1332*	*1806*	*1660*	*1689*	*1691*	*1312*
Never drank (per cent)	15	11	8	5	3	3
Drank in past week (current drinker)						
Per cent	18	23	31	45	55	55
Mean drinks per week	2.7	3.8	5.1	6.5	7.9	9.5
Females						
Sample size	*1346*	*1727*	*1742*	*1700*	*1742*	*1419*
Never drank (per cent)	20	13	6	4	3	1
Drank in past week (current drinker)						
Per cent	12	20	29	40	49	50
Mean drinks per week	2.1	2.8	4.1	4.4	5.4	6.0

(a) Weighted percentages
Source: Hill et al.[29]

Regional and cultural differences in alcoholic beverage consumption

The beer intakes of Adelaide men and women in 1983 were significantly lower than the national means, as was the proportion of reduced-alcohol beer drunk.[1] Beer intakes of men were low in Melbourne and high in Brisbane and Hobart. The proportion of reduced-alcohol beer drunk in Perth was very much higher than the national means for men and women, although the total beer intake of Perth women was much greater than the national mean. At least part of the reason for interstate differences in reduced-alcohol beer consumption may have been that in 1983 reduced-alcohol beers were a new product and were not established in some States but advertised in others. This contention has support from the apparent consumption data, which show a move in supply towards reduced-alcohol beers (see Section 2.3), and also from the 1988 and 1989 CSIRO survey data. The proportions of reduced-alcohol beer consumed in 1983 were 12 and 33 per cent respectively for men and women aged 25–64 years;[1] in 1988 the proportions were 19 and 37 per cent respectively for men and women aged 18–59 years.[30] The proportions for men and women aged 60 years and over were 28 and 53 per cent respectively in 1988 and 43 and 56 per cent respectively in 1989.[10]

Wines, particularly white wines, were more popular with women than beer. The composite figures for consumption of all wines and ciders in 1988 were 27 per cent for women and 29 per cent for men.[10] In 1983, 4 per cent of women (compared with 26 per cent of men) consumed standard beer on the survey day, but 17 per cent consumed white wine and 6 per cent consumed red wine (compared with 16 and 9 per cent for men).[1]

Information on the consumption of alcohol was also available from the 1989–90 National Health Survey.[25] Questions were asked of persons aged 18 years and over about the type and quantity of alcoholic beverages they had consumed on each of the previous seven days. The data showed that almost three-quarters of males (74 per cent, or 4.5 million) and approximately half of females (52 per cent, or 3.3 million) aged 18 years or more drank alcoholic beverages during the week before their interview. Levels of consumption were highest among younger age groups. The highest proportion of women who drank alcohol in the week before the interview was recorded in the Australian Capital Territory (61 per cent) and the lowest proportion in Queensland (50 per cent). Of women who drank in the week before the interview, 59 per cent had chosen wine. Women aged 18–24 years were most likely to drink spirits in preference to anything else, and wine in preference to beer.[25]

'Alcohol risk' was defined as daily consumption of 50 mL or more of alcohol by males and 25 mL or more by females.[31] The prevalence of alcohol risk among young adults aged 18–24 years was found to be 17 per cent for males and 10 per cent for females. The prevalence among working-age adults (25–64 years) was 16 per cent for men and 8 per cent for women. For older people (65 years and over) the prevalence of alcohol risk was 7 per cent for men and 4 per cent for women.[25]

A community survey of adult Aboriginal people from the Kimberley region found that these people were more likely to be non-drinkers than were non-Aboriginal people in the Australian population.[31] Of those who did drink, the majority consumed hazardous amounts of alcohol: 83 per cent were estimated to be drinking above the level defined by the NHMRC as harmful (more than 60 g per day for a male and more than 40 g per day for women).[28]

4.3 Food composition data for nutrient analysis*

The natural variability in composition of foods places limitations on food composition data sets. A food composition data set is the essential tool for translating information about quantities of food into estimates of its nutritional content. The food or dietary information used can vary in scope from a single food or individual dietary intake to national or international aggregate food or commodity data. Food composition data have several functions—for example, to provide information for food regulatory purposes, international trade and food aid; for agricultural and other food research; and to provide nutrient information for health professionals, researchers, educators, consumers and for food service decision-making.

The quality and availability of food composition data are of primary importance for estimating the nutrient availability of the food supply and for determining the nutrient intakes from measured food consumption.

Australian food composition data bases

The diversity of purposes for which food composition data are used calls for flexibility and an appropriate coverage of foods and nutrients. For Australian users of food composition data, the primary source of information is the Australian food composition data tables, now produced in a number of formats. The most comprehensive of these is the national reference series, *Composition of foods, Australia,*[32–36] generally referred to as COFA. This series provides data on some 1500 foods, with up to 80 nutrients per food. Further volumes are planned as more data become available.

Two condensed versions of COFA have been released: *Nutritional values of Australian foods*[37] is intended for educators and health professionals; and *Food for health*[38] is a guide to the nutritional value of food for general use. In addition, NUTTAB,[39] a summary data base on diskette, is produced for researchers, professionals and educators.

The data in these publications represent the results of many years of laboratory analysis of Australian foods. The analytical program was established to provide comprehensive data on the Australian food supply as the basis for revising the older data, which were based primarily on British data. During the planning of this revision in the late 1970s, it was decided that, given the available resources, the data acquired should first serve nutrition and health goals before aiming to meet industry requirements. Consequently, it was decided generally to sample on a regional rather than a national basis and to analyse one composite sample of food in preference to multiple samples. Primary produce was given priority over manufactured food products.

This approach maximised the range of nutrient data it was possible to produce from available resources. A limitation of the method, however, was that it did not allow for estimation of the standard errors of the reported nutrient values. Standard errors can include the effect of nutrient dispersion in particular food samples analysed but may also include the effect of differences in methodology and analytical accuracy, and

* The major contribution of Janine Lewis to the preparation and drafting of this section is gratefully acknowledged.

interpretation of the statistic is difficult. For the majority of data uses, such information is not of primary importance. The American food tables[40] provide information per nutrient for most foods on standard errors and number of samples.

Concepts and assumptions on which the data are based

Food descriptions

The identity of a food in a data base might not be the same as one in the marketplace. Sometimes foods commonly distinguished by brand or product name, or both, are not reported in food tables at that level of detail but are classified according to a more general grouping. For example, biscuits are given a general descriptive name rather than being distinguished by brand, while Vegemite™ is included in the tables by name rather than under 'yeast extract' because it is a unique product in terms of its nutrient content. Factors that determine how foods are named, and the level of specificity of composition data (for example, by brand), include the market dominance (or 'uniqueness') of the product and market volatility. Biscuits are treated generically because frequent variations in type, brand and product formulation give rise to unpredictable but usually minor compositional effects over time.

Users need to consult all ancillary information to select the most suitable nutrient profiles of foods. This information describes the food sample, including the portion analysed, and any alternative names and scientific names of the food provided. Where descriptive terms are defined, these should be referred to so that there is no misapplication of data. One example of this is the term 'lean meat'. 'Lean meat' has been defined in the Australian food composition tables as 'muscle with all traces of visible fat carefully dissected away';[32] the term was not intended to reflect the usual trimming practices of consumers (data for 50 per cent trimmed and 75 per cent trimmed cuts were provided for this purpose).

Aggregate foods

Aggregate foods are defined in the Australian tables as 'unspecified' types, cuts and cultivars of food and they are accompanied by data on more specific forms of that food. Data for 'unspecified' foods are derived from combinations of two or more analyses based on the proportions of nutrients in the food (for example, relative contribution of different meat cuts to edible carcass weight) or relative proportions such as market share or production volumes. This too is difficult to interpret and is subject to changes in food product formulations, changes in market share, and the introduction and disappearance from the marketplace of specific products. Changes such as these may occur much more frequently than the food composition database can be updated. Users of the data need to determine the level of detail required before selecting an 'unspecified' type of food or a more specific item if distinguishing features are available (for instance, seasonal information will determine whether 'orange, Navel' is more appropriate than 'orange, unspecified type'). 'Unspecified' foods are particularly useful when processing food intake data from dietary surveys.

Comparisons with other data sets

Food composition data sets from other countries have regard to those countries' legislative requirements as well as, for example, varying food preparation methods, different food uses that may alter the edible portion of a food, different cultivars, and different growing conditions.[41] An example of the effect of legislation is the composition of flour, which has long been nutrient fortified in the United States and United Kingdom but was not fortified in Australia until the 1990s.

Food names may represent different foods, and for international brands product formulations may vary from one country to another. Food ingredients used in mixed dishes may also have quite different nutrient compositions. Further, processing methods affect nutrient composition: different extraction rates for refined (white) flour are used in Australia compared with the United Kingdom, for example.[42]

Nutrients

Nutrient data are analysed and compiled according to particular analytical methods, preferred modes of expression, and conventions about the use of conversion factors. Users of such data should be familiar with the meanings and assumptions behind their use. Analytical methods change as technical advances are made, and it is important to understand the basic concepts of the methods employed to understand what exactly is being measured. For example, different values are obtained from an enzymatic-gravimetric analysis of 'dietary fibre' and a chemical method. Another example is the analysis and reporting of starch in legumes. Some legumes have a nutritionally significant proportion of their complex carbohydrate present as oligosaccharides. Australian starch analyses for these foods do not include a measure of oligosaccharide content, so some values for total carbohydrate appear lower than expected.

Carbohydrate warrants particular mention because there are at least three common methods used to calculate and express carbohydrate data. In Australia, foods are analysed directly;[32] in the British tables, analytical values are converted to monosaccharide equivalents;[42] and in the United States tables, carbohydrate is calculated by difference (protein, fat, water and ash content are analysed and the remainder is assumed to be carbohydrate).[40] In addition, the terms used for carbohydrate content differ and are not standardised according to method of calculation. The British[42] and New Zealand[43] tables express carbohydrates as monosaccharide equivalents but use the terms 'total carbohydrate' and 'available carbohydrate' respectively. Many users of food composition data have misinterpreted apparent discrepancies in nutrient data for the same foods because they have been unaware of the differences in method and description.

Conversion factors

Conversion factors are used to derive values for protein from nitrogen analysis, the proportion of fatty acids in fat, the energy content of macronutrients and the niacin equivalent of protein, and to calculate the contribution of carotenes to vitamin A (expressed as retinol equivalents) or tocopherols to vitamin E (expressed as alpha-tocopherol equivalents).

The basis for calculations of compiled nutrient values such as niacin or retinol can differ between data sets and will depend on the availability of analysed nutrient forms. For example, retinol equivalents may be calculated from retinol and β-carotene only or additional carotene forms may be analysed and included in the calculated value. Niacin-equivalent values can vary significantly depending on whether protein or tryptophan values are included in the calculated result. Similarly, lipid conversion factors for estimating fatty acid content or nitrogen factor for proteins may be applied to entire classes of foods or individually estimated from the composition of the food.

When all else fails...

Appropriate and effective use of food composition data requires a good understanding of the principles, conventions and assumptions on which the data sets are constructed, and data users must become familiar with supporting information and instructions for use of food composition data sets to avoid misinterpretation of the data. This is especially important for users of dietary analysis software because of the difficulty in scrutinising the data set used.

In summary, standard use of Australian food composition data, appropriately employed, will help to make future food consumption survey information on nutrients more representative and more amenable to cross-survey comparison.

There are several useful reviews of nutrient analysis, among them the work of Greenfield and Southgate[44,45] and the proceedings of a 1990 meeting on 'Uses and abuses of food composition data', published as a supplement to the journal *Food Australia*.[46]

Finally, although accuracy in the food analytical data is important, their use for nutrient intake assessments is much improved since, for example, the 1983 National Dietary Survey and through advances in computer technology. The major determinants of accurate assessment of nutrient intakes remain the quality of the food descriptions and quantities collected from respondents, and the food and composition knowledge of users.

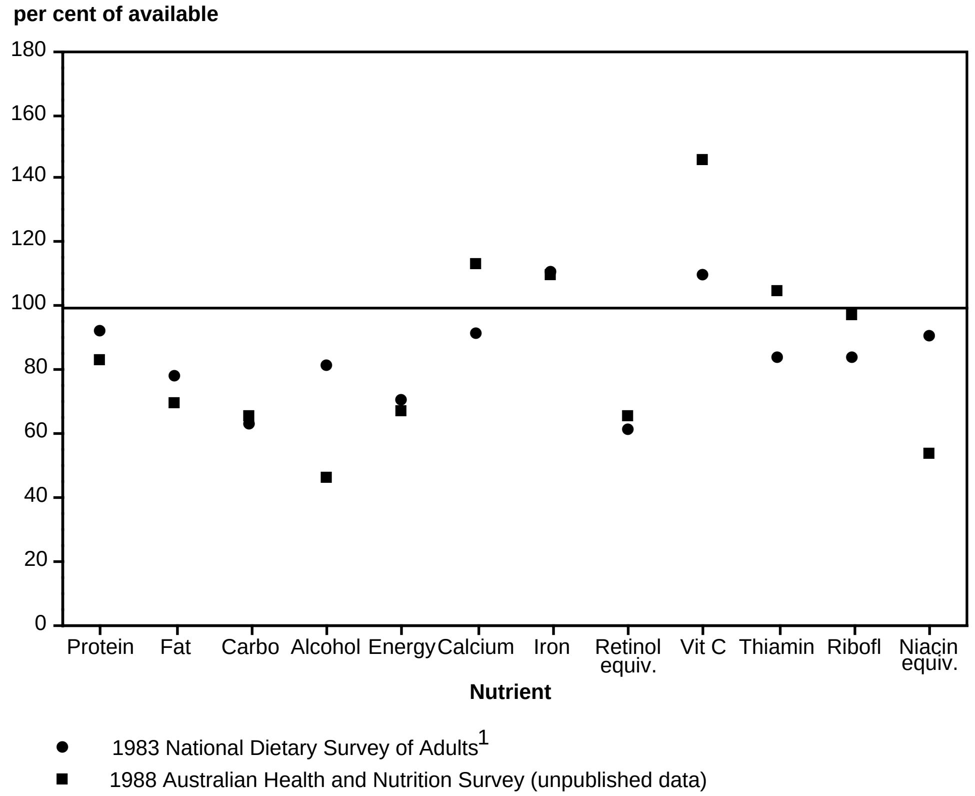
4.4 Nutrient intakes

For convenience, nutrients are generally considered in two separate categories: macronutrients and micronutrients. The principal characteristic of the macronutrients is that they are the energy sources, although other components of the diet such as water, dietary fibre and dietary cholesterol are usually included in this group. Micronutrients characteristically provide no energy, are needed in only minute quantities, and cannot be synthesised by human metabolism from simpler materials (although the vitamin niacin can be synthesised from the amino acid tryptophan and vitamin D can be synthesised in the skin from the action of sunlight on its sterol precursor).

Nutrient intakes compared with the nutrient supply

The mean energy intakes for the 1983 National Dietary Survey and the 1988 and 1989 CSIRO surveys were all about two-thirds of the available energy supply. Fat intakes ranged from 78 per cent of apparent consumption in 1983 to 63 per cent for the 1989 Survey of the Elderly. The fat contribution to energy supply was 34 per cent in 1983 and 33.6 per cent in 1989. For the 1983 National Dietary Survey of Adults, the 1988 Australian Health and Nutrition Survey and the 1989 Survey of the Elderly, the energy intakes of women were 57–60 per cent of the available supply; the figure was 73 per cent for men, except for the 1983 survey, where it was 85 per cent. Figure 4.1 shows the mean total sample intakes of selected nutrients, as a percentage of the available supply (apparent consumption), for the two national surveys with the greatest age ranges (1983 and 1988). It demonstrates that at the aggregate level, nutrient intake patterns elicited by two different data collection methods are probably reasonable approximations of some ‘real’ pattern.

The ratio of starch to simple sugars was 1.2:1 for the 1983 survey and 0.8:1 for the 1988 and 1989 surveys. This is the sort of measure that could signal changes in dietary behaviour, and it is important to clarify whether the differences have any significance. It is by no means justifiable at this stage to assume a trend. The differences for alcohol intake (80 per cent of supply in 1983 compared with 40 per cent in 1988) may reflect rapid market penetration of reduced-alcohol beers.



Source: Australian Institute of Health and Welfare (unpublished)

Figure 4.1: ***Dietary survey nutrient intake, as percentage of available nutrients***

Similarly, the total carbohydrate contribution to energy was 41 per cent for the 1983 survey, 45 per cent for the 1988 survey, and 49 per cent for the Survey of the Elderly. Protein contributed 15–17 per cent of energy for the three surveys, while for the *Apparent consumption* series the contribution was similarly stable, rising from 13 per cent of energy to 13.3 per cent over those years.

Micronutrient intakes from the surveys were compared with the apparent consumption data for the relevant years. For iron, the mean intakes were slightly higher (from 1 to 10 per cent) than the apparent consumption. Calcium intakes were also in this range, except for the 1983 survey, where intakes were about 10 per cent less than apparent consumption. Thiamin intakes were about 85 per cent of the supply, except again for the 1983 survey, where intake was 70 per cent. Vitamin A intakes varied greatly between surveys, and the differences from the apparent consumptions for the same years were also variable.

Nutrient intakes of adults

Macronutrients and energy

Mean total fat intake in the 1983 National Dietary Survey was approximately 37 per cent of energy, with saturated fatty acids comprising 16 per cent of total energy.[5] Total fat intakes for the two other surveys of adults were lower: 35 per cent of energy (13.7 per cent from saturated fatty acids) in the 1988 CSIRO survey[10] and 32 per cent of energy (13 per cent from saturated fatty acids) in the 1989 Survey of the Elderly (see Table 4.8).

CSIRO food frequency data showed an overall pattern of decline in the amount of energy contributed by fat in the diet, from 38–39 per cent in the late 1970s to 35–36 per cent in the late 1980s. This was accompanied by an increase in the proportion of polyunsaturated fatty acids and a fall in dietary cholesterol intake.[47]

Table 4.8: ***Macronutrient intake and contribution to energy intake, selected surveys, 1980s***

	Intake (g/day)			Contribution to energy (per cent)		
Survey / nutrient	**Males**	**Females**	**Persons**	**Males**	**Females**	**Persons**
1983 National Dietary Survey of Adults (aged 25 to 64)						
Protein	106	74	89	16.4	17.0	16.7
Fat	110	76	92	37.0	38.0	37.6
Carbohydrate	274	192	232	39.8	41.5	41.0
Alcohol	25	9	17	6.5	3.5	5.3
1988 Australian Health and Nutrition Survey (aged 18 and over)						
Protein	89	78	83	15.9	17.0	16.4
Fat	90	75	82	35.1	36.6	35.2
Carbohydrate	268	222	245	45.1	45.6	45.4
Alcohol	12	5	8	3.7	1.8	2.8
1989 CSIRO Survey of the Elderly (aged 55 to 75 years)						
Protein	82	75	78	15.3	16.2	15.7
Fat	81	68	74	33.0	32.0	32.4
Carbohydrate	271	246	258	47.7	50.0	48.9
Alcohol	13	5	9	4.1	1.8	2.9

Sources: 1983 National Dietary Survey of Adults;[2] CSIRO (unpublished data)

Baghurst noted that in the same period—late 1970s to late 1980s—fibre intake increased from 17–18 to 23–24 g per person per day.[47] The dietary cholesterol intakes reported for the 1983 survey were about 30 per cent greater than the reported intakes of the other surveys, and the increase in fibre intake was greater for women than for men.

Again, methodological differences between the 1983 survey and the CSIRO surveys render comparisons inappropriate.

The patterns of total carbohydrate intakes and starch and sugars intakes were different from those of fibre intakes. For females, increasing sugars intakes caused an increase in total carbohydrate intakes; for men, starch intakes were lower in the later surveys. Total carbohydrate intakes for adults were, however, much the same over the three surveys. The energy contributions of carbohydrates were around 40 per cent for the 1983 survey, but around 45 and 50 per cent respectively for the 1988 and 1989 surveys.

Alcoholic beverages

Alcoholic beverage intakes for men were consistently two-and-a-half to three times greater than those of women in 1983, 1988 and 1989. Energy contributions of alcohol for men were twice those of women for the three surveys (see Table 4.6). The two-fold difference in magnitude of intakes between the 1983 (24-hour recall) survey and the food frequency surveys of 1988 and 1989 may be due to several factors, but the difference in method clouds any interpretation.

The 1989–90 National Health Survey data are comparable. Australian Bureau of Statistics information is that under-reporting of alcohol consumption occurs in surveys of this nature. From a comparison of figures from the 1989–90 National Health Survey with data from other sources it was estimated that the overall consumption figures in the National Health Survey are under-reported by between 33 and 67 per cent, depending on the types of alcoholic drink consumed. In spite of this, since under-reporting of alcohol consumption appears consistent across respondent populations, the patterns of consumption and the relativities between different population groups described by the data are valid.[25]

The National Health Survey data were able to link alcoholic beverage consumption to health service use; indicators of health risk were derived from the average daily amount of alcohol consumed during the reference week and were grouped into relative risk levels based on the recommendations of the NHMRC.[28] Health risk levels as defined for this survey are based on consumption during the reference week and take no account of whether consumption in that week was more than, less than or about the same as usual. This differs from the NHMRC standards, which are defined on the basis of regular consumption. This point applies also to surveys such as the 1983 National Dietary Survey, for which a short-term recall method was used which again, did not give ‘usual’ intake data.

Another possible limitation of the National Health Survey data was that quantities of alcoholic beverages reported as consumed were converted to quantities of ethanol (alcohol) consumed based on factors representing an average alcohol content of each type of drink. To the extent that individuals consumed particular brands or types of drink with a higher or lower alcohol content than represented by the factor, the derived intake may understate or overstate actual intake. The accuracy of conversions was also affected when respondents reported consumption in non-standard measures. Accepting these limitations, the average consumption of male drinkers aged 18–24 years was 36 mL per day of alcohol, compared with 31 mL per day for all age groups who drank alcoholic beverages. The equivalent figures for female drinkers were 16 mL per day for 18–24-year-olds and 13 mL per day for all age groups.

Average alcohol intake was greatest for women who drank full-strength beer: 14.0 mL per day, compared with 10.2 mL per day for women who drank wine. For males the average alcohol intake for those drinking full-strength beer was 32.6 mL per day, compared with 13.8 mL per day for males who drank wine.

Sodium and potassium

Table 4.9 shows estimated dietary intakes of sodium and potassium from two recent surveys of usual intake, and the 24-hour urine results from a small subsample of the Hobart respondents to the 1989 National Heart Foundation Risk Factor Prevalence Survey. The dietary sodium intake values were at the lower end of the RDI range of 40–100 mmol per person per day. In contrast, Beard et al.[48] found that while potassium excretion was within the RDI range, sodium excretion exceeded the RDI range for men and for women. It was noted that the small size of the Hobart sample and some differences between the subsample profile and the original probability sample may raise questions about applying the conclusions to the general population. The results, however, were consistent with larger overseas studies.

The differences between intake and output assessments underlines the difficulty in estimating sodium intake. Total sodium intake includes sodium from water (whose composition is highly variable) and from pharmaceutical preparations as well as food. The salt content of manufactured food can vary and discretionary salt use is highly variable. Beard et al. concluded that the low response rate (13 per cent) in the Hobart study was at least partly due to the particular circumstances of the study and suggested that the use of 24-hour urine collections for estimating sodium and potassium flux may be a feasible monitoring tool.[48]

Table 4.9: ***Sodium and potassium intake and 24-hour excretion, by sex (mmol/day)***

Survey / sex	Sodium	Potassium
Recommended dietary intake		
All adults	40–100	50–140
1989 Hobart study		
Males	160	77
Females	124	68
1988 Australian Health and Nutrition Survey		
Males	54	52
Females	45	49
1989 CSIRO Survey of the Elderly		
Males	45	55
Females	39	57

na Not available

Sources: Recommended Dietary Intakes for Use in Australia;[49] Beard et al.[48] 1988 CSIRO Australian Health and Nutrition Survey (unpublished data); 1989 CSIRO Survey of the Elderly (unpublished data)

Other micronutrients

The food supply contains sufficient nutrients to meet the needs of the population but there is evidence to suggest that deficiencies may occur in some population subgroups. Taking the 1983 National Dietary Survey as an example, the fifth percentile intakes for vitamin A, vitamin C, zinc and iron for women aged 25–64 years were about one-third of the recommended dietary intakes; the fiftieth percentile for vitamin A and the seventy-fifth percentile for zinc were at the RDI, and the twenty-fifth percentile for vitamin C exceeded the RDI.[5]

The selenium content of foods was analysed in the 1984 and 1987 Market Basket Surveys.[50] The sensitivity of the analyses for 1984 was insufficient for estimating probable intakes (the limit of detection was 20 μg per 100 g of food, which exceeds the RDIs for infants and young children); the 1987 analyses were reported to 0.5 μg per 100 g of food. Calculated selenium intakes based on the simulated diet used for the 1987 Market Basket Survey were below the RDIs for some age–sex groups (the diet was simulated from the 1983 National Dietary Survey). In particular, the calculated intakes for men and women aged 25–34 years were 98 per cent and 84 per cent respectively of the RDIs.[50] The simulated diets, however, were based on the ninety-fifth percentile of energy intake and the mean food distribution pattern. Thus, at the mean consumption levels, intakes were 61 per cent and 51 per cent of the RDIs. It should be noted that symptoms of selenium deficiency have not been reported in Australia, nor have they in New Zealand, which is known to have selenium-deficient soils—although a recent report showed that the selenium status of New Zealand had improved since the removal of import restrictions on grains.[51]

Regional and State-level information: Victoria

Nutrient intake data for Victoria are available from the 1985 and 1990 Victorian Nutrition Surveys. In addition, the 1983 National Dietary Survey of Adults and the 1985 National Dietary Survey of Schoolchildren can provide State-level information. A survey of 225 Geelong residents, using a repeated four-day weighed-food record method, was also conducted between 1989 and 1991.[52] This creates a number of options for assessing the nutrient intakes of Victorians. Similar exercises may be possible in other States or on a regional basis. State-level surveys are important because of the primacy of State governments in administering programs. An example of where a regional approach is appropriate is the central arid zone, comprising parts of the Northern Territory and four States and with environmental and social similarities that transcend political boundaries.

The 1985 and 1990 Victorian Nutrition Surveys can be compared directly. They used the same food frequency method and the 1985 data have been re-analysed using the same Australian food composition data base used for the 1990 survey.[9] Some of the data are presented earlier in the chapter (see Table 4.4). Further comparison of these surveys is shown in Table 4.10. There appears to be a change towards a more appropriate intake pattern—fat contribution to energy down, complex carbohydrates up, iron, calcium, zinc and thiamin densities up—but if this is a significant trend, then the increase in total energy intake for men and for women is a cause for concern and for further investigation.

Table 4.10: ***Percentage contribution of macronutrients to total energy intake and micronutrient intakes per 1000 kJ energy, Victoria, 1985 and 1990, by sex***

Sex / nutrient	1985	1990	1985	1990
Males			*Per cent contribution to energy*	
Energy (kJ)	9423	10 026		
Protein (g)	86.3	93.4	15.7	16.1
Starch (g)	114	126	19.4	20.3
Total carbohydrates (g)	249	227	42.3	44.4
Sugars (g)	134	150	22.6	23.9
Fat (g)	91	94	35.3	34.3
Alcohol (g)	17.5	13.0	5.4	3.8
			Intake per 1000 kJ energy	
Thiamin (mg)	1.23	1.38	0.13	0.14
Riboflavin (mg)	2.03	2.28	0.22	0.23
Vitamin C (mg)	177	182	19.3	19.2
Iron (mg)	12.8	14.1	1.39	1.44
Calcium (mg)	913	1134	96.0	114.5
Zinc (mg)	11.4	12.5	1.22	1.26
Females			*Per cent contribution to energy*	
Energy (kJ)	7623	8116		
Protein (g)	75.6	82.1	17.1	17.4
Starch (g)	88	100	18.5	19.9
Total carbohydrates (g)	208	231	43.7	45.6
Sugars (g)	119	130	25.0	25.5
Fat (g)	73	74	35.3	33.5
Alcohol (g)	6.0	5.0	2.4	1.9
			Intake per 1000 kJ energy	
Thiamin (mg)	1.15	1.28	0.15	0.16
Riboflavin (mg)	1.86	2.10	0.25	0.26
Vitamin C (mg)	203	200	27.6	25.5
Iron (mg)	11.8	12.8	1.58	1.6
Calcium (mg)	888	1077	116.3	133.2
Zinc (mg)	10.2	11.2	1.35	1.39

Sources: Baghurst et al.[53]

Nutrient intakes of children

The baseline for children's nutrient intakes is the 1985 National Dietary Survey of Schoolchildren, which surveyed children aged 10–15 years. Surveys with comparable methodology were carried out in Western Australia in 1987 and 1988.[54] Table 4.11 shows data matched for age from the three surveys, for macronutrients and energy. There is a potential source of error in that the nutrient intakes of the Western Australian surveys were calculated by a program using British data (McCance and Widdowson's tables), and the national survey used Australian data. Nevertheless, energy intakes were similar at ages 11 and 12 years, with girls' intakes 87–90 per cent those of boys, and there was no apparent trend over time for macronutrients. The 1985 survey data show an increase in energy, fat and fibre intakes over those ages for boys, but not such an obvious trend for girls.[5] The contribution of fat for children aged 10–15 years (in 1985) was about 36 per cent with saturates contributing 16–17 per cent of energy.[5]

The pattern of consumption of refined added sugars estimated from the 1985 survey showed that most added sugars are consumed in mixed foods prepared outside the home. This is much the same as was found in the 1983 survey of adults. The apparent consumption data confirm the high levels of consumption of soft drinks found in the surveys. More than 20 per cent of the energy intake of the children came from soft drinks, confectionery, other foods with a high added sugars content (for example, biscuits and cakes), take-aways and snack products.[2,5]

Indicators of dietary quality and nutritional adequacy

There are several approaches to describing dietary data to identify groups within the population that may be consuming nutritionally inadequate diets. Three such approaches are the use of nutrient density scores, comparison with RDIs, and assessment of the distribution of food sources of nutrients.

Nutrient density scores

Nutrient density scores provide an estimate of the quality of the diet in terms of a particular nutrient (see also Section 2.4). The principle is to include all nutrient requirements in a diet that does not exceed energy requirements. The nutrient density score distributions highlight areas of concern and indicate population subgroups requiring further investigation. The 1983 National Dietary Survey data revealed a number of subgroups, based on age, sex and country of origin, with nutrient density scores of less than unity, suggesting sub-optimal nutritional quality of the diet for the nutrient of concern.[2] Nutrient density scores from the 1983 National Dietary Survey were calculated using population-weighted means of energy and nutrient RDIs and intakes; on that basis, of the nutrients examined, calcium for men and women of all age groups and iron for women aged between 25 and 54 years (that is, women of reproductive age) were identified as warranting further scrutiny.[55]

Comparisons with recommended dietary intakes

Table 4.12 lists nutrients, of those analysed from the 1983, 1988 and 1989 surveys of adults, for which nutrient intakes were below 0.5 of the RDI for 10 per cent of any age–sex group. In all cases it can be seen that the 24-hour recall method (used for the 1983 survey) and the food frequency method (used in the 1988 and 1989 surveys) give different results. Certainly, as all the surveys show, on the basis of comparison with the RDIs, monitoring (and improving) the iron status of women of reproductive age should be a priority. The iron intakes of post-pubescent girls are also likely to be inadequate.[56]

Mean calcium intakes for males were generally adequate, except that in the 1983 survey the group aged over 55 years had a reported intake of 95 per cent of the RDI; this compares with men from the 1989 Survey of the Elderly, who had an intake of 120 per cent of the RDI. The mean and median calcium intakes for women in the 1983 survey were less than the RDIs for each age group. The reported Survey of the Elderly mean intake was somewhat higher—about 95 per cent of the RDI. Generally, the results of the 1985 National Dietary Survey of Schoolchildren indicated that calcium intakes were a concern in that age group, particularly for girls. Over 40 per cent of girls aged 12–15 years and boys aged 12 and 13 years had intakes below 70 per cent of the RDI, with one-quarter being below 50 per cent of the RDI.

Table 4.11: ***Nutrient intake of children, by age and sex, selected surveys, 1980s***

Survey / age / nutrient	Intake (g/day unless stated)		Contribution to energy (per cent)	
	Males	Females	Males	Females
1985 National Dietary Survey of Schoolchildren, 11 years				
Energy (MJ)	8.5	7.4	100.0	100.0
Protein	74	63	15.1	14.5
Fat	85	72	36.6	35.6
Total carbohydrates	255	227	48.1	49.5
Fibre	18	16	–	–
Calcium (mg)	883	724	–	–
Number of respondents	*459*	*460*	–	–
1987 Western Australian survey, 11 years				
Energy (MJ)	8.4	7.6	100.0	100.0
Protein	70	63	–	–
Fat	84	78	36.8	37.8
Saturated fatty acids	35	35	15.5	16.7
Total carbohydrates	256	227	48.0	48.8
Fibre	18	15	–	–
Calcium (mg)	870	770	–	–
Number of respondents	*61*	*57*	–	–
1985 National Dietary Survey of Schoolchildren, 12 years				
Energy (MJ)	8.8	7.7	100.0	100.0
Protein	75	64	14.6	14.3
Fat	88	77	36.3	36.6
Total carbohydrates	268	233	48.9	48.9
Fibre	19	16	–	–
Calcium (mg)	930	790	–	–
Number of respondents	*456*	*479*	–	–
1988 Western Australian survey, 12 years				
Energy (MJ)	8.6	7.5	100.0	100.0
Protein	71	60	–	–
Fat	84	75	36.1	36.5
Saturated fatty acids	34	25	14.3	14.4
Total carbohydrates	264	231	49.6	49.5
Fibre	19	17	–	–
Calcium (mg)	990	830	–	–
Number of respondents	*626*	*589*	–	–

– Not applicable

Sources: 1985 National Dietary Survey of Schoolchildren;[5] Jenner & Miller[54]

Table 4.12: ***Percentage below 0.5 of RDI, selected nutrients and surveys, by age group and sex***

Sex / survey / age group	Vit. E	Zinc	Iron	Calcium	Vit. A	Vit. C	Vit. B12
Males							
1983 National Dietary Survey of Adults							
25 to 34	na	11	1	12	10	8	na
35 to 44	na	10	–	11	13	11	na
45 to 54	na	12	1	15	15	15	na
55 to 64	na	14	1	16	14	14	na
1988 Australian Health and Nutrition Survey							
18 to 39	na	3	–	3	–	–	na
40 to 59	na	6	–	5	–	–	na
60 and over	na	9	–	6	–	–	na
1989 CSIRO Survey of the Elderly							
54 to 75	13	4	–	6	1	1	na
70 to 75	8	4	–	8	1	1	na
Females							
1983 National Dietary Survey of Adults							
25 to 34	na	25	14	18	20	8	na
35 to 44	na	33	22	23	18	9	na
45 to 54	na	32	21	25	21	8	na
55 to 64	na	33	1	36	17	6	na
1988 Australian Health and Nutrition Survey							
18 to 39	na	9	5	3	–	–	na
40 to 59	na	6	3	4	–	–	na
60 and over	na	12	–	8	–	–	na
1989 CSIRO Survey of the Elderly							
54 to 75	4	5	–	12	1	–	3
70 to 75	5	5	–	11	1	–	5

– Zero

na Not available

Sources: 1983 National Dietary Survey of Adults;[2] 1988 Australian Health and Nutrition Survey (unpublished data); 1989 CSIRO Survey of the Elderly (unpublished data)

A common yardstick for further investigation is an intake of less than 70 per cent of the RDI. At least 15 per cent of women aged 18–59 years(1988)[10] had iron intakes of less than 70 per cent of the RDI and at least 13 per cent of men over 40 years and women over 18 years (1988)[10] had calcium intakes of less than 70 per cent of the RDI. Of all those surveyed in 1989 (aged 54–75 years) at least 13 per cent of men and 30 per cent of women had intakes of less than 70 per cent of the RDI.[10]

Age–sex groups surveyed in 1988 and 1989 had from 16 to 40 per cent with intakes below 70 per cent of the RDI.[10] Magnesium intakes below 70 per cent of the RDI were observed in at least 10 per cent of men aged over 65 years (1989)[13] and men aged over 40 years (1988).[10] The low intakes of vitamin E by older people shown in Table 4.11 were confirmed, with at least 20 per cent of those surveyed in 1989 having intakes below 70 per cent of the RDI.[10]

The corresponding results for the 1983 survey for most nutrients indicated higher proportions of people whose intakes on the survey day were below 70 per cent of the

RDI. The discrepancy between the 24-hour recall and food frequency surveys is more pronounced at the 70 per cent of RDI level than at 50 per cent, but the same differentiation by age–sex groups is found as in the 1988 and 1989 surveys. For example, with the exception of magnesium, the highest rates of lower intakes are found in the most closely corresponding age–sex groups for all three surveys.[5,10]

At the 70 per cent of RDI level, folate and magnesium are identified for further examination from the 1988 and 1989 surveys. Between 5 and 17 per cent of those surveyed in 1988 and 1989 had folate intakes below 70 per cent of the RDI.[10,11] The 1983 National Dietary Survey data were not analysed for folate. The 1988 and 1989 results were that 9–16 per cent of men, but not women, had low magnesium intakes. The 1983 survey reported 12 per cent of men, but 22 per cent of women, with intakes less than 70 per cent of the RDI for magnesium on the survey day.[5]

Food sources of nutrients

As discussed in Chapter 2, the distribution of nutrients among food is heterogeneous. This is the basis for the Dietary Guidelines for Australians and for food selection guides. Where particular nutrients are found chiefly in a narrow range of foods there is potential for deficient intakes. This concept is complementary to that of nutrient density scores for diets. Tables 4.13 (males) and 4.14 (females) list the major food sources of energy, macronutrients, fibre and selected micronutrients from the 1983 National Dietary Survey of Adults, the 1985 National Dietary Survey of Schoolchildren, and the 1985 and 1990 Victorian Nutrition Surveys. The tables highlight some important differences in the diets of adults and of children in the 10–15 age group.

Most noteworthy is the greater importance of dairy foods as nutrient sources for children; in adults, meat and meat products supplant dairy foods to some extent. Also noteworthy is the importance of cereals—specifically breakfast cereals—in the diets of children. Breakfast cereals provide for children more than 1.6 times the proportion of fibre than they do for adults, for males 1.7 times the thiamin and 1.6 times the iron, and for females 1.3 times the thiamin and 1.4 times the iron.[2,5]

Although the total available food supply is adequate to satisfy the energy requirements of the population, even making considerable provision for waste and inequalities and inefficiencies in the distribution of foods, these data suggest a need to ascertain whether there is sufficient of certain nutrients and to identify the richer food sources of these nutrients.

Table 4.13: ***Percentage contribution of food groups to daily nutrient intakes, selected nutrients and surveys, males***

Nutrient / food	1983 NDSA	1985 NDSC	1985 Vic	1990 Vic
Age group	*25–64*	*10–15*	*18 and over*	*18 and over*
Energy				
Cereals and products	26	29	28[(a)]	30[(a)]
Breads	*11*	*11*	*14*[(b)]	*13*[(b)]
Meat and products[(c)]	19	15	20	18
Dairy products	11	19	15	16
All other	43	37	38	36
Fat				
Meat and products[(c)]	29	21	22	19
Dairy products	17	26	21	13
Milk		*19*		
Fats (all non-cooking uses)	17	15	26[(h)]	24[(h)]
Cereals and products	15	14	11[(a)]	14[(a)]
All other	23	20	na	na
Total carbohydrate				
Cereals and products	45	43	48[(a)]	48[(a)]
Breads	*20*	*16*	*22*[(b)]	*19*[(b)]
Breakfast cereals	*5*	*11*	*5*	*5*
Vegetables	12	9	9	9
Fruits and juices[(d)]	9	8	13	13
Dairy products	7	13	10	11
All other	18	27[(e)]	na	na
Fibre				
Cereals and products	38	44	37[(a)]	36[(a)]
Breads	*19*	*17*	*28*[(b)]	*18*[(b)]
Breakfast cereals	*10*	*17*	*9*	*8*
Vegetables	33	28	31	29
Fruits and juices[(d)]	17	15	20	21
All other	11	14	11	15
Protein				
Meat and products[(c)]	42	32	35	34
Beef and veal	*19*	*8*	*na*	*na*
Poultry, eggs and fish	14	8	11	10
Cereals and products	18	23	19[(a)]	19[(a)]
Breads	*10*	*11*	*14*[(b)]	*13*[(b)]
Dairy products	14	25	20	23
All other	13	13	15	15
Iron				
Cereals and products	31	47	31[(a)]	33[(a)]
Breads	*11*	*14*	*17*[(b)]	*15*[(b)]
Breakfast cereals	*11*	*23*	*9*	*11*
Meat and products[(c)]	30	23	29	29
Vegetables	14	10	18	17
All other	25	20	23	21
Age group	*25–64*	*10–15*	*18 and over*	*18 and over*
Calcium				
Dairy products	58	72	61	63
Cereals and products	13	12	12[(a)]	11[(a)]

(continued)

Table 4.13 (continued): ***Percentage contribution of food groups to daily nutrient intakes, selected nutrients and surveys, males***

Nutrient / food	1983 NDSA	1985 NDSC	1985 Vic	1990 Vic
Breads	*7*	*5*	*7*[b]	*6*[b]
All other	29	16	27	26
Zinc				
Meat and products[c]	48	40	42	39
Cereals and products	17	21	15[a]	17[a]
Dairy products	12	21	21	24
All other	23	18	21	20
Retinol equivalents				
Meat and products[c]	29	15	na	na
Organ meats	*24*	*10*	*na*	*na*
Vegetables	34	31	na	24
Carrots	*19*	*20*	*na*	*20*
Fats (all non-cooking uses)	15	13	na	15[h]
Dairy products	11	22	na	13
All other	11	19	na	9
Thiamin				
Cereals and products	33	41	36[a]	36[a]
Breads	*14*	*12*	*17*[b]	***17***[b]
Breakfast cereals	*13*	*22*	*15*	*15*
Vegetables	18	11	18	15
Meat and products	19	9	13	16
Dairy products	9	14	14	16
Fruits and juices	7[f]	7	11	10
All other	14	18	35	29
Vitamin C				
Fruits and juices	53	50	48	42
Orange juice	*20*	*29*	*na*	*na*
Vegetables	33	16	34	32
Beverages[f]	9	26	14[g]	19[g]
All other	5	8	4	8

NDSA–National Dietary Survey of Adults
NDSC–National Dietary Survey of Schoolchildren
Vic–CSIRO Victorian Nutrition Survey
na Not available
(a) Includes confectionery
(b) Includes crackers
(c) Excludes poultry
(d) Includes fruit juices, excludes fruit juice drink
(e) Includes 9% from non-alcoholic beverages (except fruit juices)
(f) Excludes juices
(g) Includes alcoholic drinks
(h) Includes sauces

Sources: Unpublished data from 1983 National Dietary Survey of Adults, 1985 National Dietary Survey of Schoolchildren, and 1985 and 1990 Victorian Nutrition Surveys.

Table 4.14: ***Percentage contribution of food groups to daily nutrient intakes, selected nutrients and surveys, females***

Nutrient / food	1983 NDSA	1985 NDSC	1985 Vic	1990 Vic
Age group	*25–64*	*10–15*	*18 and over*	*18 and over*
Energy				
Cereals and products	25	29	27[(a)]	29[(a)]
Breads	*10*	*10*	*10*[(b)]	*10*[(b)]
Meat and products[(c)]	19	14	17	17
Dairy products	13	17	17	18
All other	43	40	39	36
Fat				
Meat and products[(c)]	24	20	20	19
Dairy products	19	24	23	24
Fats (all non-cooking uses)	16	15	26[(h)]	24[(h)]
Cereals and products	15	15	12[(a)]	17[(a)]
All other	26	26	na	na
Total carbohydrate				
Cereals and products	45	41	44[(a)]	44[(a)]
Breads	*19*	*16*	*18*[(b)]	*15*[(b)]
Breakfast cereals	*5*	*8*	*6*	*5*
Vegetables	12	9	11	11
Fruits and juices[(d)]	10	9	19	17
Dairy products	7	11	11	12
All other	26	30	34	35
Fibre				
Cereals and products	36	38	31[(a)]	32[(a)]
Breads	*16*	*12*	*17*[(b)]	*17*[(b)]
Breakfast cereals	*10*	*16*	*8*	*8*
Vegetables	32	26	33	31
Fruits and juices	23[(f)]	18[(f)]	26[(d)]	24[(d)]
All other	9	18	10	14
Protein				
Meat and products[(c)]	36	31	30	31
Beef and veal	*16*	*na*	*na*	*na*
Poultry, eggs and fish	15	9	12	11
Cereals and products	18	23	18[(a)]	18[(a)]
Breads	*na*	*11*	*11*[(b)]	*11*[(b)]
Dairy products	17	23	23	25
All other	14	14	na	na
Iron				
Cereals and products	31	44	30[(a)]	31[(a)]
Breads	*10*	*13*	*15*[(b)]	*14*[(b)]
Breakfast cereals	11	18	10	11
Meat and products[(c)]	26	21	24	27
Vegetables	16	10	21	20
All other	27	25	25	22

(continued)

Table 4.14 (continued): ***Percentage contribution of food groups to daily nutrient intakes, selected nutrients and surveys, females***

Nutrient / food	1983 NDSA	1985 NDSC	1985 Vic	1990 Vic
Age group	*25–64*	*10–15*	*18 and over*	*18 and over*
Calcium				
Dairy products	61	68	63	63
Cereals and products	12	13	11	9
Breads	*6*	*5*	*5*[b]	*4*[b]
All other	27	19	27	28
Zinc				
Meat and products[c]	41	37	37	36
Cereals and products	18	21	15[a]	17[a]
Dairy products	14	19	22	24
All other	27	23	25	23
Retinol equivalents				
Meat and products[c]	54	11	na	na
Organ meats	*51*	*6*	*na*	*na*
Vegetables	25	34	na	27
Carrots	*13*	*23*	*na*	*24*
Fats (all non-cooking uses)	8	14	na	11[h]
Dairy products	7	20	na	11
All other	6	11	na	na
Thiamin				
Cereals and products	30	35	30[a]	33[h]
Breads	*13*	*11*	*14*[b]	*15*[b]
Breakfast cereals	*12*	*17*	*13*	*14*
Vegetables	18	12	20	17
Meat and products	15	9	11	13
Dairy products	11	12	15	17
Fruits and juices	10[f]	9	14	12
All other	16	23	10	8
Vitamin C				
Fruits and juices	57	52	52	42
Orange juice	*18*	*31*	*na*	*na*
Vegetables	31	14	33	33
Beverages[f]	7	29	12[g]	17[g]
All other	5	5	3	8

NDSA – National Dietary Survey of Adults

NDSC – National Dietary Survey of Schoolchildren

Vic – CSIRO Victorian Nutrition Survey

na Not available

(a) Includes confectionery

(b) Includes crackers

(c) Excludes poultry

(d) Includes fruit juices, excludes fruit juice drink

(e) Includes 9% from non-alcoholic beverages (except fruit juices)

(f) Excludes juices

(g) Includes alcoholic drinks

(h) Includes sauces

Sources: Unpublished data from 1983 National Dietary Survey of Adults, 1985 National Dietary Survey of Schoolchildren, and 1985 and 1990 Victorian Nutrition Surveys.

Nutrients of concern

The two nutrients of greatest concern—consistently, whatever approach is taken—are calcium and iron, for which supplementary guidelines were established in the revised Dietary Guidelines for Australians.[17] Iron intake is of concern in the diets of women of reproductive age because of the increased requirement needed to offset menstrual blood loss, and calcium is of concern for the same group because of the association between dietary calcium intakes in young women and later (post-menopausal) susceptibility to osteoporosis. The iron intakes and iron status of Australians have been reviewed comprehensively by Cobiac and Baghurst;[57] Chapter 5 provides a summary of the studies they reviewed.

Other characteristics of the 1983 National Dietary Survey data suggested that among the population subgroups that may be vulnerable to nutrient inadequacies are women of reproductive age (iron, calcium), men and women born in Asia or southern Europe, women with no secondary education, men and women who are obese, women who are pregnant or lactating, elderly people, Aboriginal people, children who do not eat breakfast, children of non-English-speaking background and children from single-parent homes.[2,5,55]

Consideration of nutrient availability and adequacy for all groups should include a context of the relative proportions of the foods that make up the food supply, factors affecting wastage (including levels of wastage of these foods), and factors affecting food distribution both to and within population groups. There is, however, no need to increase the total food supply in terms of energy, given the excess of supply over intakes and low nutrient densities for several nutrients.

4.5 Food safety and hygiene

As noted, food safety and hygiene in Australia are regulated by State governments. The food supply is monitored regularly for agricultural and other chemical residues and microbiological contaminants, and the National Food Authority continuously reviews and revises food standards.[58] Minimum residue levels are set for pesticides and agricultural chemicals and these are being incorporated in the Food Standards Code.[58]

Australia has one of the safest, least contaminated, and best safeguarded food supplies in the world. Nevertheless, attitudinal surveys consistently find that consumers view contamination of foods with chemical residues as the most important food issue. This view has been reported as common from a 1992 survey of supermarket shoppers,[58] among people aged 16–22 years,[25] in a survey of Victorian adults,[59] and in national samples by Worsley[61–63] and Crawford and Baghurst.[64] Such a view is also a phenomenon in other developed countries.[64] It may be indicative of a need for better consumer information and education about the food supply.

Surveillance of food safety and hygiene

Two continuing survey programs monitor residue levels and contamination of foods: the Australian Market Basket Surveys and the National Residue Survey. There is also an Imported Food Inspection Program conducted jointly by the National Food Authority and the Australian Quarantine and Inspection Service,[58] and there are State-run surveys (in Victoria, for example[66]).

The Bureau of Rural Resources conducts the National Residue Survey to examine residues in raw food commodities, especially meat but including grains, honey, fruit, vegetables, eggs and dairy foods. Produce is examined for residues of insecticides, fungicides and antibiotics and for environmental contaminants such as heavy metals.[67] Results from 1986 to 1990 show that there has been a decrease in reports of residues.[67–69] In 1989, 57 830 samples were tested; detectable residues were found in 21 per cent of the samples and 714 samples (1.2 per cent) exceeded the maximum residue level or maximum permitted concentration (see Box 4.1 for an explanation of terms). In 1990, 50 648 samples were tested; 14.2 per cent had detectable residues and 347 samples (0.7 per cent) exceeded the maximum residue level or maximum permitted concentration.[67]

Box 4.1: Residual and contaminant levels: terminology

The ***acceptable daily intake*** *(ADI) is the daily dosage of a chemical that, during a lifetime, appears to pose no appreciable risk on the basis of current knowledge; that is, practical certainty that injury will not result even after a lifetime of exposure.*[68]

The ***maximum residue level*** *(MRI) is the maximum concentration of a residue of an agricultural or veterinary chemical that is legally permissible or recognised as acceptable, such that the sum of residues of the chemical from all sources in the human diet does not exceed the ADI.*[69]

The ***maximum permitted concentration*** *(MPC) is similar to the MRL but applies to environmental contaminants such as heavy metals.*[69]

MRIs and MPCs are expressed as milligrams per kilogram or as 'parts per million', which is the same thing. When incorporated in legislation, MRLs and MPCs have legal force. MRLs are set down under A14 of the Food Standards Code and MPCs under A12.[33]

The provisional tolerable weekly intake (PTWI) is the permissible human weekly exposure to a contaminant that has a cumulative effect on the body but that is unavoidably present in otherwise wholesome foods (for example, mercury in seafood).

PTWIs are expressed as an amount (generally in the milligram or microgram range) per

The first Australian Market Basket Survey was conducted in 1970 and the eighteenth in 1992.[49,58,70,71] These surveys scrutinise food prepared for consumption and are the responsibility of the National Food Authority,[58] which examines a selected range of foods, covering products that are important in the Australian diet and a number of foods that are considered to be indicators of contamination. Since the 1987 survey, probable dietary intake levels have been estimated by simulating a diet from the foods surveyed, using the National Dietary Surveys of 1983 and 1985 as the basis. The number of foods sampled is relatively small (about 50) and, from a dietary perspective, somewhat unrepresentative. This is because of the need to monitor foods that, although highly susceptible to contamination, are consumed by relatively few people or in relatively small amounts (examples are liver and wheat bran).

The last three surveys reported (1986, 1987 and 1990—the 1992 survey results were not yet available) examined foods for a range of chlorinated organic compounds, organophosphorous insecticides and trace elements. Supplementary surveys examined specific areas of concern, among them lead levels in acidic canned foods, cadmium in chocolate products, and extraction solvents in decaffeinated tea.[71] The development of advanced packaging materials and knowledge about interactions between food and packaging materials has been an important technological advance,[72] and the migration of molecules from packaging into foods has also been examined by the National Food Authority.[71] The conclusion to be taken from National Food Authority data is that the food supply is safe and levels of contaminants have decreased.

Table 4.15: ***Estimated intakes of contaminants and residues based on simulated diets, Australian Market Basket Surveys, 1987 and 1990 (kg body mass/day)***

	Man		Woman		Boy		Girl	
Substance	**1987**	**1990**	**1987**	**1990**	**1987**	**1990**	**1987**	**1990**
Organochlorines								
Total DDT analogues (nanograms)	26	1	22	1	33	1	24	1
Other (nanograms)	108	47	118	49	112	24	89	42
Organophosphorus pesticides								
Fenitrothion (nanograms)	2200	890	2600	850	2900	1130	2400	810
Other (nanograms)	240	240	276	241	212	540	172	300
Other contaminants								
Aflatoxins (picograms)	29	1	14	3	29	15	29	1
Arsenic (nanograms)	–	543	–	457	–	714	–	514
Selenium (nanograms)	157	–	143	–	229	–	171	–
Cadmium (nanograms)	386	429	371	400	614	614	471	457
Lead (nanograms)	2430	1260	2360	1230	2470	1240	2060	1090
Mercury (nanograms)	–	57	–	57	–	29	–	43
Aluminium (µg)	314	–	314	–	2290	–	1710	–

– Not surveyed

Source: Adapted from 1987 and 1990 Australian Market Basket Surveys[49,70,71]

Chemical contamination

Lead

In the 1986 Australian Market Basket Survey some samples of wine had lead levels above the maximum limits specified by the NHMRC. Based on the simulated diet, calculated intakes based on median lead levels were around 10 per cent of the provisional tolerable weekly intakes; using the ninetieth percentile lead levels, intakes were still below 60 per cent of provisional tolerable weekly intakes.[70]

Foods of concern in 1987 were bran, liver, beans and canned beetroot. Calculated lead intakes were again well below provisional tolerable weekly intakes. The simulated diet was revised for the 1987 survey and direct comparisons cannot be made with earlier surveys.[49] The 1990 theoretical intakes were again well below the provisional tolerable weekly intakes.[71]

A special survey of lead-soldered cans used for acidic foods was conducted in 1990. Although lead concentrations increased with increased food acidity, all were below maximum permitted concentrations.[71]

Cadmium

In the 1986 Australian Market Basket Survey, cadmium levels exceeded the NHMRC maximum limits in cornflakes, potatoes, onions, carrots and peanuts, although the calculated dietary intakes were much less than the provisional tolerable weekly intakes, even when ninetieth percentile cadmium levels were used.[70] Cadmium levels were lower in 1987.[49] Theoretical cadmium intakes in 1990 were similar to the 1987 figures, although the median liver cadmium level and ninetieth percentile potato and onion levels exceeded maximum permitted concentrations.[71] Victorian monitoring in 1990–91 found detectable levels of cadmium in potatoes, spinach, lupins and rapeseed.[66] Maximum permitted concentrations were exceeded in 11 of 255 vegetable and grain samples.

Aluminium

In the 1987 Australian Market Basket Survey aluminium levels were determined in infant formulas and cereal foods. The testing was done in response to public concern about aluminium in breast milk substitutes[73] and a hypothesised link between aluminium and Alzheimer’s disease.[74] Human milk and breast milk substitutes were analysed for aluminium in 1990. Little or no aluminium was found in human milk samples. Low levels were found in all other foods analysed, with the aluminium concentration in soy-based foods four to five times that of foods based on cows’ milk.[71]

Selenium

Selenium levels were examined in 1984 and 1987 and calculated dietary intakes were below toxic levels.[49] Selenium is a micronutrient (see Section 4.4).

Fluoride

Fluoride levels in four tap water samples analysed in 1986 had a mean of 1.1 mg per litre. Tea infusions were found to have fluoride concentrations of 2.7 mg per litre, including fluoride from the water.[70] The fluoride content of infant formulas was surveyed in 1987. The range of contents was up to 0.19 mg per 100 g in non-soy-based products and up to 0.34 mg per 100 g in soy-based products.[49]

Other trace elements

Tin levels in canned meat, beetroot, pineapple and baby foods were surveyed in 1987 and were ‘either low or consistent with the type of product being analysed’.[49] Arsenic was surveyed in 1984 and 1990. Theoretical dietary intakes were below half the provisional tolerable weekly intakes in both years.[71]

Mercury was surveyed in seafoods in the 1990 Australian Market Basket Survey (earlier surveys had shown that mercury was virtually undetectable in other foods, although a Victorian survey detected mercury in one of 22 grain samples[66]). Mercury was detected in all the seafood samples in 1990, but theoretical intakes were 15 per cent or less than the provisional tolerable weekly intakes and levels were similar to those found in earlier surveys.[71]

Chlorinated organic compounds

Organochlorine residues were found in 25 out of 53 foods in 1987, compared with 24 out of 59 in 1986 and 33 out of 59 in 1985.[49] Detection rates were 2.2 per cent in 1985, 1.7 per cent in 1986 and 2.2 per cent in 1987.[49] About half the positives were DDT and analogues.[49,70] All calculated theoretical intakes were below 10 per cent of the acceptable daily intakes in 1986. All human milk samples had detectable levels of DDT or breakdown products in 1985 and 1986;[70] it was not surveyed in 1987. Probably the most significant finding in the 1990 survey was the decrease in levels of DDT breakdown products in human milk and their absence from fruits and vegetables; this suggests a gradual disappearance of such compounds from the environment. Organochlorine residue levels in 1990 were generally low.[71]

Organophosphorus insecticides

Organophosphorus insecticide residue detection rates were 0.6 per cent in 1985, 1.6 per cent in 1986 and 2.2 per cent in 1987.[49,70] Residues were most commonly found in wheat-based foods, although there was a downward trend between 1983 and 1986. The most common residue was fenitrothion, with detection rates of 6.6 per cent in 1985, 8 per cent in 1986 and 14.6 per cent in 1987; the theoretical dietary intakes were within 20 per cent of the acceptable daily intake for some children.[49,70] Some celery samples in both 1985 and 1986 exceeded the maximum residue limit for the insecticide chlorpyrifos, but theoretical dietary intakes for this and other compounds except fenitrothion were negligible.[70]

In 1990 significant levels of fenitrothion, chlorpyrifos methyl, and pirimiphos methyl were found in wheat-based products, particularly those in which bran was retained. The maximum levels in bran were, however, less than in previous years.[71] Singular findings were of chlorpyriphos in a sample of strawberries (not permitted; the pesticide chlorothalonil was also found and it too is not permitted) and at levels in excess of the maximum residue level in some egg and liver samples.[71]

Other pesticides

Other insecticides and fungicides were detected at very low levels. Pyrethroids were present in 0.3 per cent of samples in 1986[71] and 0.6 per cent in 1987.[49] In 1990 a number of pesticides not part of the usual screening were detected, among them levels of the pesticide medithadion in excess of the maximum residue level for lettuce and the presence of chlorothalonil and vinclozolin in a number of samples.[71]

Accidental poisoning or contamination

Accidental death from poisoning by drugs, medicaments and biologicals is recorded at age-standardised rates of 13 and 6 per million for men and women respectively in 1990 and has declined by about 3 per cent per year in the last decade.[75] In 1991 eight men and two women died of alcohol poisoning (ICD-9:860.0—see Chapter 5 for an explanation of ICD-9 codes). There were two deaths ascribed to ingestion of contaminants in 1991 (ICD-9:E863—includes contamination with organochlorine and organophosphorus agricultural chemicals) and one person died as a result of eating a poisonous plant.

Biological contamination

An example of a naturally occurring contaminant in food is ciguatera in fish.[76] Micro-organisms cause changes in foods, some of which are desirable (for example, the many fermentation products of milk and botrytis mould on wine grapes) and some of which are undesirable because of spoilage of food or because they can cause disease to crops (for example, *Phylloxera* in grape vines and rust in wheat) or to consumers ('food poisoning').

Aflatoxin levels in peanuts were analysed as part of the Market Basket Surveys. Detection rates were nil in 1984, 2.4 per cent in 1985, 27 per cent in 1986 and 14 per cent in 1987.[49] One of 51 samples slightly exceeded the NHMRC maximum specified level (16 mg per kg compared with the specified maximum of 15 mg per kg) in 1986.[70] Of 176 peanut butter samples examined in 1986, 65 per cent had detectable aflatoxin levels, and 10 samples exceeded the NHMRC maximum specified level. The detection rate was 66 per cent in 1987, but only two of 190 samples exceeded the NHMRC maximum.[49] Calculated daily dietary intakes ranged from 0.001 mg per kg of body mass for adults to 0.007 mg per kg of body mass for children in 1986; they were less in 1987.[49] A level for tolerable exposure has not been determined. Aflatoxin levels were much lower in 1990 than in 1987.[71]

Microbiological food poisoning

Sixty-four people died as a result of microbiological food poisoning between 1979 and 1990. The age-standardised death rates for all infectious intestinal diseases (ICD–9:001–009) declined by about 9 per cent annually between 1979 and 1990, to two and three per million for males and females respectively. Characteristically, the deaths occur in the very young and the very old.[75]

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