

Paper delivered at the 10th Biennial Conference of the

Australian Population Association

POPULATION AND GLOBALISATION:

AUSTRALIA IN THE 21ST CENTURY

Melbourne 28th November to 1st December 2000

Melbourne Australia

Apples and oranges, a taste of demography in nutrition

Tricia Cook

Australian Food and Nutrition Monitoring Unit, University of Queensland. Herston Qld 4029

Tricia Cook, Apples and oranges, a taste of demography in nutrition

1 Introduction

The objective of this paper is to illustrate the benefit of using demographic techniques to analyse data relating to food and beverage consumption in Australia.

Appropriate comparisons of age and sex related data require that differences in the population distribution between, for example, geographical regions in Australia be considered. Dietary intake data are highly age and sex related. Use of population standardization techniques with dietary intake data will, in metaphorical terms, prevent apples from inadvertently being compared with oranges.

2 Background and definitions

This paper is based on results from the 1995 National Nutrition Survey (1995 NNS), conducted by the Australian Bureau of Statistics (ABS) in collaboration with the then Department of Health and Family Services. The analysis is limited to adult intakes only because of sample size constraints with the child data. Adults are defined as persons over 18 years of age in accordance with Australia's Recommended Dietary Intakes (NHMRC, 1991). Comparative data from the 1983 National Dietary Survey of Adults are not included in this paper as the published results are currently under review (CDH, 1986 and DCSH, 1987).

The Australian Food and Nutrition Monitoring Unit, a consortium of

specialist staff from Queensland, Sydney and Deakin universities, is evaluating results from national nutrition surveys held in 1983, 1985 and 1995. The analysis is part of a program of work to establish a national food and nutrition monitoring (statistical reporting) system in Australia and is funded by the Commonwealth Department of Health and Aged Care.

Throughout this paper the term food is frequently used to encompass both foods and beverages. The term dietary data encompasses foods, beverages and nutrients.

Dietary intake data in this paper relate to recalls of foods and beverages eaten by respondents to the 1995 NNS survey on the day prior to interview. The nutrient intake estimates were derived by converting the reported food and beverage intakes into their component nutrients, based on a specially developed 'nutrient composition of foods' classification database. All dietary data in this paper were prepared using the 1995 NNS Confidentialised Unit Record File (CURF) (ABS, 1999a).

The paper includes estimates for a number of selected nutrients including energy, protein, total fat, cholesterol and the carbohydrates of starch and sugar. Data for selected food and beverage groups are also presented. Foods and beverages are grouped according to their main ingredient. For example, estimates of egg intake include products and dishes in which egg is the main but not necessarily sole ingredient (eg omelette).

Population data in this paper were sourced from the ABS and unless stated otherwise relate to resident population estimates.

3. Acknowledgements

Grateful thanks are extended to colleagues at the Nutrition Program of the University of Queensland for their advice and assistance in preparing this paper. In particular, the work of Rick Allsopp to instate the 1995 NNS CURF is acknowledged.

Preparation of this paper also benefited from support provided by Dr Shail Jain and Peter Routh from ABS Demography Section and Elizabeth Gillam from the Queensland Department of Communication and Information, Local Government, Planning and Sport.

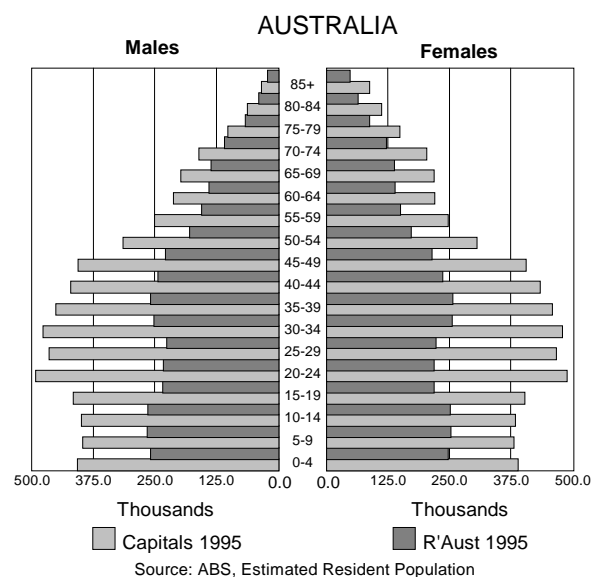
The views expressed in this article are principally those of the author and do not necessarily reflect those of the Australian Food and Nutrition Monitoring Unit or the Commonwealth Department of Health and Age Care.

4 Population distribution

Differences exist in the age and sex distribution of the Australian population between geographical regions.

Figure 1 compares the age and sex of persons estimated to live in Australia's eight capital cities with the rest of Australia in 1995. Significant differences exist between these two distributions in both absolute and relative terms. Remainder Australia had a higher proportion of persons aged less than 20 years than the capital cities in 1995. Conversely, the region had a lower proportion of people aged 20 to 64 years and a higher proportion of people aged 65 years or more, than the capital cities.

Figure 1 Age and sex distribution of Australia's capital cities and the rest of Australia, 1995



Adjustments to account for these age and sex differentials are needed to allow appropriate comparison of data pertaining to urban and rural Australia. Adoption of population standardization techniques will also enhance data comparisons between ethnic groups.

Results from the 1996 Census of Population and Housing (ABS, 1999b) reveal that the age profile of persons born in Europe (including the United Kingdom) is significantly older (median age 51 years) than that of the Australian born population (median age 30 years), reflective of the ageing of post World War II European migrants. The median age of persons born in Asia (35 years) was also above that of the Australian born in 1996 but is a result of relatively few children associated with the predominantly business-aged migrants from Asia since the 1980's.

5 Food and nutrient distributions

Estimates of average daily food and beverage consumption by age and sex are provided in table 1 and illustrated in figure 2.

These data confirm that dietary intakes are age and sex related.

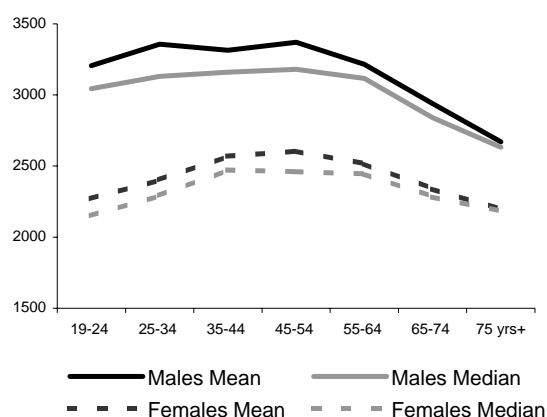
Table 1 Mean daily FOOD and BEVERAGE intake (grams) by age and sex, Australia 1995

	Males	Females
19-24	3,206	2,271
25-34	3,356	2,403
35-44	3,314	2,570
45-54	3,370	2,604
55-64	3,215	2,515
65-74	2,939	2,339
75 yrs+	2,671	2,195
All ages	3,240	2,444

Source: ABS, 1995 NNS

Age and sex related food and beverage data for adults from the 1995 NNS suggest that males consume more than females at every age and that average daily intakes peak around age fifty before declining thereafter.

Figure 2 Average daily FOOD and BEVERAGE intake (grams) by age and sex, mean and median, Australia 1995



Means as well as medians are typically calculated with dietary data as the distribution of many food and nutrient intakes are skewed. (Rutishauser, 2000).

The term mean refers to the arithmetic midpoint of a range of observed values. Whereas, the term median denotes the value at which half the observations are lower or higher. A characteristic of skewed distributions is that, unlike normal distributions, the mean does not equal the median.

Comparison of results depicted in figures 3 and 4 reveals that the distribution of daily bread consumption by adult males in 1995 was less skewed than that of egg consumption. Figure 3 shows that relatively few adult males in the survey did not eat bread on the day prior to the interview. This is contrary to egg consumption. From Figure 4 it is apparent that most male respondents aged over 18 years did not eat egg based products or dishes in the 24 hours preceding the interview.

Figure 3 Daily BREAD intake (grams), Adult Males, Australia 1995

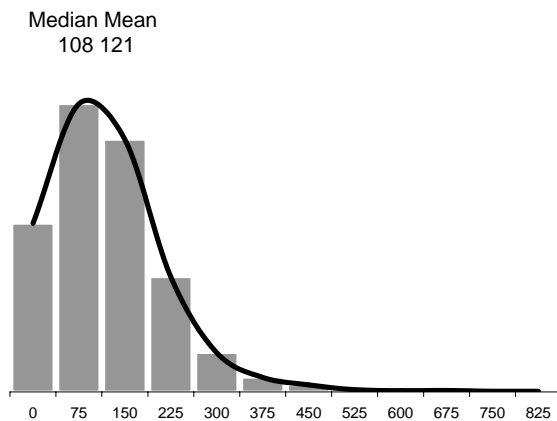
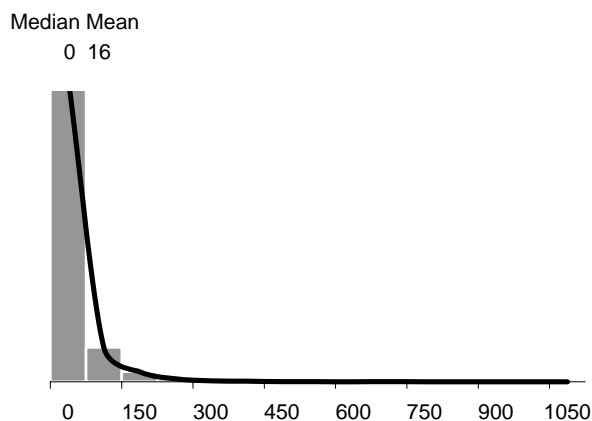


Figure 4 Daily EGG intake (grams), Adult Males, Australia 1995



The impact of skewed distributions on both mean and median estimates is most marked for foods and beverages that are not regularly or popularly consumed. The median values of such foods tend to equal zero across all age groups. Mean intakes are also adversely affected in highly skewed distributions, especially when they are the midpoint of extreme values. For example the estimate of mean daily egg consumption for adult males in 1995 (at 16 grams) is calculated from a range of observations bounded by zero grams at one extreme and 1000 grams at the other (the equivalent of consuming 20 whole eggs in a day).

Differences in mean and median intakes are relatively less important when intakes are assessed across a range of food and beverage groups (refer figure 2). This is also true for macro-nutrient intakes (eg protein, total fat, starch and sugar) as they are present in most foods and beverages consumed.

Despite intake distributions being highly skewed for some foods and nutrients, use of population standardization techniques is expected to greatly enhance data comparability of dietary intake estimates.

The following section provides results for adult dietary intake estimates from the 1995 NNS which have been age-adjusted using the direct standardisation method. The population standard is the Australian estimated resident population in ten-year cohorts at 30 June 1995.

Age adjustments are based on estimated mean intakes by age and sex. Median intakes could not be used for a number of foods and beverages because of medians of zero for each age group being evaluated.

However, care is needed when interpreting the results of mean intake estimates, especially for those foods and beverages with highly skewed distributions (eg egg and alcoholic beverage intakes).

6. Age-adjusted dietary intakes

6.1 Regional considerations

Table 2 provides data on average daily consumption of selected nutrients for females in metropolitan and rural Australia from the 1995 NNS. Data relating to Queensland, the Australian Capital Territory and the Northern Territory are excluded from this table due to variations in geographic definitions on the CURF.

Table 2 Mean daily NUTRIENT intake, original and age-adjusted, FEMALES over 18 years by geographic region of Australia (a), 1995

	Original	
	Metro (b)	Rural (c)
Energy (kJ)	7,510	7,370 *
Protein (g)	74.1	72.8 *
Total fat (g)	67.7	67.1
Starch (g)	114	108 *
Sugar (g)	96.0	97.0
Cholestrol(mg)	239	239

	Age- adjusted	
	Metro (b)	Rural (c)
Energy (kJ)	7,500	7,430
Protein (g)	74.1	73.3
Total fat (g)	67.6	67.6
Starch (g)	114	109 *
Sugar (g)	95.6	97.9 *
Cholestrol(mg)	239	240

* Difference between the metropolitan and rural estimate is statistically significant at $\alpha = 0.05$

(a) excludes QLD, ACT and NT due to definitional variations

(b) Metro includes capital cities and urban centres with a population of more than 100,000

(c) Rural includes rural and remote areas

Source: ABS, 1995 NNS and AFNMU

Age standardization produces an appreciable difference in selected nutrient intakes for females between metropolitan and rural Australia. Apparent differences in energy and protein intake are principally a product of differences in the age distribution of women in metropolitan and rural Australia (table 2).

Of the selected nutrient intakes analysed, only starch remains significantly lower for females in rural rather than metropolitan Australia when age differences are factored into the calculations. In part this differential is reflected by lower pasta and rice consumption (refer table 3).

Table 3 Mean daily intake of selected FOODS and BEVERAGES (a), FEMALES over 18 years by geographic region of Australia (b), 1995

	Age-adjusted (grams)	
	Metro (c)	Rural (d)
Bread	83	85
Pasta	31	17 *
Rice	44	16 *
Potato	43	46
Other vegetables	190	193
Fruit	146	147
Meat	78	84
Poultry and game	36	35
Fish and seafood	26	17 *
Egg	11	12
Coffee	379	397
Tea	123	125
Milk	195	207
Alcoholic drinks	94	115 *
Total (e)	2,435	2,471

* Difference between the metropolitan and rural estimate is statistically significant at $\alpha = 0.05$
(a) selected food and beverage groups defined by the main ingredient
(b) excludes QLD, ACT and NT due to definitional variations
(c) Metro includes capital cities and urban centres with a population of more than 100,000
(d) Rural includes rural and remote areas
(e) all food and beverage groups

Source: ABS, 1995 NNS and AFNMU

Age-adjusted average daily pasta consumption for adult females in rural Australia in 1995 is estimated at 17 grams. This is approximately half the comparable estimate for women in metropolitan Australia. On average, daily rice consumption for women in rural Australia was almost one third that estimated for women in metropolitan Australia in 1995.

For comparative purposes, table 4 provides age-adjusted mean daily intakes for selected foods and beverages for men by geographical region in Australia in 1995. Intake differences between the regions are statistically significant for more foods and beverages for males than females. This outcome is not principally a consequence of age-adjustment.

Table 4 Mean daily intake of selected FOODS and BEVERAGES (a), MALES over 18 years by geographic region of Australia (b), 1995

	Age-adjusted (grams)	
	Metro (c)	Rural (d)
Bread	118	125
Pasta	39	23 *
Rice	57	21 *
Potato	59	67 *
Other vegetables	215	235 *
Fruit	143	133
Meat	137	162 *
Poultry and game	54	44 *
Fish and seafood	32	26 *
Egg	14	20 *
Coffee	460	522 *
Tea	217	243
Milk	245	283 *
Alcoholic drinks	377	480 *
Total (e)	3,149	3,402 *

* Difference between the metropolitan and rural estimate is statistically significant at $\alpha = 0.05$
(a) selected food and beverage groups defined by the main ingredient
(b) excludes QLD, ACT and NT due to definitional variations
(c) Metro includes capital cities and urban centres with a population of more than 100,000
(d) Rural includes rural and remote areas
(e) all food and beverage groups

Source: ABS, 1995 NNS and AFNMU

In total, males in rural Australia ate and drank more on average per day than males in metropolitan Australia in 1995 (table 5).

This result is reflected in data showing greater rates of overweight and obesity for males in rural Australia than metropolitan Australia in 1995 (table 6). The data in table 6 is based on defined ranges for weight/height ratios (known as the Body Mass Index or BMI). The data is not age-adjusted.

Table 6 Defined weight group of persons aged over 18 years by sex and geographic region of Australia (a), 1995

	Males (%)	
	Metro (b)	Rural (c)
Underweight	3.8	2.7
Normal weight	33.2	29.7
Overweight or obese	63.0	67.6
Total	100.0	100.0
	Females (%)	
	Metro (b)	Rural (c)
Underweight	11.9	8.7
Normal weight	41.8	39.4
Overweight or obese	46.9	51.9
Total	100.0	100.0

(a) excludes QLD, ACT and NT due to definitional variations

(b) Metro includes capital cities and urban centres with a population of more than 100,000

(c) Rural includes rural and remote areas

Source: ABS, 1995 NNS

Nearly seventy per cent of males in rural Australia who responded to the 1995 NNS were considered overweight or obese based on BMI calculations. By

comparison, approximately one half of female participants (either from metropolitan or rural Australia) were defined as overweight or obese.

These figures may overstate the extent of over nutrition in adults due to the limitations of BMIs.

6.2 Ethnicity considerations

By the mid 1990's, the age and sex distribution of Australian residents born in Europe differed markedly from that of the Australian born. This is a consequence of the European born profile being dominated by post World War II migrants. Age standardization produces dramatic differences in estimates of dietary intakes for the European born (refer tables 7 and 8).

Original and age-adjusted estimates of the average daily intake of selected nutrients by females born in the United Kingdom or New Zealand are provided in table 7, together with comparable data for the Australian born. Table 8 provides similar data for females born in other European countries.

Table 7 Mean daily NUTRIENT intake, original and age-adjusted, FEMALES over 18 years by country of birth, Australia 1995

	Original	
	Australia	UK/NZ (a)
Energy (kJ)	7,490	7,540
Protein (g)	73.7	75.1
Total fat (g)	68.0	68.3
Starch (g)	110	112
Sugar (g)	98.5	94.4 *
Cholesterol(mg)	239	239

	Age- adjusted	
	Australia	UK/NZ (a)
Energy (kJ)	7,470	7,620 *
Protein (g)	73.7	75.4 *
Total fat (g)	67.8	68.9 *
Starch (g)	110	114 *
Sugar (g)	97.8	95.7
Cholesterol(mg)	240	238

* Difference between Australian and overseas born estimate is statistically significant at $\alpha = 0.05$
(a) includes Ireland, United Kingdom and New Zealand

Source: ABS, 1995 NNS and AFNMU

When age differences are accounted for, women born in the United Kingdom or New Zealand are shown to have had distinctly different diets from Australian born women in 1995 (table 7). By comparison, apparent differences in the diets of females born in Europe (excluding the United Kingdom) to those born in Australia are principally a consequence of age differentials between the population groups (table 8).

Table 8 Mean daily NUTRIENT intake, original and age-adjusted, FEMALES over 18 years by country of birth, Australia 1995

	Original	
	Australia	O'Europe (a)
Energy (kJ)	7,490	7,070 *
Protein (g)	73.7	70.2 *
Total fat (g)	68.0	63.3 *
Starch (g)	110	108
Sugar (g)	98.5	91.7 *
Cholesterol(mg)	239	234

	Age- adjusted	
	Australia	O'Europe (a)
Energy (kJ)	7,470	7,300
Protein (g)	73.7	70.7 *
Total fat (g)	67.8	65.7
Starch (g)	110	113
Sugar (g)	97.8	94.8
Cholesterol(mg)	240	235

* Difference between Australian and overseas born estimate is statistically significant at $\alpha = 0.05$
(a) includes North, South, Eastern and Western Europe, former USSR and the Baltic States

Source: ABS, 1995 NNS and AFNMU

Age-adjusted estimates of average daily nutrient intake for the Asian born are provided in Table 9 for comparative considerations only. Intake differences between Australian residents born in Asia and those born in Australia are only partially a consequence of age-adjustment.

Table 9 Mean daily NUTRIENT intake for ASIAN born (a) males and females aged over 18 years in Australia, 1995

	Males (age-adjusted)	
	Australia	Asia (a)
Energy (kJ)	10,980	10,570
Protein (g)	108	106
Total fat (g)	98.5	88.0 *
Starch (g)	161	192 *
Sugar (g)	134	109 *
Cholestrol(mg)	356	352
	Females	
	Australia	Asia (a)
Energy (kJ)	7,470	7,580
Protein (g)	73.7	78.4 *
Total fat (g)	67.8	64.7 *
Starch (g)	110	138 *
Sugar (g)	97.8	81.9 *
Cholestrol(mg)	240	257 *

* Difference between Australian and overseas born estimate is statistically significant at $\alpha = 0.05$
(a) includes South East, North East and Southern Asia

Source: ABS, 1995 NNS and AFNMU

On average, persons born in Asia were estimated to have daily diets that were higher in starch (and protein and cholestrol for women) and lower in total fat and sugar than those of the Australian born, in 1995.

Differences in food and beverage intakes between ethnic groups in Australia are better illustrated by comparison of the share of specific foods and beverages to total intakes. Otherwise variations in the average amount consumed by different ethnic groups complicate the comparisons. Data relating to selected foods and beverages consumed in 1995 are provided

for males and females in tables 10 and 11, respectively.

Table 10 Share of mean daily intake of selected FOODS and BEVERAGES (a), MALES over 18 years by country of birth, Australia 1995

	Age-adjusted (%)			
	Aust	UK/NZ (b)	O'Eur (c)	Asia (d)
Bread	3.7	3.5	4.3	2.9
Pasta	0.9	1.1	1.9	3.0
Rice	0.8	1.1	1.0	12.9
Potato	1.9	1.9	1.7	1.5
Other vegetables	6.9	6.8	6.5	6.3
Fruit	4.2	3.9	6.3	5.5
Meat	4.5	4.3	4.7	5.2
Poultry and game	1.5	1.5	2.0	2.4
Fish and seafood	0.9	0.8	0.7	1.7
Egg	0.5	0.4	0.4	0.6
Coffee	14.8	16.0	16.2	9.1
Tea	7.3	4.4	6.3	6.1
Milk	8.0	8.1	6.2	7.5
Alcoholic drinks	13.5	12.7	13.9	5.5
Total (e)	100.0	100.0	100.0	100.0

(a) selected food and beverage groups defined by the main ingredient

(b) includes Ireland, United Kingdom and New Zealand

(c) includes North, South, Eastern and Western Europe, former USSR and the Baltic States

(d) includes South East, North East and Southern Asia

(e) all food and beverage groups

Source: ABS, 1995 NNS and AFNMU

Tables 10 and 11 show considerable variation in foods consumed by specific ethnic groups in 1995. For example, the higher starch intake of those born in Asia resulted from increased rates of pasta (noodles) and rice consumption but was

limited by reduced rates of bread and potato consumption.

Some care is needed in interpreting the results provided in tables 10 and 11 because the data may not be totally comparable. For example, vegetables consumed by those born in Asia may tend to weigh less than those consumed by the Australian born, thereby limiting the value of comparing average intakes by gram weight.

Table 11 Share of mean daily intake of selected FOODS and BEVERAGES (a), FEMALES over 18 years by country of birth, Australia 1995

	Age-adjusted (%)			
	Aust	UK/NZ	O'Eur	Asia
	(b)	(c)	(d)	(e)
Bread	3.4	3.4	4.1	2.5
Pasta	0.9	0.9	1.6	3.6
Rice	0.7	0.9	1.7	12.8
Potato	1.9	1.7	1.3	0.8
Other vegetables	7.8	8.3	8.0	7.0
Fruit	5.9	4.6	7.9	6.1
Meat	3.2	3.3	2.9	3.8
Poultry and game	1.5	1.0	1.1	2.5
Fish and seafood	0.9	0.7	0.9	2.5
Egg	0.5	0.4	0.3	0.7
Coffee	15.8	16.0	19.5	7.9
Tea	5.4	4.8	4.2	3.3
Milk	8.3	8.7	8.0	7.9
Alcoholic drinks	4.4	4.5	3.1	1.1
Total (e)	100.0	100.0	100.0	100.0

(a) selected food and beverage groups defined by the main ingredient

(b) Ireland, United Kingdom and New Zealand

(c) North, South, Eastern and Western Europe, former USSR and the Baltic States

(d) South East, North East and Southern Asia

(e) all food and beverage groups

Source: ABS, 1995 NNS and AFNMU

7. Conclusions

- Food and nutrient intakes are highly age and sex related. Comparison of intake estimates over time and between subgroups of the population benefit from the use of population standardization techniques.
- Public health policies and programs relating to food and nutrition practices need to target specific age and sex groups in the population. To increase effectiveness, regional and cultural considerations need to be reflected in nutrition guidelines.
- Comparison of food and beverage intakes over time will determine the degree of culinary assimilation that has occurred especially in the diets of the Australian born.
- The extent of overweight and obesity in the Australian adult population in 1995 requires this public health issue to be treated as a priority.
- To allow dietary changes in the Australian population to be adequately monitored, surveys need to be conducted at regular intervals and samples need to be of sufficient size to enable high quality estimates to be produced by age, sex, ethnicity and geographical region.
- In metaphorical terms, this will assist apples to continue to be compared with apples.

8. References

Australian Bureau of Statistics 1999a, *National Nutrition Survey Confidentialised Unit Record File 1995*, ABS, Canberra.

Australian Bureau of Statistics 1999b, *CDATA96 Expanded Community Profile*, 1996 Census of Population and Housing (revision 1999), ABS, Canberra.

Australian Bureau of Statistics (various), *Australian Demographic Statistics*, Catalogue No 3101.0, ABS, Canberra and unpublished data.

Commonwealth Department of Health 1986, *National Dietary Survey of Adults: 1983 No. 1 Foods Consumed*, AGPS, Canberra.

Department of Community Services and Health 1987, *National Dietary Survey of Adults: 1983 No. 2 Nutrient Intakes*, Commonwealth Government Printer, Canberra.

National Health and Medical Research Council 1991, *Recommended Dietary Intakes for use in Australia*, AGPS, Canberra.

Rutishauser IHE 2000, *Getting it right: how to use the data from the 1995 National Nutrition Survey*, Commonwealth Department of Health and Aged Care, Canberra (pp21-23).