Sociodemographic determinants of energy, fat and dietary fibre intake in Australian adults

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Abstract

Objective: To examine the relationship between sociodemographic factors (sex, age, education, occupation and region of birth) and absolute levels of energy, fat and fibre intake in adults at the national level.

Design, setting and subjects: The 1983 National Dietary Survey of Adults (NDSA), covering six Australian capital cities, collected food and nutrient intake data using the 24-hour recall method, from subjects aged 25–64 years ($n = 6255$).

Results: Interactions of variables occurred, especially for males. The greatest effect on male intake of all three dietary components was a combination of age and education. For females, the main explanatory variable for fat and energy intake was age, but that for fibre was a combination of region of birth and education. Both education (alone or in combination) and region of birth (alone or in combination) had a greater effect than occupation (alone or in combination).

Conclusions: Energy, fat and fibre intakes vary considerably between sociodemographic groups. Such variability must be taken into account in formulating policy and planning decisions and in assessing temporal change.

Keywords
Nutrient intake
Dietary components
Energy
Fat
Fibre
Sociodemographic characteristics
Australia

Diet is a major contributory factor in many leading causes of mortality and morbidity including coronary heart disease, hypertension, stroke, some cancers and diabetes mellitus[1–5]. Ischaemic heart disease was responsible for 23% of all deaths in Australia in 1996[6] and hypertension is a leading cause for medical consultation and drug prescription[7]. Nevertheless, national population-based research into the diet and nutritional status of Australians is sparse.

While there have been many clinical studies on the effects of diet and several regional dietary surveys (for example refs 8 and 9), there have been far fewer national dietary surveys of the Australian population. National surveys were carried out in 1938, 1944, 1983 (adults), 1985 (school children), 1988, 1989 (elderly persons), 1993 and 1995[10–14]. The 1988, 1989 and 1993 surveys were semiquantitative food frequency surveys conducted by post[15]. Reflecting this irregularity of data collection on actual food consumption, many public health nutrition policy and research decisions[7,16–20] have been informed by apparent food consumption based on food production, imports, exports and sales[21,22].

As Cashel[23] has noted, the use of apparent consumption data has considerable limitations for population studies. First, such data allow only for the analysis of trends in food and nutrient availability rather than actual consumption. Dietary surveys have shown that nutrient intake is well below supply[15]. Second, the per capita nature of apparent consumption data takes no account of the unequal distribution of foods and nutrients among different sociodemographic subgroups of the population. Thus, the data provide only a crude national indicator. Third, the per capita nature precludes determination of whether change in the indicator is due to a real change in diet or to a change in the composition of the population. Finally, the per capita data also preclude determination of those subgroups in which the greatest dietary change is occurring.

There is thus a need to analyse the relationship between sociodemographic factors and food and nutrient intake at the national level. While this has been partially achieved in various national bivariate analyses relating nutrient intake to a single sociodemographic variable or in analysis of covariance (for example refs 12, 24 and 25), a fully multivariate approach simultaneously relating nutrient intake to several sociodemographic variables has not been undertaken. Such an analysis is reported in this paper for the dietary components, energy, fat and dietary fibre, based on data from the 1983 NDSA. The importance and timeliness of this study are underlined by the recent release of the results of the 1995 National Nutrition Survey[14] which permit future analysis and monitoring of dietary change since 1983 at national, state

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and sociodemographic group levels. Such detailed monitoring has not been possible in Australia since the Second World War. The 1988 and 1993 surveys are limited by sample size and the restriction of sociodemographic variables to age, sex and education.

The analysis presented here is concerned with absolute levels of intake and not with relative measures of nutrient density. This is considered useful because of the common use of absolute data in public health decision making, programme planning and education. Absolute intake analysis is also valuable where levels of intake may be inadequate even though nutrient density may be high. An analysis of nutrient densities is the subject of forthcoming research.

Methods

The 1983 NDSA was conducted as a component of the National Heart Foundation's Risk Factor Prevalence Survey (RFPS). Data were collected using the 24-hour dietary recall method at survey centres in Sydney, Melbourne, Brisbane, Adelaide, Perth and Hobart. (The data were not available by city, precluding analysis at this level.) These six capital cities accounted for 61% of the Australian population[26]. Visual aids such as food models and calibrated cooking and eating utensils were employed to ensure accuracy and to standardize collection techniques across all survey centres. Fieldwork was conducted from May to November. The dietary data provide information about the type and amount of food eaten by individuals over a 24-hour period, excluding Fridays and Saturdays, and the nutrients contained in these foods.

The sampling frame for the RFPS was the 1983 Commonwealth electoral roll. The sample was restricted to those aged 25 to 64 years and was systematically selected within each city after sorting by sex and 5-year age group. The subsample for the NDSA was drawn by selecting at least two out of every three participants in the RFPS, resulting in a sample size of 6255[24]. The response rate was 75.3%[24]. This sampling procedure inevitably introduces an element of bias. The use of electoral rolls as a sampling frame omits those ineligible to vote, those not registered to vote and those who fail to notify a change of address, and therefore results in the underrepresentation of migrants, the young and the more mobile. The NDSA sample was also found to be slightly biased towards RFPS respondents who were born in Australia[24].

The analysis presented here concerns three selected dietary components, namely intake of energy, fat and dietary fibre, chosen because they are the key dietary components targeted by current dietary guidelines[16]. Current nutritional concerns are to achieve a lower intake of fat, a higher intake of fibre and to balance energy intake with output[16].

The available sociodemographic variables comprised age, sex, country of birth, occupation and education. Age was available in 10-year age groups. For the purposes of this analysis, country of birth was grouped into five regions of birth: Australia (including, on the basis of similar dietary intake, 14 respondents born in the USA), northern Europe (predominantly the United Kingdom), southern Europe, Asia and Africa. The small numbers of respondents born in Africa and Asia limit the reliability of results for these groups. Occupation was regrouped into four categories: not working (comprising the unemployed, homemakers and the retired); blue collar (labourers, farmers, tradepersons, sportpersons and transport workers); white collar (clerical, sales and service workers); and upper white collar (professionals and executives). Education comprised four attainment categories, namely primary (only), some secondary, (completed) secondary, and (some) tertiary. All analyses were performed separately for males and females as sex differences in the intake of dietary components were significant. Table 1 shows the sociodemographic composition of the NDSA sample.

The effects of sociodemographic factors on the intake of dietary components were analysed by bivariate and multivariate analyses of variance. Where a significant two-way interaction was indicated in the multivariate models, the relevant variables were combined to form a new variable. When two-way interactions were taken into account in this way, previously significant

Table 1 Sociodemographic composition of the sample

Sociodemographic characteristics	Males*	Females
Total	3021	3234
Age (years)		
25–34	823	869
35–44	823	896
45–54	703	727
55–64	672	742
Region of birth		
Australia	2144	2467
Northern Europe	539	487
Southern Europe	203	172
Asia	102	84
Africa	33	24
Education		
Primary	356	367
Some secondary	819	1094
Secondary	961	1188
Tertiary	885	585
Occupation		
Not employed	354	1598
Blue collar	1167	366
White collar	400	727
Upper white collar	1099	543

* Occupation missing for one male respondent.

three-way interactions were no longer significant. The final models include only significant variables.

The models explain only a small percentage of the variation in intake: for males, this percentage was 9% for energy and fat and 3% for fibre; and for females, 4% for energy and fat and 3% for fibre. While such low explanatory power may be unacceptable in many areas of study, it is unavoidable in dietary analysis due to daily variation in diet which cannot be explained by any single factor or combination of factors[27].

Results

Results of the bivariate analysis of each of the four sociodemographic factors on the mean intake of the dietary components are shown in Table 2. For males, all factors had a significant effect on energy, fat and fibre intake. Increasing age was associated with decreasing intakes of energy, fat and fibre. For region of birth, males born in southern Europe had, by a considerable margin, the lowest mean intake of energy, fat and fibre. In contrast, males born in Australia and northern Europe tended towards the highest intakes of these three dietary components, though males born in Africa had the highest intake of fibre. For education, the attainment of at least some secondary education was associated with increased intakes of energy, fat and fibre, but there was little difference between some secondary and a complete secondary education. Tertiary education had a negative effect on the intake of energy and fat but a markedly positive effect on fibre intake. Amongst the employed, increased occupational status was associated with lower intakes of energy and fat, and though there was a less clear relationship with the intake of fibre, upper white collar occupations were associated with the highest intake. Males who were not working had the lowest intake of all three dietary components.

For females, significant effects were found for all factors except age on fibre intake. As in the case of males, increasing age was associated with decreasing intakes of energy and fat, but in contrast to males, fibre intake remained fairly constant. For region of birth, the highest intakes of energy and fat were for females born in Australia, while the lowest were for those born in Africa. Dietary fibre intake was highest among those born in northern Europe and lowest among those born in Asia. Higher educational attainment was associated with increased intakes of energy, fat and fibre, as was higher occupational status among the employed. Females who were not working had the lowest intakes of energy and fat, but had a higher intake of fibre than those in blue collar occupations.

Comparing the sexes, male intake exceeds female intake for all dietary components, reflecting the greater total volume, weight or mass of food consumed. There

Table 2 Mean intake of selected dietary components by sociodemographic characteristics for males and females

Sociodemographic characteristics	Males			Females		
	Energy (kJ)	Fat (g)	Fibre (g)	Energy (kJ)	Fat (g)	Fibre (g)
Total mean	11 110	111.4	24.0	7 301	74.5	19.3
Age (years)	*	*	*	*	*	
25–34	12 406	127.6	25.5	7 992	83.3	19.5
35–44	11 425	114.2	24.3	7 333	75.7	18.8
45–54	10 579	104.1	23.8	7 003	70.5	19.4
55–64	9 688	95.8	22.1	6 746	66.9	19.8
Region of birth	*	*	*	*	*	*
Australia	11 374	115.3	24.2	7 391	76.1	19.3
Northern Europe	10 843	108.4	24.4	7 214	71.7	20.5
Southern Europe	9 447	86.6	21.1	6 533	65.4	18.1
Asia	10 478	99.4	23.7	7 091	68.3	16.5
Africa	10 389	96.2	25.1	6 038	60.1	19.7
Education	*	*	*	*	*	*
Primary	10 054	98.3	21.4	6 561	65.9	17.4
Some secondary	11 271	114.1	22.9	7 139	72.8	18.5
Secondary	11 378	114.1	23.8	7 444	76.4	19.5
Tertiary	11 091	111.3	26.4	7 780	79.5	21.9
Occupation	*	*	*	*	*	*
Not employed	9 990	98.0	22.1	7 102	72.3	19.1
Blue collar	11 603	116.3	23.9	7 301	74.5	18.4
White collar	11 055	111.0	22.9	7 520	76.5	19.5
Upper white collar	10 968	110.7	25.1	7 595	78.5	20.6
Number of respondents	3 021	3 021	3 021	3 234	3 234	3 234

* $P < 0.05$.

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is, however, a tendency for intakes to converge as age increases. For energy and fat, this convergence is due to a faster decline with age in males, whereas for fibre it is also due to an increase in female intake at ages 45+. Broad similarity of the male and female patterns also occurs in energy, fat and fibre intake by region of birth, though some deviations occur such as the relatively small differential in the fat intake of those born in southern Europe. For education, similar male and female patterns were found for fibre intake only, while for occupation, patterns were dissimilar for all dietary components. Female intakes tended to show more linear relationships with education and occupation than did male intakes. The different patterns for male and female intakes by occupation, in particular in relation to those not working, are in part due to the fact that for males this category will comprise mainly the unemployed and early retirees whereas for females it will also include substantial numbers of homemakers whose dietary habits would be influenced by their husband's or partner's occupation which might be in any of the four categories.

The multivariate models are shown in Tables 3 and 4 for males and females, respectively. These indicate the strength (β) of the effect of each significant sociodemographic variable on the intake of dietary components, and the net effect, in terms of the adjustment to mean intake, of membership of each variable category. The models predict the intake of dietary components according to sociodemographic characteristics. For example, for energy intake in males, the strongest effect was for the combined variable age/education ($\beta = 0.25$) with weaker but significant effects for region of birth ($\beta = 0.11$) and occupation ($\beta = 0.09$). This model predicts, for example, an average energy intake of 12 108 kJ for males born in Australia (+206 kJ), aged 25–34 with tertiary education (+1065 kJ) and engaged in upper white collar occupations (–273 kJ).

The models show that for males the greatest effect on the intake of all three dietary components is the combined variable, age/education. The effect of this variable on energy and fat intake shows a pattern of positive net effects for the youngest males and those aged 35–44 with lower educational attainment and negative effects for the oldest males and those aged 45–54 excepting those with some secondary education. For energy intake, additional positive effects are separately associated with birth in Australia and blue collar occupation, while negative effects were found for all other regions of birth, particularly southern Europe, and for all other occupations, particularly white collar. For fat intake, region of birth and occupation were combined. With only two exceptions, positive effects were found for those born in Australia and negative effects for those born elsewhere. Only those born in Australia with white collar occupations and those born in northern Europe with blue collar occupations deviated from this general pattern.

For dietary fibre, a different pattern emerges in the effect of age/education. Positive effects were found for those with tertiary education and for those aged 25–34 with secondary education, while the largest negative effects were found amongst those with primary education, those in the youngest and oldest age groups with some secondary education and those in the oldest age group with secondary education. This suggests that (increased) education is an important factor in increasing intake of fibre, especially for younger males. The additional effect of occupation is to increase fibre intake for those in blue collar occupations and to reduce intake in other occupations, notably white collar. This occupational effect is similar to that found for energy intake.

The models for females differ considerably from those for males. In general, the relationships are not as strong, as seen in the β values. Again, there is similarity in the models for energy and fat intake: the main explanatory variable is age, with region of birth also being significant. The pattern in the effects of these variables is very similar in the two models: intakes decrease as age increases, such that positive effects were found at younger ages and negative effects at older ages, while a small positive effect was found for those born in Australia and negative effects for all other regions of birth, particularly for Africa. For energy intake, education has an additional effect with higher levels of educational attainment being associated with higher intakes.

For fibre intake in females, the model includes only one variable, the combination of region of birth and education. The pattern of effects is similar for those born in Australia and northern Europe in that intake increases with educational attainment within these two groups. For the remaining regions of birth (for which effects were calculable) the only positive effect is for those born in southern Europe with secondary education.

Discussion

The levels of energy and fat intake reported in the NDSA are likely to be underestimates of average daily intake, since it has been shown elsewhere that mean intakes on Fridays and Saturdays (the two days excluded) are higher than on other days[14,28]. The fact that the NDSA covered only the colder months of May to November will also have implications for the representativeness of the data, with mean levels of all three dietary components likely to be higher than over the year as a whole[14]. The omission of young and elderly adults also affects representativeness. It is also likely that the mean levels of energy, fibre and for females fat are higher,

Table 3 Net effect of sociodemographic characteristics on mean intakes of selected dietary components for males

Sociodemographic characteristics	Energy (kJ) (mean = 11 110)	Fat (g) (mean = 111.4)	Fibre (g) (mean = 24.0)	Number of respondents
Region of birth	$\beta = 0.11$			
Australia	206			2143
Northern Europe	–123			539
Southern Europe	–1452			203
Asia	–677			102
Africa	–336			33
Occupation	$\beta = 0.09$		$\beta = 0.05$	
Not employed	–262		–0.4	354
Blue collar	484		0.7	1167
White collar	–432		–1.3	400
Upper white collar	–273		–0.2	1099
Age/Education	$\beta = 0.25$	$\beta = 0.23$	$\beta = 0.17$	
25–34/Primary	–	–	–	9
35–44/Primary	684	11.7	–3.6	59
45–54/Primary	–817	–11.7	–2.2	111
55–64/Primary	–1527	–13.9	–3.0	177
25–34/Some secondary	711	13.5	–2.4	170
35–44/Some secondary	772	8.2	–0.2	206
45–54/Some secondary	24	0.2	–0.7	226
55–64/Some secondary	–1343	–15.4	–2.2	216
25–34/Secondary	1708	19.4	2.0	339
35–44/Secondary	262	1.7	–0.3	268
45–54/Secondary	–899	–11.4	–1.5	191
55–64/Secondary	–1601	–16.8	–2.7	163
25–34/Tertiary	1065	12.6	3.3	305
35–44/Tertiary	–24	–3.0	1.9	290
45–54/Tertiary	–547	–6.9	2.6	174
55–64/Tertiary	–921	–12.1	1.8	116
Region of birth/Occupation		$\beta = 0.17$		
Australia/Not employed		1.9		232
Australia/Blue collar		8.2		804
Australia/White collar		–4.9		300
Australia/Upper white		1.3		807
N Europe/Not employed		–9.4		66
N Europe/Blue collar		6.7		211
N Europe/White collar		–3.1		58
N Europe/Upper white		–5.2		204
S Europe/Not employed		–36.7		38
S Europe/Blue collar		–22.8		114
S Europe/White collar		–1.3		23
S Europe/Upper white		–12.8		28
Asia/Not employed		–15.5		13
Asia/Blue collar		–27.2		30
Asia/White collar		–0.3		14
Asia/Upper white		–7.2		45
Africa/Not employed		–		5
Africa/Blue collar		–		8
Africa/White collar		–		5
Africa/Upper white		–6.7		15

–, too few cases (<10).

and the mean level of fat for males lower, than would be the case for a truly nationally representative sample since rural and remote areas were not covered[14]. Though generally regarded as reliable for group means, it is possible that the method of data collection also affects means: for example, the 24-hour recall method tends to produce lower means than the dietary history method, though comparable means to estimated and weighed food records[29]. However, whilst these factors may bias mean levels of intake, they will have little or no effect on between-group variability since they are not directly related to sociodemographic characteristics of the sample.

The method of data collection employed is not the most optimal for analysis at the individual level. Compared to other methods of data collection, such as dietary history, the 24-hour recall method produces larger within-group variances because of daily variation in foods consumed[29,30]. Differences between groups are thus less likely to be statistically significant. The

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Table 4 Net effect of sociodemographic characteristics on mean intakes of selected dietary components for females

Sociodemographic characteristics	Energy (kJ) (mean = 7301)	Fat (g) (mean = 74.5)	Fibre (g) (mean = 19.3)	Number of respondents
Age (years)	$\beta = 0.14$	$\beta = 0.17$		
25–34	600	8.5		869
35–44	27	1.4		896
45–54	–249	–3.9		727
55–64	–491	–7.9		742
Region of birth	$\beta = 0.07$	$\beta = 0.08$		
Australia	64	1.3		2467
Northern Europe	–12	–1.4		487
Southern Europe	–503	–8.2		172
Asia	–371	–8.5		84
Africa	–1413	–16.1		24
Education	$\beta = 0.07$			
Primary	–362			367
Some secondary	–102			1094
Secondary	62			1188
Tertiary	293			585
Region of birth/Education			$\beta = 0.14$	
Australia/Primary			–1.9	229
Australia/Some secondary			–0.8	871
Australia/Secondary			–0.2	903
Australia/Tertiary			2.6	464
N Europe/Primary			–0.4	33
N Europe/Some secondary			0.5	145
N Europe/Secondary			1.1	224
N Europe/Tertiary			3.2	85
S Europe/Primary			–2.9	91
S Europe/Some secondary			–4.0	46
S Europe/Secondary			7.5	26
S Europe/Tertiary			–	9
Asia/Primary			–0.5	13
Asia/Some secondary			–2.6	23
Asia/Secondary			–4.4	27
Asia/Tertiary			–2.5	21
Africa/Primary			–	1
Africa/Some secondary			–	9
Africa/Secondary			–	8
Africa/Tertiary			–	6

–, too few cases (<10).

results presented here are thus conservative. National data based on other methods are not available.

The findings show considerable variability in the intake of energy, fat and fibre between different sociodemographic subgroups. The similarity with respect to the effects of sociodemographic variables on the intake of energy and fat reflects the high energy content of foods high in fat. The presence of variability confirms that per capita apparent intake data are seriously deficient as a basis for addressing the nutritional adequacy of different sections of the population. Per capita measures of intake are similarly deficient.

The existence of significant sociodemographic differentials in the intake of dietary components means that temporal changes in population-wide measures of intake could be largely the result of demographic change rather than change in diet. In the period since the NDSA was conducted, the Australian population has undergone changes in age structure, in the proportion of people born overseas, in their regions of origin and, for females in particular, in education and employment[31–35]. These changes alone will have resulted in changed mean intakes of dietary components and nutrients at the national level. Thus, trends in national mean intake, for example that shown by direct comparison of the 1983 and 1995[14] dietary surveys, are not necessarily indicative of actual trends in intake. In order to accurately assess trends, structural changes in the population must be taken into account. Again, this illustrates the inadequacy of per capita apparent intake data for addressing trends in the nutrient intake of the population.

The findings for energy intake broadly confirm those of previous studies. The statistically significant inverse effect of occupation for (employed) males but not for females is supported by similar findings for occupational category based on training and qualification[35] and for socioeconomic status based on occupation, occupational position and training or education[36]. It is noted that both of these variables are composites

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of occupation and education. An important difference between these and the present study is that here education and occupation are separately but simultaneously included in the models, allowing the net effects of each to be determined. Separate and additive effects of occupation and education have been found elsewhere for males[37]. Knowledge of the separate effects of occupation and education is valuable for policy and planning purposes. This study has shown that education (alone or in combination with age or region of birth) has a stronger effect on all three dietary components than occupation (alone or in combination). The relevance of education over other socioeconomic variables is also suggested by studies showing that education has the strongest and most consistent association with the risk factors for cardiovascular disease[38]. This brings into question previous Australian findings, not based on simultaneous inclusion, suggesting that occupational status has a greater effect than education[35].

Possible explanations for the inverse relationship between energy and fat intake and occupation and education include the status value of different foods, greater health awareness among the higher socioeconomic groups, their greater ability to understand abstract concepts and their higher incomes[38]. Low income is a possible explanation for the negative effect of not being employed on the energy intake of males[39], the lesser effect among females being attributable to the inclusion in this category of homemakers who may belong to high income households.

This study also differs from other Australian studies in that region of birth is taken into account. Region of birth (alone or in combination) has a greater effect on the intake of all three dietary components than occupation, on which other studies have focused. Energy intake for both males and females and fat intake for females are highest for those born in Australia. For fat intake among males, the combination of region of birth and occupation shows that fat intake is highest for those born in Australia or northern Europe with blue collar occupations. This accords with findings of a high incidence of coronary heart disease among blue collar workers in Australia[18]. However, male blue collar workers born in southern Europe or Asia have a low fat intake. The low intake of energy and fat of males and females born in southern Europe accords with their lower morbidity and mortality from coronary heart disease[40,41]. Studies that do not take region of birth (or ethnicity) into account erroneously conclude that occupation (as a single variable) is the major determinant of energy and fat intakes because of the predominance of the Australian-born population.

A further difference between this and other studies is that age is treated as an independent variable with the possibility of interaction, rather than used only to adjust means. The occurrence of interactions between age and education for male energy and fat intakes demonstrates the gain in explanatory power of the fully multivariate model. Further, the involvement of education in this interaction may explain why other studies have not found education to be significant[35].

The range of intake for sociodemographic subgroups is seen in Table 5, which shows maximum and minimum intakes of dietary components, derived from Tables 3 and 4. For example, the maximum intake of fat in males (139.0 g) is that found among those aged 25–34 years, born in Australia, in blue collar occupations with completed secondary education. Table 5 also shows these minima and maxima relative to their respective means. Fat intake in males has a relatively wide range, with a minimum of 52% and a maximum of 125% of the mean. The ranges are smaller for fibre and energy, due mainly to higher minima. It is seen that females have a narrower relative variation in energy and fat intakes than males, but that they have a wider variation in fibre intake. The range for energy is considerably larger than that reported in other studies for age-adjusted socioeconomic groups[35,36,38], again indicating that socioeconomic status alone is inadequate for explaining variability. Indeed, the extent of variation in energy intake in these other studies is commensurate with that shown by the bivariate analysis of the present study. Clearly the greater part of variability is explained by the larger number of variables and their synergistic interaction.

Thus, in several ways this study has demonstrated the importance of adopting a fully multivariate approach,

Table 5 Predicted minimum and maximum intakes of dietary components of sociodemographic groups*

	Males			Females		
	Minimum	Mean	Maximum	Minimum	Mean	Maximum
Energy (kJ)	7626	11110	13509	5277	7301	8258
Proportion of mean	0.69		1.22	0.72		1.13
Fat (g)	57.9	111.4	139.0	50.6	74.5	84.3
Proportion of mean	0.52		1.25	0.68		1.13
Fibre (g)	19.1	24.0	28.1	15.0	19.3	26.8
Proportion of mean	0.79		1.17	0.77		1.39

* Calculated from Tables 3 and 4.

based on as many variables as possible. It has been clearly shown that the significance of explanatory variables differs between the bivariate and multivariate analyses. For example, for females occupation was significant for all dietary components in the bivariate analysis but not significant for any when other variables were included in the model. It is to be expected that similar, if less pronounced, differences would occur between models based on different numbers of variables, such that models based on fewer variables are potentially misleading. The fully multivariate approach also allows interactions to be taken into consideration. Significant interactions for males occurred between age and education in the models for energy, fat and fibre intakes, and between region of birth and occupation in the model for fat intake. For females, a significant interaction occurred between region of birth and education in the model for fibre. Models precluding interactions are also potentially misleading. In both these respects, this study provides a more detailed and thus more accurate explanation of the intake of the three dietary components than many other studies.

Conclusions

These findings have important implications for policy formulation, programme design and evaluation, and nutritional monitoring over time. The extent of variation in the intake of dietary components by sociodemographic factors indicates that it is inappropriate to base policy and planning decisions on crude per capita measures that take no account of this variation. Furthermore, the fact that the bivariate (group averages) and multivariate (net effects) results differ means that policy and planning decisions will be misinformed if multivariate analyses, based on as many variables as possible, are not taken into account. In programme design the multivariate approach enables more precise targeting of groups at nutritional risk, leading to more appropriate and cost-effective programme delivery.

The variation in the intake of dietary components between different sociodemographic groups also points to the need to take population structure into account in monitoring national-level intake of dietary components over time. Given the changing Australian population structure, per capita measures of the intake of the three dietary components discussed in this paper are clearly inadequate as indicators of temporal change. For effective monitoring and well-informed policy formulation, changes in the sociodemographic composition of the population must be taken into account.

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