

University of Wollongong

**Research Online**

---

Faculty of Social Sciences - Papers (Archive)

Faculty of Arts, Social Sciences & Humanities

---

2003

## **Benefits and barriers to the consumption of a vegetarian diet in Australia**

Emma Lea

*Deakin University*

Anthony Worsley

*University of Wollongong, [tworsley@uow.edu.au](mailto:tworsley@uow.edu.au)*

Follow this and additional works at: <https://ro.uow.edu.au/sspapers>



Part of the [Education Commons](#), and the [Social and Behavioral Sciences Commons](#)

---

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: [research-pubs@uow.edu.au](mailto:research-pubs@uow.edu.au)

---

## Benefits and barriers to the consumption of a vegetarian diet in Australia

### Abstract

**Objective:** The aim of this study was to examine consumers' perceived benefits and barriers to the consumption of a vegetarian diet.

**Design:** Survey (written questionnaire) that included questions on perceived benefits and barriers to the consumption of a vegetarian diet.

**Setting:** South Australia.

**Subjects:** Six hundred and one randomly selected South Australians.

**Results:** The main perceived *barriers* to adopting a vegetarian diet were enjoying eating meat and an unwillingness to alter eating habits. This was the case for men, women and all age groups, although there were sex and age differences present in over half of the barrier items. For example, family food preferences were a greater problem for women than for men, while the oldest group was more likely to agree that humans are 'meant' to eat meat than the younger groups. The main *benefits* associated with vegetarian diets were health benefits: increased fruit and vegetable intake, decreased saturated fat intake, weight control. Animal welfare-related benefits and disease prevention were also important. Age and sex differences were apparent, although age differences were more important than sex differences.

**Conclusions:** The majority of respondents perceived there to be health benefits associated with the consumption of a vegetarian diet, but also, predictably, enjoyed eating meat. Given this, it is likely that interest in plant-based diets that contain some meat is higher than that in no-meat diets. An understanding of the perceived benefits and barriers of consuming a vegetarian diet will allow the implementation of strategies to influence meat and vegetarianism beliefs, dietary behaviour and, hence, public health.

### Keywords

australia, benefits, barriers, consumption, diet, vegetarian

### Disciplines

Education | Social and Behavioral Sciences

### Publication Details

Lea, E. & Worsley, A. (2003). Benefits and barriers to the consumption of a vegetarian diet in Australia. *Public Health Nutrition*, 6 (5), 505-511.

# Benefits and barriers to the consumption of a vegetarian diet in Australia

Emma Lea\* and Anthony Worsley

School of Health Sciences, Deakin University, 221 Burwood Highway, Burwood, Victoria 3125, Australia

Submitted 9 May 2002; Accepted 5 December 2002

## Abstract

**Objective:** The aim of this study was to examine consumers' perceived benefits and barriers to the consumption of a vegetarian diet.

**Design:** Survey (written questionnaire) that included questions on perceived benefits and barriers to the consumption of a vegetarian diet.

**Setting:** South Australia.

**Subjects:** Six hundred and one randomly selected South Australians.

**Results:** The main perceived *barriers* to adopting a vegetarian diet were enjoying eating meat and an unwillingness to alter eating habits. This was the case for men, women and all age groups, although there were sex and age differences present in over half of the barrier items. For example, family food preferences were a greater problem for women than for men, while the oldest group was more likely to agree that humans are 'meant' to eat meat than the younger groups. The main *benefits* associated with vegetarian diets were health benefits: increased fruit and vegetable intake, decreased saturated fat intake, weight control. Animal welfare-related benefits and disease prevention were also important. Age and sex differences were apparent, although age differences were more important than sex differences.

**Conclusions:** The majority of respondents perceived there to be health benefits associated with the consumption of a vegetarian diet, but also, predictably, enjoyed eating meat. Given this, it is likely that interest in plant-based diets that contain some meat is higher than that in no-meat diets. An understanding of the perceived benefits and barriers of consuming a vegetarian diet will allow the implementation of strategies to influence meat and vegetarianism beliefs, dietary behaviour and, hence, public health.

**Keywords**  
Beliefs  
Benefits  
Barriers  
Meat  
Vegetarian  
Plant-based diets  
Health  
Survey  
Australia

In recent years there appears to have been a move by consumers away from red meat, accompanied by a growing awareness of vegetarianism. Vegetarians exclude meat, fish and fowl from their diet, basing their diet mainly on plant foods, although perhaps due to this growing awareness some people wish to identify as 'vegetarian' despite including some animal flesh (particularly fish and fowl) in their diet<sup>1–3</sup>. There is evidence to suggest that the prevalence of vegetarianism has increased in countries such as the USA and Britain<sup>4–7</sup>. This dietary change has implications for public health, the food supply and the environment<sup>3,8,9</sup>. Diets with an emphasis on plant foods are recognised by many researchers, government and health organisations as providing important health benefits, such as a reduction in the risk of contracting cardiovascular disease<sup>10–16</sup>. In order to realise these benefits, it is important that studies are conducted which examine the attitudes of consumers towards meat and

plant foods. The knowledge gained may lead to the implementation of more effective health promotion programmes. The aim of this paper is to examine data on Australian consumers' perceived benefits and barriers to the consumption of a vegetarian diet, as this has consequences for the consumption of plant-based diets and plant foods in general.

Perceived benefits and barriers to change have been examined in many studies of dietary change<sup>17–23</sup>. Perceived benefits of dietary changes and of healthy eating may include being healthy, disease prevention, weight control and improved quality of life<sup>23</sup>. To our knowledge, the only study that has examined the perceived benefits of vegetarian diets among the general population is that conducted by Kalof *et al.*<sup>24,25</sup>. Their random population survey of 420 US residents looked at four benefits and found that around 45% of the sample somewhat or strongly agreed with each of the following:

\*Corresponding author: Email emmalea@deakin.edu.au

vegetarian diets help prevent cruelty to farm animals; the consumption of a vegetarian diet helps to increase food availability and to reduce hunger problems world-wide; vegetarian diets are less harmful to the environment than are diets that contain meat. Around 60% at least partially agreed with the fourth item: that a vegetarian diet tends to be healthier than a diet that includes red meat<sup>24,25</sup>.

It has been argued that it is only when the benefits of change outweigh the barriers that a change in behaviour occurs<sup>26–29</sup>. People often face barriers when they try to change their food consumption<sup>18–20</sup>. Indeed, applications of the transtheoretical model of behavioural change ('stage of change' model, which posits behavioural change occurring through five separate stages: pre-contemplation, contemplation, preparation, action and maintenance<sup>30,31</sup>) specify ways to deal with such perceived barriers<sup>32</sup>. These barriers may be practical or attitudinal. For example, one attitudinal barrier to dietary change is the belief commonly held by consumers that their diet is already balanced or healthy<sup>18,33,34</sup>, while irregular working hours is an important practical barrier<sup>19</sup>. The main perceived barriers to eating a healthy diet in a European Union (EU) survey related to lack of time and to taste<sup>35</sup>. Time has also been found to be a major barrier to the more specific health behaviour of consuming more fruit and vegetables, with inconvenience also important<sup>17,\*</sup>.

The perceived benefits and barriers that the general population has to eating a vegetarian diet have not been examined in depth before, to our knowledge. It was posited that some barriers were likely to be the same as barriers to other dietary behaviours, such as those mentioned above (e.g. a perception of inconvenience), while others would be more specific to vegetarianism. For example, since meat is traditionally a central element of a meal in Western society<sup>36</sup>, not knowing what to replace meat with may be one of the barriers to becoming vegetarian. An examination of the perceived barriers and benefits of consuming a vegetarian diet will allow the implementation of strategies to influence meat and vegetarianism beliefs and dietary behaviour. Although

this study did not examine the benefits and barriers to plant foods *per se*, it is likely that the results will have some relevance to plant foods and plant-based diets that may contain some meat.

## Methods

### Procedure

One thousand individuals were randomly selected from the South Australian population by using the software package Marketing Pro (April 1999 version, Desktop Marketing Systems Pty Ltd), which contains a comprehensive list of residences from the telephone directory.

A questionnaire entitled *Food Choice, Information and Your Attitudes*, a cover letter and a reply-paid envelope were mailed to each person in the sample in mid-1999. A number of follow-ups to the original mailing, including a replacement questionnaire, were conducted in order to improve the response rate. Full details have been reported elsewhere<sup>37</sup>.

### The questionnaire

Full details of the questionnaire have been given previously<sup>37,38</sup>. In brief, the questionnaire included 25 items about personal barriers to vegetarian diets, some of which were similar to the Institute of European Food Studies (IEFS) EU survey on attitudes to food, nutrition and health<sup>34</sup>. Twenty-four items were used to assess the perceived benefits of vegetarian diets, including personal benefits and those with wider implications. Some of these items were also modelled on the IEFS survey<sup>34</sup>. Five-point Likert-type scales were used to assess agreement/disagreement on the items. Respondents were asked to identify themselves as non-vegetarian, semi-vegetarian or vegetarian (no definition was provided), and the frequency of consumption of animal products (red meat, white meat, fish/seafood, eggs, dairy) was measured. Level of interest in vegetarianism was gauged ('not interested', 'somewhat interested', 'very interested' or 'do not know'). Thirteen demographic variables, including sex and age, were elicited.

### Data analysis

The frequency of participants' responses to the items was measured, and cross-tabulations (including Pearson's chi-squared test of statistical significance) by sex and age group were performed. Age groups were formed by splitting respondents' ages into tertiles: 15–39, 40–55 and 56–91 years. It should be mentioned that, given the cross-sectional nature of this study, age and cohort are inextricably linked. There was no need to perform a multivariate test of effects as the correlation between age group and (male) sex was weak (0.114).

Analyses were conducted with SPSS for Windows statistical software (version 10).

\*It should be noted that the barriers and benefits of a behavioural change that an individual *actually* faces might differ from those that they *perceive* they face. For example, an individual may believe that they will be negatively stereotyped if they alter their behaviour, but this may not necessarily occur upon making the behavioural change (although, of course, a belief that one will be negatively stereotyped may be an effective barrier whether or not such stereotyping actually occurs). Similarly, an individual may believe that one benefit of a behavioural change is increased longevity (for example), but this may not actually be the case. Indeed, there may be strong benefits of making a behavioural change that have been identified by the scientific community which are not realised by an individual, who instead may perceive other (perhaps less valid, according to the scientific community) benefits to be more important. However, it is the benefits perceived by an individual that are important in prompting behavioural change.

It should be noted that the number of significance tests conducted in this study introduces the possibility of Type I error.\* The results report significance levels of 0.05, 0.01 and 0.001 so that readers can judge which significance level is most appropriate to placate concerns about Type I error.

## Results

Of the subjects who could be contacted, 70.6% filled out the questionnaire ( $n = 603$ ), with two questionnaires being unusable. Approximately 15% ( $n = 146$ ) of the sample could not be contacted because their addresses were incomplete or had changed since the Marketing Pro data were collected, or they were unable to be contacted by telephone.

Table 1 lists some of the demographic characteristics of the respondents and the general South Australian population, as obtained from the 1996 Census of Population and Housing<sup>40</sup>. The main biases were under-representation of 19–24-year-olds and over-representation of 45–64-year-olds and married people, compared with the Census data.

Of the sample, 1.5% identified as vegetarian and 7.2% as semi-vegetarian. About half of the semi-vegetarians never or rarely ate red meat, while most (85%) of the vegetarians never ate red or white meat, fish or seafood. Almost 40% of the sample indicated that they were somewhat or very interested in vegetarianism. Just over 15% of respondents had low meat consumption (consuming red meat less than once a week) but did not describe themselves as semi-vegetarian or vegetarian, 65.2% had moderate meat consumption (eating red meat between one and four times a week) and 10.7% had high meat consumption (eating red meat daily or almost daily).

The main perceived barrier to adopting a vegetarian diet was enjoying eating meat (Table 2). There was also a perceived need for further information about vegetarian diets. Of note is that specific health concerns were of relatively low importance, ranking ninth and below. Indeed, vegetarianism was believed to have certain benefits, especially health-related benefits such as increased consumption of fruit and vegetables (Table 3). Animal welfare benefits ranked fourth, while environmental benefits ranked tenth.

The strongest barriers towards the consumption of a vegetarian diet for both men and women were the enjoyment of eating meat and an unwillingness to alter eating habits or routines. However, there were some sex differences present (Table 2) in about half of the items. For example, women were more likely than men to agree that the unwillingness of their family, spouse or partner to eat

**Table 1** The demographic characteristics of the random population survey respondents ( $n = 601$ ) compared with the South Australian population as a whole, as obtained from the 1996 Census

	Survey respondents (%)	1996 Census* (%)
Sex		
Female	56.8	51.4
Male	43.2	48.6
Age†		
15–18 years	0.7	6.7
19–24 years	3.8	10.5
25–44 years	40.9	38.0
45–64 years	33.4	26.9
65+ years	21.2	17.4
Country of birth		
Australia	74.2	75.5
Other country	25.8	24.5
Employment status‡		
Employed full-time	29.8	34.2
Employed part-time	17.6	17.1
Unemployed	1.7	6.1
Marital status		
Married§	69.0	54.0
Widowed/divorced	17.4	17.2

\* Note that data could only be included in this table where Census items were directly comparable to questionnaire items.

† No minimum age prerequisite was specified for participation in the survey, but as the survey was addressed to a person listed in the phone directory it was expected that younger people (particularly under-18s) would be less likely to participate. As no one under 15 participated in the survey, the Census data for age excludes those under 15 (i.e. the percentages are expressed as a percentage of those aged 15 and over). The Census percentages do not total 100% due to the inclusion of overseas visitors (with no age stated) in the total number of persons.

‡ The survey percentages for 'employed full-time' and 'employed part-time' exclude those self-employed, as there was a separate category for the latter, comprising 7.3% of the sample. However, the Census data included the self-employed with full-time or part-time employed. Therefore, the survey 'employed full-time' and 'employed part-time' categories are underestimates. Also note that, in both the Census and the questionnaire, 'unemployed' does not include students and those not looking for work, such as retired people.

§ In the survey, 'married' includes 'living together', whereas in the Census, it does not. Therefore, the survey figure is an overestimate.

vegetarian food presented a barrier to their own consumption of vegetarian food ( $P < 0.001$ ). In contrast, women were less likely than men to agree that humans are 'meant' to eat meat ( $P < 0.05$ ).

There were strong age/cohort differences for over half of the items, although the two main barriers were the same for each age/cohort group (like eating meat, unwillingness to alter eating habits). The oldest group was more likely to agree that humans are 'meant' to eat meat than the younger groups ( $P < 0.001$ ) and that meat-eating family members presented a barrier to the consumption of a vegetarian diet ( $P < 0.001$ ). They also tended to have more health concerns than the younger groups.

The benefits of the consumption of a vegetarian diet that most respondents were in agreement with were increased intake of fruit and vegetables and decreased saturated fat intake (Table 3). Weight control, improving animal welfare and disease prevention were also important. Thus, health benefits were paramount.

\*Type I error is: '[the] probability of incorrectly rejecting the null hypothesis – in most cases, this means saying a difference or correlation exists when it actually does not'<sup>39</sup>.

**Table 2** Percentages of total respondents in agreement (strongly agree plus agree) with barriers to eating a vegetarian diet, together with percentages and *P*-values for comparisons between sex and age/cohort groups†

Item	% Agree (% Unsure)							
	All	Women	Men	<i>P</i>	15–39 years	40–55 years	56–91 years	<i>P</i>
I like eating meat	78 (9)	76 (11)	80 (7)	NS	80 (10)	73 (9)	82 (8)	NS
I do not want to change my eating habit or routine	56 (17)	57 (17)	54 (17)	NS	53 (19)	52 (17)	63 (14)	NS
I think humans are meant to eat meat	44 (25)	39 (26)	49 (22)	*	41 (25)	33 (25)	57 (24)	***
My family eats meat	43 (9)	44 (7)	41 (11)	NS	43 (8)	32 (7)	53 (12)	***
I need more information about vegetarian diets	42 (17)	42 (14)	40 (19)	NS	40 (15)	42 (17)	44 (17)	NS
There is too limited a choice when I eat out	35 (21)	34 (16)	36 (27)	***	37 (21)	31 (21)	37 (19)	NS
My friends eat meat	32 (12)	31 (9)	32 (16)	*	31 (10)	22 (9)	41 (18)	***
My family/spouse/partner won't eat vegetarian food	30 (14)	39 (10)	18 (19)	***	35 (15)	26 (13)	28 (15)	NS
I would be (or am) worried about my health (other than lack of iron or protein)	28 (28)	31 (25)	25 (31)	NS	30 (18)	21 (34)	35 (30)	***
There is not enough iron in vegetarian diets	28 (36)	29 (31)	27 (43)	**	28 (30)	26 (36)	30 (43)	*
It is inconvenient	23 (25)	24 (19)	22 (32)	**	26 (24)	17 (24)	26 (26)	NS
Vegetarian diets are boring	23 (28)	20 (26)	25 (32)	*	22 (26)	18 (26)	28 (32)	*
There is not enough protein in vegetarian diets	22 (36)	23 (30)	21 (43)	**	21 (29)	17 (36)	28 (42)	***
I don't know what to eat instead of meat	21 (17)	23 (14)	19 (20)	NS	24 (14)	17 (16)	24 (19)	NS
I don't want to eat strange or unusual foods	21 (14)	20 (12)	21 (16)	NS	12 (13)	12 (14)	39 (13)	***
I don't have enough willpower	20 (15)	23 (15)	17 (15)	NS	24 (15)	14 (17)	22 (12)	NS
Vegetarian diets are not filling enough	18 (29)	16 (24)	20 (35)	***	21 (25)	10 (29)	24 (32)	***
I wouldn't (or don't) get enough energy or strength from the food	16 (33)	16 (29)	16 (37)	NS	17 (28)	9 (33)	22 (35)	**
I lack the right cooking skills	15 (14)	14 (12)	15 (17)	NS	13 (14)	13 (12)	18 (16)	NS
Vegetarian options are not available where I shop or in the canteen or at my home	14 (20)	11 (17)	17 (23)	**	16 (18)	10 (17)	16 (24)	NS
Someone else decides on most of the food I eat	10 (7)	5 (6)	15 (9)	***	7 (11)	6 (5)	16 (6)	**
I would (or do) feel conspicuous among others	9 (19)	9 (15)	9 (24)	*	7 (19)	9 (14)	12 (24)	*
It takes too long to prepare vegetarian food	8 (31)	9 (27)	7 (37)	*	7 (26)	7 (28)	9 (40)	*
I don't want people to stereotype me negatively (e.g. that I must be strange)	8 (13)	8 (10)	7 (17)	*	4 (13)	4 (10)	17 (16)	***
People would (or do) think that I'm a wimp or not 'macho' enough	4 (11)	3 (9)	4 (14)	NS	3 (10)	2 (8)	7 (16)	**

All: *n* = 601; women: *n* = 337; men: *n* = 256; 15–39 years: *n* = 195; 40–55 years: *n* = 197; 56–91 years: *n* = 192.

† The full question asked was: 'Some people believe that vegetarian diets have specific difficulties, such as those listed below. How much do you agree or disagree with these difficulties? (Please circle one answer for each statement.) Being a vegetarian would be (or is) difficult for me because...' Responses provided were 'strongly disagree', 'disagree', 'not sure', 'agree' and 'strongly agree'.

\*, *P* < 0.05; \*\*, *P* < 0.01; \*\*\*, *P* < 0.001; NS, not significant.

Both sex and age/cohort differences were apparent. Age/cohort differences appeared to be more important than sex differences, as there were sex differences for one-third of the benefits of vegetarianism items and age/cohort differences for two-thirds of the items. A greater proportion of men compared with women agreed that the consumption of a vegetarian diet helps to decrease saturated fat intake (*P* < 0.05), while more women agreed that eating a vegetarian diet could help improve animal welfare/rights (*P* < 0.001). However, the two main perceived benefits were identical for men and women (fruit and vegetables, saturated fat). This was also the case for the three age/cohort groups. Weight control ranked third for the oldest and youngest groups, but fifth for the middle-aged group. There was more agreement with the disease prevention aspects of vegetarian diets among the youngest group, although, paradoxically, there was least disagreement with this item among the eldest group.

Among relatively less important benefit items, older people were more likely to agree that one benefit of eating a vegetarian diet is the consumption of a greater variety of interesting foodstuffs. Although animal welfare benefits ranked eighth among older people, as opposed to third and fourth among middle-aged and

younger people respectively, and fewer older people agreed that this was a benefit, differences in the level of agreement with this item were not statistically significant. The youngest group was more likely to agree that there are environmental benefits associated with the consumption of a vegetarian diet (*P* < 0.05), with over a quarter in agreement.

## Discussion

The findings show that a significant proportion of the Australian population is interested in vegetarianism and believes that there are associated health benefits. Health benefits were also found to be the most important of four benefits in the US study by Kalof *et al.*<sup>24,25</sup>. Given that, in the current study, enjoyment of eating meat was the strongest barrier to vegetarian diets, it is likely that interest in plant-based diets that contain some meat is higher than that in no-meat diets. The findings should be of importance for food producers and the food industry, as well as health professionals.

As would be expected, there were strong perceived barriers against the consumption of a vegetarian diet. These tended to be associated more with enjoyment of

**Table 3** Percentages of total respondents in agreement (strongly agree plus agree) with benefits of eating a vegetarian diet, together with percentages and *P*-values for comparisons between sex and age/cohort groups†

Item	% Agree (% Unsure)							
	All	Women	Men	<i>P</i>	15–39 years	40–55 years	56–91 years	<i>P</i>
Eat more fruit and vegetables	74 (10)	75 (10)	74 (10)	NS	79 (8)	71 (10)	73 (12)	NS
Decrease saturated fat intake in my diet	65 (21)	63 (21)	69 (22)	*	65 (19)	67 (19)	64 (26)	NS
Control my weight	40 (29)	38 (27)	42 (32)	NS	45 (22)	33 (31)	41 (35)	**
Help animal welfare/rights	36 (31)	40 (33)	31 (27)	***	42 (27)	37 (29)	28 (36)	NS
Prevent disease in general (e.g. heart disease, cancer)	36 (38)	37 (36)	34 (40)	NS	40 (29)	34 (39)	31 (46)	*
Be healthier by decreasing my intake of chemicals, steroids and antibiotics which are found in meat	31 (41)	36 (42)	26 (40)	**	31 (44)	29 (37)	35 (43)	NS
Stay healthy	30 (36)	32 (34)	27 (38)	NS	36 (26)	22 (39)	31 (41)	***
Eat a greater variety of interesting foods	25 (33)	28 (32)	23 (35)	NS	24 (29)	25 (30)	28 (40)	*
Increase my control over my own health	23 (38)	24 (38)	22 (38)	NS	27 (34)	17 (35)	26 (46)	**
Help the environment	22 (35)	23 (39)	21 (30)	*	29 (32)	17 (33)	20 (40)	*
Save money	21 (37)	23 (32)	19 (43)	*	28 (31)	17 (36)	19 (44)	*
Be fit	21 (32)	21 (36)	21 (29)	NS	23 (26)	16 (30)	23 (40)	**
Have plenty of energy	20 (46)	22 (45)	17 (47)	NS	22 (42)	16 (47)	22 (48)	NS
Lower my chances of getting food poisoning	19 (33)	20 (36)	17 (30)	NS	20 (31)	16 (29)	22 (42)	**
Live longer	18 (48)	16 (51)	21 (45)	NS	17 (42)	18 (47)	20 (55)	*
Have a better quality of life	17 (37)	18 (37)	14 (39)	NS	18 (33)	13 (35)	20 (44)	**
Increase the efficiency of food production	15 (43)	15 (47)	16 (38)	NS	15 (40)	15 (39)	17 (50)	NS
Decrease hunger in the Third World	14 (39)	13 (44)	15 (34)	*	16 (34)	12 (36)	15 (49)	**
Be more content with myself	11 (36)	12 (36)	10 (36)	NS	11 (30)	8 (31)	15 (47)	***
Have a tastier diet	11 (34)	12 (36)	10 (32)	NS	11 (29)	7 (35)	14 (38)	NS
Be less aggressive	8 (36)	9 (38)	6 (35)	NS	7 (32)	5 (30)	11 (47)	***
Create a more peaceful world	7 (26)	7 (31)	7 (20)	**	8 (22)	4 (20)	10 (36)	***
Satisfy my religious and/or spiritual needs	5 (19)	6 (21)	3 (16)	*	4 (19)	6 (16)	5 (23)	NS
Help the feminist cause	3 (28)	3 (30)	3 (26)	NS	3 (25)	2 (21)	4 (39)	***

All: *n* = 601; women: *n* = 337; men: *n* = 256; 15–39 years: *n* = 195; 40–55 years: *n* = 197; 56–91 years: *n* = 192.

† The full question asked was: 'Some people believe that vegetarian diets have specific *benefits*, such as those listed below. How much do you *agree* or *disagree* with each possible benefit? (Please circle one answer next to each possible benefit.) I believe a vegetarian diet could (or does) *help* me to... or I believe vegetarianism can help...' Responses provided were 'strongly disagree', 'disagree', 'not sure', 'agree' and 'strongly agree'.

\*, *P* < 0.05; \*\*, *P* < 0.01; \*\*\*, *P* < 0.001; NS, not significant.

eating meat, an unwillingness to alter one's diet, the perception that humans are 'meant' to eat meat and social concerns (i.e. difficulties due to one's family consuming meat), than with health concerns. This suggests that the promoters of plant-based diets need to focus on the tastiness and convenience of plant-based meals and perhaps meat analogues. According to the results, 42% of the general population would appreciate such information on vegetarian eating. This kind of promotion may be particularly important for women as they had more difficulties than did men due to their family consuming meat. Other studies on more general healthy eating behaviours have also found that family preferences can be a problem for women<sup>20,41</sup>.

Apart from health benefits, the results show that animal welfare is related to the apparent interest in vegetarianism, particularly among women. This concurs with the results of Kalof *et al.*'s study<sup>24,25</sup>, in which women were more likely than men to agree that a vegetarian diet helps prevent cruelty to farm animals. The consumption of more interesting foods and environmental issues were also of some importance. Studies have shown that animal welfare and environmental issues, as well as health, are important for vegetarians<sup>42</sup>. Environmental reasons are often cited as

justification for vegetarianism. These include destruction of forested areas to make room for grazing animals or for their food crops, soil erosion, excessive water usage, water pollution and methane production<sup>8,43</sup>.

The current study suggests that animal welfare and environmental issues are of concern to a larger portion of the Australian population than vegetarians, as has been shown for the US population<sup>24,25</sup>, and that they may need to be addressed by the food industry and public health personnel. Women and younger people are more likely to be concerned about these issues and would perhaps make the most receptive targets.

It is interesting that older people were in strongest agreement with a relationship between eating a variety of interesting foods and vegetarianism. A few studies have shown that although it is often believed that older people have more conservative tastes than younger people, in actuality they do not<sup>44–46</sup>. The taste of meat-free meals is generally an area that is neglected, with the focus tending to be more on health. Although health is certainly the most important perceived benefit, the taste and variety of plant foods and plant-based meals could be areas to address more strongly by health promoters and the food industry.

Although this study has relevance for the consumption of plant foods and plant-based diets, future research could look *specifically* at the benefits and barriers of plant foods and plant-based diets that may or may not contain some meat.

These findings have important implications for public health. Diets that emphasise plant foods usually contain low levels of cholesterol, animal protein and saturated fat, and are high in folate, fibre, antioxidants, phytochemicals and carotenoids. Vegetarian diets have been shown to provide health benefits, such as a decrease in ischaemic heart disease mortality and lower mean body mass<sup>13</sup>. However, diets low in meat may increase the risk of not meeting the needs for some nutrients, such as iron and zinc<sup>47</sup>. Red meat consumption in Australia (and similar countries) has been decreasing since the 1970s<sup>48</sup> and the prevalence of vegetarianism has been increasing in countries such as Britain and the USA<sup>4-7</sup>. It is important that current and future low meat consumers know how to plan their diets to ensure that both adequate nutrient intakes and maximum benefit can be obtained.

## References

- Adams CJ. *The Sexual Politics of Meat: A Feminist-Vegetarian Critical Theory*. New York: Continuum, 1990.
- Fiddes N. Social aspects of meat eating. *Proceedings of The Nutrition Society* 1994; **53**: 271-80.
- Maurer D. *Vegetarianism: Movement or Moment?* Philadelphia, PA: Temple University Press, 2002.
- American Dietetic Association. How many vegetarians are there?. *Journal of the American Dietetic Association* 1997; **97**(11): 1287.
- Gallup. *The Realeat Survey 1997 - Changing Attitudes to Meat Consumption*. Newport Pagnell, UK: Haldane Foods, 1997.
- Vegetarian Resource Group. *How Many Vegetarians Are There? A 2000 National Zogby Poll* [online]. Available at: <http://www.vrg.org>. Accessed 31 March 2000.
- Vegetarian Society UK. *Summary of RealEat Polls 1984-1999* [online]. Available at: <http://www.vegsoc.org/info/realeat.html>. Accessed 9 April 2001.
- Pimentel D, Houser J, Preiss E, White O. Water resources: agriculture, the environment, and society. *Bioscience* 1997; **47**(2): 97-106.
- Spedding CRW. The effect of dietary changes on agriculture. In: Lewis B, Assmann G, eds. *The Social and Economic Contexts of Coronary Prevention*. London: Current Medical Literature, 1990.
- American Dietetic Association. Position of the American Dietetic Association: vegetarian diets. *Journal of the American Dietetic Association* 1997; **97**(11): 1317-21.
- Bingham SA. High-meat diets and cancer risk. *Proceedings of The Nutrition Society* 1999; **58**: 243-8.
- Key TJ, Davey GK, Appleby PN. Health benefits of a vegetarian diet. *Proceedings of The Nutrition Society* 1999; **58**: 271-5.
- Key TJ, Fraser GE, Thorogood M, Appleby PN, Beral V, Reeves G, et al. Mortality in vegetarians and nonvegetarians: detailed findings from a collaborative analysis of 5 prospective studies. *American Journal of Clinical Nutrition* 1999; **70**(Suppl.): S516-24.
- Potter JD. Your mother was right: eat your vegetables. *Asia Pacific Journal of Clinical Nutrition* 2000; **9**(Suppl.1): S10-12.
- US Department of Health and Human Services (DHHS). *Healthy People 2010 - Conference Edition*. Washington, DC: US DHHS, 2000.
- World Cancer Research Fund/American Institute for Cancer Research (AICR). *Food, Nutrition and the Prevention of Cancer: A Global Perspective*. Washington, DC: AICR, 1997.
- Balch GI, Loughrey K, Weinberg L, Lurie D, Eisner E. Probing consumer benefits and barriers for the national 5 A Day campaign: focus group findings. *Journal of Nutrition Education* 1997; **29**: 178-83.
- Cox DN, Anderson AS, Lean MEJ, Mela DJ. UK consumer attitudes, beliefs and barriers to increasing fruit and vegetable consumption. *Public Health Nutrition* 1998; **1**(1): 61-8.
- Lappalainen R, Saba A, Holm L, Mykkanen H, Gibney MJ. Difficulties in trying to eat healthier: descriptive analysis of perceived barriers for healthy eating. *European Journal of Clinical Nutrition* 1997; **51**(Suppl. 2): S36-40.
- Lloyd HM, Paisley CM, Mela DJ. Barriers to the adoption of reduced-fat diets in a UK population. *Journal of the American Dietetic Association* 1995; **95**(3): 316-22.
- McDonnell GE, Roberts DCK, Lee C. Stages of change and reduction of dietary fat: effect of knowledge and attitudes in an Australian university population. *Journal of Nutrition Education* 1998; **30**: 37-44.
- Sparks P, Guthrie CA, Shepherd R. The dimensional structure of the perceived behavioral control construct. *Journal of Applied Social Psychology* 1997; **27**(5): 418-38.
- Zunft HJF, Friebe D, Seppelt B, de Graaf C, Margetts B, Schmitt A, et al. Perceived benefits of healthy eating among a nationally-representative sample of adults in the European Union. *European Journal of Clinical Nutrition* 1997; **51**(Suppl. 2): S41-6.
- Kalof L, Dietz T, Stern PC, Guagnano GA. Social psychological and structural influences on vegetarian beliefs. *Rural Sociology* 1999; **64**(3): 500-11.
- Dietz T, Guagnano GA, Stern PC. *US National Telephone Survey on Environmental Values*. Fairfax, VA: Northern Virginia Survey Research Laboratory, George Mason University, 1994.
- McIntosh WA, Kubena KS, Jiang H, Usery CP, Karnei K. An application of the Health Belief Model to reductions in fat and cholesterol intake. *Journal of Wellness Perspectives* 1996; **12**(2): 98-107.
- Nestle M, Wing R, Birch L, DiSogra L, Drewnowski A, Middleton S, et al. Behavioral and social influences on food choice. *Nutrition Reviews* 1998; **56**(5): S50-74.
- Rosenstock IM. Historical origins of the Health Belief Model. *Health Education Monographs* 1974; **2**(4): 328-35.
- Wolinsky FD. *The Sociology of Health: Principles, Professions and Issues*. Boston, MA: Little/Brown, 1980.
- Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: applications to addictive behaviors. *The American Psychologist* 1992; **47**(9): 1102-14.
- Prochaska JO, Velicer WF, Rossi JS, Goldstein MG, Marcus BH, Rakowski W, et al. Stages of change and decisional balance for 12 problem behaviors. *Health Psychology* 1994; **13**(1): 39-46.
- Horwath CC. Applying the transtheoretical model to eating behaviour change: challenges and opportunities. *Nutrition Research Reviews* 1999; **12**: 281-317.
- Beard L, Wyllie A, Caswell S. *Towards Understanding Eating Habits in New Zealand: A Qualitative Investigation*. Auckland: Department of Community Health, University of Auckland, 1989.
- Kearney M, Gibney MJ, Martinez JA, de Almeida MDV, Friebe D, Zunft HJF, et al. Perceived need to alter eating



- habits among representative samples of adults from all member states of the European Union. *European Journal of Clinical Nutrition* 1997; **51**(Suppl. 2): S30–5.
- 35 Kearney JM, McElhone S. Perceived barriers in trying to eat healthier – results of a pan-EU consumer attitudinal survey. *British Journal of Nutrition* 1999; **81**(Suppl. 2): S133–7.
  - 36 Twigg J. Vegetarianism and the meanings of meat. In: Murcott A, ed. *The Sociology of Food and Eating: Essays on the Social Significance of Food*. Aldershot, UK: Gower, 1983; 18–30.
  - 37 Lea E, Worsley A. Influences on meat consumption in Australia. *Appetite* 2001; **36**(2): 127–36.
  - 38 Lea E, Worsley A. The cognitive contexts of beliefs about the healthiness of meat. *Public Health Nutrition* 2002; **5**(1): 37–45.
  - 39 Hair JF, Anderson RE, Tatham RL, Black WC. *Multivariate Data Analysis*, 4th ed. Englewood Cliffs, NJ: Prentice Hall, 1995.
  - 40 Australian Bureau of Statistics (ABS). *1996 Census of Population and Housing*. Basic Community Profile Software. Canberra: ABS, 1996.
  - 41 Crawford DA, Baghurst KI. Diet and health: a national survey of beliefs, behaviours and barriers to change in the community. *Australian Journal of Nutrition and Dietetics* 1990; **47**(4): 97–104.
  - 42 Rozin P, Markwith M, Stoess C. Moralization and becoming a vegetarian: the transformation of preferences into values and the recruitment of disgust. *Psychological Science* 1997; **8**(2): 67–73.
  - 43 Lewis S. An opinion on the global impact of meat consumption. *American Journal of Clinical Nutrition* 1994; **59**(Suppl.): S1099–102.
  - 44 Bilderbeck N, Holdsworth MD, Purves R, Davies L. Changing food habits among 100 elderly men and women in the United Kingdom. *Journal of Human Nutrition* 1981; **35**(6): 448–55.
  - 45 Sjogren A, Osterberg T, Steen B. Intake of energy, nutrients and food items in a ten-year cohort comparison and in a six-year longitudinal perspective: a population study of 70- and 76-year-old Swedish people. *Age and Ageing* 1994; **23**(2): 108–12.
  - 46 Drewnoski A, Henderson SA, Driscoll A, Rolls BJ. The Dietary Variety Score: assessing diet quality in healthy young and older adults. *Journal of the American Dietetic Association* 1997; **97**(3): 266–71.
  - 47 Mann JI. Optimizing the plant-based diet. *Asia Pacific Journal of Clinical Nutrition* 2000; **9**(Suppl. 1): S60–4.
  - 48 Baghurst K. Red meat consumption in Australia: intakes, contributions to nutrient intake and associated dietary patterns. *European Journal of Cancer Prevention* 1999; **8**: 185–91.