Nutritional knowledge, beliefs and behaviours in teenage school students

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Abstract

Three hundred and ninety-one adolescent Western Australians, mean age 15.8 years, completed questionnaires to determine nutritional knowledge and behaviours including stage of change; health beliefs and values; barriers to change; self-efficacy; locus of control; dietary patterns; alcohol and smoking habits; television-watching; weight, height and body image. Highest ranking beliefs and values regarding healthy diets were improving health, feeling energetic, feeling good about oneself, controlling weight, lowering cholesterol, testing willpower and improving appearance. Important barriers to healthy eating were lack of suitable foods at home and school, inability to influence food choices at home, and ignorance about nutrients. Nutritional knowledge, particularly concerning fat, was deficient. Healthy eating related negatively to television watching and alcohol, and positively to self-efficacy, nutrition knowledge, considering weight control and well-being as important, and having influence over foods at home. Of the 28% of boys and girls who drank alcohol, 20% reported intake above ‘safe’ limits. Twenty-four percent of boys and 22% of girls smoked. Fifty-four percent of girls and 21% of boys considered themselves overweight including 20% of the leanest girls and 8% of the leanest boys. Nutrition education for adolescents should incorporate self-efficacy, relevant health values and barriers-to-change, education about nutrients, and improved access to healthy foods. Adolescent smoking and drinking should also be targeted.

Introduction

Reductions in morbidity and mortality associated with lifestyle diseases may be achievable if satisfactory nutritional practices are adopted in early life and maintained in the long-term (Gliksman et al., 1987, 1993). During adolescence, young people are assuming responsibility for their own eating habits, health-related attitudes and behaviours (Coates et al., 1982) and their growing independence is often associated with unconventional eating patterns (Truswell and Darnton-Hill, 1981). Although dietary behaviour during adolescence may be transitory in some individuals, health-related behaviours show tracking through adolescence (Kelder et al., 1994). In a survey of teenagers in Scotland, Sweeting and Anderson (1994) found that dietary habits appeared to be established by the age of 15. If habits acquired in adolescence persist into adult life, behaviours established in young people may have important long-term consequences for health.

Knowledge about healthy food choices can be a predisposing factor for the adoption of a healthy diet (Thomas, 1994) but it is insufficient to motivate healthy eating (Carmody et al., 1987) and psychosocial factors must also be considered. Many behavioural models have been applied to eating behaviour. The Health Belief Model (Rodenstock, 1966) maintains that health habits are a function
of perceived vulnerability to a disorder and the belief that a particular health measure will be sufficient to overcome this vulnerability. This enables understanding of why people practice health behaviours and prediction of some of the circumstances under which their health behaviour will change. However, undertaking many health behaviours also requires a sense of personal control, i.e. a belief that it is actually possible to perform the health behaviour. Bandura (1977, 1986) reasoned that an important determinant of the practice of health behaviours is a sense of self-efficacy which is the belief that an individual can control their practice of a particular behaviour. Self-efficacy affects a range of health behaviours including weight control (Strecher et al., 1986) and quitting smoking (Prochaska and DiClemente, 1984). In reviewing the role of self-efficacy in achieving health behaviour change, Strecher et al. (1986) found strong relationships between self-efficacy and both change and maintenance of behaviour. Experimental manipulations designed to increase feelings of self-efficacy can be successful and enhancement of self-efficacy is related to subsequent behaviour change (Strecher et al., 1986).

Locus of control is similar to self-efficacy but refers to a more general expectation relating to an individual’s interaction with the environment rather than beliefs about the practice of a specific health behaviour. Individuals with an ‘internal’ locus of control are more likely to engage in preventive health behaviours because they see these steps as helping to protect them against poor health (for review, see Strickland, 1978). However, there is not a strong relationship between locus of control and preventive health behaviour (Taylor, 1986; for review, see Wallston and Wallston, 1984).

Ajzen (1985) and Ajzen and Madden (1986) revised the theory of Fishbein and Ajzen (1975) to formulate the Theory of Planned Behaviour. They argue that, in addition to knowing an individual’s attitudes, subjective norms and behavioural interactions with respect to a given behaviour, it is necessary to know their perceived behavioural control over that action. The Theory of Planned Behaviour maintains that a health behaviour will be adopted if an individual believes that the advantages of success outweigh the disadvantages of failure, if they believe they are expected to perform the behaviour by people with whom they wish to comply, and if they have enough control over internal and external factors influencing the attainment of the behavioural goal (Taylor, 1986). Thus, feelings of perceived control and self-efficacy appear to be important in demonstrating attitude–behaviour consistency, even when there is a clear behavioural intention to act on an attitude.

The uptake and maintenance of health-related behaviour will also be determined by an individual’s readiness to change, as proposed by Prochaska and DiClemente (1983). The stages of change model, which relates to the transtheoretical model of behaviour change (Prochaska and DiClemente, 1992), classifies behaviours as pre-contemplation (not interested in change), contemplation (thinking about changing), preparation (planning to change), action (actively changing behaviour) or maintenance (sustaining change). In a large survey (Glanz et al., 1994) there was a stepwise association between dietary behaviour and stage of change based on a seven-item algorithm. Nutrition intervention programs are likely to have greater success when both influences on food choice and the theoretical framework applicable to changes in health-related behaviours are taken into account. Perception of risk, belief in a connection between diet and disease, perceived benefits of a healthy diet, and knowledge of which foods should be chosen predispose to healthy dietary choices. Recognition of barriers to change, the extent of social support and the development of skills, e.g. in selecting low-fat foods, are among enabling factors affecting food choices. Assessment of the costs and benefits of dietary change and dealing with feelings of deprivation from restriction of favorite foods also influence diet-related behaviour. Sufficient knowledge about diet is needed for an individual to assess the quality of their own diet and their perception of dietary norms, particularly
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in regard to people whose opinions they consider significant, influences their classification with regard to stage of change. Motivation to adopt healthy eating patterns and self-efficacy are important determinants of behavioural change (Glanz et al., 1993).

If behavioural modification is to be achieved, factors influencing that behaviour, such as habits, attitudes, knowledge and barriers to change, must be identified (Sallis et al., 1988). Understanding the health beliefs of adolescents is particularly important as, in this age group, there are considerable differences from those of adults, even when adolescents are compared with their parents (Nada-Raja et al., 1994). In the present study, we measured knowledge about nutrition and beliefs, behaviours, and possible barriers affecting healthy food choices in adolescents in Perth, Western Australia. These findings were examined in relation to eating habits and other lifestyle factors.

Subjects and methods

Subjects

The sample included 480 year 11 students (15–16 year olds) from two Perth metropolitan public high schools and one co-educational private school. High schools were randomly chosen from a list of higher and lower socioeconomic status (SES) schools classified according to the Australian Bureau of Statistics’ relative urban advantage (McLennan, 1990) where higher SES relates to such indicators as non-manual occupations and higher income. A single co-educational college was also selected to compare students from public schools with a higher SES private school.

With the cooperation of the year 11 coordinators at the three schools, questionnaires were distributed to all year 11 students in mainstream classes, comprising 110 students at the low SES public school, 120 students at the private school and 250 from the high SES public school. Special education classes and students learning English as a second language were excluded because of possible literacy problems in completing the questionnaire.

Questionnaire

The questionnaire was completed at each school under teacher’s supervision. It included three items on self-reported age, weight and height, seven items on stages of behaviour change, 18 items on each of health belief and values, 18 items on self-efficacy, five items on locus of control, 16 items on barriers to change, eight items on nutritional knowledge, and seven items on eating patterns. In addition there was one item on each of alcohol, smoking habits and television watching. Usual intake of fatty foods, water and soft drinks was determined using a 16-item questionnaire; the variety of foods eaten was addressed using an additional 22 items. Perceptions of body image and whether usual eating habits were healthy were assessed using one item for each and additional items sought information about the use of special diets.

Behavioural variables and construction of the scales

Readiness to change behaviour was based on the stages of behaviour change theory (Prochaska and DiClemente, 1983) using questions adapted from an algorithm by Greene et al. (1994). Students were asked if they considered their diet to be healthy and, if so, for how long they had eaten a healthy diet (action and maintenance). Those who considered their diet to be unhealthy were asked whether they intended to adopt healthier eating habits and, if so, how immediate was their intention to change (pre-contemplation and contemplation).

A six-point Likert scale was used in the evaluation of health beliefs, health values, barriers to change and self-efficacy. For 18 health beliefs, the scale ranged from true (1) to untrue (6). Health values (18 items) and barriers to change (16 items) ranged from important (1) to unimportant (6). Questions relating to health beliefs were of the form: ‘If I were to adopt a healthier diet for the next two weeks it would...’ followed by statements such as ‘improve my appearance’ or ‘help lower my cholesterol’.
In the self-efficacy section students ranked items according to their confidence that they could do them (sure they could = 1, sure they could not = 6). Only 18 of the 61 items from those used by Sallis et al. (1988) were chosen to keep the questionnaire to a manageable length. This subset had previously been validated by the Department of Medicine, Royal Perth Hospital. These items were of the form: ‘How sure are you that you could ....’ followed by statements such as ‘stick to healthy foods when eating with friends’ or ‘substitute reduced fat milk for whole milk’.

Control over food intake was assessed with a five-point Likert scale which ranged from almost always (1) to never (5) (Williams et al., 1993). Items were: (1) Do you have any say in what foods are bought at home? (2) Do you have any say in how food is prepared or cooked at home? (3) Do you choose what goes onto your plate? (4) Do you decide how much you eat? (5) Do you decide what you eat for lunch at school? (6) When you are out with friends do you decide for yourself what to eat? (7) Do you eat breakfast? Locus of control was measured on a four-point Likert scale which ranged from very much or definitely (1) to none at all or not at all (4) (Falconer et al., 1993). Items asked whether students considered (1) that diet affected future health; (2) that health depends on how they take care of themselves; (3) that it is possible to prevent sickness; (4) that they would try foods recommended by health professionals; and (5) that they were more concerned about diet than they used to be. Perception of body image was determined with one item asking if the students considered themselves to be underweight, normal weight or overweight.

Nutritional knowledge

Eight items about nutritional knowledge based on the Australian dietary guidelines (NHMRC, 1993) were included (Vandongen et al., 1995). These items aimed to assess whether students knew enough about the nutrients, particularly fat and fibre, in common foods to be able to make healthy food choices. The items are shown in Table VI with the four possible responses for each, only one of which was correct. A total nutrition knowledge score was obtained by adding the responses, scoring one for each correct answer and zero otherwise.

Lifestyle factors

In the school time available, it was impossible to use diet records or detailed food frequency questions to gauge nutrient intake. A 30-item food variety score adapted for Western Australian children (Milligan, 1994) was used as a measure of eating diversity. In assessing food variety, individuals were asked to tick which of 30 food items they had eaten in the past week. Responses do not measure frequency of consumption but the number of different foods eaten during the week. The food variety score addresses the first dietary guideline for Australians to ‘enjoy a wide variety of nutritious foods’ (NHMRC, 1993). A high food variety score indicates compliance with this NHMRC guideline and has been shown in other populations to correlate with healthy eating habits (Ries and Dachler, 1986).

Questions about fat intake, validated against food frequency data (Kinlay et al., 1991), provided a score indicating usual fat consumption. The items included in the fat score related to the weekly consumption of ice cream, cheese, whole milk and low fat milk, biscuits, cake, chocolate, and the type of spread (butter or margarine) used. Questions also asked whether foods were usually fried and whether individuals usually removed all, some or none of the fat from meat and chicken before eating. Additional questions assessed consumption of fish, soft drinks and water, the addition of salt to prepared foods and the use of special diets, as well as the use of alcohol and cigarettes and the amount of television watching on weekdays and weekends.

Statistical methods

Data were analysed using SPSS/PC. For continuous variables (age, weight, height) one-way analysis of variances was used to compare schools and gender. For interval variables Mann–Whitney U-tests or Kruskal–Wallis tests were used to compare groups. $\chi^2$ tests were used for categorical data.
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Internal consistency was assessed using Cronbach's \( \alpha \). As internal reliability for the self-efficacy scale was acceptable (Cronbach's \( \alpha = 0.8763 \)), a total score was calculated by summing the responses to all self-efficacy questions. Responses were recoded as 'most important' = 6 and 'least important' = 1, so that higher values indicated greater levels of self-efficacy. Similarly a total score was calculated for locus of control (Cronbach's \( \alpha = 0.7683 \)). Spearman correlation coefficients were used to examine relationships between psychological variables, nutrition knowledge and eating patterns, and these relationships were explored further using linear regression. A level of \( P < 0.05 \) was considered significant.

Results

Subjects

Of the 480 eligible year 11 students, a total of 391 completed the questionnaire. Questionnaires were completed by 85 (77.3%) of the 110 students at the low SES school, 104 (86.7%) of the 120 at the private school and 202 (80.8%) of the 250 students at the high SES school. Gender distribution was almost equal (191 boys and 200 girls) with boys making up 47% of participants at the low SES school, 48% at the private school and 50% at the high SES school.

Table 1 shows means and confidence intervals for the age, weight, height and body mass index (BMI) for the respondents. Girls at the high SES school were significantly shorter and lighter than those at the other school; however, there was no significant difference for BMI. The mean BMI for boys and girls at all schools corresponded to reported normal values for this age group (Hammer, 1991).

Stages of change

A significantly greater \(( P < 0.05)\) percentage of boys at the low SES school (70%) considered that they made healthy food choices compared to the high SES school (57%) and the private school (55.1%). Significantly more girls (79.7%) than boys (59.5%) tried to choose healthy foods \(( P < 0.05)\).

Among students in the maintenance phase (eating a healthy diet for more than 6 months) there was a significantly greater proportion of boys from the high SES school (53.6%) compared with 38.8% from the private school and 47.5% from the low SES school \(( P < 0.05)\). For girls there was also a significantly greater proportion in the maintenance phase from the high SES school \(( P < 0.05)\), the respective percentages being 52.9, 37.7 and 46.7%. Significantly more girls from the private school (39.6%) were in the action phase (changed to a healthy diet in the past 3 months) compared with...
the low SES (26.7%) and high SES (26.4%) schools ($P < 0.05$). Significantly more girls (30.3%) than boys (15.7%) were classified in the action phase ($P < 0.05$).

Amongst those who said they did not try to eat a healthy diet, 63% were pre-contemplators who did not intend ever to eat a healthy diet. A significantly higher proportion of boys who were precontemplators came from the high SES school (54.7%) compared with 18.9% from the low SES school and 26.4% from the private school ($P < 0.05$). Similarly, for girls precontemplators comprised 56.5% from the high SES school, 17.4% from the low SES school and 26.1% from the private school ($P < 0.05$). Boys made up a significantly greater proportion ($P < 0.05$) of the pre-contemplators (69.7%) than girls (30.3%).

**Health beliefs and values**

Table II shows the items used for health beliefs and values and the percentage of boys and girls ranking these items in the highest two categories. Overall, health beliefs considered to be true by the largest proportion of students related to improving health (81%), feeling energetic (63%), feeling good (62%), lowering cholesterol (61%), testing willpower (57%), weight control (53%) and improving appearance (44%). Significantly more girls than boys believed that the benefits of a healthy diet related to improving health, feeling good about oneself, weight control, improving appearance, feeling energetic, testing their willpower and saving money.

Table II shows the percentage of boys and girls ranking health values in the highest two categories. The health values considered important by the greatest proportion of students overall were improving health (82%), increasing energy (81%), feeling good about oneself (80%), weight control (61%), improving appearance (58%), saving money (58%) and lowering cholesterol (51%). The proportion of girls ranking feeling good about oneself, weight control, improving health and appearance as important was significantly higher than for boys.

<table>
<thead>
<tr>
<th>Items for beliefs and values relating to the effects of a healthy diet</th>
<th>Responses in the highest two categories (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beliefs</td>
<td>Boys</td>
</tr>
<tr>
<td>Improving health</td>
<td>74.6</td>
</tr>
<tr>
<td>Feeling energetic</td>
<td>57.1</td>
</tr>
<tr>
<td>Feeling good about myself</td>
<td>52.6</td>
</tr>
<tr>
<td>Lowering cholesterol</td>
<td>58.4</td>
</tr>
<tr>
<td>Losing weight or maintaining desired weight</td>
<td>44.2</td>
</tr>
<tr>
<td>Testing willpower</td>
<td>52.6</td>
</tr>
<tr>
<td>Improving appearance</td>
<td>36.0</td>
</tr>
<tr>
<td>Cutting down food choices</td>
<td>33.9</td>
</tr>
<tr>
<td>Saving money</td>
<td>26.8</td>
</tr>
<tr>
<td>Being a good example for others</td>
<td>23.3</td>
</tr>
<tr>
<td>Craving certain foods</td>
<td>19.8</td>
</tr>
<tr>
<td>Changing mood and personality</td>
<td>20.6</td>
</tr>
<tr>
<td>Involving a lot of planning and inconvenience</td>
<td>20.9</td>
</tr>
<tr>
<td>Leading to failure</td>
<td>5.4</td>
</tr>
<tr>
<td>Offending people</td>
<td>6.3</td>
</tr>
<tr>
<td>Not being supported by my family</td>
<td>4.7</td>
</tr>
<tr>
<td>Limiting social life</td>
<td>4.2</td>
</tr>
<tr>
<td>My friends laughing at me</td>
<td>5.8</td>
</tr>
</tbody>
</table>

* $P < 0.05$ for differences related to gender.
The response for health beliefs and health values did not differ significantly between schools.

**Barriers to change**

Table III shows the items used and the percentage of boys and girls ranking barriers to change in the highest two categories of importance. The barrier to change considered important by the largest proportion of students, combining responses from boys and girls, was healthy food not being available at home (45.1%). Other barriers related to healthy foods being unavailable in school canteens (41.4%), ignorance of calorie content (40.3%), sugar and fat content (42.2%) and fibre content (41.1%) of food, lack of control over buying of food (40.2%), and problems in sticking to a healthy diet (39.6%), particularly in girls. Girls were significantly more likely than boys to report a number of barriers including family support, ignorance of fibre content, insufficient planning time and problems in sticking to a healthy diet.

**Self-efficacy and locus of control**

The self-efficacy score (Table IV) was higher in girls than in boys, but there were no significant differences in healthy food choices in relation to school. Boys who considered their food choices as healthy had significantly greater self-efficacy scores than other boys. Similarly girls who reported trying to eat a healthy diet had a higher self-efficacy score than those reporting unhealthy diets.

Locus of control scores showed similar patterns to those for self-efficacy, with significantly higher values in girls (Table IV). For those reporting their diet as healthy, locus of control score was higher than in other students. There were no significant differences in locus of control scores according to school.

**Control over food intake**

Table V shows the proportion of boys and girls who considered they ‘almost always’ or ‘quite often’ had control over their food intake. Significantly more girls than boys had some say over how their food is prepared, what is served on their plate and what they eat for school lunch. There were no significant differences in the overall proportion of boys and girls eating breakfast; however, there were significant differences between girls according to

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**Table III. Percentage of responses in the highest two categories for items relating to perceived barriers to eating a healthy diet**

<table>
<thead>
<tr>
<th>Items used to determine barriers to change</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foods that fit into a healthier diet are not available at home</td>
<td>45.4</td>
<td>44.9</td>
</tr>
<tr>
<td>I find it difficult to make healthy food choices at the school canteen</td>
<td>40.3</td>
<td>42.0</td>
</tr>
<tr>
<td>I do not know which foods are best to reduce sugar and fat</td>
<td>38.3</td>
<td>45.2</td>
</tr>
<tr>
<td>I have no control over the foods available at home</td>
<td>37.4</td>
<td>42.9</td>
</tr>
<tr>
<td>I do not know how many calories are in different foods</td>
<td>35.6</td>
<td>42.3</td>
</tr>
<tr>
<td>I do not know which foods are high in fibre</td>
<td>35.3</td>
<td>46.2*</td>
</tr>
<tr>
<td>I have trouble knowing how much I should eat</td>
<td>32.6</td>
<td>37.6</td>
</tr>
<tr>
<td>I have trouble sticking to a healthy diet</td>
<td>32.4</td>
<td>44.7*</td>
</tr>
<tr>
<td>I find it difficult to choose healthy foods for school lunches</td>
<td>31.6</td>
<td>35.7</td>
</tr>
<tr>
<td>I have trouble choosing healthy foods when I am out with family or friends</td>
<td>29.8</td>
<td>36.1</td>
</tr>
<tr>
<td>My family does not support my efforts to eat a healthier diet</td>
<td>29.4</td>
<td>35.9*</td>
</tr>
<tr>
<td>I don't see any benefits from my efforts to eat a healthier diet</td>
<td>26.6</td>
<td>32.1</td>
</tr>
<tr>
<td>It is difficult to find time to plan healthy meals</td>
<td>26.3</td>
<td>36.9*</td>
</tr>
<tr>
<td>It is difficult for me or my family to shop for the foods I need</td>
<td>24.5</td>
<td>30.5</td>
</tr>
<tr>
<td>I use food as a treat or reward for myself</td>
<td>20.2</td>
<td>26.0</td>
</tr>
<tr>
<td>I find that a healthy diet is too expensive</td>
<td>17.6</td>
<td>24.9</td>
</tr>
</tbody>
</table>

*P < 0.05 for differences related to gender.
Table IV. Self-efficacy scores and locus of control scores (mean and 95% CI) related to gender and to healthy or unhealthy food choices

<table>
<thead>
<tr>
<th>Variable</th>
<th>Self-efficacy</th>
<th>Locus of control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Healthy food choices</td>
<td>Unhealthy food choices</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys</td>
<td>76.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>66.5</td>
</tr>
<tr>
<td>girls</td>
<td>80.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>70.8</td>
</tr>
<tr>
<td>Locus of control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>boys</td>
<td>16.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>14.9</td>
</tr>
<tr>
<td>girls</td>
<td>17.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>15.3</td>
</tr>
</tbody>
</table>

<sup>a</sup>P < 0.05 for gender difference; <sup>b</sup>P < 0.05 for difference between patterns of food choice (Mann–Whitney test).

Table V. Percentage of boys and girls ranking responses to questions related to eating patterns as ‘almost always’ or quite often

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percentage ranking response as ‘usually’</th>
<th>χ² value (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Influence on foods bought at home</td>
<td>56.8</td>
<td>61.0</td>
</tr>
<tr>
<td>Influence on food preparation at home</td>
<td>38.0</td>
<td>51.5</td>
</tr>
<tr>
<td>Choosing food served onto plate</td>
<td>43.8</td>
<td>62.0</td>
</tr>
<tr>
<td>Choosing amount of food eaten</td>
<td>78.6</td>
<td>83.0</td>
</tr>
<tr>
<td>Choosing school lunch</td>
<td>66.7</td>
<td>79.5</td>
</tr>
<tr>
<td>Choosing food when out with friends</td>
<td>88.0</td>
<td>90.5</td>
</tr>
<tr>
<td>Eating breakfast</td>
<td>71.9</td>
<td>68.0</td>
</tr>
</tbody>
</table>

Table VI. Percentage of boys and girls correctly answering nutrition knowledge questions

<table>
<thead>
<tr>
<th>Nutrition knowledge item</th>
<th>Percent of correct answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>Which has carbohydrate? Meat/Butter/Bread/Cheese</td>
<td>75.0</td>
</tr>
<tr>
<td>Which has no fibre? Brown bread/Beans/White bread/Meat</td>
<td>62.0</td>
</tr>
<tr>
<td>Which is high in fat? Potatoes/Boiled sweets/Margarine/Cottage cheese</td>
<td>34.9</td>
</tr>
<tr>
<td>Which is high in fibre? Orange juice/Eggs/Rice/Meat</td>
<td>78.1</td>
</tr>
<tr>
<td>Which has most iron? Milk, Cheese and eggs/Nuts, dried beans and cauliflower/</td>
<td>59.4</td>
</tr>
<tr>
<td>Liver, beef and breakfast cereal/Rice, Vegemite and biscuits</td>
<td></td>
</tr>
<tr>
<td>Which is low in fat? Hamburger with ‘the lot’/Grilled fish and chips/Ham and cheese sandwich/</td>
<td>42.7</td>
</tr>
<tr>
<td>None of these</td>
<td></td>
</tr>
<tr>
<td>Which increases fibre in a spaghetti meal? Cooking less/Using canned tomatoes/Wholemeal spaghetti/Adding cheese</td>
<td>77.1</td>
</tr>
<tr>
<td>Which meal is lowest in fat? Bread and polony/Roast lamb and baked vegetables/Fried egg/</td>
<td>50.5</td>
</tr>
<tr>
<td>Jacket potato and baked beans</td>
<td></td>
</tr>
</tbody>
</table>
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school. Only 43.4% of girls at the low SES school regularly ate breakfast, compared to 72.3% at the private school and 73% at the high SES school ($\chi^2 19.16, P = 0.0140$). The respective proportions for boys were 72.5, 74 and 72.7%. There were no significant differences by school for boys.

Nutrition knowledge

Eight items pertaining to nutrition knowledge were included in the questionnaire (Table VI). The mean score of correct responses was significantly greater (Mann-Whitney $2.54, P = 0.011$) for girls (5.3, CI 5.0–5.5), than for boys (4.8, CI 4.5–5.0). Table VI shows the items and the percentage of boys and girls who answered each item correctly. At least 60% of students answered items correctly except for the three questions relating to fat content of foods.

A number of misconceptions were evident. For example, 22% of students believed that white bread rather than meat contained no fibre, 22% considered that boiled sweets rather than margarine were high in fat, 42% thought a ham and cheese sandwich was low in fat, and 25% thought bread and polony was lower in fat than a baked potato and baked beans.

Food variety score

Food variety score measures the number of different foods eaten during the preceding week and is not a measure of frequency of consumption. The total food variety score did not differ significantly according to gender but was significantly lower (Kruskal–Wallis 6.74, $P = 0.0344$) at the low SES school (mean 15.9, CI 14.9–17.0) than at the private school (mean 17.0 CI 16.1–17.9) and the high SES school (mean 17.1, CI 16.6–17.7).

The food group scores differed significantly between schools for cereal, fish, fruit and nuts with the low SES school having the lowest score. For cereals the mean score for the low SES school was 3.0 (CI 2.8–3.2) compared with a mean of 3.4 (CI3.2–3.6) for the private school and 3.3 (CI 3.2–3.4) for the high SES school (Kruskal–Wallis 8.83, $P = 0.0121$). The mean score for fish intake was 2.2 (CI 1.9–2.6) for the low SES school, 2.4 (CI 2.1–2.7) for the private school and 2.8 (CI 2.6–3.0) for the high SES school (Kruskal–Wallis 14.97, $P = 0.0000$). For fruit the mean score was 3.0 (CI 2.6–3.2) for the low SES school, 3.4 (CI 3.1–3.7) for the private school and 3.3 (CI 3.1–3.5) for the high SES school (Kruskal–Wallis 6.05, $P = 0.0421$). The low SES school scored significantly lower in consumption of nuts (Kruskal–Wallis 6.49, $P = 0.0389$) with a mean score of 0.4 (CI 0.3–0.6) compared with the private school (0.7, CI 0.6–0.9) and high SES school (0.6, CI 0.5–0.7). Separate analysis by gender for cereal and fruit showed no significant differences for boys but for girls there were significant differences for both food groups due mainly to very low consumption amongst the girls at the low SES school (Kruskal–Wallis for cereal 5.98, $P = 0.0288$, for fruit 8.90, $P = 0.0117$). The mean score for cereals for girls was 3.0 (CI 2.8–3.2) at the low SES school, 3.4 (CI 3.2–3.6) at the private school and 3.3 (CI 3.2–3.4) at the high SES school. For fruit the respective means for girls were 2.7 (CI 2.2–3.2), 3.4 (CI 3.0–3.8) and 3.4 (CI 3.2–3.7).

Boys who considered they had eaten a healthy diet for at least 6 months had a mean food variety score of 18.0 (CI 16.9–19.1) compared with a mean of 16.1 (CI 15.0–17.2) in other boys (Mann–Whitney 2.12, $P = 0.0129$). The respective mean values for girls were 17.4 (CI 16.8–17.1) and 15.6 (CI 14.7–16.5) (Mann–Whitney 3.22, $P = 0.0001$).

Eating habits

Measurement of usual fat consumption using the fat score (Kinlay et al., 1991) showed significantly higher levels (Mann–Whitney 4.70, $P = 0.0000$) for boys (mean 6.0, CI 5.7–6.4) than for girls (mean 5.4, CI 5.2–5.7), but did not differ between schools. There was a significantly lower fat score (Mann–Whitney 1.99, $P = 0.039$) for those who tried to eat a healthy diet (mean 5.3, CI 5.0–5.6) compared with those who did not (mean 5.8, CI 5.4–6.2).

Because of reported dietary differences between drinkers and non-drinkers (Herbeth et al., 1988) as well as smokers and non-smokers (Veenstra et al., 1993), the fat score was examined in relation
to smoking and drinking habits. A significantly higher fat intake was found in both smokers (Mann–Whitney, 2.05, \(P = 0.0407\)) and drinkers (Mann–Whitney 2.52, \(P = 0.0116\)). The mean fat score in smokers was 6.0 (CI 5.6–6.4), compared with non-smokers 5.3 (CI 4.6–6.1), and was 6.1 (CI 5.4–7.0) in drinkers compared with 5.2 (CI 4.5–5.8) in non-drinkers.

Overall, 45.5% of boys and 53.3% of girls rarely added salt to prepared foods. For girls at the private school 71.2% rarely used salt compared with 55.6% at the low SES school and 43.6% at the high SES school (\(\chi^2 5.98, P = 0.026\)). A similar, but not significant, trend was seen amongst boys with 54.0% at the private school, 46.2% at the low SES school and 41.0% at the high SES school rarely using salt. Reported consumption of fish was examined because of its association with lower risk of cardiovascular disease (Vandongen et al., 1993). Only 20.0% of boys and 22.1% of girls ate fish at least fortnightly, and there were no significant differences related to school.

Body image and special diets
Almost three times as many girls (54%) as boys (20%) considered themselves overweight. Of those who were in the upper quartile of BMI distribution, 68.3% of girls and 31.7% of boys thought they were too fat while 7.3% of boys in the upper BMI quartile thought they were too thin. Of students in the lowest quartile of BMI distribution, 21.1% of girls and 7.9% of boys thought they were too fat. There was no significant difference in perception of body image by school.

Special diets were used by 7.7% of boys and 20.4% of girls (\(\chi^2 15.40, P = 0.0040\)). Losing weight was the reason given for the diet by 27.8% of boys and 62.2% of girls, while 16.7% of boys and 18.9% of girls reported themselves to be vegetarians, 22.2% of boys and 2.7% of girls had food allergies, and 33.3% of boys and 16.2% of girls were on a diet for other reasons, most of which were related to sports training. There were no significant differences in type of special diet eaten between schools.

Soft drink and water
Girls, compared with boys, consumed significantly fewer glasses of soft drinks per week (Mann–Whitney 4.90, \(P = 0.0000\)), with the lowest intake among girls at the private school (Kruskal–Wallis 15.41, \(P = 0.0005\)), the respective means being 2.8 (CI 2.2–3.4), 1.8 (CI 1.5–2.1) and 2.7 (2.2–3.2) for the low SES, private and high SES schools. For boys, the respective means were 3.7 (CI 3.8–4.7), 4.0 (CI 2.9–5.1) and 4.7 (CI 3.6–5.8) glasses per week. Girls at the private school also consumed significantly more glasses of water per week (Kruskal–Wallis 6.97, \(P = 0.0307\)), with a mean of 13.4 (CI 10.2–16.5) in the low SES school, 20.0 (CI 17.0–22.8) in the private school and 15.1 (CI 12.2–17.9) in the high SES school. Overall, 81.6% of girls and 83.8% of boys drank soft drinks during the week of the survey.

Cigarettes and alcohol
Figure 1 shows cigarette use and alcohol consumption by sex and school for students who drank or smoked during the week of the survey. Overall, 28.6% of boys and 28.4% of girls drank alcohol, and 24.2% of boys and 22.4% of girls were smokers. There were no significant differences in the proportions of drinkers or smokers according to gender. The mean number of drinks and cigarettes, derived only from those who smoked or drank, showed significant differences between schools, with the private school having the greatest percentage of smokers (\(\chi^2 19.57, P = 0.000\)) and drinkers (\(\chi^2 36.94, P = 0.0000\)). For smokers, boys on average smoked 27 cigarettes a week (CI 18.7–35.7) and girls 28 a week (CI 20.6–35.3). For drinkers, the mean alcohol consumption for boys was 9.1 glasses a week (CI 6.2–12.0) and for girls 4.2 glasses a week (CI 3.2–5.2) (Mann–Whitney 2.92, \(P = 0.0035\)). Those at the high SES school had the highest mean consumption of alcohol (Figure 1) (Kruskal–Wallis 9.21 \(P = 0.0120\)).

Responses were classified according to the recommended safe drinking limits of not more than two drinks per day for females and not more than four drinks per day for males (NHMRC,
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Fig. 1. Frequency of smokers (a) and drinkers (b) and mean cigarette (c) and alcohol (d) consumption for smokers and drinkers by school for girls (●) and boys (■). *P < 0.005 for difference between schools.

The alcohol intake in 10 boys (18% of male drinkers) and one girl exceeded the safe drinking guidelines. No information was available to distinguish a pattern of regular drinking from binge drinking at weekends.

Television viewing

Both boys (Kruskal–Wallis 13.07, \( P = 0.0014 \)) and girls (Kruskal–Wallis 25.5, \( P = 0.0000 \)) at the private school watched significantly fewer hours of television during the week and girls at the private school also watched significantly less television at weekends (Kruskal–Wallis 10.81, \( P = 0.0045 \)). The mean number of hours of television per day during the school week was 3.4 (CI 2.6–4.2) for girls and 3.7 (CI 2.9–4.5) for boys at the low SES school, 1.5 (CI 1.1–2.0) for girls and 2.2 (CI 1.7–2.6) for boys at the private school, and 2.7 (CI 2.3–3.1) for girls and 3.8 (CI 2.9, 4.7) for boys at the high SES school. For weekend television viewing the mean number of hours per day was 4.5 (CI 3.7–5.4) for girls and 5.0 (CI 3.9–6.0) for boys at the low SES school, 3.1 (CI 2.6–3.7) for girls and 4.9 (CI 4.0–5.9) for boys at the private school, and 4.4 (CI 3.8–4.9) for girls and 6.3 (CI 5.0–7.6) for boys at the high SES school. Girls watched a mean of 2.6 h/day (CI 2.3–2.9) during the week and 4.1 h/day (CI 3.7–4.4) at weekends. The respective means for boys were 3.3 h/day (CI 2.8–3.9) and 5.6 h/day (CI 4.9–6.4). Differences between boys and girls were significant for both weekday and weekend viewing (Mann–Whitney \( 2.62, P = 0.0081 \); 3.65, \( P = 0.0001 \)).

Television watching during the week correlated negatively with nutrition knowledge scores (\( r = -0.1170, P = 0.028 \)). There were no significant correlations between television watching and BMI, nor between TV watching and fat score or food variety score.
Regression models
Kinlay’s fat score or the food variety score were used as dependent variables in linear regression models and variables showing significant univariate relationships with these variables were entered in the model. All variables were continuous except for gender (girls = 0, boys = 1), drinking and smoking (0 = abstainer, 1 = drinker or smoker), and two dummy variables which were used to identify the private school and the high SES school in relation to the low SES school. All models controlled for gender, age and school.

Table VII shows that the fat intake score related negatively to both self-efficacy and to a high level of control over foods bought at home, and positively to television watching, drinking alcohol and being male. Nutrition knowledge score was not significant in this regression model. With food variety score as the dependent variable there were significant positive relationships with self-efficacy, nutrition knowledge, considering weight control as an important health value, having control over foods bought at home and male gender. In addition, dummy variables indicating school showed a significantly higher food variety score in students from the high SES school compared with the low SES school.

Discussion
This study of almost 400 15-year-old students has provided results which have implications for designing health promotion programs for adolescents. Weight control, improving appearance, lowering cholesterol, increasing energy, feeling good and improving health were all considered to be important health values. Perceived barriers to change related to availability of healthy food at home and in the school canteen and lack of control over food at home. Ignorance about nutrient content of foods was recognized as a barrier to change, especially by girls, and the reality of this concern was apparent in responses to nutrition knowledge questions.

Perceived self-efficacy, i.e. the belief that an individual can carry out a specific behaviour (Bandura, 1977; Kingery, 1990), was strongly related to healthy eating patterns. This finding is
consistent with reports showing self-efficacy to be a key factor in the eating behaviour of middle-aged women (Shannon et al., 1990). We found that boys had significantly lower self-efficacy scores than girls, in line with the report of Sallis et al. (1988). Conversely, Kingery (1990) found no differences in self-efficacy associated with gender in his study of college students. Self-efficacy did not differ according to SES in our study, again consistent with the findings of Sallis et al. (1988).

Using the same locus of control questions as Falconer et al. (1993), we obtained similar findings. However, self-efficacy was a better predictor of eating habits than locus of control as previously reported (Kaplan, 1984).

The health-belief model suggests an association between dietary behaviour and an individual's perception of risk (Thomas, 1994) and has been used to measure beliefs and values influencing healthy behaviour patterns (Contento and Murphy, 1990). Similarly, the 'theory of reasoned action' suggests that attitudes can be predicted from beliefs and evaluative beliefs (Kristal et al., 1990). Girls ranked many health beliefs and values items as more important than did the boys, particularly in relation to weight control. This is consistent with other Australian studies reporting the importance of weight control to girls (Falconer et al., 1993). In regression models a high ranking for the health values of weight control and feeling good about oneself were significant predictors of a healthy eating pattern suggesting possible targets for modifying dietary behaviour in adolescents. However, given concerns about anorexia in young women, care should be taken in such a strategy.

Barriers to change must also be considered in planning health education programs. The lack of healthy food at home and in the school canteen and ignorance of the nutrient content of various foods were highly ranked as reasons preventing students from eating a healthy diet. Girls ranked barriers to change more highly than did boys and identified some different barriers they considered important. Concerns of females over the time involved in planning a healthy meal has been reported previously (Urban et al., 1992) and may reflect their more realistic views of meal preparation. Greater understanding of the benefits of a healthy diet and skills in preparing quick, easy, nutritional meals may overcome the perceived barrier of planning time. In regression models, control over foods bought at home was a significant independent predictor of healthy eating patterns and more girls than boys were able to influence what they eat, particularly relating to food preparation at home, choosing food served and choosing school lunch. Encouraging boys to take part in these processes may improve their food choices and improved availability of healthy foods both at home and at school is needed.

Students' self-perception of ignorance about nutrient content of foods was supported by responses to nutrition knowledge questions, particularly concerning fat content. Serious misconceptions indicated difficulties in translating nutrient advice into food choices. For example, white bread was considered to be lower in fibre than meat and boiled sweets were believed to be higher in fat than margarine. Although nutritional knowledge and eating patterns are not strongly correlated (Carmody, 1987), knowledge is a predisposing factor for eating behaviour (Thomas, 1994). In the present study, knowledge score was a significant predictor of the variety of foods consumed.

Health-related behaviour is influenced by an individual's readiness to change. Although most students in the present study would be classified as being in the maintenance stage (Prochaska and DiClemente, 1983), a minority, particularly boys and students at the high SES school were 'pre-contemplators', i.e. they did not intend to adopt a healthy diet. Although this response may merely reflect 'healthy' adolescent rebelliousness, further information is needed about this group before appropriate nutrition education material can be designed to focus on their needs.

Interpretation of behavioural factors relating to a healthy diet depends upon assessing eating habits. In our study, a food variety and fat score were used instead of diet records or food frequency methods to keep the questionnaire of manageable length. The food variety score has been validated.
in primary school children in Perth by comparing results with diet records in the same subjects (Milligan, 1994). In other populations, Ries and Dachler (1986) have shown it to be of value in dietary assessment. The food variety score provides some information about foods actually eaten and targets the first of the national nutritional guidelines for Australians, i.e. to enjoy a wide variety of nutritious foods. Kinlay et al. (1991) have validated their fat score against food frequency methods and recommend this technique as useful in population-based studies.

The fat score in the present study was higher in boys than girls and in students who considered their food choices unhealthy. Drinkers and smokers also had higher scores for fat intake which is consistent with the reported association between a high fat, low fibre diet, smoking (Fulton et al., 1988) and drinking (Herbeth et al., 1988). Less healthy food choices in males are consistent with the finding that women value health more highly than men and more readily adopt preventive health strategies (Kristiansen, 1990). Women also acquire knowledge about healthy eating in response to a nutrition education program more satisfactorily than men (Finnegan et al., 1990). Gender differences in beliefs and behaviours need to be considered in designing health promotion programs.

The lower SES of the school was associated with unhealthy behaviours, which is similar to previous reports (Adler et al., 1993). In the present study, food variety score was lower at the low SES school, especially for cereals and fruit, where almost half of these girls reported that they did not eat breakfast, a behaviour associated with higher cholesterol (Resnicow, 1991) as well as with nutritional deficiencies (Morgan et al., 1986) and impaired academic performance (Simeon and Grantham-McGregor, 1989). Less variety in foods eaten is associated with lower SES and may reflect disposable income. However, increased cardiovascular risk in lower socio-economic groups (Alder, 1993) may also be related to other behaviour patterns.

Smoking and drinking were more common among private school students, but mean consumption was lower than at the high SES school. The NHMRC dietary guidelines (1993) recommend water as the preferred drink for children. In our study, girls at the private school conformed to this guideline drinking the most water and little soft drink. The high consumption of soft drinks by other students suggests this is an area which could be targeted for intervention. Greater intake of nuts, less salt use, less consumption of soft drinks and greater consumption of water in private school students suggest that their dietary patterns are more consistent with national dietary guidelines.

There is an increasing trend toward adolescent dieting (Gortmaker et al., 1987), raising concerns about developmental delay and increased incidence of eating disorders. Although the student population studied here conformed to previously reported normal values for BMI (Hammer et al., 1991), over half of the girls and 20% of boys considered themselves overweight and 13% of girls were on a weight-reducing diet. These results are similar to those among Californian school girls reported by Huenemann et al. (1968), in which 46% wanted to lose weight. It is of particular concern that about 21% of girls and 8% of boys in the lowest BMI quartile thought they were too fat.

Twenty four percent of boys and 22% of girls were self-reported smokers compared with 25% of boys and 28% of girls among 16 year olds in a nation-wide survey of Australian secondary school students (Hill et al., 1993). Hill et al. (1993) also found boys to be heavier smokers than girls (mean of 38 cigarettes per week versus 28 cigarettes per week). In our survey the mean number of cigarettes per week for smokers was similar for boys and girls, 27 for boys and 28 for girls. The proportion of students drinking alcohol was lower than reported for 16 year olds by Hill et al. (1993) (44 versus 28%) but the mean alcohol consumption was similar in both surveys. A significant positive association was found between alcohol consumption and smoking for both boys and girls, as previously reported (NHMRC, 1993). It is disturbing to find that almost one-fifth of drinkers reported alcohol consumption above the safe drinking guidelines of not more than two drinks
per day for females and not more than four drinks per day for males (NHMRC, 1992). The pattern of binge drinking common in young adults (Wechsler and Isaac, 1992) places them at further risk in the short term in relation to traffic accidents, violence and other social problems. In the longer term, cardiovascular risk is increased when associated with higher blood pressure (Wannamethee and Shaper, 1991) and lower HDL cholesterol (Gruchow et al., 1982). If health-related behaviour is to be improved in this age group, smoking and at-risk drinking must be targeted.

Television watching has also been linked with an unhealthy diet, high cholesterol levels (Hei et al., 1990) and obesity (Dietz and Gortmaker, 1985). This may be influenced by unhealthy nutrition messages in commercials (Lank et al., 1992), eating snack foods and decreased physical activity (Robinson et al., 1993). In our study, television watching was a significant independent predictor of fat score in regression. We found no association between television watching and BMI, similar to the findings of Robinson et al. (1993). Less healthy food choices associated with more hours of television watching in the present study and fewer leisure-time hours available for exercise suggest that cardiovascular risk is likely to increase with the duration of watching television.

Our findings indicate that the priorities for nutritional health promotion amongst adolescents should involve increasing perceived self-efficacy to choose healthy foods (Kingery, 1990) given that behaviour change can be achieved by strategies to improve self-efficacy (Strecher et al., 1986). Campaigns should focus on the health beliefs and values considered most important, mainly relating to improving health, increasing energy and feeling good about oneself as well as to appearance and weight control. However, priorities should be modified according to gender, particularly with regard to weight control which girls ranked more highly.

Family involvement is also needed to ensure that healthy foods are available at home and to encourage participation in food buying, preparation and serving, particularly for boys. In a controlled trial in 10- to 12-year-old children, we have found improved dietary practices with involvement of the family in nutrition education programs compared to entirely school-based programs (Vandongen et al., 1995). However, these programs, designed for primary school children, are not immediately applicable to older students. One possible approach is the use of mailed material directed at educating parents which Crockett et al. (1989) have shown to be effective in improving knowledge about nutrition, modifying diet-related behaviours, involving children in nutritional activities at home and influencing foods available at home. Healthy foods should also be available at school canteens and several schools are attempting to address this need through parent-teacher groups. There is a need for more widely accessible information applicable to allowing healthy food choices in school canteens. For example, in Western Australia, the recently formed West Australian Canteen Association is providing resources and support to facilitate changes in school canteens.

Students need education about the nutritional content of food, particularly fat, in order to make appropriate food choices. Nutrition education in schools is usually directed at younger children and, given the academic pressures on older high-school students, it is unlikely that teaching time would be dedicated to this need. The students' lack of knowledge about foods rather than nutrients suggest that foods should be a focus for nutrition education programs implemented in primary schools. Health promotion materials to reinforce these messages and to give older students an easily available source of reference to check their food choices may also be helpful. Smoking and at-risk drinking are targeted in Western Australia, as in many other areas, by government-funded programs, and should be included in any strategy to improve health-related behaviours in adolescents. Such a global approach becomes particularly important in view of the associations between smoking, drinking and dietary behaviour reported previously (Herbeth et al., 1988; Hebert and Kabat, 1990) and found in the present study. Media campaigns have been widely used to target smoking and drinking behaviour in teenagers and consideration should be given
to developing media campaigns publicising nutritional messages appropriate to this age group.

The present study has shown trends in nutrition-related behaviour as well as smoking, drinking and television watching among senior high school students in the Perth metropolitan area. In order to devise appropriate health promotion programs, educators need to understand these patterns of behaviour as well as understanding the attitudes, beliefs and values underlying the health-related choices of adolescents. Our findings suggest the need for a re-evaluation of health promotion programs for high school students, including assessment of the place of media campaigns, while taking account of differences related to gender and socio-economic status at this critical age of behavioural and physical development.

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