

INTERNATIONAL ARTICLE

Lifestyle-related Characteristics of Young Low-Meat Consumers and Omnivores in Sweden and Norway

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Purpose: To compare the lifestyle-related characteristics of low-meat consumer and omnivore adolescents in Sweden and Norway.

Methods: A total of 2041 students (578 from Umeå, Sweden; 504 from Stockholm, Sweden; and 959 from Bergen, Norway), with a mean age of 15.5 years, completed a questionnaire. Information was collected about physical characteristics, and health, family situation, social, exercise, alcohol, and tobacco habits. The response rate was 95% in Umeå, 91% in Stockholm, and 83% in Bergen. Statistical analyses included Chi-square and Mann-Whitney U tests.

Results: There was no reported difference between low-meat consumers and omnivores with respect to alcohol use, smoking, weight, or amount of exercise. Female low-meat consumers more frequently used smokeless tobacco, reported having more sick days during the last year, attached less importance to “being healthy,” and had been depressed more often than female omnivores. Male low-meat consumers reported, to a greater extent than male omnivores, having been tired without reason, having often had headaches and having been depressed. Female low-meat consumers had parents with a higher average level of education than did female omnivores and more often spent time with friends after school.

Conclusions: Vegetarianism or low-meat consumption is mainly a female phenomenon among adolescents in this study. The study indicates that the lifestyle of young low-meat consumers differs from the lifestyle found in

previous studies of vegetarians with respect to the respondents’ exercise habits, their perception of their own health, and their use of alcohol and tobacco. Contrary to findings from other studies, adherence to a low-meat diet may not correlate with other health promotion practices among adolescents in Sweden and Norway. © *Society for Adolescent Medicine*, 2002

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Vegetarianism has been practiced for many centuries by diverse populations and for a variety of reasons but the prevalence in the world population as a whole has been low [1,2]. In recent years, parts of the developed world have seen a rapid increase in the number of young people choosing a vegetarian diet, often for ideological rather than for health reasons [3–6]. The association of vegetarianism and young people is not surprising, since the young are more likely than older more-conservative adults, to explore alternative lifestyles [7]. Studies suggest that people who practice vegetarianism are more aware than others of the factors influencing their dietary intake and of the importance of a healthy lifestyle in general [8]. Many studies have found that vegetari-

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ans tend to be slimmer, smoke less, drink less alcohol, and exercise more [9–12]. These lifestyle characteristics are often represented among traditional health-oriented Scandinavian vegetarians who adopt a healthy lifestyle to prevent disease and cure unhealthy bodies, which was emphasized by the noted Scandinavian author Are Waerland [13]. Good health may indeed be related to a meatless dietary regimen and there are many studies showing a positive association between vegetarian diets and the prevention of certain diseases such as, for example, obesity and ischemic heart disease [14]. However, good health is not necessarily a consequence of a meatless diet *per se*, as it also depends on individual attitudes, lifestyle, and dietary planning. Traditional health-oriented vegetarians differ from omnivores not only in their diet but also other lifestyle factors. Therefore, we decided that it would be interesting to investigate whether the lifestyle of today's young low-meat consumers differs from that of omnivore adolescents and from those previously reported in studies of vegetarians. The purpose of this study, then, is to describe the lifestyle-related characteristics of adolescent low-meat consumers and omnivores living in Sweden and Norway.

Methods

Subjects

This study was performed in three cities: Umeå in northeastern Sweden (104,000 inhabitants), Stockholm in mid-eastern Sweden (1.8 million inhabitants), and Bergen in western Norway (220,000 inhabitants). Lists of municipal senior secondary schools were obtained from the education authorities and the students were recruited during the autumn of 1996. The Swedish subjects were recruited by a random sample of the ninth-grade classes (with students aged 15 to 16 years) of municipal senior secondary schools. Classes with more than 15 students, rather than individuals, were the sampling units, because the school setting simplified data collection and increased the probability of a high response rate. Students who were absent on the day of the survey were given an opportunity to complete the form at another time. The questionnaire was handed to 608 students out of 1151 (53% of sample) in Umeå and 554 students of 5407 (10% of sample) in Stockholm. A total 1082 Swedish adolescents completed the questionnaire, including 578 (95%) students from 22 classes and nine schools in Umeå, and 504 (91%) students from 22 classes and 17 schools in Stock-

holm. In both Umeå and Stockholm, all classes selected and all students present on the day of the survey were willing to participate in the study. In Bergen, Norway, a random sample of 11 schools was drawn from a total of 24 schools in the municipality. Three schools refused to participate and were replaced by randomly selecting three new schools from the remaining 13. A questionnaire was distributed to 1152 students out of 2239 (51% of sample) in Bergen. A total of 959 (83%) Norwegian students (aged 15 to 16 years) from 43 classes and 11 schools completed the questionnaire. Altogether 2041 Swedish and Norwegian ninth-grade students participated in the study.

In Sweden, the central school administrations, the principals of each school, the teachers, and the pupils in the classes involved were informed and gave their consent to the study. In Norway, permission to conduct the study was obtained from the education authorities; teachers and pupils in the schools involved were informed and gave their consent. The study was approved by the Research Ethics Committee of the Medical Faculty, Umeå University.

Questionnaire

A pilot study using the questionnaire was performed in the spring of 1996 with 44 ninth-grade students from a village near Umeå and 30 ninth-grade students in Bergen. The questionnaire was then revised to prevent misunderstandings. The entire questionnaire used in the present study has not been validated, although some of the questions have previously been tested and validated [15]. For the present study, each student was asked to complete a questionnaire in the classroom. The respondent was given the opportunity to ask questions if anything was unclear, and the completed forms were collected at the end of the session. The Swedish questionnaire was comprised of 207 items, and the Norwegian questionnaire contained 165 items. The two instruments contained 106 identical items.

This article reports on the data on lifestyle-related characteristics from 53 items (19 from both questionnaires and 34 from the Swedish one). Response alternatives for all items are shown in Tables 1 through 5. Eighteen items measured frequency of specific activities, and participants indicated average frequency by marking one of the five following options: "seldom or never," "1 to 2 times/month," "3 to 4 times/month," "2 to 3 time/week," and "every day." To permit comparison between frequent activities and those that were less frequent, frequencies

Table 1. Physical Data for Low-Meat Consumers and Omnivores in Umeå, Stockholm, and Bergen, 1996

Physical Data ^a	Female Low-Meat Consumers (<i>n</i> = 108)	Female Omnivores (<i>n</i> = 880)	Male Low-Meat Consumers (<i>n</i> = 41)	Male Omnivores (<i>n</i> = 976)
Age in years ^b (mean ± SD)	15.6 ± 0.3	15.6 ± 0.3	15.6 ± 0.3	15.6 ± 0.3
Weight in kg (mean ± SD)	56.2 ± 9.1	55.1 ± 7.3	61.6 ± 9.0	62.4 ± 9.1
Height in cm (mean ± SD)	166 ± 7	166 ± 6	176 ± 7	175 ± 8
BMI (mean ± SD)	20.4 ± 2.7	20.0 ± 2.4	19.8 ± 1.9	20.3 ± 2.5
BMI cutoff points for females/males (%)				
Underweight < 16.5/16.8	1	4	5	4
Normal weight 16.5–24.3/16.8–23.7	94	92	92	89
At risk of overweight 24.4–28.5/23.8–27.2	4	3	3	6
Overweight > 28.5/27.2	1	1	0	1
Opinion about weight ^b (%)				
Weigh too much	29	26	14	6
Weigh a little too much	30	23	18	12
Okay	28	40	36	54
Weigh slightly too little	10	8	27	22
Weigh too little	3	3	4.5	6

^a Comparisons between low-meat consumers and omnivores were made separately for both genders using the Pearson Chi-square and Mann-Whitney nonparametric U tests.

^b Results pertain to Umeå and Stockholm, with 90 female low-meat consumers, 447 female omnivores, 23 male low-meat consumers, and 493 male omnivores.

BMI = body mass index; SD = standard deviation.

were converted to times per month [16]. For example, a response of “2 to 4 times/week” (3 times per week) was converted to 12 times per month.

Answers of subjects were excluded when it was obvious that they had not responded seriously, such as drawing a line through the maximum frequency answer for all items instead of marking each item. This pattern of responses was rare, occurring approximately 15 times out of a total of 2041 subjects.

Responses to food consumption items were used to classify subjects as either low-meat consumers or omnivores. Subjects were classified as low-meat consumers if they had reported eating pork, poultry, and other animal products “seldom or never” during the previous 12 months; all others were defined as omnivores. The subjects’ eating habits are described elsewhere [17]. Results for different types of low-meat consumers (e.g., lacto-vegetarians and vegans) were grouped together and then compared with the results for omnivores from the three cities to achieve greater statistical reliability.

Statistical Analysis

The Swedish data were entered into a computer with the aid of an optical mark reader using Teleform (Cardiff Software, Inc.) and were proofread twice by the first author (C.L.L.). The Norwegian data were manually entered into the computer and were proofread once. SPSS version 9.0.1 was used for all statis-

tical analyses. Data are presented according to diet and gender. Information about gender was missing for one low-meat consumer and 35 omnivores. The body mass index (BMI; kg/m²) was calculated from self-reported weight and height. A Mann-Whitney U test was used on ordinal data and a Pearson Chi-square (or Fisher’s exact test) was computed for frequency data to identify significant differences between groups. A two-tailed *p* value of <.05 was considered to be statistically significant.

Results

Of 149 low-meat consumers, 72.5% were females and information about gender was missing for one low-meat consumer. The average response rate for questionnaire items was 96% and the lowest item response rate was 80%. There were no significant differences in age, weight, or height among respondents with different diets or from different cities.

Physical and Health Characteristics

There were no reported differences in weight or calculated BMI between low-meat consumers and omnivores of either gender (Table 1). Female low-meat consumers reported more sick days during the previous year, attached less importance to “being healthy,” and believed they had the ability to affect their own health to a greater extent than did female

Table 2. Health Data for Low-Meat Consumers and Omnivores in Umeå, Stockholm, and Bergen, 1996

Health Data ^a	Female Low-Meat Consumers (<i>n</i> = 108)	Female Omnivores (<i>n</i> = 880)	Male Low-Meat Consumers (<i>n</i> = 41)	Male Omnivores (<i>n</i> = 976)
Sick days during a year (mean \pm SD)	9.9 \pm 12*	8.3 \pm 12	5.5 \pm 6.3	6.6 \pm 9.0
Perception of health ^b (%)				
Very good/excellent	25	36	52	62
Good	45	40	44	27
Moderate	23	21	4	10
Poor	7	3	0	1
Importance of being healthy ^b (%)				
Very important	64**	79	65	71
Quite important	27	18	31	22
Neither important nor unimportant	8	3	0	5
Unimportant	1	0	4	2
Ability to affect own health ^b (%)				
Yes	94*	86	83	86
No	6	14	17	14
Tired without reason ^{b,c} (%)				
Yes	49	52	64*	42
No	51	48	36	58
Often have a headache ^{b,c} (%)				
Yes	37	34	38*	17
No	63	66	62	83
Sleep badly ^{b,c} (%)				
Yes	25	23	23	14
No	75	77	77	86
Unable to concentrate ^{b,c} (%)				
Yes	58	55	59	42
No	42	45	41	58
Stomach disorder ^{b,c} (%)				
Yes	22	23	32	15
No	78	77	68	85
Depressed ^{b,c} (%)				
Yes	54**	37	36**	14
No	46	63	64	86

* Results significantly different from results for omnivores ($p < .05$).

** Results significantly different from results for omnivores ($p < .01$).

^a Comparisons between low-meat consumers and omnivores were made separately for both genders using the Pearson Chi-square (or Fisher's exact test) and Mann-Whitney nonparametric U tests.

^b Results pertain to Umeå and Stockholm, with 90 female low-meat consumers, 447 female omnivores, 23 male low-meat consumers, and 493 male omnivores.

^c During the last week.

SD, standard deviation.

omnivores (Table 2). Female low-meat consumers also reported that they had been depressed during the last week more often than did female omnivores, while male low-meat consumers reported more often than male omnivores that they had been tired without reason, had often had headaches, and had been depressed during the last week (Table 2).

Family and Social Characteristics

The average level of education was higher for both parents of female low-meat consumers than for parents of female omnivores, but there was no reported difference in the number of people in the family (Table

3). The reported frequency of time spent with friends after school was higher for female low-meat consumers than for female omnivores. However, there were no reported differences in time spent with organizations and clubs, in nights out with friends, or in the number of close friends. Female low-meat consumers reported having less contact with adult neighbors than did female omnivores, but there was no reported difference for either gender in feeling lonely (Table 3).

Exercise, Alcohol, and Tobacco Habits

There was no difference between low-meat consumers and omnivores of either gender when classified

Table 3. Family Data and Social Characteristics for Low-Meat Consumers and Omnivores in Umeå, Stockholm, and Bergen, 1996

Family and Social Characteristics ^a	Female Low-Meat Consumers (<i>n</i> = 108)	Female Omnivores (<i>n</i> = 880)	Male Low-Meat Consumers (<i>n</i> = 41)	Male Omnivores (<i>n</i> = 976)
Number of people in family <20 years ^{b,c} (mean ± SD)	1.2 ± 1.0	1.3 ± 1.2	1.4 ± 1.2	1.4 ± 1.2
Number of people in family ≥20 years ^{b,c} (mean ± S.D.)	1.9 ± 0.6	1.9 ± 0.7	1.8 ± 0.6	1.9 ± 0.7
Number of parents living with respondent ^b (mean ± S.D.)	1.7 ± 0.4	1.8 ± 0.4	1.8 ± 0.4	1.8 ± 0.5
Education of mother ^b (%)				
Up to ninth grade	12**	17	18	13
Secondary school	24	40	21	41
University studies	59	40	61	43
Do not know	5	3	0	3
Education of father ^b (%)				
Up to ninth grade	13*	18	17	14
Secondary school	27	37	14	36
University studies	54	41	66	46
Do not know	6	4	3	4
Time with organization/club in times per week (mean ± SD)	1.5 ± 1.6	1.5 ± 1.7	1.8 ± 1.7	1.9 ± 1.7
Time with religious choir/organization/club in times per week (mean ± SD)	0.3 ± 0.9	0.3 ± 0.8	0.1 ± 0.3	0.2 ± 0.8
Time with friends after school in times per week (mean ± SD)	4.2 ± 1.7*	3.8 ± 1.6	4.6 ± 1.4	4.1 ± 1.6
Night outs with friends in times per week (mean ± SD)	3.8 ± 1.8	3.6 ± 2.0	4.5 ± 2.2	3.9 ± 2.1
Number of close friends (%)				
None	1	2	3	2
1	6	7	5	6
≥ 2	93	91	92	92
Age of most friends (%)				
Older	15	9	7	8
The same age	67	71	75	73
Younger	0	0	0	1
Older and younger	18	19	18	17
Do not spend time with friends	0	1	0	1
Contact with adult neighbors (%)				
No contact at all	12*	5	12	11
Say hello to some	71	71	75	69
Talk to them daily	17	21	13	17
Do things together	0	3	0	3
Feeling lonely (%)				
Very often	6	2	5	1
Often	6	7	4	4
Once in a while	23	26	32	16
Seldom	46	48	36	50
Never	19	17	23	29

* Results significantly different from those for omnivores ($p < .05$).

** Results significantly different from those for omnivores ($p < .01$).

^a Comparisons between low-meat consumers and omnivores were made separately for both genders using the Pearson Chi-square and Mann-Whitney nonparametric U tests.

^b Results pertain to Umeå and Stockholm, with 90 female low-meat consumers, 447 female omnivores, 23 male low-meat consumers, and 493 male omnivores.

^c Minus the respondent.

SD, standard deviation.

in groups with high, moderate, or low physical activity. There were also no differences between low-meat consumers and omnivores with respect to claiming to get enough exercise, or reporting activity hours (Table 4). No differences between low-meat

consumers and omnivores of either gender was seen in amount of time spent in specific activities, such as walking, cycling, dancing, running, aerobics/gymnastics, weight lifting, soccer, ice hockey, floor ball, basketball, handball, badminton, tennis, horseback

Table 4. Exercise Data for Low-Meat Consumers and Omnivores in Umeå, Stockholm, and Bergen, 1996

Exercise ^a	Female Low-Meat Consumers (<i>n</i> = 108)	Female Omnivores (<i>n</i> = 880)	Male Low-Meat Consumers (<i>n</i> = 41)	Male Omnivores (<i>n</i> = 976)
Physical activity (%)				
High (≥ 4 hours per week)	34	35	62	49
Moderate (2 to 3 hours per week)	26	28	18	25
Low (≤ 1 hour per week)	40	37	20	26
Enough exercise ^{b,c} (%)				
Not at all	11	6	0	4
Fair	8	9	4	7
Partly	49	56	52	34
Completely	32	29	44	55
Activity hours per week (mean \pm SD)	2.9 \pm 2.7	3.2 \pm 3.0	4.8 \pm 3.4	4.3 \pm 3.5

* Results significantly different from those for omnivores ($p < .05$).

^a Comparisons between low-meat consumers and omnivores were made separately for both genders using the Pearson Chi-square and Mann-Whitney nonparametric U tests.

^b Results pertain to Umeå and Stockholm, with 90 female low-meat consumers, 447 female omnivores, 23 male low-meat consumers, and 493 male omnivores.

^c Enough exercise for feeling both mentally and physically healthy.

riding, martial arts, track and field events, or skiing. However, female low-meat consumers less often spent time swimming (1.0 ± 1.8 times/month) than did female omnivores (2.0 ± 4.6 times/month) ($p < .05$).

There were no differences between low-meat consumers and omnivores of either gender with respect to the frequency of alcohol use or smoking (Table 5). However, female low-meat consumers reported using smokeless tobacco more often than did female omnivores.

Discussion

The participants in this study were drawn from a population of 15- to 16-year-old students in Umeå,

Stockholm, and Bergen. School attendance in the ninth grade is compulsory in the Swedish and Norwegian school systems, and the rate of participation in the study was very high as all students in the classrooms completed the questionnaire. The 24 schools in Bergen ranged in size from one to five classes of ninth graders, so clustering probably reduced precision. However, the schools selected were distributed throughout the municipality and may be regarded as representative of senior secondary schools in the municipality of Bergen.

Worsley and Skrzypiec [18] concluded that the prevalence of vegetarianism varies depending on whether the subjects are asked if they are vegetarian (self-reported) or are classified as vegetarian in light of their self-reported eating habits. Self-definition

Table 5. Alcohol and Tobacco Use by Low-Meat Consumers and Omnivores in Umeå, Stockholm, and Bergen, 1996

Alcohol and Tobacco Use Data ^a	Female Low-Meat Consumers (<i>n</i> = 108)	Female Omnivores (<i>n</i> = 880)	Male Low-Meat Consumers (<i>n</i> = 41)	Male Omnivores (<i>n</i> = 976)
Alcoholic beverages (%)				
Often (≥ 4 times per month)	20	15	15	18
Regularly (1 to 3 times per month)	28	33	23	26
Seldom (< 1 time per month)	52	52	62	56
Smoking (%)				
Daily	21	17	10	15
Sometimes	18	17	24	14
Never	61	66	66	71
Smokeless tobacco (%)				
Daily	0*	0	12	5
Sometimes	10	2	17	14
Never	90	98	71	81

* Results significantly different from those for omnivores ($p < 0.05$).

^a Comparisons between low-meat consumers and omnivores were made separately for both genders using the Pearson Chi-square.

results in a higher prevalence of vegetarianism than classification according to actual diet [18]. In the present study, definitions of "low-meat consumer" and "omnivore" were based on the subjects' responses to consumption frequency questions and not on the subjects' perceptions of their own eating behavior. Since the questionnaire in the present study relied on the self-reported food consumption of a limited number of animal food products, the subjects who reported eating these animal products "seldom or never" were called "low-meat consumers" rather than "vegetarians." Interestingly, 65 of the 150 subjects who were defined as low-meat consumers spontaneously noted at the end of the questionnaire that they were vegan, lacto-vegetarian, or semi-vegetarian. A drawback and a risk of this approach to classifying low-meat consumers is that there may have been misclassification of individuals. Nevertheless, these figures indicate that many low-meat consumers may be vegetarians.

The findings of the present study, like those of Worsley and Skrzypiec [18] show that low-meat consumption among adolescents is primarily a female phenomenon. The reason for vegetarianism was not investigated in the present study. However, it has been suggested that vegetarian females appear to hold quite different views of animal welfare and health issues, for instance, compared with omnivore females, and especially teenage males [18].

Physical and Health Characteristics

A study by Appleby et al. [19] showed that vegetarians have a lower body weight than omnivores. The weight difference seemed to be related to diet and lifestyle. Thus, vegetarianism seems to offer some protection from obesity and obesity-related diseases. Studies have suggested that self-reported weights and heights distort the BMI score, with a tendency to get underestimated weight and overestimated height [20]. However, because all subjects in the present study gave self-reported data, the presence of such bias ought to be the same in both dietary groups. In this study, there was no difference in either weight or BMI between low-meat consumers and omnivores. Sweden and Norway have no standard definitions of excess weight or obesity in adolescents. However, in 2000 the National Center for Chronic Disease Prevention and Health Promotion, in collaboration with the U.S. National Center for Health Statistics, developed age- and sex-specific BMI percentiles for adolescents [21]. Using these cutoff points, 4.5% of the adolescents in the present study, 5.5% of the males and

3.4% of the females, were at risk of being overweight. A previous study [22], which measured the weight and height of 842 Swedish adolescents (aged 14 and 17 years), showed that 4% of the males and 6% of the females were at risk of being overweight (cutoff BMI, >25). In a Norwegian study [23] of 1564 adolescents (aged 18 years), 6% of the adolescents, both male and female, were at risk of being overweight (cutoff BMI, >26). The findings of the present study may suggest that in contrast to traditional, health-oriented vegetarians, young low-meat consumers of today are no slimmer than omnivores.

White et al. [24] expressed concern about a possible association between anorexia nervosa and vegetarianism among females, especially in cases where young women with excessively restrictive diets attempt to rationalize their eating disorder as a vegetarian diet. In the present study, there was no difference between low-meat consumers and omnivores in reported opinion about weight. This may indicate that concern about weight is not a major reason among adolescents for becoming low-meat consumers. Meanwhile, the importance of being healthy did not seem to be a major reason, because female low-meat consumers attached less importance to "being healthy" than female omnivores. Freeland-Graves [1] found that vegetarians strongly believed themselves to be healthier than omnivores. However, in our study there was no difference between low-meat consumers and omnivores in the respondents' perceptions of their own health. Female low-meat consumers reported more sick days and had been depressed more often than female omnivores, and male low-meat consumers had been tired without reason, had had headaches, and had been depressed more often than male omnivores. These results imply that these low-meat consumers are not feeling healthier than omnivores. However, it is important to note that being depressed was measured with only one item, and is thus a crude measurement. It may be that people with poor health are more likely than others to choose a vegetarian lifestyle in an attempt to improve their health. Another explanation for the comparatively poor health of the low-meat consumers may be that young low-meat consumers become low-meat consumers for ethical rather than for health reasons, and therefore do not have the same interest in practicing a healthy lifestyle as do more health-oriented vegetarians. Previous studies have shown that young vegetarians are motivated by ethical rather than health-related reasons [25,26]. If this was the case for these subjects, then their future health benefits of eating little or no

meat may not be as great as previous studies of vegetarians would lead us to expect. However, it is important to note that the low-meat consumer group may not be comparable with vegetarians if misclassification has occurred.

Family and Social Characteristics

A previous study [18] found few statistically significant differences between omnivores and vegetarians of different socioeconomic status. In the same study, vegetarianism appealed to female adolescents from all socioeconomic status groups, but adolescent females in high socioeconomic status areas were more likely to consider becoming vegetarian. In the same vein, another study [27] showed a higher prevalence of female low-meat consumers among females whose parents were highly educated.

Being vegetarian may also affect adolescents' opportunities to socialize and be accepted by their peer group. A U.S. study [7] of 150 vegetarians and 150 age- and sex-matched omnivores found that more vegetarians than omnivores belonged to social organizations or clubs. However, a study of ideological vegetarians found that they usually adopt vegetarianism on their own, without joining an organization [28]. This may be because they already belong to a subculture that exists within various other subcultures such as the environmental movement or the animal protection movement. The finding that vegetarians more often belong to social organizations or clubs [7,27] was not supported by the present study, but female low-meat consumers more frequently spent time with friends after school, as in the above-mentioned U.S. study [7].

Exercise, Alcohol Use, and Tobacco Habits

Many studies have shown that vegetarians suffer much less than omnivores from the primary risk factors of coronary heart disease [11,12]. If the low-meat consumers in the present study were more health conscious than omnivores, as was true for traditional vegetarians, one might expect that they would be more involved in physical exercise than omnivores. This proved not to be the case in this study, where no difference was observed between low-meat consumers and omnivores. A U.S. study [1] found that nearly three times as many vegetarians (32%) as omnivores (12%) abstained from alcohol, and their incidence of daily consumption was half that of the omnivores. In contrast, in this study, there

was no difference in the frequency of consumption of alcoholic beverages between young low-meat consumers and young omnivores. In addition, the young low-meat consumers in this study smoked as frequently as the young omnivores. These findings are consistent with the results of a study of 321 adolescents (aged 12 to 20 years) in Minnesota [3] and imply that the young low-meat consumers of today do not share the values of traditional Scandinavian vegetarians with respect to alcohol and tobacco. A questionnaire study of 6027 Swedish ninth-grade students in 1996 [29] showed that 17% of the females and 12% of the males smoked daily. This result is quite similar to that of the present study, except that 21% of female low-meat consumers reported smoking daily. A Norwegian survey in 1993 [30] found that 21% of females and 20% of males in Norway smoked at least once a week, and the corresponding rates for Sweden were 19% and 15%, respectively. Alcohol was consumed at least once a week by 7% of females and 9% of males in Norway and by 11% and 19%, respectively, in Sweden. In the present study, female low-meat consumers used smokeless tobacco more frequently than did female omnivores. A possible explanation for this may be that there was a higher prevalence of low-meat consumers in Umeå (16%) than in Stockholm (5%) and Bergen (4%) [17], and the use of smokeless tobacco is more common in the northern part of Sweden. Another Swedish questionnaire study in 1996 [29] showed that only 1% of female ninth-graders used smokeless tobacco.

The absence of differences in exercise, alcohol use, and tobacco use between low-meat consumers and omnivores in this study may be caused by misclassification resulting in low-meat consumers not being comparable with vegetarians. However, if this was not the case, a possible explanation may be that young low-meat consumers change their dietary intake for ethical rather than for health reasons, and therefore are not as interested in a healthy lifestyle as more health-oriented vegetarians.

Based on the response to a limited number of food frequency questions, the classification into dietary groups is a limitation in the present study. Some of the participants who were classified as low-meat consumers (vegetarians) in the study may not actually identify themselves as such, and the lack of pork and chicken, for example, in their diets may be owing to any number of reasons, such as dietary preference. Because all food items cannot be covered in a questionnaire of this type, there are always some foods containing animal ingredients that will not be

included. Another limitation of the study is that the validity of many of the questions was not assessed.

Conclusion

Low-meat consumption is mainly a female phenomenon. The results of this study suggest that the lifestyle of young low-meat consumers differs from lifestyles of vegetarians in previous studies in the areas of perception of health, participation in organizations and clubs, frequency of exercise, alcohol consumption, and tobacco use. Contrary to findings in other studies, adherence to a low-meat diet may not correlate with other health promotion practices among adolescents in Sweden and Norway.

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