

Vegetable and fruit consumption and its determinants in young Finnish adults

By Tea Lallukka, Marjaana Lahti-Koski and Marja-Leena Ovaskainen

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ABSTRACT

Background: The low consumption of vegetables and fruit among young adults is a growing universal concern.

Objective: To examine determinants of vegetable consumption among young Finnish adults aged 25 to 34 years.

Design: A questionnaire covering health behaviour, socio-economic status and food frequencies was sent to subjects in 1997 (participation rate 64%, n=1589). A 24-h recall was collected for a subsample of these participants.

Results: Education, parental status, place of midday meal, perception of diet, physical activity, and smoking explained 21% of habitual use of vegetables and fruit in women aged 25–29, 29% in women aged 30–34 and 25% in men of both age groups. Frequent consumption of vegetables and fruit was associated with a higher vegetable and fruit intake in the 24-h recall.

Conclusion: Effective strategies to increase consumption of vegetables and fruit are needed. Particularly young adults with low education, smokers or the physically inactive are at high risk for inadequate vegetables and fruit in their diets.

Key words: Education, Finland, lifestyle, vegetable consumption, young adults

Introduction

According to dietary recommendations, diets should be based on vegetables, roots, fruit, berries and cereal products (1). The increased consumption of vegetables and fruit has been the most prevalent change in food patterns of Northern Europeans (2,3). However, young adults and adolescents seem to have a low consumption of vegetables and fruit (4–7).

While numerous studies exist on the regular diets of adolescents, studies concerning young adults (aged 25–34 years) are scarce. Nevertheless, young adults are in many ways an interesting group for examining food choices. Parental influence can have a strong impact on the development and persistence of health beliefs and behaviours (8). However, dietary choices may be modified for many reasons during early adulthood and may be overshadowed by other life aspects, leading to an unsatisfactory diet (9).

The low nutrient density in the diet of young adults is one of the main dietary concerns in Finland (10). While the intake of potatoes, roots, and fruit and berries has been found to be lower in the youngest age group (25–34 years) compared with older adults (35–64 years), the intake of fresh vegetables appears not to vary across these age groups (11). However, a high density of fat and sugar and a low density of fibre has been found to be associated with low fruit and vegetable intake among young Danish women (12).

Associations between high education and more frequent consumption of vegetables and fruit seem convincing (13–16). In addition, lifestyle factors, such as non-smoking (5,15,17) and physical activity (18), have been found to correlate positively with vegetable and fruit consumption. Attention to a healthy diet also seems to be an important predictor of healthy food choices (4,19).

The objective of this study was to examine associations of consumption of vegetables and fruit with socio-economic and lifestyle factors among young Finnish adults. A further aim was to identify strategies for health specialists to promote healthy food choices in young adults.

Subjects and methods

Study design

The data used in this study were collected as part of the FINRISK study, which was carried out to assess the levels of cardiovascular risk factors in Finland between January and March 1997 (20). For the FINRISK study, a random sample of 10 000 persons aged 25–64 years was drawn from the population registers of five regions: the cities of Helsinki and Vantaa (capital region), the cities of Turku and Loimaa and their surrounding rural communities, and the provinces of Oulu, Kuopio and Northern Karelia. In each region and ten-year age group, the sample included 250 men and 250 women. The subjects were invited to a health examination at a local health centre. The participation rate was 72% (n=7159).

Along with the invitation to the local health centre, a questionnaire to be completed at home was sent to subjects. This included questions on health, food choices and education as well as on marital, parental and employment status. In addition, a 38-item food frequency section was included. Information on subjects' weight and height was obtained by measurements carried out at the health centre. This study reports data on the youngest age group (25–34 years) only. Participants comprised 725 men and 864 women, the overall participation rate being 64% (58% for men and 69% for women).

At the examination, 40% of participants (1016 subjects) were invited to further participate in a more extensive dietary interview. In all, 305 men and 361 women (participation rate 66%) completed the dietary survey. In the 1997 dietary survey, participants were interviewed by the 24-h recall method and 99% of the recalls were accepted (n=666). To control for measurement error, three-day food diaries (n=73) and repeated 24-h recalls (n=59) were collected (11).

Tea Lallukka, MSc*, Marjaana Lahti-Koski, MSc, Marja-Leena Ovaskainen, PhD, National Public Health Institute, Dept of Epidemiology and Health Promotion, Unit of Nutrition, Mannerheimintie 166, FIN-00300 Helsinki, Finland.

Correspondence: Marja-Leena Ovaskainen
E-mail: marja-leena.ovaskainen@ktl.fi

Variables

An aggregated variable of consumption of vegetables and fruit was constructed from five original food items on the food frequency questionnaire (FFQ) of the FINRISK 1997 Study. Subjects were asked to specify using six alternatives how often they had eaten vegetables and fruit during the past 12 months (Table 1). A sum index of frequencies of vegetable and fruit consumption was calculated using questions on frequencies of fresh vegetables, root crops, fresh salads, cooked vegetables, vegetable dishes, fruit and berries. Potatoes were not included in the aggregate. The original responses were converted into number of consumptions per month (0, 1.5, 4.5, 9, 25 and 35 times/month). Following this modification, subjects were categorized into two groups based on the sum index: vegetable and fruit consumption of either < 60 (low) or ≥ 60 (high) times per month.

Educational level was divided into two groups: low (12 years at most) and high (more than 12 years) education. Parental status was defined as either having children of 16 years or younger or not having children. Occupation was originally divided into seven categories: farmer, blue-collar worker, white-collar worker, student, housewife, pensioner or unemployed. In this study, four groups were used after combining the four latter groups.

The midday meal on weekdays was originally allocated to one of six categories. These alternatives were combined in our study to describe either a self-made lunch (packed lunch or lunch at home) or a lunch prepared by someone else (at a restaurant, bar, worksite canteen or other cafeteria). Subjects who had lunch in an unspecified place or not at all formed a third, separate group.

In lifestyle variables, participants were asked to describe their leisure-time physical activity (low, medium, high), perception of personal diet (healthy–unhealthy) and use of tobacco (smoker–non-smoker).

Statistical analyses

Statistical analyses were done using SAS programs. Variance analyses using the general linear model (GLM) procedure were performed to estimate determinants of aggregated vegetable and fruit consumption. We formed a model to study factors that may have an influence on vegetable and fruit consumption. Aggregated vegetable and fruit consumption (times per month) was the dependent variable. Parental status, educational level, lifestyle factors (perception of diet, physical activity, smoking habits) and midday meal were included as independent variables. The final model included all the variables mentioned above and it was adjusted for body mass index (BMI). Generalization of the GLM procedure, a mixed model for measurement error, was used to compare the means of food intake based on 24-h recalls of the subjects with low and high vegetable use according to the food frequency questionnaire.

Sexes were kept separate in all analyses. The ten-year age group was analysed as one group except in modelling, where it was divided into two 5-year age groups (25–29 years and 30–34 years). This was done because the socio-economic situation (marital and parental status, educational level, employment status) of participants varied with age, which could have caused bias in the analyses of variance when comparing the group means of ten-year age groups.

Results

Basic characteristics of study variables are shown in Table 2. About 69% of women and 53% of men had received an education of more than 12 years. Most of the subjects were married or cohabiting. About half of the women and 37% of men had children aged 16 years or younger. The majority of subjects who had children were married.

Table 1. Food frequency questionnaire (FFQ): How often do you usually consume following food items? Think over the latest 12 months. Answer every line. Circle the number that corresponds to frequency. The six alternatives were: 1. Less than once/month or not at all // 2. Once or twice/month // 3. Once a week // 4. Twice a week // 5. Almost every day // 6. Once a day or more often.

<i>Vegetables</i>						
Fresh vegetables, root crops or fresh salads	1	2	3	4	5	6
Cooked vegetables	1	2	3	4	5	6
Vegetable dishes	1	2	3	4	5	6
<i>Fruit, berries</i>						
Fruit	1	2	3	4	5	6
Berries, fresh or frozen	1	2	3	4	5	6

Table 2. Distribution (%) of educational level, marital, parental and employment status, and occupation for young adults aged 25–34 years in the National FINRISK 1997 Study.

Variable	Men		Women	
	FINRISK 1997 n=725 %	24-h recall n=305 %	FINRISK 1997 n=864 %	24-h recall n=361 %
<i>Educational level</i>				
12 years or less	47	50	31	33
over 12 years	53	50	69	67
<i>Marital status</i>				
married	33	36	43	40
cohabiting	30	29	30	33
single	34	32	24	23
separated, divorced or widowed	2	3	4	4
<i>Parental status</i>				
no children	63	60	45	46
children ≤ 16 years	37	40	55	54
<i>Employment status</i>				
full-time job or student	72	71	56	57
part-time job	2	1	2	2
unemployment	6	8	10	11
is imminent				
unemployed, laid off, maternity leave/retired	20	20	32	31
<i>Occupation</i>				
farmer	8	8	4	4
blue-collar worker	26	29	3	3
white-collar worker	40	38	54	55
student	12	9	14	15
housewife	1	1	14	16
unemployed or pensioner	13	15	10	8
<i>Body mass index (BMI)</i>				
≤ 25 kg/m ²	52	57	71	70
> 25 kg/m ²	48	43	29	30

Table 3. Frequencies, times per month, mean (SD), of vegetable and fruit consumption^a by socio-economic factors and diet perception of young adults in two age groups in the National FINRISK 1997 Study.

Variable ^b	Men (n=725)		Women (n=864)	
	25-29 yrs. n=343	30-34 yrs. n=382	25-29 yrs. n=402	30-34 yrs. n=462
<i>Educational level</i>				
≤12 years	33 (27)	41 (29)	58 (34)	57 (31)
>12 years	48 (29)	51 (27)	66 (32)	72 (32)
Overall p-value	0.008	ns	ns	0.002
<i>Parental status</i>				
no children	42 (28)	45 (28)	67 (33)	66 (31)
children ≤16 years	39 (32)	48 (28)	60 (32)	67 (33)
Overall p-value	ns	0.02	ns	ns
<i>Leisure-time physical activity</i>				
low	30 (27)	37 (26)	53 (30)	54 (28)
medium	42 (32)	49 (28)	65 (34)	69 (32)
high	47 (26)	54 (27)	71 (31)	75 (32)
Overall p-value	0.02	0.0004	0.02	0.004
<i>Smoking habits</i>				
non-smoker	47 (30)	51 (29)	68 (32)	70 (32)
ex-smoker ^c	34 (21)	48 (26)	68 (32)	67 (30)
ex-smoker ^d	57 (37)	43 (23)	75 (43)	73 (45)
smoker	35 (27)	39 (26)	53 (32)	57 (32)
Overall p-value	0.04	ns	0.048	ns
<i>Lunch</i>				
worksite cafeteria, restaurant or bar	50 (28)	55 (24)	72 (29)	77 (29)
at home or packed lunch	36 (30)	44 (29)	61 (34)	64 (32)
no lunch or other	30 (22)	36 (27)	61 (37)	49 (32)
Overall p-value	0.0005	0.02	ns	0.03
<i>Perception of personal diet</i>				
healthy	65 (41)	71 (39)	94 (44)	103 (35)
fairly healthy	48 (29)	53 (26)	69 (30)	73 (30)
not particularly healthy or unhealthy	34 (25)	38 (25)	50 (28)	51 (26)
(fairly) unhealthy	23 (24)	23 (15)	50 (25)	41 (26)
Overall p-value	0.0001	0.0001	0.0001	0.0001
R-Square	0.25	0.25	0.21	0.29

^aTimes per month, mean values, standard deviations in parentheses, includes fresh and cooked vegetables, vegetable dishes, fruit and berries; ^bAdjusted for Body Mass Index and all variables presented in the model; ^cfinished smoking over a half year ago; ^dfinished smoking less than a half year ago; ns=non-significant (statistical test by GLM).

Of the men, 70% had full-time jobs or studied and 20% were temporarily or permanently unemployed. The corresponding proportions for women were 56% and 32%. Nearly half of the men and one-third of the women were overweight (BMI>25).

Socio-economic and lifestyle factors explain vegetable consumption

Young adults (aged 25–34 years), especially men, had lower consumption frequencies (p-value (chi²) 0.001) of vegetables and fruit compared with older participants (aged 35–64 years) of the FINRISK study population (data not shown). Among the young adults, average consumption frequencies of vegetables and fruit were 44 and 65 times/month, for men and women, respectively.

Education, parental status, leisure-time physical activity, smoking habits, place of midday meal and perception of diet explained about 21% of the variation in aggregated vegetable and fruit consumption among women aged 25 to 29 and 30% among women aged 30 to 34. For men in both 5-year age groups, the model explained 25% of the variation in the aggregated vegetable and fruit consumption (Table 3). For both men and

women, the frequencies of consumption seemed higher for those with high education. These differences were significant for the younger 5-year age group in men and the older 5-year age group in women.

Non-smoking, lunch outside the home, high leisure-time physical activity and perception of having a healthy diet were also associated with higher frequencies of aggregated vegetable and fruit consumption. Only physical activity and perception of diet were significantly associated with aggregated vegetable and fruit consumption in all age groups. Parental status was also representative of marital status because most of the participants with children were married or cohabiting. However, having children or living with someone did not seem to have an impact on vegetable consumption, except for men aged 30 to 34 years. Having children seemed to be linked with their higher consumption of vegetables and fruit.

We also tested interaction between education and the midday meal, but the interaction was not statistically significant (data not shown). Adding occupation to the model had no effect on other results, so it was not included in the final model. Interactions between the midday meal and occupation and between education

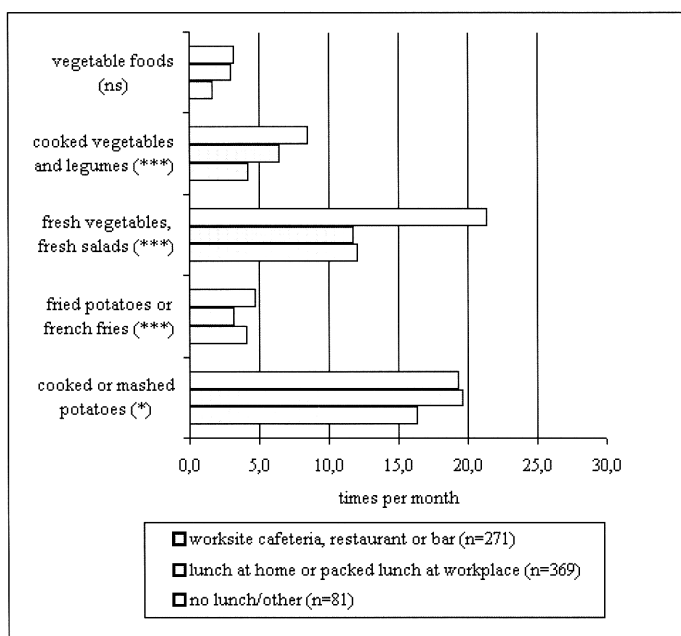


Figure 1. Frequencies for vegetable consumption (per month) by midday meal on weekdays for men aged 25–34 years in the FINRISK 1997 Study (tested by variance analysis:

*p-value<0.05; **p-value<0.01; ***p-value<0.001; ns=non-significant)

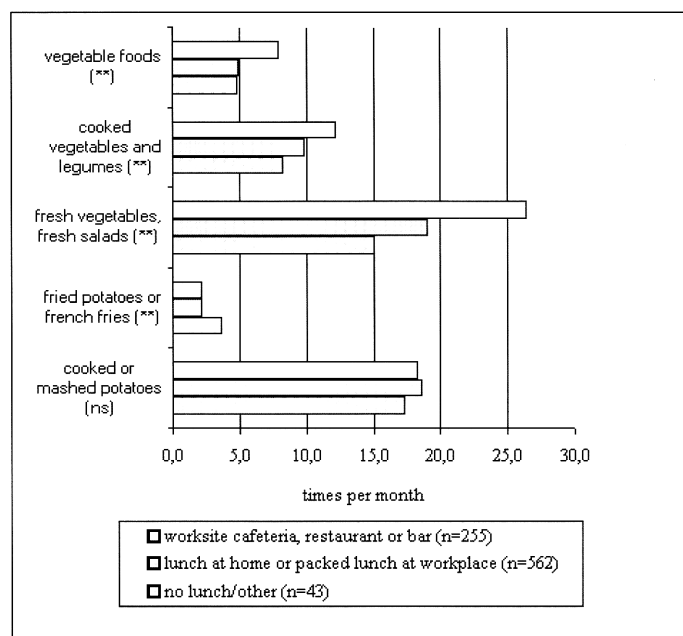


Figure 2. Frequencies for vegetable consumption (per month) by midday meal on weekdays for women aged 25–34 years in the FINRISK 1997 Study (tested by variance analysis:

*p-value<0.05; **p-value<0.01; ***p-value<0.001; ns=non-significant)

and occupation were also analysed, but they were not statistically significant (data not shown).

Young women who frequently ate fast food had a lower consumption of vegetables and fruit than women who seldom ate fast food (data not shown). In contrast, no associations were found between alcohol intake and vegetable consumption.

The place of midday meal was clearly associated with consumption of separate vegetable groups (Figures 1 and 2). Those having lunch in a worksite cafeteria, restaurant or bar significantly more often consumed fresh and cooked vegetables than those having a homemade lunch or not eating lunch at all. Women who usually skipped lunch ate fried potatoes and french fries more frequently than women who ate lunch. In both education categories, the consumption of fresh vegetables or other vegetables was higher when lunch was usually eaten outside the home (data not shown).

Vegetable and fruit intake by 24-h recall

The high consumption of vegetables, fruit and berries according to the FFQ was combined with the higher fruit and fresh vegetable intake in the 24-h recall (Table 4). Bread intake did not differ by vegetable intake for women, but the intake of rye bread was higher in the 24-h recall for men with more frequent vegetable consumption. For women, the intake of breakfast cereals and porridge was higher when they had had high frequencies of vegetable consumption according to the questionnaire. Frequency of eating french fries and fried potatoes was inversely associated with the frequency of vegetable and fruit consumption in women (p-value 0.03, data not shown) but not in men.

Discussion

Consumption of vegetables and fruit among young Finnish adults is lower than recommended. However, women seem to consume vegetables and fruit more often than men. High education, physical activity at leisure time, perception of healthy diet, non-smoking and eating lunch outside the home are associated with higher consumption of vegetables and fruit.

Education and occupation have been used as variables to study

the impact of socio-economic status on vegetable consumption. A large meta-analyses covering 15 European countries using these indicators found that both higher level of education and occupation are associated positively with the consumption of vegetables and fruit (16). However, in our study, only high education was found to be associated with frequent consumption of vegetables and fruit. The lack of association between occupation and vegetable and fruit consumption might be partly explained by the young age and a lack of stable occupation of the participants and the abundance of students and housewives. Our finding that consumption of vegetables and fruit is higher for persons with high education is supported by earlier studies on adults in Finland (13) and Norway (4). Only 7% of Norwegian men and 13% of women with high education reached the US recommendation of vegetable consumption at least five times a day.

Persons with high education presumably have an increased ability to obtain or understand health-related information in general and the dietary information specifically needed to develop health-promoting behaviours (16). Such an interpretation of our results would suggest that strategies to increase consumption of vegetables and fruit, particularly among men with low education, are needed. Advertising and information campaigns aimed directly at this group might be one way to increase interest in eating more vegetables and fruit. However, economic status may also have had an impact on the higher vegetable and fruit consumption of participants with high education.

Subjects having lunch in a restaurant, bar or worksite cafeteria had a higher consumption of vegetables, especially fresh vegetables and salads. Educational level appears to be connected with eating in organized worksite cafeterias or the habit of having lunch in a restaurant. This was also suggested by our data, although the interaction between education and lunch place was not statistically significant. The social acceptability of vegetables and encouragement within the social network to choose vegetables or fruit may be different for persons with high education. In a worksite nutrition intervention (25), enabling and mediating factors were found to explain changes in dietary habits. On the other hand, participants with low education in our study also had a higher consumption of vegetables if they

Table 4. Mean intake of vegetarian and cereal foods by 24-h recall in low and high^a habitual consumers of vegetables and fruit^b (FFQ) in the National FINRISK 1997 Study.

Food by 24-h recall	Men (n=305)			Women (n=361)		
	Habitual vegetable and fruit consumption on FFQ					
	Low g/day	High g/day	p ^c	Low g/day	High g/day	p ^c
Cooked or mashed potatoes	88	126	ns	53	53	ns
Berries	3	5	ns	9	10	ns
Berry juices	145	118	ns	79	78	ns
Fruit juices	64	120	ns	81	80	ns
Fruit	84	162	0.0015	87	152	0.0001
Vegetable-based salads	14	23	0.039	16	20	ns
Fresh vegetables and roots	19	53	0.0002	31	56	0.0003
Vegetable dishes, cooked vegetables	16	48	ns	23	46	0.036
Salads including meat or fish	7	5	ns	5	11	ns
Breakfast cereals, porridge	50	81	ns	39	68	0.002
Pizza	28	22	ns	19	16	ns
Rye bread	116	120	0.032	56	57	ns
Wheat and white bread	74	74	ns	55	60	ns
Wheat bun	42	26	ns	25	19	ns

^alow consumption=60 times per month or less; high consumption=at least 60 times per month

^bIncludes fresh and cooked vegetables, vegetable dishes, fruit and berries

^cns=non-significant (statistical test by mixed model of GLM)

regularly had lunch outside the home. Thus, an organized lunch seems to be an easy way to increase consumption of salad vegetables.

Associations between higher consumption of vegetables and having lunch outside the home might be explained by vegetables and fresh salads usually being included in the price of lunch in Finland. As a result, vegetables are often eaten at least with the midday meal. Alternatively, when lunch is prepared at home, vegetables frequently seem to be lacking. Not unexpectedly, however, eating in fast food restaurants was inversely associated with vegetable consumption. This does not take into account the small proportion of vegetables present in a hamburger. In agreement with our study, fruit and vegetable intake of American women has been shown to be lower among frequent fast food restaurant users, suggesting either healthy options being displaced by other foods in the restaurant, or abstention from choosing fruit and vegetables on other eating occasions (26).

Our finding of healthy lifestyle factors being associated with more frequent consumption of vegetables and fruit is in agreement with many recent studies. Physical activity has been shown to be an important factor in healthy lifestyle, especially in consumption of vegetables and berries (15,18). Regular exercise and close attention to a healthful diet were associated with frequent vegetable consumption also in other studies carried out in Norway (4) and Spain (15). French students who believed in the importance of health behaviour also reported an effort to eat more fruit (19). In addition, smoking has previously been shown to be related to low vegetable consumption (4,7,17).

The basic data for this study were collected by a questionnaire covering food frequencies, health behaviour and socio-economic situation. Food frequencies are assumed to be representative of the habitual diet. Food intakes based on 24-h dietary recalls were also used in the analyses to estimate vegetable consumption. The value of the 24-h recall is in providing estimates of the average intake of large groups that are comparable with those obtained using more cumbersome techniques (21). Under-reporting and intra-individual variation in food intake are the main sources of bias in the recollection of the previous day (22). Among young adults in our study, a high

consumption frequencies of aggregated vegetables and fruit were shown to be associated with higher intakes of vegetable food items in the 24-h recall.

The participation rate was different between men (58%) and women (69%). This did not bias the results because sexes were analysed in separate models. Typically, subjects who refuse to participate are a heterogeneous group, but those more interested in their diet in general tend to more willingly participate in dietary studies (23). Therefore, a difference exists between refusals and participants.

In our study, the participation rate also differed by education. The proportion of persons with high education was higher among women than men (Table 2). One assumption which might be made is that men with high education were not motivated or felt they were too busy to participate, whereas women with high education were more eager to participate in a health survey. The large proportion of women with high education may have biased the results. In addition, high educational level as well as female gender may predict under-reporting in daily food consumption (24). It is possible that the effect of background variables would have been stronger if the proportions of women with low education and men with high education had been higher, thus being more representative of the general population.

The Finnish National Nutrition Council (1) states that vegetables and fruit are to be eaten daily in many forms. For health promoters, the key is getting young adults, who are undergoing continual changes in their lives, to re-evaluate or reprioritize the need for vegetables and the benefit of more frequent vegetable and fruit consumption in their diet. Results of an earlier study suggest that the effectiveness of efforts to promote positive food behaviour among young adults may be improved by incorporating means to overcome common barriers (27). Lack of time, convenience and price were noted to have particularly large impacts on eating and food choices.

In conclusion, the challenge remains for nutrition specialists to determine an optimal way of motivating young adults to eat more vegetables and fruit. Factors such as recommending a midday meal containing vegetables should be considered as ways of increasing consumption of vegetables and fruit.

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