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Consumption of healthy foods and associated sociodemographic factors among Russian, Somali and Kurdish immigrants in Finland

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Short title: Consumption of healthy foods among immigrants

Abstract

Aims: We evaluated the consumption of healthy foods among Russian, Somali and Kurdish immigrants in Finland, and examined the relationship between sociodemographic factors and food consumption.

Methods: We used data from the Migrant Health and Wellbeing Study (Maamu), a population-based health interview and examination survey in six different municipalities in Finland between 2010 and 2012. Altogether 635 men and 737 women, aged 18-64 years, of Russian (n = 527), Somali (n = 337) and Kurdish (n = 508) origin were included. The important sociodemographic determinants of healthy food consumption: sex, age, education, place of residence and household size, were assessed by logistic regression.

Results: Based on the consumption frequencies of recommended healthy foods: fruits, berries, vegetables, fish and rye bread, immigrants of Russian origin had higher consumption of healthy foods than their peers of Kurdish and Somali origin. Low consumption of fresh vegetables, fruits and berries was found among Somali immigrants. Sex and age were the most important determinants of healthy food consumption, as women and older age groups had diets closer to the national nutrition recommendations. High educational level was also positively associated with healthy food consumption.

Conclusions: We found ethnic differences in the consumption of healthy foods among the immigrant groups of Russian, Somali and Kurdish origin in Finland. Sociodemographic factors, especially age, sex and education, seem to also play an important role in immigrants' food consumption. Further studies examining consumption of fruits, berries and fresh vegetables among Somali immigrants in Finland are needed.

Keywords; Immigrants, Consumption, Healthy foods, Sociodemographic factors, Finland

Introduction

Immigrant populations are on the rise in European countries. Currently, 5.9% of persons living in Finland are of a foreign background [1]. Immigration is often accompanied by change in dietary patterns [2]. Such changes involve adoption of food norms of the new country i.e. "dietary acculturation", which may either improve or diminish the dietary quality, the latter increasing the risk of developing chronic diseases. Immigrants may also preserve their traditional dietary habits [2,3].

To provide feedback and guidance for public health policy, it is important to evaluate consumption of healthy foods in the population based on the level of adherence to dietary recommendations [4]. Following the Nordic recommendations, the recent Finnish nutrition recommendations emphasise a health-promoting diet with a high consumption of vegetables, berries and fruits, daily consumption of whole grain bread and other whole cereal products, and consumption of fish 2-3 times a week, among others [5,6].

Both socioeconomic and sociodemographic differences in healthy food consumption have been observed among populations from Finland, Baltic countries and Russia [7-9]; female sex and higher education were associated with more frequent consumption of fruits and vegetables in the studies [7-9]. In addition, sociodemographic factors such as higher income, education, and age have been found to be associated with healthier dietary patterns in several other countries [10-12].

In this study, we aimed to evaluate the consumption of four selected healthy foods (fresh vegetables, fruits and berries, fish, rye bread) among the major immigrant groups in Finland: Russians, Somalis and Kurds [1]. The selected foods are included in the Finnish nutrition recommendations as components of a health-promoting diet [6]. We also examined the relationship between sociodemographic factors and food consumption among the three immigrant groups.

Methods

Design and study population

The Migrant Health and Wellbeing Study (Maamu) [13] is the first population-based health interview and examination survey among immigrants in Finland. Altogether 3000 individuals aged 18-64 years of Russian, Somali and Kurdish origin – subsequently also referred to as Russians, Somalis and Kurds (a sample of 1,000 individuals from each immigrant group) were invited to the study. The study was conducted in the cities of Helsinki, Espoo, Vantaa (2010–2011), Turku (2011), Tampere and Vaasa (2012). The participants of the study were randomly selected from the National Population Register. The inclusion criteria were (1) country of birth: Somalia, Iraq/Iran or Russia/former Soviet Union, (2) mother tongue: Kurdish and Russian/Finnish (for Kurdish and Russian participants, respectively), and (3) at least one-year residency in Finland and living in one of the above-mentioned six cities. Immigrant communities were informed about the study (in mosques and meeting places). Also, a number of personal contacts were made through phone calls and home visits in order to enhance the recruitment. Data were collected in the participants' native language by multilingual trained personnel who spoke both the participants' native language and Finnish. Details on the Maamu Study have been described elsewhere [13,14]. The Maamu Study was coordinated by the National Institute for Health and Welfare (THL), with the aim of providing comprehensive information on health, wellbeing, needs and use of health services among the three major migrant groups in Finland [13].

Current study sample

The present study is based on data from persons answering at least one of the dietary questions in the interview. Data from 1372 participants (635 men and 737 women) were used in this study. Russian, Somali and Kurdish participants (respondents to the dietary questions) comprised 38% (527), 25% (337), and 37% (508) of the sample, respectively.

Ethical approval

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Coordinating Ethics Committee of Helsinki and Uusimaa Hospital District. Written informed consent was obtained from all subjects.

Sociodemographic factors

Data on the sociodemographic factors of sex, ethnicity, age and place of residence were obtained from the sampling frame. For the other sociodemographic information, the respondents were asked, during the interview, about their educational attainment (in their home countries and in Finland), the year they had moved to Finland (for determining the years lived in Finland), their current marital status, and the number of household members (including the participant).

Assessment of healthy food consumption

In the interview, the food-related questions focused on the use of the basic Finnish food items considered to be part of a healthy diet [5,6]. Consumption frequency of fresh vegetables and fruits and berries were examined by the following questions: (1) How often have you eaten vegetables and root vegetables (except potatoes) during the latest week (7 days) as such, in grated form or in fresh salads? (2) How often have you eaten fruits and berries during the latest week (7 days)? With regard to consumption of fish, the question asked was: how often have you eaten fish or fish dishes during latest month? Consumption of rye bread was examined by this question: (1) how many slices of rye bread do you normally eat in a day? The question on rye bread was included because it is one of the most important sources of dietary fibre in Finland [15], and also to assess the immigrants' adaptation to the Finnish food culture.

Statistical analysis

The statistical analyses included descriptive statistics and logistic regression. Different sampling probabilities and non-response were handled using the inverse probability weights based on register information on age, sex, immigrant group, study location, and marital status. In addition, sampling design was taken into account through finite population correction in all analyses [16,17]. Data were analysed separately for each immigrant group. Differences in sociodemographic characteristics and healthy food consumption between males and females were analysed using Chi-square test with Statistical Analysis System (SAS) Survey procedures. Association between sociodemographic factors and food consumption were examined using logistic regression analysis with SAS Survey procedures. The unadjusted model included the relationship between each selected food (vegetables, fruits and berries, fish food and rye bread) as a dependent variable and each sociodemographic factor (sex, age, basic education, place of residence and household size) as an independent variable added one at a time. In addition, the adjusted model was performed by entering the remaining sociodemographic variables into the model simultaneously with the independent variable of interest. Based on results from preliminary analyses, years lived in Finland, and marital status were not associated with variables of interest. Hence, they were not included in the final models. Daily consumption of fresh vegetables and fruits and berries was rare among Somali participants, hence different cut-offs (at least 3 days/week) was adopted for the consumption of fresh vegetables and fruits and berries among Somalis. The results are presented as odds ratios (ORs) and 95% confidence intervals (CI). Statistical significance in all analyses was taken as $P < 0.05$. All analyses were carried out using the Statistical Analysis System for Windows, Version 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Background characteristics of participants

The majority of the participants of Russian and Somali origin were women (64% and 54%, respectively), while there were more men (57%) than women among the Kurds (Table I). Russian participants were older, and more educated than other immigrant groups. The majority of the participants in all groups lived in the Helsinki metropolitan area (55-79%). Most of the participants were married, or had registered partners or were cohabiting (57-65%). Somalis had the largest household size.

Ethnic differences in consumption of healthy foods

A higher proportion of the participants of Russian and Somali origin ate rye bread daily than the Kurdish participants (79% and 73% vs. 58%) (data shown sex-specific in Table I). Consumption of fresh vegetables was more frequent among Russians (60%) and Kurds (44%) than Somalis (1%). Similarly, fruits and berries were consumed more frequently by Kurds (63%) and Russians (60%) than Somalis (1%). However, 85% of Somali participants consumed fresh vegetables, and 78% consumed fruits and berries on 1-2 days a week. Fish was consumed more frequently among Russians and Somalis than Kurds (43% and 37% vs. 19%) (data not shown).

In all immigrant groups, there were differences between men and women in the food consumption (Table I). A larger proportion of women than men consumed rye bread daily (Kurdish) and had more frequent consumption of fresh vegetables (Kurdish) and fruits and berries (Russians) (Table I).

Sociodemographic differences in daily consumption of healthy foods according to immigrant groups

Russian origin

In the unadjusted models, there were differences in terms of sex, age and household size in the consumption of healthy foods among Russians (Table II). These differences were also significant

after adjustment for the other sociodemographic factors. The adjusted ORs were slightly smaller but not affected by confounding factors. In the adjusted model, women, the oldest age group and individuals with a larger household size were more likely to have higher consumption of healthy foods than others. Women were 1.87 times more likely to consume fruits and berries than men. Fresh vegetables (OR=1.91) and fruits and berries (OR=2.14) were most likely to be consumed in the oldest age group. Slices of rye bread consumed were likely to increase within increasing household size. Education and place of residence were not related to any dietary factor, and fish consumption was not associated with any of the sociodemographic factors.

Kurdish origin

Differences in the consumption of healthy foods among Kurds were observed by sex, age, place of residence and household size in the unadjusted models (Table III). In the adjusted models, women were more likely than men to consume vegetables and rye bread. The oldest age group was nearly two times more likely to consume fruits and berries (OR=1.94) daily than the youngest one. Kurds with the highest educational level were more likely to eat vegetables (OR=1.85) than ones with no education. Fresh vegetables (OR=0.61) were less likely to be consumed by Kurds living in the metropolitan area. However, individuals living in the metropolitan area were more likely to frequently consume fish (OR=1.60) than those living in other municipalities. Fresh vegetables (OR=0.44) were less likely to be consumed daily by Kurds with a smaller household size than in larger households.

Somali origin

Differences in the consumption of healthy foods found among Somalis in the unadjusted models included age, education, place of residence and household size (Table IV). In the adjusted models, Somalis within the older age groups were less likely to consume fresh vegetables and fruits and berries. The 30-44-year-olds were more likely to consume fish (OR=2.17), and rye bread was more

likely to be consumed among the oldest age groups (30-64-year-olds) than the younger ones. Fresh vegetables (OR=5.35) were more likely consumed by Somalis with the highest educational level than by the ones with no education. Fresh vegetables (OR=0.10) and fruits and berries (OR=0.24) were less likely to be consumed by Somalis living in the metropolitan area than by those living in the other municipalities. Household size was not associated with any of the food groups after multivariate adjustment.

Discussion

In this study, the consumption of four selected food groups representing healthy foods: vegetables, fruits and berries, fish and rye bread, and the sociodemographic determinants of their consumption by the largest immigrant groups in Finland: those of Russian, Somali and Kurdish origin, were examined. Our findings revealed ethnic differences in the consumption of healthy foods among all of the studied immigrant groups in Finland. Russian immigrants had higher consumption of healthy foods than the participants of Kurdish and Somali origin. Low consumption rate of fresh vegetables and fruits and berries was found in the Somali group. Fish consumption was lower than recommended in all groups, especially Kurds. The diet of women was closer to the nutrition recommendations than that of men. Older participants were more likely to have higher consumption of healthy foods, with the exception of less frequent consumption of fresh vegetables and fruits and berries among older Somalis. High educational level, and living outside the metropolitan area were positively associated with consumption of healthy foods. However, place of residence showed some contradictory associations and the results were not uniformly strong in the food items across the immigrant groups.

The selection of the four food groups (vegetables, fruits and berries, fish and rye bread) as indicators of healthy food consumption was based on their positive association with health [5] and their central role within the Finnish food culture. The importance of vegetables, fruits and berries

and rye bread as sources of vitamins, minerals and dietary fibre has long been emphasised. In addition, the fish consumption recommendation (2-3 times/week) contributes to an adequate vitamin D intake [6].

Dietary habits among immigrants, living in Finland, have not to date been extensively studied [18]. To the best of our knowledge, this study is the first to investigate consumption of healthy foods in association with sociodemographic factors among Russian, Somali and Kurdish immigrants in Finland. Dietary changes after migration may affect nutritional quality, either in positive or negative way, and thus are key explanatory factors of health status. Such dietary changes are influenced by sociodemographic, economic and cultural factors as well as by the level of exposure to the host country [2].

Comparing the results of the present study with those of the Health 2011 study, performed in the same timeframe and manner in the general Finnish population [19], the food consumption pattern among the immigrants here is similar to that of the Finnish population with respect to higher healthy food consumption among older age groups and women. Higher intake of fruits and berries among older Russian and Kurdish immigrants, and more frequent rye bread consumption among older Somalis were similar to findings for the Finnish population. Moreover, similar sex differences in the consumption of vegetables and fruits and berries were found.

In further comparison with the general Finnish population, based on the recent national Finnish dietary survey, FINDIET 2012 [15], the consumption frequency of rye bread and fish in Russians and Somalis, and fruits and berries in Russians and Kurds were not much different from that of the general Finnish population. The consumption of fresh vegetables seems to be higher in Finnish population than among the immigrant groups of this study. However, the dietary assessment method used in the FINDIET 2012 Survey was 48-hour dietary recall and thus the results on food consumption are not directly comparable with ours.

The higher consumption of fresh vegetables and rye bread by Russians may be traced, in part, to the fact that Russia and Finland are neighbouring countries with somewhat similar food cultures and use of some similar traditional food products, such as rye bread [8]. Hence, Russians are more easily adapted to the Finnish food habits. Our result of a higher consumption of fruits and berries than vegetables among Kurds is opposite to that of a study in Iran, where vegetables were consumed in greater numbers than fruits [20]. A similar result of low daily intake of fruit (97%) and vegetables (92%) was reported among the Somali population in the United Kingdom [21]. An unclear definition of a balanced diet or what constitutes a healthy diet has earlier been reported for Somalis [21,22]; this topic warrants further investigation in Finland, and if findings support this contention, an intervention should follow.

Traditionally, Somalis eat a variety of breads such as enjera (made from teff and sorghum flour) or muufo (made from corn flour), for breakfast and dinner [22]. Hence, this might have influenced their high intake of rye bread in this study. Rye bread is regarded as a traditional Finnish food; its higher consumption rate among immigrants may also be associated with its frequent provision in the canteens and other food services of schools and educational institutions. Adoption of rye bread as a part of the daily diet among immigrants will bring some health benefits if replacing the use of less nutritious white bread.

The low fish consumption in our study confirmed previous findings. Among Somalis, occasional fish intake was earlier reported and this lends credence to meat being a valued food item in Somali meals based on a cultural perspective that “if there is no meat, it is not a Somali meal.” [22]. According to Ahadi et al. [23], fish was rarely eaten weekly in Iranian households (Kurdish), as opposed to meat and poultry.

Higher consumption of healthy foods, especially fruit and vegetable, has been consistently reported in women [7,24]. The significant result of more frequent vegetable consumption by Kurdish women

than Kurdish men is supported by an earlier study [25]. Our result concerning higher consumption of fruits by Russian women than men is in line with previous studies conducted among Russians [9,26]. The lower frequency of healthy food consumption observed among men may be explained by fewer men than women knowing the current nutrition recommendations and being aware of the associations between healthy food consumption, especially fruits and vegetables, and disease prevention [24]. However, eating is not always driven by recommendations, but by hunger or pleasure. Hence, there may be little motivation for maintaining a healthy diet among men.

An association between the frequency of fruit and vegetable consumption and age, among both men and women, has been reported in other studies [7,10]. The positive association between age and consumption of healthy foods in our study, among Russians and Kurds, may be explained by increased health concerns with age. Our observation in Kurds is inconsistent with earlier studies in which older age was associated with lower consumption of fruit [20,25].

As expected, an increase in the consumption rate of vegetables was associated with a high level of education among Kurds and Somalis. Studies carried out among adults in Iran, Finland, Russia and the Baltic countries found an association between high educational level and frequent intake of fruits and vegetables [7,12,27].

With regard to the place of residence, a previous study among Iranians likewise found fish to be mostly eaten weekly by urban families in Iran [23]. However, contrary to our result among Kurds, vegetables were more consumed by urban households in the earlier study [23]. The results of Ahadi et al. [23] can be attributed to a high level of education and nutrition knowledge among urban households. Despite equal accessibility to healthy foods in all Finnish municipalities, the availability and easy access to variety of fast foods and unhealthy food choices may be one explanatory factor for the lower fruit and vegetable intake of Kurds and Somalis living in the metropolitan area.

Our study showed positive association between increased household size and rye bread consumption among Russians and Kurds, and with fresh vegetable consumption in Kurds. This may be due to increasing dietary diversity in larger households [28], unlike a one-person household where simple meals [29], probably of a lesser quality, are adopted. The presence of a woman [29] and children in the household is also likely to encourage better-quality diets.

Strengths and limitations

This study has some limitations. Firstly, the high non-response rate, which was majorly due to inability to reach the subjects, resulted in a small sample size study. Even though the participation rate was satisfactory, the effects of non-response to dietary questions in the Maamu study may not be completely corrected in the weighting analyses. Furthermore, care must be taken when generalizing the results of this study outside Russian, Somali and Kurdish populations in Finland. Secondly, the dietary questions employed were designed to measure consumption frequencies and eating habits among the immigrant population groups. Hence, food consumption cannot be evaluated quantitatively. In addition, the dietary questions, due to their structure, cannot assess food consumption in terms of adherence to food recommendations. The dietary questions were also limited because they were based on previous population surveys in Finland and on Finnish food culture. The dietary questions may not reveal the full dietary patterns of the immigrants in this study, as they were meant to measure adherence to the Finnish dietary recommendations. Nevertheless, the questions were indicators of integration and adaptation to the Finnish diet. The uncommon consumption of fresh vegetables and fruits and berries among Somali participants may be due to the question focusing on fresh, uncooked vegetables. An earlier study found that such vegetables as carrots, peas, green peppers, spinach and garlic were reported to be commonly consumed among Somalis living in the United States and that the vegetables are usually cooked together with meat or in stews [30]. Among fruits, raw sliced banana was often consumed with rice

[30]. Vegetables were reported to be often consumed, either as part of the main course or in a salad, in the focus group discussions conducted among Somali men and women, also in the United States [22]. Another explanation for the discrepancy may be misclassification or misidentification of foods not popular in the participants' home country. The adoption of different cut-offs for the consumption of vegetables and fruits and berries among Somalis affect comparisons with other groups.

Despite the stated limitations, an important strength of the study is that the sample represents large immigrant groups from a few different parts of Finland. In 2014, the Russian-speaking population remains the largest foreign language-speaking population in Finland, representing about 22% of the foreign language population. Somali speakers are the fourth largest population, while Kurdish speakers are the sixth largest population of foreign origin in Finland [1]. It is worth noting that the interviews and health examinations in the Maamu study were conducted in the participants' native language. Hence, the quality and reliability of Maamu data are regarded rather high. In relation to increasing immigration around the world, our study provides an up-to-date insight into immigrants' consumption of healthy foods. It also provides novel information about the association between sociodemographic factors and food habits among three different groups of immigrants especially in Finland.

Conclusions

Differences were present in healthy food consumption among immigrants of Russian, Somali and Kurdish origin in Finland, and associations emerged between sociodemographic factors and the food consumption within each immigrant group. Immigrants from Russia had higher consumption of healthy foods than their Kurdish and Somali peers. Low intake of fresh vegetables and fruits and berries in Somali adults was common. In all groups, especially Kurds, fish consumption was lower than recommended. Sex differences in food consumption suggested that women had healthier food

consumption than men. Older age groups and individuals with high educational level also experience higher consumption of healthy foods. Efforts to improve food consumption towards adherence to the nutrition recommendations among all immigrant groups, particularly adequate intake of fruits, berries and vegetables in Somalis, are required. Further studies regarding the low consumption of fruits, berries and fresh vegetables among Somali immigrants in Finland are needed. Future studies should also focus on more detailed measurements of food consumption and diversity within each immigrant group.

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Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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Table I. Socio-demographic factors and consumption of healthy foods by immigrant group and sex among the respondents to dietary questions.

	Russian (527)					Kurdish (508)					Somali (337)				
	Men (188) 36%		Women (339) 64%		*P* Value	Men (291) 57%		Women (217) 43%		*P* Value	Men (156) 46%		Women (181) 54%		*P* Value
	N	%	N	%		N	%	N	%		N	%	N	%	
Age (years)															
18-29	67	36	86	25	**0.010**	110	38	66	30	0.211	69	44	73	40	0.738
30-44	64	34	100	30		120	41	103	48		59	38	70	39	
45-64	57	30	153	45		60	21	48	22		28	18	39	21	
Basic education															
No	-	-	-	-	**0.035**	20	7	38	17	**0.001**	20	13	58	33	**<0.001**
Basic school/equivalent	48	25	56	17		148	51	86	40		71	46	89	50	
High school/equivalent	141	75	282	83		123	42	93	43		65	41	31	17	
Place of residence															
Metropolitan Area	143	76	274	81	0.147	162	56	115	53		132	85	160	88	0.190
Other Municipalities	45	24	64	19		128	44	102	47	0.537	24	15	21	12	
Years in Finland															
<=5	39	21	70	21	0.096	66	23	39	18	0.424	32	21	42	24	0.630
6-14	91	48	129	38		152	52	119	55		67	43	67	37	
>=15	59	31	139	41		73	25	59	27		56	36	70	39	
Marital status															
Married/Partnership/ Cohabitation	105	56	195	58	0.727	184	63	147	68	0.342	99	64	119	67	0.588
Other	83	44	144	42		106	37	70	32		57	36	59	33	
Household size															
1 person	52	27	69	20	0.083	90	31	15	7	**<0.001**	46	29	13	7	**<0.001**
2-4 persons	124	66	257	76		137	47	140	64		52	33	69	38	
> 4 persons	13	7	13	4		64	22	62	29		58	38	99	55	
Rye bread daily															
No	42	22	66	20	0.507	157	54	59	27	**<0.001**	33	22	57	31	0.083
Yes	145	78	272	80		134	46	157	73		119	78	124	69	
Vegetables per week															
Not at all	5	3	12	4	0.417	16	6	9	4	**0.020**	6	4	31	17	NA
1-2 days/week	28	15	36	11		83	28	45	21		142	92	142	78	
3-5 days/week	51	27	79	23		82	28	51	23		6	4	5	3	
6-7 days/week	104	55	211	62		110	38	112	52		0	0	3	2	
Fruits and berries per week															
Not at all	9	5	4	1	**0.002**	8	3	5	2	0.191	10	6	42	23	NA
1-2 days/week	38	20	43	13		67	23	38	18		135	87	12	71	
3-5 days/week	51	27	67	20		46	16	26	12		11	7	9	5	
6-7 days/week	90	48	224	66		170	58	148	68		0	0	2	1	
Fish per week															
Not at all	11	6	8	2	0.267	50	17	28	13	0.432	6	4	29	16	**<0.001**
1 time per week/rarely	96	51	146	55		181	62	152	70		86	55	91	50	
≥ 2 times per week	81	43	145	43		60	21	37	17		64	41	61	34	

Significant differences between men and women are presented in bold. *P* values <0.05 from Chi-square test.

Basic education: No = participant had not received formal school education; Basic education or equivalent = attended either primary school or the equivalent / part of primary school or primary school and secondary school or equivalent / part of junior high school; High school or equivalent = attended high school or part of high school or an equivalent school.

Place of residence: Metropolitan area = Helsinki, Espoo and Vantaa; Other municipalities = Turku, Tampere and Vaasa.

Marital status category "Other" = divorced or living apart, widowed or unmarried.

Rye bread daily: Yes = ate ≥ 1 slice.

Fish per week: ate fish 1 time per week/rarely (1-2 times per month or once per week); ate fish ≥ 2 times per week (i.e. 2 times per week or, 3 or more times per week).

NA = Not applicable (too few observations for statistical analysis in the cell "6-7 days/week").

Missing information: For Russians: rye bread (n=2), fruits and berries (n=1).

For Kurds: education (n=1), years in Finland (n=1), rye bread (n=1).

For Somalis: education (n=2), years in Finland (n=3), marital status (n=4), rye bread (n=4), vegetables (n=2).

Table II. Associations between sociodemographic factors and consumption of selected food groups among Russian participants (n=527).

	Vegetables (6-7 days/week)		**Fruits and berries (6-7 days/week)**		**Fish (at least 2 times/week)**		**Rye bread (at least 1 slice/day)**	
	Unadjusted OR (95% CI)	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**
Sex								
Men	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Women	1.33 (0.89-2.01)	1.21 (0.79-1.86)	**2.13 (1.41-3.21)**	**1.87‡ (1.21-2.90)**	1.00 (0.67-1.50)	0.87 (0.57-1.33)	1.18 (0.73-1.93)	1.10 (0.66-1.83)
Age (years)								
18-29	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30-44	1.37 (0.83-2.28)	1.28 (0.75-2.19)	1.41 (0.85-2.34)	1.16 (0.68-1.97)	1.04 (0.62-1.75)	0.90 (0.52-1.54)	1.63 (0.89-2.97)	1.25 (0.67-2.31)
45-64	**2.00 (1.22-3.27)**	**1.91‡ (1.14-3.19)**	**2.52 (1.53-4.17)**	**2.14‡ (1.27-3.59)**	1.57 (0.97-2.56)	1.43 (0.86-2.36)	1.64 (0.93-2.90)	1.50 (0.84-2.70)
Basic education								
No								
Basic school/equivalent	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
High school/equivalent	0.79 (0.48-1.30)	0.66 (0.39-1.13)	1.29 (0.80-2.10)	1.01 (0.60-1.71)	1.47 (0.89-2.41)	1.35 (0.82-2.24)	1.35 (0.77-2.37)	1.16 (0.64-2.11)
Place of residence								
Metropolitan area	1.00 (0.68-1.44)	0.91 (0.61-1.34)	1.03 (0.70-1.50)	0.88 (0.59-1.32)	1.20 (0.83-1.74)	1.13 (0.77-1.67)	1.23 (0.79-1.92)	1.16 (0.74-1.83)
Other municipalities	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Household size								
1 person	0.91 (0.36-2.31)	0.79 (0.29-2.10)	0.55 (0.21-1.42)	0.44 (0.16-1.18)	0.67 (0.25-1.73)	0.57 (0.21-1.59)	**0.01 (0.00-0.08)**	**0.01‡ (0.00-0.08)**
2-4 persons	1.81 (0.76-4.31)	1.53 (0.62-3.73)	1.46 (0.60-3.53)	1.09 (0.44-2.73)	1.32 (0.54-3.21)	1.14 (0.45-2.89)	**0.02 (0.00-0.13)**	**0.02‡ (0.00-0.12)**
> 4 persons	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Significant associations are presented in boldface. Odds ratios (ORs) and 95% confidence intervals (CIs) from logistic regression.
Unadjusted: only sociodemographic variables of interest were included in the model.
Adjusted: all other sociodemographic variables were included in the model. ‡ Statistically significant adjusted results.
Basic education: No = participant had not received formal school education; Basic education or equivalent = attended either primary school or the equivalent / part of primary school or primary school and secondary school or equivalent / part of junior high school; High school or equivalent = attended high school or part of high school or an equivalent school.
Place of residence: Metropolitan area = Helsinki, Espoo and Vantaa; Other municipalities = Turku, Tampere and Vaasa.
Fish at least 2 times/week = ate fish 2 times per week or, 3 or more times per week.
Rye bread daily at least 1 slice/day = ate ≥ 1 slice.
Missing information: rye bread (n=2), fruits and berries (n=1).

Table III. Associations between sociodemographic factors and consumption of selected food groups among Kurdish participants (n=508).

	Vegetables (6-7 days/week)		**Fruits and berries (6-7 days/week)**		**Fish (at least 2 times/week)**		**Rye bread (at least 1 slice/day)**	
	Unadjusted OR (95% CI)	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**
Sex								
Men	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Women	**1.77 (1.27-2.47)**	**1.62‡ (1.12-2.34)**	**1.52 (1.08-2.14)**	1.35 (0.94-1.95)	0.79 (0.52-1.19)	0.85 (0.55-1.33)	**3.14 (2.22-4.45)**	**3.22‡ (2.21-4.69)**
Age (years)								
18-29	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30-44	1.15 (0.78-1.68)	0.96 (0.64-1.45)	1.43 (0.98-2.09)	1.28 (0.85-1.92)	0.86 (0.54-1.39)	0.90 (0.55-1.48)	1.20 (0.82-1.74)	1.00 (0.66-1.51)
45-64	**1.65 (1.05-2.57)**	1.48 (0.91-2.40)	**2.21 (1.38-3.55)**	**1.94‡ (1.17-3.20)**	1.22 (0.72-2.08)	1.30 (0.74-2.29)	**1.74 (1.10-2.75)**	1.59 (0.96-2.62)
Basic education								
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Basic school/equivalent	0.82 (0.49-1.39)	1.14 (0.64-2.02)	0.82 (0.47-1.43)	1.01 (0.56-1.81)	1.67 (0.82-3.41)	1.53 (0.73-3.24)	0.66 (0.38-1.13)	0.99 (0.57-1.73)
High school/equivalent	1.25 (0.74-2.11)	**1.85‡ (1.05-3.29)**	0.88 (0.50-1.53)	0.97 (0.54-1.73)	1.56 (0.76-3.22)	1.38 (0.64-2.96)	1.09 (0.63-1.89)	1.65 (0.93-2.91)
Place of residence								
Metropolitan Area	**0.65 (0.47-0.91)**	**0.61‡ (0.43-0.86)**	1.00 (0.71-1.40)	0.96 (0.68-1.37)	**1.66 (1.09-2.53)**	**1.60‡ (1.04-2.45)**	1.14 (0.82-1.59)	1.13 (0.79-1.62)
Other municipalities	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Household size								
1 person	**0.39 (0.23-0.65)**	**0.44‡ (0.25-0.78)**	0.63 (0.38-1.04)	0.80 (0.46-1.37)	1.36 (0.73-2.57)	1.29 (0.66-2.53)	**0.51 (0.31-0.85)**	0.74 (0.43-1.28)
2-4 persons	0.72 (0.49-1.07)	**0.64‡ (0.43-0.97)**	1.35 (0.90-2.02)	1.35 (0.89-2.05)	1.27 (0.76-2.11)	1.21 (0.70-2.10)	0.81 (0.54-1.21)	0.68 (0.44-1.06)
> 4 persons	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Significant associations are presented in boldface. Odds ratios (ORs) and 95% confidence intervals (CIs) from logistic regression.
Unadjusted: only sociodemographic variables of interest were included in the model.
Adjusted: all other sociodemographic variables were included in the model. ‡ Statistically significant adjusted results.
Basic education: No = participant had not received formal school education; Basic education or equivalent = attended either primary school or the equivalent / part of primary school or primary school and secondary school or equivalent / part of junior high school; High school or equivalent = attended high school or part of high school or an equivalent school.
Place of residence: Metropolitan area = Helsinki, Espoo and Vantaa; Other municipalities = Turku, Tampere and Vaasa.
Fish at least 2 times/week = ate fish 2 times per week or, 3 or more times per week.
Rye bread daily at least 1 slice/day = ate ≥ 1 slice.
Missing information: education (n=1), years in Finland (n=1), rye bread (n=1).

Table IV. Associations between sociodemographic factors and consumption of selected food groups among Somali participants (n=337).

	Vegetables (at least 3 days/week)		Fruits and berries (at least 3 days/week)		Fish (at least 2 times/week)		Rye bread (at least 1 slice/day)	
	Unadjusted OR (95% CI)	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**	**Unadjusted OR (95% CI)**	**Adjusted‡ OR (95% CI)**
Sex								
Men	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Women	1.19 (0.43-3.24)	2.21 (0.79.-6.18)	0.82 (0.34-1.98)	1.06 (0.42-2.65)	0.73 (0.45-1.19)	0.75 (0.43-1.30)	0.61 (0.35-1.04)	0.61 (0.33-1.12)
Age (years)								
18-29	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
30-44	**0.23 (0.09-0.58)**	**0.27‡ (0.09-0.82)**	**0.22 (0.08-0.60)**	**0.29‡ (0.10-0.79)**	**2.26 (1.29-3.94)**	**2.17‡ (1.20-3.93)**	**3.46 (1.89-6.33)**	**3.08‡ (1.64-5.76)**
45-64	**0.18 (0.05-0.61)**	**0.24‡ (0.07-0.79)**	0.38 (0.10-1.41)	0.51 (0.13-2.00)	1.11 (0.57-2.17)	1.14 (0.56-2.33)	**3.15 (1.49-6.65)**	**3.34‡ (1.46-7.65)**
Basic education								
No	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Basic school/equivalent	0.81 (0.31-2.09)	1.33 (0.54-3.30)	1.64 (0.70-3.82)	2.07 (0.85-5.08)	1.30 (0.71-2.37)	1.21 (0.62-2.35)	1.20 (0.67-2.17)	1.29 (0.66-2.53)
High school/equivalent	1.14 (0.34-3.85)	**5.35‡ (1.24-23.14)**	1.32 (0.42-4.16)	2.96 (0.84-10.49)	**2.01 (1.03-3.91)**	1.71 (0.79-3.71)	**2.40 (1.10-5.20)**	1.83 (0.74-4.51)
Place of residence								
Metropolitan area	**0.13 (0.05-0.35)**	**0.10‡ (0.03-0.32)**	**0.26 (0.12-0.56)**	**0.24‡ (0.11-0.53)**	1.06 (0.68-1.63)	0.80 (0.47-1.35)	**1.72 (1.09-2.72)**	1.30 (0.75-2.25)
Other municipalities	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Household size								
1 person	2.76 (0.71-10.70)	2.80 (0.58-13.37)	1.58 (0.42-6.04)	1.24 (0.27-5.75)	0.72 (0.36-1.45)	0.69 (0.32-1.48)	0.89 (0.42-1.89)	0.98 (0.40-2.42)
2-4 persons	2.12 (0.69-6.50)	1.85 (0.59-5.79)	2.44 (0.92-6.46)	2.03 (0.71-5.83)	0.76 (0.44-1.31)	0.95 (0.53-1.71)	**0.50 (0.28-0.89)**	0.66 (0.36-1.21)
> 4 persons	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Significant associations are presented in boldface. Odds ratios (ORs) and 95% confidence intervals (CIs) from logistic regression.
Unadjusted: only sociodemographic variables of interest were included in the model.
Adjusted: all other sociodemographic variables were included in the model. ‡ Statistically significant adjusted results.
Basic education: No = participant had not received formal school education; Basic education or equivalent = attended either primary school or the equivalent / part of primary school or primary school and secondary school or equivalent / part of junior high school; High school or equivalent = attended high school or part of high school or an equivalent school.
Place of residence: Metropolitan area = Helsinki, Espoo and Vantaa; Other municipalities = Turku, Tampere and Vaasa.
Vegetables at least 3 days/week = ate vegetables for 3-5 days or for 6-7 days.
Fruits and berries at least 3 days/week = ate fruits and berries for 3-5 days or for 6-7 days.
Fish at least 2 times/week = ate fish 2 times per week or, 3 or more times per week.
Rye bread daily at least 1 slice/day = ate ≥ 1 slice.
Missing information: For Russians: education (n=2), years in Finland (n=3), marital status (n=4), rye bread (n=4), vegetables (n=2).