

Heterogeneity of nutritional habits of Lithuanian ethnolinguistic groups: population-based study

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Background. Lithuania is a Northern European country consisting of two main ethnolinguistic groups: Samogitians and Highlanders. The objective of the paper is to investigate differences in nutritional habits of 18–65-year-old Lithuanians living in different ethnolinguistic regions.

Materials and methods. A representative, population-based, random sample of the 18–65-year-old ethnic Lithuanian population was interviewed from 17 December 2008 to 20 May 2013. Lithuanians living in their ethnolinguistic region for at least three generations were included ($n = 1,133$). We analysed responses to 12 questions about nutritional habits of respondents. For the univariate analysis, we applied the chi-squared test. For the clusterisation of the survey questions, we employed a multiple correspondence analysis (MCA).

Results. Comparing Samogitians' and Highlanders' responses according to their gender, education, and place of residence, we observed more often significant differences ($p < 0.05$) for the urban population, respondents without higher education, and women. The nutrition of Highlanders was more consistent with national and WHO nutritional recommendations. Significant differences were obtained in the consumption of fish ($p = 1.9 \cdot 10^{-12}$), milk ($p = 1.8 \cdot 10^{-4}$) and grain products ($p = 0.01$). MCA revealed that all questions fall into three groups with a different composition for Samogitians and Highlanders. We failed to demonstrate the impact of different nutritional habits on the body mass index.

Conclusions. According to the univariate and multivariate analysis, the nutritional habits of Lithuanian ethnolinguistic regions are heterogeneous. Dependency on an ethnolinguistic region might be considered an important factor for the preparation of appropriate health and nutrition education and disease prevention programmes. The issue of excess weight remains equally important for both ethnolinguistic groups.

Keywords: nutrition, life style, overweight, social determinants of health, Lithuanian population, public health

INTRODUCTION

Accurate data on dietary habits are crucial for understanding the influence on disease and for informing policy priorities. Some studies show differences in nutritional habits between countries and monitor them over time, emphasising the importance of harmonised databases and methods (1–3). There are, however, few studies that analyse the nutritional habits of a single population. Ethnic differences in obesity among immigrants from developing countries were studied in Oslo. This study showed large differences in generalised and central obesity (4). Another study indicated the importance of family and personal migration histories for policies for those who are overweight and obese (5).

We bring scientific novelty by studying the nutritional habits of ethnolinguistic groups in one country, Lithuania. From psychological (6), anthropological (7) and genetic studies (8) we know that the ethnic Lithuanian population is not homogeneous. Lithuania is a Northern European country consisting of two main ethnolinguistic groups: Samogitians and Highlanders. According to the 2011 population census data (9), 84.2% of the population are ethnic Lithuanians. It is estimated that the ethnic Lithuanian population consists of 24.5% Samogitians and 75.5% Highlanders (10). These historically formed ethnolinguistic groups have different cuisine and traditions possibly intergenerationally transferred (11). Therefore our hypothesis is that nutritional habits should be distinct between Samogitians and Highlanders. Potentially different food consumption patterns might have a different impact on overweight and obesity, consequently needing different health and nutrition education and disease prevention programmes by public health bureaus (12). Although the nutrition of the inhabitants of Lithuania is monitored every few years according to gender, education and demographics (13–15), differences in nutrition between the different ethnolinguistic groups have never been studied.

Although traditional statistical methods are still popular for survey analysis, data mining techniques are increasingly applied for surveys (16). If the survey data is of a qualitative type, a multiple

correspondence analysis (MCA) can be applied to analyse all data simultaneously. MCA is analogous to a factor analysis of continuous variables. The differences between the distributions of preferences are measured by chi-squared distances (17). A nutrition survey analysis using MCA has never been performed in Lithuania before.

The objective of the paper is to investigate differences in the nutritional habits of 18–65-year-old Lithuanians living in different ethnolinguistic regions.

MATERIALS AND METHODS

Participants

For representativity, randomly selected participants were recruited through 36 local primary healthcare centres representing the three ethnolinguistic sub-regions of each ethnolinguistic region: Western, Eastern and Southern Highlanders, and Northern, Western and Southern Samogitians. To insure ethnicity, the family of all participants must have been living in their ethnolinguistic region for at least three generations.

The survey was conducted from 17 December 2008 to 20 May 2013. Ethical approval for the biomedical research was obtained from the Vilnius Regional Biomedical Research Ethics Committee (No. 158200-05-329-79) and an informed written consent was received from each participant.

Data collection

In the study we used the questionnaire created by the World Health Organisation (WHO) Regional Office for Europe for nutritional and lifestyle analysis in the Baltic countries (15). According to international guidelines, the National Nutrition Centre (State Environmental Health Centre since 1 October 2008) has been carrying out studies of the nutritional and lifestyle habits of the adult Lithuanian population using this questionnaire every five years since 1997 (18).

Individuals of Lithuanian descent completed the questionnaire, which contains 34 questions. The questionnaire included the questions about demographic, health behaviours, selected dietary habits and food beliefs. In this paper we analyse 12 questions about nutritional habits (detailed

information about the questions in the Nutritional habits section). As potential confounders, information about age, gender, education and region (urban or rural) were used. One outcome, the variable body mass index (BMI, units kg/m²), was calculated from the self-reported weight and height.

Statistical analysis

We report continuous variables as mean \pm standard deviation (M \pm SD). The normality of these variables was tested using the Kolmogorov–Smirnov and Shapiro–Wilk tests. The tests revealed that the variables were not distributed normally, and therefore the Mann–Whitney U criterion was used to compare distributions.

The homogeneity of frequency distributions was assessed by applying the chi-squared test and multiple correspondence analyses. The multiple imputation procedure was applied to fill in the missing data.

The data analysis was performed using the IBM SPSS Statistics v19 (IBM Corp., Somers, NY, USA) and R v3.1.0 (The R Foundation, Vienna, Austria). For the MCA, the FactoMineR package was applied (19), and for the multiple imputation we used the mi package (20). The level of significance was set at 0.05.

RESULTS

General characteristics of the sample

During the survey period, 1,436 inhabitants of Lithuania were interviewed with questionnaires. After rejection of the records that did not conform to the age ($n = 300$) and records in which gender was not specified ($n = 3$), the responses of 1,133 respondents were used for further statistical analysis. The question response rate was between 90.8 and 99.5%.

Samogitians and Highlanders accounted for 49 and 51%, respectively, of all respondents. Women made up 56% of all respondents: 51% of Samogitians and 61% of Highlanders. Respondents having only primary, secondary or special education amounted to 63% (66% of Samogitians and 61% of Highlanders), and those having higher education amounted to 37% (34% of Samogitians and 39% of Highlanders). Of the respondents, 69% (69% of Samogitians and 69% of Highlanders) indicated that they lived in a city.

We found that the average age of Highlanders was statistically significantly higher than the average age of Samogitians (Table 1), indicating that age might be a confounder for the differences in nutritional habits.

Table 1. Comparison of the average age (in years) between the ethnolinguistic groups by gender, education, and place of residence

	All respondents			Samogitians			Highlanders			<i>p</i> -value
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Gender										
Male	495	42.1	11.9	271	42.0	12.1	224	42.2	11.7	0.689
Female	638	42.5	11.5	287	41.1	11.6	351	43.7	11.3	0.003
Total	1133	42.3	11.7	558	41.5	11.9	575	43.1	11.5	0.012
<i>p</i> -value	–	0.810	–	0.241	–	0.233	–	–	–	–
Education										
Primary, secondary or special	698	42.9	12.3	357	42.1	12.4	341	43.7	12.1	0.050
Higher	404	41.0	10.7	184	40.0	10.8	220	41.9	10.5	0.067
Total	1102	42.2	11.7	541	41.4	11.9	561	43.0	11.5	0.016
<i>p</i> -value	–	0.001	–	0.016	–	0.012	–	–	–	–
Region										
Urban	786	42.8	11.7	386	42.0	11.9	400	43.6	11.5	0.048
Rural	346	41.2	11.6	172	40.4	11.7	174	42.1	11.4	0.128
Total	1132	42.3	11.7	558	41.5	11.9	574	43.1	11.5	0.012
<i>p</i> -value	–	0.033	–	0.152	–	0.109	–	–	–	–

Grey background indicates significant differences; Mann–Whitney U test *p*-value <0.05.

We did not find any statistically significant differences in our outcome variable, BMI, between the ethnolinguistic groups (Table 2). The necessary data for BMI calculation was provided by 94% of respondents (48% of Samogitians and 52% of Highlanders). The average BMI of men was statistically significantly higher than the average BMI of women. The average BMI of respondents with higher education was statistically significantly lower than

the average BMI of respondents who had attained only primary, secondary or special education.

Knowing that the average might not reveal a difference in the BMI of the ethnolinguistic groups, we analysed the BMI categories (Fig. 1). We found that 41% of Samogitians and 38% of Highlanders had normal BMI (18.5–24.99) and about 60% of the respondents had excessive body weight, with close to 23% of the respondents be-

Table 2. Analysis of the average body mass index (kg/m^2) of the respondents by ethnolinguistic group, gender, education, and place of residence

	All respondents			Samogitians			Highlanders			<i>p</i> -value
	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Gender										
Male	460	27.3	4.6	246	27.2	4.2	214	27.4	5.1	0.836
Female	609	26.5	5.4	269	26.5	5.5	340	26.6	5.4	0.469
Total	1069	26.9	5.1	515	26.8	5.0	554	26.9	5.3	0.690
<i>p</i> -value	–	$4.76 \cdot 10^{-4}$	–	–	0.003	–	–	0.037	–	–
Education										
Primary, secondary or special	656	27.3	5.3	326	27.2	5.0	330	27.5	5.6	0.535
Higher	389	26.0	4.7	175	25.9	4.6	214	26.1	4.7	0.634
Total	1045	26.8	5.1	501	26.7	4.9	544	26.9	5.3	0.578
<i>p</i> -value	–	$1.13 \cdot 10^{-4}$	–	–	0.006	–	–	0.005	–	–
Region										
Urban	746	26.7	5.0	358	26.6	4.8	388	26.7	5.2	0.828
Rural	322	27.3	5.4	157	27.2	5.2	165	27.5	5.6	0.651
Total	1068	26.9	5.1	515	26.8	5.0	553	26.9	5.3	0.665
<i>p</i> -value	–	0.094	–	–	0.345	–	–	0.165	–	–

Grey background indicates significant differences; Mann–Whitney U test *p*-value <0.05.

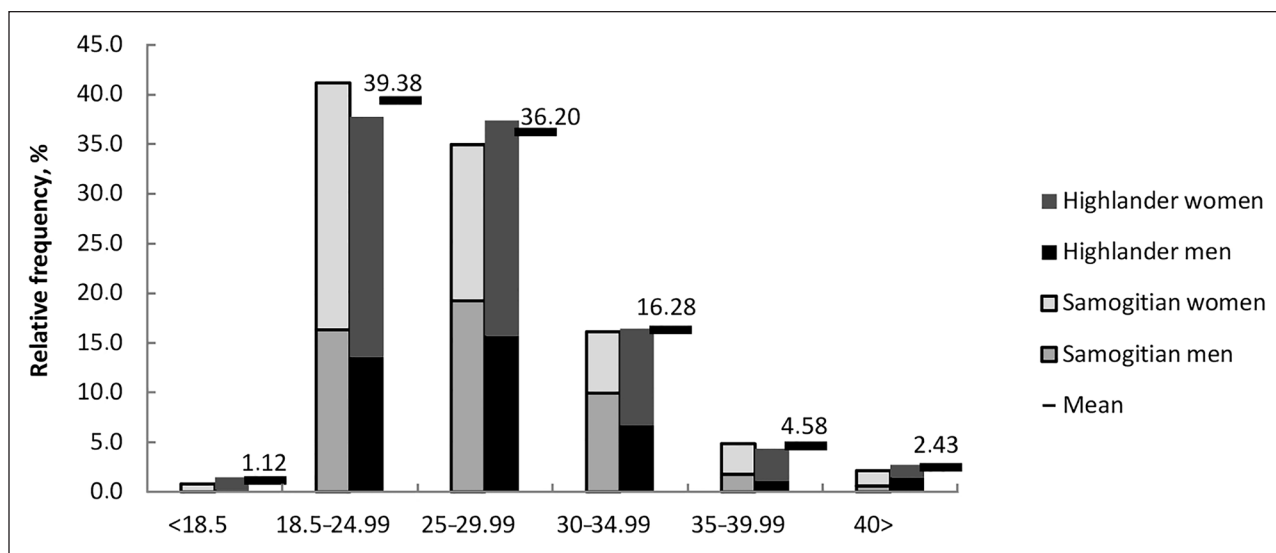


Fig. 1. Distribution of the body mass index between the ethnolinguistic groups

ing obese. There were no statistically significant differences in the BMI categories of the two ethnolinguistic groups.

Although we did not find any statistically significant differences in our outcome variable, BMI, between the ethnolinguistic groups, we used it as a supplementary variable in the MCA.

Nutritional habits

From the univariate analysis of nutritional habits, based on the chi-squared test, one can observe somewhat different habits (Table 3). Consumption

of fish was the most distinctive difference, as we found significant differences with respect to all factors analysed. About half (47% total: 38% Samogitians, 56% Highlanders) of Lithuanians ate fish and fish products 1–2 times per week.

Another habit that was different was the consumption of milk and dairy products. About 28% of all Lithuanians (25% of Samogitians and 30% of Highlanders) used the latter products each day. According to the analysis, Highlanders consumed milk and dairy products more often than Samogitians.

Table 3. Comparison of the nutritional habits of ethnolinguistic groups: chi-squared test, *p*-values

Question	Label for MCA	Total	Gender		Education		Region	
			Male	Female	Primary, secondary or special	Higher	Urban	Rural
1. The main criteria according to which you choose food:								
1.1. Improvement of health (disease prevention)	health	0.89	0.28	0.14	0.64	0.95	0.81	0.57
1.2. Necessity for special diet	diet	0.34	0.12	0.89	0.34	0.72	0.56	0.41
1.3. Price	price	0.36	0.86	0.17	0.54	0.01	0.20	0.85
1.4. Palatability	taste	0.86	0.88	0.68	0.61	0.90	0.95	0.76
1.5. Influence of family members	family	0.50	0.95	0.45	0.18	0.37	0.55	0.03
2. How many times do you eat vegetables (excluding potatoes)?								
2.1. Fresh	veg_fresh	0.09	0.38	0.09	0.20	0.37	0.03	0.81
2.2. Boiled or steamed	veg_boil	0.09	0.94	0.04	0.14	0.14	0.05	0.82
3. How often do you eat grain products (bread, porridge, etc.)?								
4. How often do you eat fish and fish products?	fish	$1.9 \cdot 10^{-12}$	$1.7 \cdot 10^{-3}$	$2.2 \cdot 10^{10}$	$1.8 \cdot 10^{-10}$	0.04	$8.6 \cdot 10^{-11}$	0.01
5. How often do you eat meat and meat products?								
6. How often do you consume milk and dairy products?	milk	$1.8 \cdot 10^{-4}$	0.07	0.01	0.03	0.01	$3.2 \cdot 10^{-5}$	0.09
7. Do you salt already prepared meals?								
7. Do you salt already prepared meals?	salt	0.04	0.31	0.10	0.27	0.07	0.11	0.26
8. Which fats do you most frequently use for cooking (for frying, boiling or stewing)?								
8.1. Butter	butter	0.06	0.06	0.32	0.11	0.35	0.01	0.84
8.2. Margarine	marge	0.33	0.53	0.41	0.42	0.11	0.12	0.72
8.3. Vegetable oil	oil	0.17	0.87	0.07	0.05	0.69	0.26	0.34

Table 3. (continued)

8.4. Animal fats	fat	0.29	0.63	0.34	0.06	0.45	0.15	0.82
9. Do you always eat at the same time?	regime	0.01	0.15	0.05	0.16	0.04	0.02	0.35
10. Do you also eat between the main meals?	snack	0.14	0.79	0.05	0.04	0.93	0.49	0.12
11. Do you think that your nutrition is appropriate (good) and you get enough nutrients?	prop_diet	$3.5 \cdot 10^{-3}$	0.92	$1.1 \cdot 10^{-3}$	$2.9 \cdot 10^{-4}$	0.67	$2.2 \cdot 10^{-3}$	0.40
12. Do you consume food supplements (vitamins, minerals, amino acid products, etc.)?	supplem	0.12	0.02	0.34	0.41	0.16	0.10	0.41

Gray background indicates significant differences; p -value < 0.05 .

We found significant differences between the ethnolinguistic groups in the consumption of grain products (bread, porridge, etc.) and salt, the nutrition regimen (eating at the same time), and the perception of nutrition appropriateness (goodness). Of total respondents 58% (60% of Samogitians and 56% of Highlanders) indicated that they consume grain products every day and several times a day. Just above half of total respondents (58% of Samogitians and 51% of Highlanders) indicated that they add additional salt if a dish is not salty enough. A total of 72% (76% of Samogitians and 69% of Highlanders) indicated that they usually do not follow a nutrition regimen. According to perception, 42% of Samogitians and 50% of Highlanders (46% in total) indicated that their

nutrition was inappropriate and it did not provide enough nutrients.

In general, comparing Samogitians' and Highlanders' responses with respect to their gender, education, and place of residence, we obtained more significantly different results for the urban population, respondents without higher education, and women.

MCA confirmed the univariate analysis findings that the ethnic Lithuanian population is heterogeneous with respect to nutrition habits. All confounding variables, including BMI, were introduced in the analysis as supplementary variables at the initial stage. Due to low significance, they were, however, discarded from further analysis. In Fig. 2 one can see that all questions fall into three groups

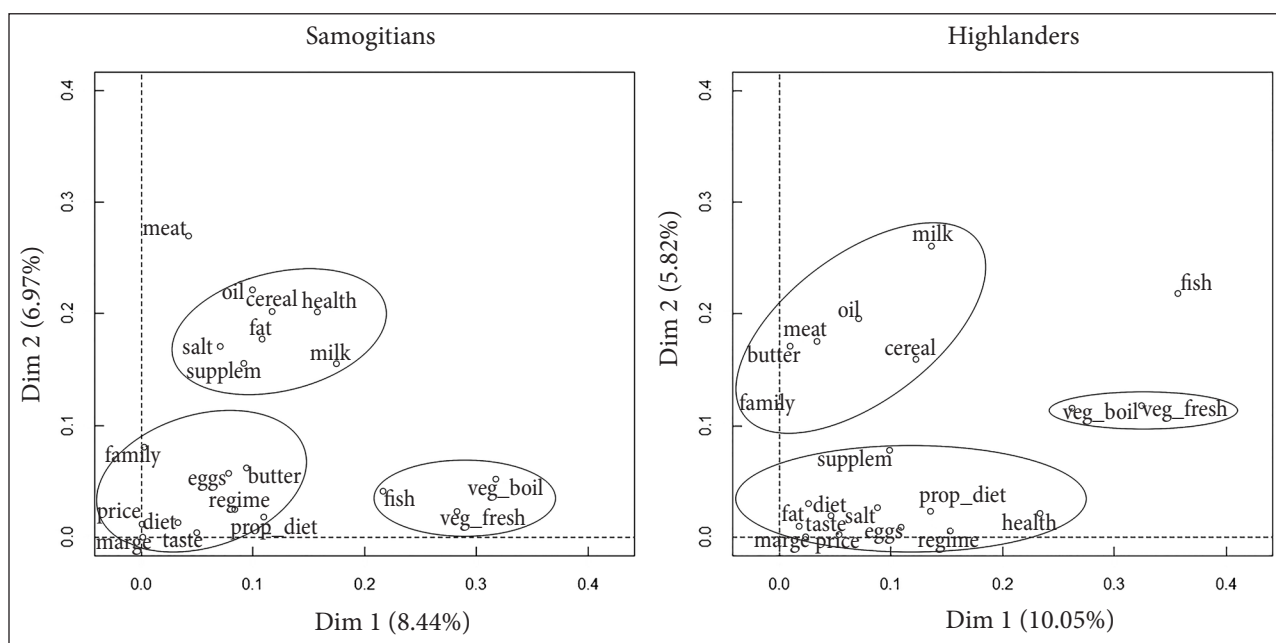


Fig. 2. Differences in Samogitians' and Highlanders' nutritional habits from MCA

with different compositions for Samogitians and Highlanders, indicating different nutritional habits. Highlanders more commonly consume fish and fish products than Samogitians (larger value in both Dimensions 1 and 2). For both groups the fish question is associated with questions about the consumption of fresh and boiled vegetables. It is interesting that the question about meat consumption is associated with oil and butter for Highlanders and with oil and fat for Samogitians. The first two dimensions explain the data variance of 15.87% of Highlanders and 15.41% of Samogitians.

DISCUSSION

Since 1997, the nutritional habits of the inhabitants of Lithuania have been monitored according to gender, education, and demographics every five years. According to the latest published survey of nutrition habits in 2007 (21), fewer than half of the respondents eat fresh vegetables (not including potatoes) every day or almost every day. The consumption of boiled vegetables (not including potatoes) 1–2 times per week is close to 48%. Just over half of the respondents consumed grain products daily or several times per day. The majority of the Lithuanian population eat fish and fish products 1–2 times a week. Every third respondent consumes milk and milk products every day.

In this study we investigated the nutritional habits of ethnic Lithuanians and searched for the differences between two ethnolinguistic groups: Samogitians and Highlanders. In addition to the traditional univariate analysis of a nutrition survey, we used MCA to examine all nutritional questions together. From that analysis we determined that like the entire Lithuanian population, ethnic Lithuanians tend to eat meat almost every day, grain products every day, and boiled vegetables (not including potatoes) 1–2 times per week. We, however, observed a larger proportion (65.1% compared with 43.4%) of respondents eating fresh vegetables (not including potatoes) every day or almost every day. Highlanders tend to eat fresh vegetables each day more often than Samogitians. Fish consumption showed an even more pronounced disparity. It is interesting that the geographical position of Samogitians, who live closer to the sea and might have better access to fish and fish products and better quality fish and fish products, does not

determine higher consumption of fish. Samogitians tend to eat fish products less than 1 time per week, compared with Highlanders eating fish products 1–2 times per week. In addition, unlike the entire Lithuanian population, we observed differences in the consumption of fish with respect to gender, education, and place of residence, indicating that dependence on an ethnolinguistic group might be an important confounding factor for the analysis of nutritional habits. The MCA analysis adds the additional insights that the fish consumption of both ethnolinguistic groups is associated with the consumption of vegetables (not including potatoes). The consumption of meat is associated with other questions such as fats, milk, and grain. Also we determined that age, as a supplementary variable in the MCA analysis, was not significant, confirming homogeneous habits in the age group analysed.

Comparing the nutritional habits of respondents to national and WHO nutritional recommendations (22, 23), the nutritional habits of Highlanders matched nutritional recommendations more closely than the nutritional habits of Samogitians. We observed that both Samogitians and Highlanders consumed vegetables too rarely but meat and meat products too often. Although Samogitians more often than Highlanders consumed grain products, only every second respondent consumed such products every day as recommended. Samogitians more often than Highlanders tended to use salt for already prepared dishes, contradicting nutritional recommendations. Highlanders more often than Samogitians followed a nutrition regimen and consumed fish and fish products as recommended.

Although we found statistical differences in nutritional habits, we failed to demonstrate their impact on BMI. Like many countries in the world, Lithuania faces the public health problem of excess body weight. According to the Statistics Lithuania (24), 48.6% of the Lithuanian population older than 15 years had normal BMI (18.5–24.9), 33.0% were overweight, and 15.1% were obese in 2005. Despite having different age groups, we found a similar pattern in our analysis. The prevalence of being overweight also corresponds to the regular surveys (13–15), although we did find a larger proportion of obese respondents and a lower proportion of overweight respondents. As in the aforementioned studies, we also found

significant average BMI differences with respect to the gender and education for the total sample and for each ethnolinguistic group separately. We could not, however, associate different nutritional habits and excess weight with the ethnolinguistic groups. A logistic regression analysis was applied but no significant results were obtained. In the MCA, BMI, as a supplementary variable, was not significant either. That indicates that despite somewhat different nutritional habits, the issues of excess weight remain equally important for both ethnolinguistic groups.

Limitations of the study

This study had two potential limitations. The quality of the data may have been affected due to the response bias in recall ability and social desirability (25). Also, in the study we used the self-reported height and weight for BMI calculation. The use of self-reported data is, however, common in public health studies as shown in the systematic review by Grober 2007 (26). In that review, it is shown that mean differences in BMI (self-reported minus direct measurement) are underestimated by 0.4 to 1.0 in general population studies. From that one can see our results as favourable. There are, however, no studies about differences in accuracy between the self-reported and measured data for the Lithuanian population, and we cannot quantify the possible bias effect.

CONCLUSIONS

The main ethnolinguistic groups in Lithuania are heterogeneous with respect to nutritional habits; the most significant differences are between the consumption of fish, milk, and grain products. The nutrition of Highlanders is more consistent with national and WHO nutritional recommendations. MCA confirmed the findings of the univariate analysis that the main ethnolinguistic groups in Lithuania are heterogeneous with respect to nutrition habits. Despite distinctive nutritional habits, excess weight remains equally important for both ethnolinguistic groups. Dependency on ethnolinguistic region might be considered an important factor (together with gender, education, and place of residence) for the preparation of appropriate health and nutrition education and disease prevention programmes.

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LIETUVOS ETNOLINGVISTINIŲ GRUPIŲ MITYBOS ĮPROČIŲ HETEROGENIŠKUMAS

Santrauka

Darbo tikslas. Palyginti 18–65 metų amžiaus etninių žemaičių ir etninių aukštaičių mitybos įpročius.

Tyrimo medžiaga ir metodai. Nuo 2008 m. gruodžio 17 d. iki 2013 m. gegužės 20 d. buvo apklausta reprezentatyvi, atsitiktinė 18–65 metų amžiaus 1 133 etninių lietuvių imtis. Tyrime dalyvavo lietuviai, kurių mažiausia trys giminės kartos gyveno viename iš Lietuvos etnolingvistinių regionų: Žemaitijoje arba Aukštaitijoje. Šiame straipsnyje analizuojami respondentų atsakymai į 12 klausimų apie jų mitybos įpročius. Respondentų grupių palyginimui buvo naudojamas Chi kvadratų kriterijus. Etnolingvistinių grupių atsakymai analizuoti daugiamatės atitikties kriterijumi.

Tyrimo rezultatai. Daugiausia statistiškai reikšmingų ($p < 0,05$) žemaičių ir aukštaičių mitybos įpro-

čių skirtumų nustatyta tarp miesto gyventojų, aukštojo išsilavinimo neturinčiųjų respondentų bei moterų. Aukštaičių mityba labiau atitiko nacionalines ir Pasaulio sveikatos organizacijos mitybos rekomendacijas. Reikšmingiausiai skyrėsi žuvies ($p = 1,9 \cdot 10^{-12}$), pieno ($p = 1,8 \cdot 10^{-4}$) ir grūdinių produktų ($p = 0,01$) vartojimas. Daugiamatės atitikties analizė parodė, kad abiejų etnolingvistinių grupių mitybos įpročiai pasiskirsto į tris grupes ir skiriasi tarp žemaičių ir aukštaičių. Nepaisant minėtų etnolingvistinių grupių mitybos įpročių skirtumų, statistiškai reikšmingų kūno masės indekso skirtumų nenustatyta.

Išvados. Mitybos įpročiai skirtinguose Lietuvos etnolingvistiniuose regionuose reikšmingai skiriasi. Priklausymas skirtingiems etnolingvistiniams regionams gali būti laikomas svarbiu veiksniu rengiant atitinkamas sveikatinančios mitybos ugdymo bei ligų prevencijos programas. Antsvorio problema išlieka vienodai svarbi abiejuose etnolingvistiniuose regionuose.

Raktažodžiai: mityba, gyvensena, atsvaris, socialiniai sveikatos determinantai, lietuvių populiacija, visuo-
menės sveikata