

## Socio-economic differences in the use of dairy fat in Russian and Finnish Karelia, 1994–2004

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### Abstract

**Objectives** To determine socio-economic differences from 1994 to 2004 in the use of butter and milk in Pitkäranta in the Republic of Karelia, Russia and North Karelia, Finland.

**Methods** Health behaviour surveys in Pitkäranta ( $n = 3,599$ ) and North Karelia ( $n = 3,652$ ) in 1994, 1996, 1998, 2000 and 2004.

**Results** A clear overall decrease occurred in the use of butter in cooking in Pitkäranta from 1994 to 2004. In both areas, subjects with lower education used butter in cooking and drank fat-containing milk more often. Regarding butter on bread, the educational patterns in the two areas were opposite: in Pitkäranta, subjects with lower education used butter less often but in North Karelia, they used butter on bread more often. Practically, no changes in socio-economic differences from 1994 to 2004 were observed in either area.

**Conclusions** The socio-economic differences in the use of dairy fat were stable in both areas but larger in North

Karelia than in Pitkäranta. Our results support earlier assumptions of a weaker role of education as a determinant of health in Russia than in the western societies.

**Keywords** Socio-economic factors · Education · Dairy fat · Russia · Finland

### Introduction

Mortality and life expectancy in Russia have been characterized by dramatic fluctuations over the past three decades. The increase in mortality was especially rapid in the early 1990s with a peak in 1993–1995. During the later part of the 1990s, mortality rate was declining with a new rising trend at the turn of the millennium. The fluctuations have often been interpreted in the context of the collapse of the Soviet Union in 1991 and the social and political changes connected with it (Cockerham 1997; Meslé et al. 1992; Mezentseva and Rimachevskaya 1992; Murphy et al. 2006; Shkolnikov et al. 1996, 2001; World Bank Europe and Central Asia region Human Development Department 2005; World Health Organization Regional Office for Europe 2005). Health behaviour, such as smoking, physical activity, food habits and use of alcohol, is closely related to cardiovascular diseases (CVDs), Russia's leading cause of death. According to available studies, health behaviour is unfavourable in Russia, compared with almost any industrially developed country. The prevalence of smoking, for instance, is extremely high in Russia, especially among men, over 60% of who smoke (Bobak et al. 2006; Gilmore et al. 2004; Laatikainen et al. 2006; Vlasoff et al. 2008). Studies on physical activity in Russia are scarce, but results from limited regions suggest very low levels of leisure-time physical activity compared with Western Europe

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(Cockerham 1999; Gast et al. 2006; Haenle et al. 2006; Laaksonen et al. 2001; Laatikainen et al. 2006; Matilainen et al. 1994; Palosuo et al. 1995; Vlasoff et al. 2008). Heavy use of alcohol is considered as an important factor in the fluctuations of mortality, including cardiovascular mortality, in Russia (Jukkala et al. 2008; Leon et al. 2007; Malyutina et al. 2002; Ryan 1995).

Moreover, food behaviour is less beneficial for health in Russia than in EU countries. Consumption of fresh vegetables, fruits, and berries is very low (Laaksonen et al. 2001; Matilainen et al. 1994). Evidence of the use of foods containing fat in the Republic of Karelia shows that substantial changes have occurred since the early 1990s. In 1992, 71% of men and 80% of women in Pitkäranta used butter on bread (Matilainen et al. 1994; Vlasoff et al. 2008). No soft margarine was on the market at that time. In the following years, new fat products were introduced and after 10 years the proportions of men and women using butter on bread were only 43 and 39%, respectively (Vlasoff et al. 2008). Both vegetable oil and butter have been traditionally used in cooking in Russia. However, in Pitkäranta, a notable shift occurred from butter to vegetable oil use in cooking between 1992 and 2002 (Vlasoff et al. 2008).

Socio-economic differences in health behaviour and mortality have been observed in almost all countries for which data exist. Socio-economic differences have also been reported in Russia in total and CVD mortality with a higher risk in the lower socio-economic groups (Malyutina et al. 2004; Plavinski et al. 2003). There is, however, little information on the contribution of socio-economic position to the differences in health behaviour and especially food behaviour. Even less is known about how the differences in food behaviour between socio-economic groups may have changed. Inquiry and measurement of socio-economic position are complex issues in former socialist countries like Russia. Some researchers have suggested that education and occupation may be weaker determinants of health in socialist societies than they normally are in Western societies (Bobak et al. 2000; Palosuo et al. 1998) due to a historically different stratification process and status formation in these societies (Kivinen 1994; Piirainen 1997). For example, high level of education was not a guarantee of higher salary or higher occupational status in the Soviet Union. Similarly, the role of income and money in societies undergoing rapid transformation towards a market economy and relying partly on barter economy has been less straightforward than in countries with a longer history of market economies, such as Finland (Bobak et al. 1998; Heistaro et al. 2001; McKee et al. 1998; Palosuo 2000; Palosuo et al. 1998). Thus, while in Western societies variables indicating health and health-related behaviour usually show relatively regular linear socio-economic

gradients, similar relationships cannot be expected in former socialist or transitional societies.

The Republic of Karelia in Russia and North Karelia in Finland are geographically very close with 296 km of common border (Fig. 1). They have even partly shared a common history as Finnish regions until the end of the Second World War when the district of Pitkäranta was annexed to the Soviet Union. Also, culturally and genetically the two Karelias were close before the Second World War. The majority of Finnish speaking Karelians moved from the district of Pitkäranta to North Karelia after the Second World War. However, there are still some Finnish speaking Karelians in the area. The Republic of Karelia had a limited contact with North Karelia or other foreign countries during the Soviet era and currently the two Karelias are politically, economically and culturally very different. The Republic of Karelia is a part of the Russian Federation. In 2002, the population of the republic numbered 176,000; 37% resided in the capital, Petrozavodsk (Republic of Karelia 2005). In the district of Pitkäranta, there were some 28,000 inhabitants, half living in the city of Pitkäranta. The biggest employers are a pulp factory, the city of Pitkäranta and a quarry. The district of Pitkäranta was originally chosen as a study area, because it represented a typical district in the Republic of Karelia with both industry and agriculture. North Karelia is the most eastern province of Finland with 168,000 inhabitants. The biggest city in North Karelia, Joensuu, has 58,000 inhabitants. In 2006, 8% of working population was occupied in agriculture and forestry, 26% in secondary production and 65% in service sector (Suomen Kuntaliitto 2009).

The comparison of these two areas is interesting for several reasons. The border between Finland and Russia demarcates one of the largest gaps in the standard of living

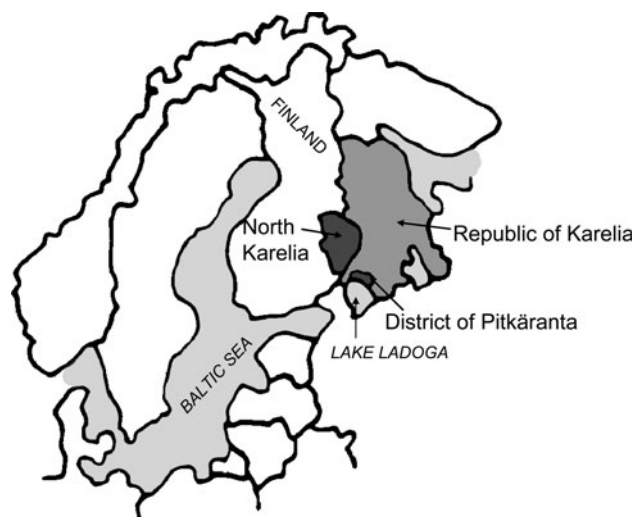


Fig. 1 Map of the study areas

in the world. Finnish North Karelia underwent a rapid positive development with improvements in cardiovascular health and health behaviour including a decrease in the use of dairy fat, partly due to the efforts of comprehensive, community-based intervention, the North Karelia Project, in the 1970s (Puska et al. 2009). The Finnish experiences have been considered relevant to the present developments in Eastern and Central Europe.

This study will focus on changes and socio-economic differences in the use of butter and milk. Butter and fat-containing milk were chosen as focus foods as they were important sources of saturated fat in Finland in the 1970s. Their use has decreased remarkably in Finland thereafter. Several Finnish studies have demonstrated that Finns with lower socio-economic position use more dairy fat (Leino et al. 1999; Petkeviciene et al. 2007). This study draws on data that allow a comparison between two neighbouring areas, the district of Pitkäranta in the Republic of Karelia, Russia and North Karelia in Finland. Results from previous studies give grounds to expect clearer socio-economic variation in Finnish North Karelia than in Russian Karelia.

The aim of this study was to examine whether there were socio-economic differences in the use of butter and milk, and whether they widened, diminished or remained the same from 1994 to 2004 in two culturally different areas. Differences between educational and employment status groups and changes in socio-economic differences within the two areas are compared.

## Methods

The data were collected in both areas by cross-sectional surveys in 1994, 1996, 1998, 2000 and 2004. All surveys were conducted during the spring. In North Karelia, the questionnaires were sent by mail, and in Pitkäranta, nurses from the Central Hospital of Pitkäranta brought the questionnaires to the respondents' homes. The participants were asked to return the questionnaires to their closest hospital or ambulatory clinic. The age range of the subjects included in the analyses of this study was 25–64 years. The subjects were drawn from the National Population Register in Finland. In Pitkäranta, the subjects were drawn from patient records in 1994 and 1996 and from electoral lists in 1998, 2000 and 2004. All surveys, except the 1994 survey in Pitkäranta, were based on a simple random sample. In 1994, the sample in Pitkäranta was stratified with each 10-year age group having an equal number of men and women. Because of a highly even population structure in Russia among working age population the proper random sampling and age stratified random sampling methods finally result in fairly similar age distributions in the original samples.

The basic characteristics of the subjects are presented in Table 1. In Pitkäranta, the number of 25–64-year-old subjects in the 1994 sample was 1,000. In 1996, the sample size was 1,500. The samples in the 1998, 2000 and 2004 surveys were again 1,000 persons. In 1998, 2000 and 2004, persons who had died or permanently moved out of the survey area in the interval between sampling and survey were excluded from the original sample in calculating the response rates. Also persons in prison at the time of the survey were excluded. In 1994 and 1996, there was no possibility to obtain information on non-respondents. In 1996, the response rate in Pitkäranta was exceptionally low (Table 1). The economic situation was very difficult at that time which complicated the data collection period. In addition, after a risk factor survey in 1992 and a health behaviour survey in 1994 that were carried out in close collaboration with staff from the Finnish National Public Health Institute, in the 1996 survey, the local staff in Pitkäranta were responsible for data collection. Unfortunately, several problems occurred, which resulted in a poor response rate. The biggest ethnic groups of the study population in Pitkäranta were Russians (65%), Belorussians (15%) and Karelians (10%). The remaining 10% comprised Ukrainians, Tatars, Ingrians and Finns.

In North Karelia, a random sample of 1,200 persons in the age group 15–64 years was drawn in all study years, except in 1996, when the sample size was 1,900. The number of persons in the age group 25–64 years ranged from 959 to 973 in all but the 1996 survey, when it was 1,585. The response rates for 25–64-year-olds included in this study were calculated for a sample from which persons living abroad were excluded (Table 1). All respondents in the North Karelian surveys were Finnish citizens.

The survey methodology has been described earlier in detail (Laatikainen et al. 2006). The questionnaires for the two areas were designed to be as similar as possible and included questions on socio-demographic factors, health behaviour and use of health services. Some questions for the two areas were different, reflecting the local social and cultural environments. For example, fat and milk categories were chosen to represent the locally available products.

All analyses were carried out separately for men and women. Education and employment status were chosen to indicate socio-economic position. Education was measured as the total number of years of education. The years of education were divided into three tertiles within each 5 year birth cohort in the two areas. This relative education variable was used because in Finland and Russia the educational systems differ, and defining categories that appropriately describe subjects' educational levels in a comparable way is not possible. In addition, the data included persons who were born between 1930 and 1979, and in both countries the education systems and the

**Table 1** Characteristics of the study data

	Pitkäranta		North Karelia	
	Men ( <i>n</i> = 1,585)	Women ( <i>n</i> = 2,014)	Men ( <i>n</i> = 1,753)	Women ( <i>n</i> = 1,899)
Study year, <i>n</i> (response rate, %)				
1994	384 (77%)	412 (82%)	333 (65%)	355 (77%)
1996	317 (43%)	413 (52%)	514 (62%)	529 (70%)
1998	292 (68%)	385 (77%)	328 (61%)	330 (76%)
2000	304 (71%)	430 (80%)	298 (61%)	343 (73%)
2004	288 (69%)	374 (74%)	280 (58%)	342 (71%)
Age, years (%)				
25–34	26	21	18	20
35–44	29	30	28	27
45–54	27	28	30	28
55–64	18	21	23	24
Education (%)				
Low	32	25	36	34
Intermediate	38	40	31	33
High	30	35	33	33
Mean years of education	11.3	11.5	11.3	12.2
Employment status (%)				
Employed	77	70	67	62
Unemployed	8	4	14	13
Others	16	26	19	25
Marital status (%)				
Married or co-habiting	80	71	71	76
Single	9	5	21	11
Separated or divorced	9	13	7	9
Widowed	2	11	1	4
Food habits (%)				
Use of butter, mixtures of butter and oil and hard margarines in cooking	27	22	38	38
Use of butter, mixtures of butter and oil and hard margarines on bread	65	66	26	23
Consumption of fat-containing milk	55	48	46	28
Mean number of milk glasses per day	1.2	0.8	2.0	1.2

distributions of years of education have changed notably over time.

Based on a question on occupation and employment, a variable indicating the employment status was constructed: (1) employed, (2) unemployed and (3) others. The third category included pensioners, housewives, students and persons on long-term sick leave.

We would have also liked to analyse food habits by marital status. However, a similar classification for marital status was not possible in the two areas, since the distributions were too distinct. For example, the proportion of widowed women was quite high in Pitkäranta, while that of single men in North Karelia was over twofold compared to

that in Pitkäranta. Thus, marital status was excluded from the analyses.

The questionnaire included an extensive set of questions on food habits each year. For the analyses, three variables were chosen as indicators of saturated fat: (1) use of butter in cooking, (2) use of butter on bread and (3) consumption of milk containing fat. Categories from multiple choice questions were combined to construct the dichotomous outcome variables ‘butter in cooking’ and ‘butter on bread’. In multiple choice questions only one option was allowed. The questions were: (1) what kind of fat is usually used in your home for food preparation? and (2) what kind of fat do you mostly use on bread? Hard margarine and any

mixture of butter and oil consisting mainly of saturated fat was categorized as “butter”, and the reference category included persons using other fats, like vegetable oil or soft margarine, or no fat in cooking or on bread. Since new fat products became available in grocery stores during the study period, corresponding new categories were added to the questionnaires. In Pitkäranta, soft margarine did not come on the market until 1997. Thus, it was included in the questionnaire from the 1998 survey. Regarding consumption of milk containing fat, two questions were used to construct the variable: (1) how many glasses of milk or sour milk do you drink daily? (open-ended question) and (2) if you drink milk, what kind of milk do you usually drink? (multiple choice question). The amount of fat from milk was calculated by multiplying the fat content of the milk type that the respondents reported of usually consuming by the number of glasses of milk consumed daily. The variable was then dichotomized to form a variable indicating whether the subject got any fat from milk consumption. The question about the number of milk glasses was used in the construction of the variable to include only those who drank milk on a daily basis in the category of subjects consuming milk containing fat.

Variations in the use of saturated fat by education during the study years in both areas were also examined graphically. In Figs. 1 and 2, variables with three categories were

used. For fat type in cooking, the categories were subjects using (1) butter, (2) vegetable oil and (3) no fat in cooking. In North Karelia, soft margarine was also included in the second category because the fatty acid composition of Finnish soft margarine is quite similar to that of vegetable oil. In the case of fat type on bread, the three categories were as follows: (1) butter, (2) margarine and (3) no fat on bread. The results for the categories no fat in cooking or on bread are not shown. In Fig. 3, the dichotomous variable (yes/no fat from milk consumed) was used.

Statistical analyses

Because the sample in Pitkäranta in 1994 was stratified with each 10-year age group having an equal number of men and women, the oldest age groups were overrepresented in the sample compared with simple random samples. To check whether the dissimilar sampling method might affect the results, the 1994 data from Pitkäranta were adjusted by weighting the data according to the age distribution in Pitkäranta in 1996 (separately for men and women). The adjusted distributions for fat type in cooking, fat type on bread and consumption of milk containing fat were compared with unadjusted data. Since the adjustment had practically no effect on the results, the data for 1994 were not adjusted in the final analyses.

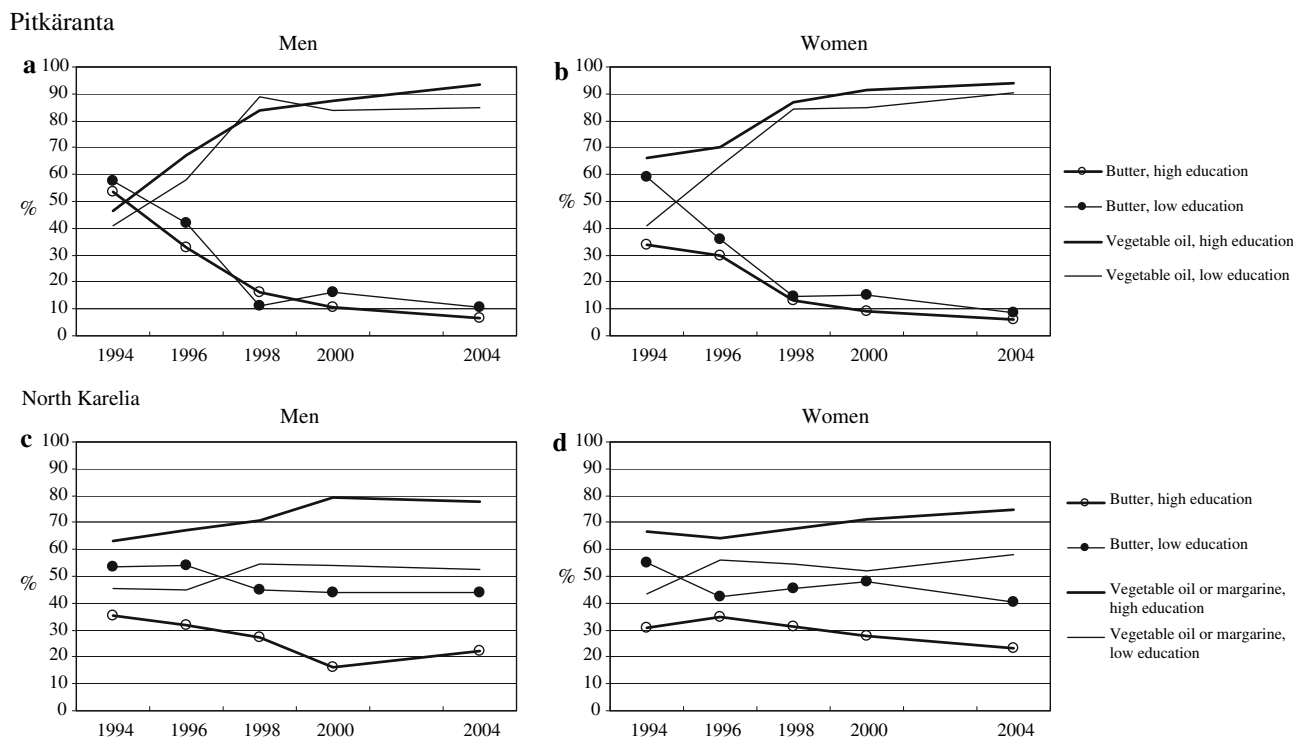
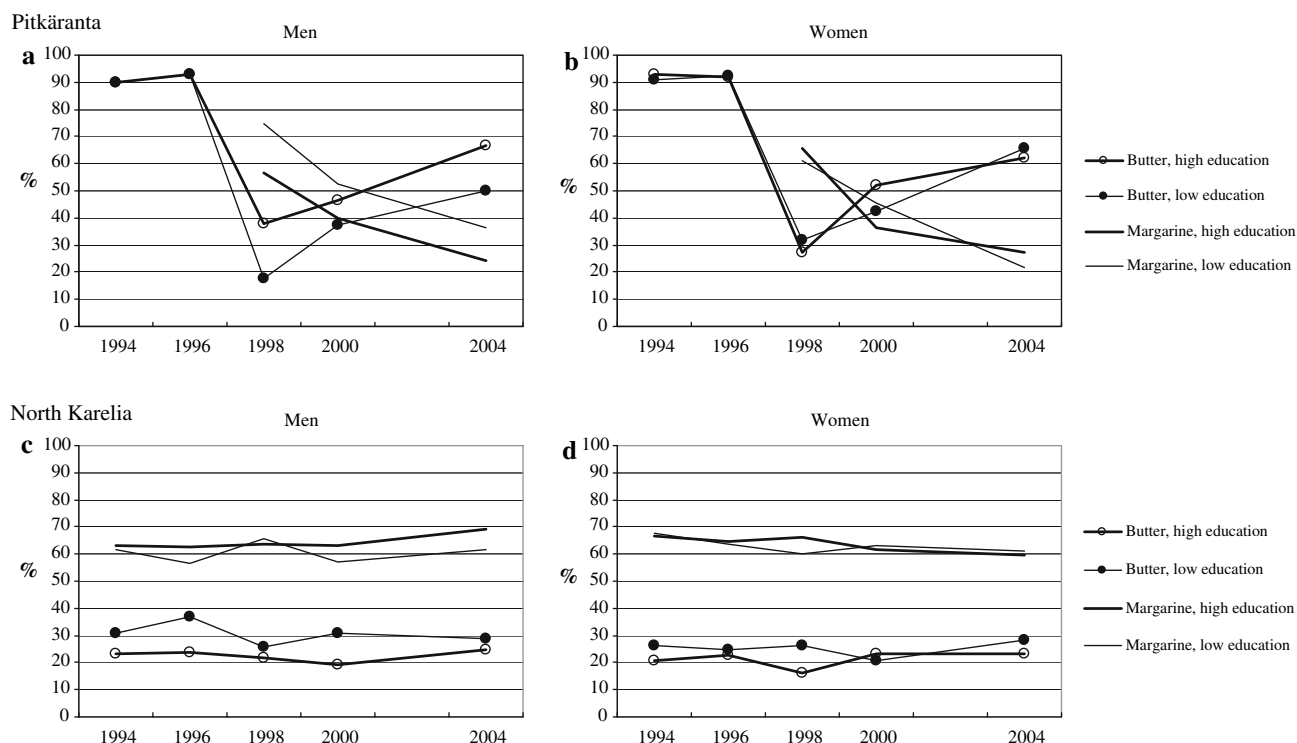


Fig. 2 Fat type in cooking in the highest and lowest education tertile in Pitkäranta and North Karelia, 1994–2004. Data for the group using no fat in cooking is not shown. Butter includes mixtures of butter and oil and hard margarines



**Fig. 3** Fat type on bread in the highest and lowest education tertile in Pitkäranta and North Karelia, 1994–2004. Data for the group using no fat on bread is not shown. Butter includes mixtures of butter and oil and hard margarines

The data from Pitkäranta and North Karelia were analysed separately. Logistic regression analysis was used to study differences in the use of selected foods by educational level and employment status separately for each study year and for all study years combined. All analyses were performed separately for men and women, with age adjustment using 10-year age categories. The results according to the level of education were adjusted for employment status, but since the adjustment had only very minor and inconsistent effects, it was not used in the final analyses. In some cases, the adjustment attenuated the effects slightly.

To check whether the effect of education and employment status on selected food habits varied depending on study year, the interaction terms for interaction between study year and educational level or employment status were tested. The interactions were tested after adjustment for age. The interaction term was significant only in the case of interaction between study year and employment status for the dichotomous variable 'consumption of fat-containing milk' among women in Pitkäranta.

The analyses were carried out with the Stata statistical software package, version 9.2 (StataCorp College Station, TX, USA).

## Results

### Use of butter in cooking

A clear decrease occurred in the use of butter in cooking from 1994 to 2004 in Pitkäranta for both sexes (results shown by education tertiles in Fig. 2a, b). The same was observed in North Karelia, but to a lesser extent (Fig. 2c, d).

Based on results including all study years, subjects with a lower educational level were more likely to use butter in cooking in both areas (Table 2). However, in Pitkäranta, the association was less clear than in North Karelia.

In Pitkäranta, unemployed men were less likely to use butter in cooking than their employed counterparts, whereas no statistically significant differences by employment status were observed among North Karelian men (Table 2). Among women, there were no statistically significant differences in the use of butter in cooking by employment status in either area.

No significant interaction terms for the interaction of education and study year or employment status and study year were found in either area (data not shown). Thus, the effects of education and employment status on using butter in cooking appeared stable over the study period.

**Table 2** Use of butter in cooking by educational level and employment status in Pitkäranta and North Karelia, 1994–2004

	1994	1996	1998	2000	2004	1994–2004
<i>Pitkäranta, men</i>						
Education						
High	1	1	1	1	1	1
Intermediate	0.81 (0.46, 1.42)	1.46 (0.81, 2.64)	1.45 (0.67, 3.11)	1.82 (0.78, 4.25)	1.81 (0.56, 5.80)	1.24 (0.92, 1.66)
Low	1.19 (0.68, 2.09)	1.51 (0.78, 2.89)	0.70 (0.27, 1.80)	1.64 (0.68, 3.93)	1.66 (0.53, 5.18)	1.26 (0.93, 1.71)
Employment status						
Employed	1	1	1	1	1	1
Unemployed	0.83 (0.26, 2.65)	1.34 (0.45, 4.03)	1.21 (0.38, 3.82)	0.19 (0.02, 1.41)	0.55 (0.12, 2.58)	<b>0.53 (0.32, 0.89)</b>
Others <sup>a</sup>	0.82 (0.37, 1.80)	2.23 (0.94, 5.27)	0.45 (0.16, 1.21)	0.67 (0.24, 1.88)	1.51 (0.51, 4.47)	0.73 (0.50, 1.05)
<i>North Karelia, men</i>						
Education						
High	1	1	1	1	1	1
Intermediate	1.02 (0.58, 1.79)	<b>1.79 (1.12, 2.86)</b>	1.57 (0.85, 2.91)	<b>3.23 (1.62, 6.44)</b>	1.75 (0.86, 3.54)	<b>1.66 (1.28, 2.15)</b>
Low	<b>2.14 (1.22, 3.72)</b>	<b>2.54 (1.64, 3.95)</b>	<b>2.16 (1.23, 3.81)</b>	<b>4.17 (2.16, 8.07)</b>	<b>2.57 (1.33, 4.99)</b>	<b>2.54 (1.99, 3.24)</b>
Employment status						
Employed	1	1	1	1	1	1
Unemployed	1.10 (0.57, 2.13)	1.22 (0.72, 2.06)	0.65 (0.31, 1.36)	0.49 (0.22, 1.12)	0.92 (0.40, 2.11)	0.90 (0.67, 1.22)
Others <sup>a</sup>	1.36 (0.73, 2.53)	0.79 (0.47, 1.33)	0.88 (0.40, 1.92)	0.61 (0.29, 1.28)	0.87 (0.44, 1.70)	0.88 (0.66, 1.17)
<i>Pitkäranta, women</i>						
Education						
High	1	1	1	1	1	1
Intermediate	<b>2.28 (1.35, 3.83)</b>	0.77 (0.51, 1.15)	1.05 (0.52, 2.15)	0.91 (0.39, 2.14)	1.23 (0.46, 3.31)	1.16 (0.90, 1.48)
Low	<b>3.03 (1.68, 5.49)</b>	1.24 (0.76, 2.04)	1.08 (0.49, 2.39)	1.58 (0.69, 3.62)	1.46 (0.53, 3.97)	<b>1.39 (1.05, 1.82)</b>
Employment status						
Employed	1	1	1	1	<sup>b</sup>	1
Unemployed	3.91 (0.43, 35.62)	1.14 (0.45, 2.85)	0.47 (0.06, 3.70)	<b>3.19 (1.16, 8.79)</b>		0.89 (0.52, 1.51)
Others <sup>a</sup>	0.67 (0.33, 1.35)	0.98 (0.62, 1.54)	1.30 (0.60, 2.82)	1.54 (0.69, 3.40)		0.82 (0.63, 1.08)
<i>North Karelia, women</i>						
Education						
High	1	1	1	1	1	1
Intermediate	<b>2.23 (1.26, 3.96)</b>	1.27 (0.80, 2.00)	1.50 (0.82, 2.76)	1.48 (0.84, 2.59)	1.39 (0.77, 2.50)	<b>1.52 (1.19, 1.94)</b>
Low	<b>2.89 (1.68, 4.95)</b>	1.39 (0.89, 2.19)	<b>1.84 (1.04, 3.28)</b>	<b>2.43 (1.38, 4.30)</b>	<b>2.29 (1.27, 4.12)</b>	<b>2.05 (1.62, 2.60)</b>
Employment status						
Employed	1	1	1	1	1	1
Unemployed	2.07 (0.98, 4.39)	0.98 (0.56, 1.69)	1.60 (0.76, 3.35)	0.91 (0.44, 1.86)	1.10 (0.51, 2.38)	1.21 (0.90, 1.63)
Others <sup>a</sup>	0.79 (0.45, 1.40)	0.85 (0.53, 1.38)	1.53 (0.83, 2.82)	<b>2.24 (1.22, 4.11)</b>	1.27 (0.69, 2.34)	1.20 (0.94, 1.54)

Values are expressed as OR (95% CI). The figures are adjusted for age. The significant figures are written in bold

<sup>a</sup> Category 'others' includes pensioners, housewives, students and persons on a long-term sick leave

<sup>b</sup> Analyses could not be performed because there were too few observations in the cell 'unemployed'

### Use of butter on bread

Marked changes were seen in the type of fat used on bread in Pitkäranta (results by education tertiles in Fig. 3a, b). When soft margarine came on the market, its use exceeded the use of butter on bread, but after 1998 its popularity

declined. In North Karelia, no noteworthy changes occurred in the type of fat used on bread during the study period (Fig. 3c, d).

In Pitkäranta, men with a higher educational level were more likely to use butter on bread (Table 3). The opposite was true in North Karelia. Among women, the direction of

**Table 3** Use of butter on bread by educational level and employment status in Pitkäranta and North Karelia, 1994–2004

	1994	1996	1998	2000	2004	1994–2004
<i>Pitkäranta, men</i>						
Education						
High	1	1	1	1	1	1
Intermediate	0.97 (0.38, 2.49)	1.00 (0.33, 2.98)	0.70 (0.37, 1.31)	1.37 (0.77, 2.43)	1.01 (0.54, 1.90)	0.94 (0.71, 1.23)
Low	0.99 (0.40, 2.48)	1.13 (0.34, 3.78)	<b>0.38 (0.18, 0.80)</b>	0.68 (0.37, 1.25)	<b>0.46 (0.25, 0.87)</b>	<b>0.67 (0.50, 0.88)</b>
Employment status						
Employed	1	<sup>b</sup>	1	1	1	1
Unemployed	<b>0.14 (0.04, 0.54)</b>		1.32 (0.51, 3.40)	<b>0.35 (0.15, 0.81)</b>	<b>0.14 (0.06, 0.33)</b>	<b>0.32 (0.22, 0.48)</b>
Others <sup>a</sup>	1.30 (0.38, 4.43)		0.58 (0.26, 1.32)	0.78 (0.38, 1.61)	0.54 (0.26, 1.13)	<b>0.53 (0.38, 0.74)</b>
<i>North Karelia, men</i>						
Education						
High	1	1	1	1	1	1
Intermediate	0.64 (0.33, 1.25)	1.09 (0.65, 1.83)	1.21 (0.62, 2.38)	1.40 (0.70, 2.81)	1.29 (0.64, 2.59)	1.08 (0.82, 1.43)
Low	1.48 (0.80, 2.74)	<b>1.89 (1.18, 3.03)</b>	1.30 (0.70, 2.42)	<b>1.94 (1.01, 3.72)</b>	1.14 (0.58, 2.23)	<b>1.58 (1.21, 2.05)</b>
Employment status						
Employed	1	1	1	1	1	1
Unemployed	1.70 (0.84, 3.43)	1.06 (0.60, 1.88)	<b>0.28 (0.09, 0.83)</b>	0.77 (0.33, 1.76)	0.85 (0.35, 2.04)	0.89 (0.64, 1.24)
Others <sup>a</sup>	1.09 (0.54, 2.20)	0.78 (0.45, 1.38)	0.65 (0.26, 1.61)	0.76 (0.35, 1.65)	0.70 (0.34, 1.45)	0.80 (0.58, 1.09)
<i>Pitkäranta, women</i>						
Education						
High	1	1	1	1	1	1
Intermediate	0.63 (0.26, 1.54)	0.86 (0.44, 1.66)	1.17 (0.68, 2.00)	0.66 (0.41, 1.08)	0.70 (0.43, 1.14)	0.84 (0.68, 1.04)
Low	0.82 (0.30, 2.22)	1.17 (0.49, 2.80)	1.17 (0.64, 2.13)	0.69 (0.41, 1.15)	1.18 (0.69, 2.04)	0.80 (0.63, 1.02)
Employment status						
Employed	1	1	1	1	1	1
Unemployed	<b>0.12 (0.02, 0.78)</b>	1.77 (0.23, 13.64)	0.58 (0.16, 2.12)	0.56 (0.25, 1.27)	0.70 (0.28, 1.80)	<b>0.51 (0.33, 0.77)</b>
Others <sup>a</sup>	<b>0.33 (0.12, 0.88)</b>	0.91 (0.45, 1.87)	0.69 (0.37, 1.29)	0.68 (0.41, 1.12)	0.69 (0.42, 1.16)	<b>0.54 (0.43, 0.68)</b>
<i>North Karelia, women</i>						
Education						
High	1	1	1	1	1	1
Intermediate	1.59 (0.84, 3.01)	0.76 (0.45, 1.31)	1.94 (0.95, 3.95)	0.87 (0.47, 1.63)	1.09 (0.60, 2.00)	1.11 (0.85, 1.46)
Low	1.47 (0.80, 2.69)	1.12 (0.67, 1.86)	1.84 (0.92, 3.66)	0.82 (0.43, 1.57)	1.32 (0.72, 2.44)	1.23 (0.94, 1.60)
Employment status						
Employed	1	1	1	1	1	1
Unemployed	0.93 (0.41, 2.13)	0.66 (0.34, 1.31)	<b>2.41 (1.07, 5.46)</b>	0.40 (0.15, 1.09)	1.32 (0.61, 2.86)	0.91 (0.65, 1.30)
Others <sup>a</sup>	0.58 (0.29, 1.17)	0.77 (0.44, 1.33)	1.51 (0.76, 3.01)	1.14 (0.58, 2.24)	1.21 (0.64, 2.29)	0.95 (0.72, 1.26)

Values are expressed as OR (95% CI). The figures are adjusted for age. The significant figures are written in bold

<sup>a</sup> Category 'others' includes pensioners, housewives, students and persons on a long-term sick leave

<sup>b</sup> Analyses could not be performed because there were too few observations in the cell 'others'

educational differences was similar to that of men in both areas, but the differences did not reach statistical significance.

In Pitkäranta, the unemployed were notably less likely to use butter on bread than employed men [odds ratio (OR) = 0.32; 95% confidence interval (CI) 0.22, 0.48] and employed women (OR = 0.51; 95% CI 0.33, 0.77)

(Table 3). The group 'others' was also less likely to use butter on bread than employed subjects. In North Karelia, there were no notable differences in the use of butter on bread by employment status.

The interaction terms for education and study year and employment status and study year were statistically non-significant; thus, the effects of education and employment

status were stable over the study period also in the case of using butter on bread (data not shown).

### Consumption of milk containing fat

In Pitkäranta, there was notable fluctuation in the consumption of fat-containing milk (Fig. 4a, b), and the changes were not consistent among education groups. In North Karelia (Fig. 4c, d), a slight decrease was observed in the proportion of respondents who consumed fat-containing milk in both the highest and the lowest education tertiles for both sexes.

In Pitkäranta, women with the lowest educational level were most likely to drink milk containing fat (Table 4). The direction of the association was the same in men, but the association did not quite reach statistical significance. In North Karelia, subjects with lower education were also more likely to drink milk containing fat, and the difference by educational level was significant in both sexes.

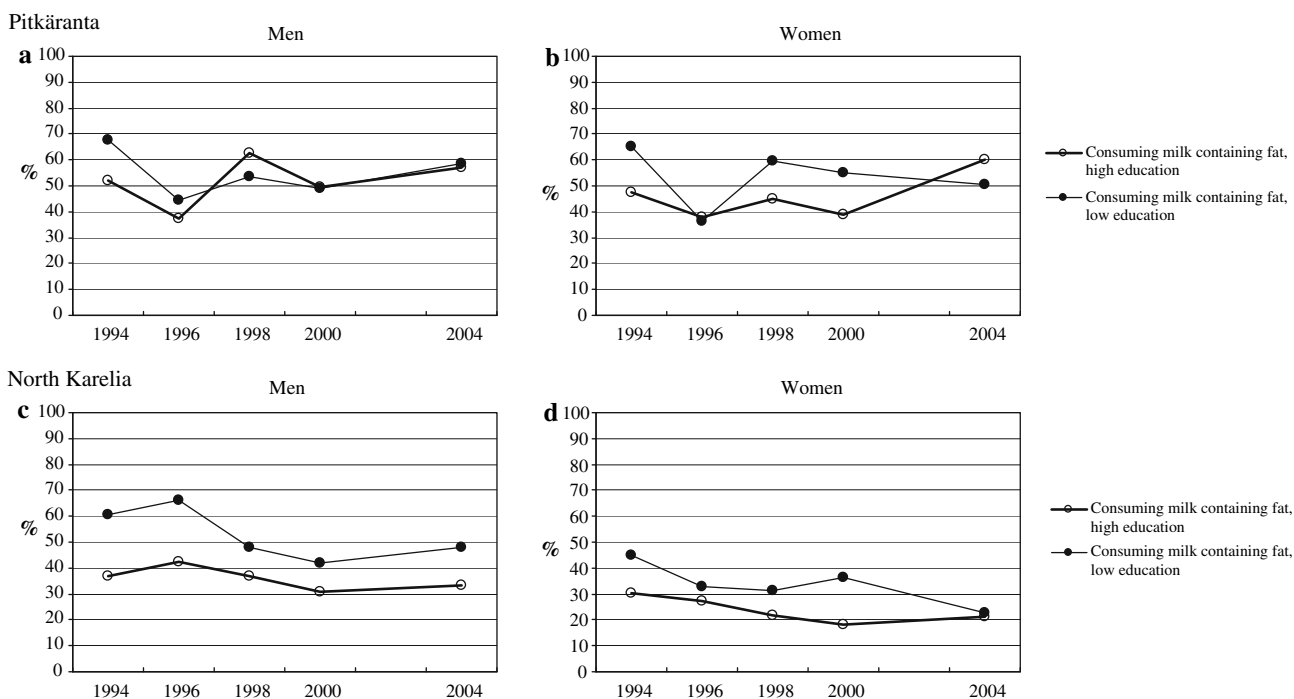
No apparent differences by employment status were observed in Pitkäranta. By contrast, in North Karelia, unemployed subjects were more likely to drink fat-containing milk than their employed peers in both sexes, with odds ratios of 1.71 (95% CI 1.27, 2.29) in men and 1.67 (95% CI 1.22, 2.27) in women (Table 4). In women, the group 'others' was also more likely to drink fat-containing milk compared with the employed subjects, with an odds ratio of 1.54 (95% CI 1.18, 2.00).

The interaction for education and study year was not significant in either area. Nor was the interaction for employment status and study year for men in Pitkäranta or for either sex in North Karelia significant. However, in Pitkäranta, the interaction of employment status and study year in explaining consumption of fat-containing milk was significant in women ( $p = 0.03$ ). However, the numbers of women in the categories 'unemployed' and 'others' were reasonably small, which may have led to random fluctuation, causing contradictory trends in the employment status categories.

### Discussion

Our study examined socio-economic differences in the use of butter and milk from 1994 to 2004 in the district of Pitkäranta in the Republic of Karelia, Russia and in North Karelia, Finland. The effects of education and employment status on the use of butter in cooking or on bread and consumption of fat-containing milk were quite stable over the study period in both areas i.e. the socio-economic differences did not widen or diminish over the 10-year period.

As far as we know, no similar data exist that would allow comparisons of neighbouring but very different areas over a decade. Socio-economic differences in food habits have not to date been extensively studied in Russia. For example, research on mortality suggests that food habits



**Fig. 4** Consumption of fat-containing milk in the highest and lowest education tertile in Pitkäranta and North Karelia, 1994–2004, among men and women. Data for the group not drinking fat-containing milk is not shown

**Table 4** Consumption of fat-containing milk by educational level and employment status in Pitkäranta and North Karelia, 1994–2004

	1994	1996	1998	2000	2004	1994–2004
<i>Pitkäranta, men</i>						
Education						
High	1	1	1	1	1	1
Intermediate	1.05 (0.60, 1.84)	1.76 (0.98, 3.18)	0.96 (0.53, 1.77)	0.79 (0.44, 1.40)	0.97 (0.53, 1.77)	1.10 (0.85, 1.42)
Low	<b>2.07 (1.18, 3.62)</b>	1.49 (0.76, 2.91)	0.60 (0.31, 1.16)	1.07 (0.59, 1.95)	1.05 (0.57, 1.95)	1.30 (0.99, 1.70)
Employment status						
Employed	1	1	1	1	1	1
Unemployed	3.31 (0.70, 15.72)	<b>0.10 (0.01, 0.76)</b>	0.68 (0.28, 1.61)	0.78 (0.36, 1.68)	0.98 (0.47, 2.03)	0.81 (0.55, 1.20)
Others <sup>a</sup>	0.91 (0.43, 1.95)	1.79 (0.72, 4.47)	1.31 (0.66, 2.61)	0.62 (0.30, 1.28)	0.97 (0.48, 1.98)	1.02 (0.74, 1.40)
<i>North Karelia, men</i>						
Education						
High	1	1	1	1	1	1
Intermediate	<b>1.79 (1.04, 3.10)</b>	1.43 (0.92, 2.24)	1.22 (0.68, 2.19)	1.67 (0.89, 3.14)	1.12 (0.58, 2.14)	<b>1.43 (1.12, 1.82)</b>
Low	<b>2.71 (1.55, 4.76)</b>	<b>2.62 (1.70, 4.05)</b>	1.59 (0.92, 2.74)	1.64 (0.91, 2.95)	1.81 (0.99, 3.33)	<b>2.09 (1.65, 2.64)</b>
Employment status						
Employed	1	1	1	1	1	1
Unemployed	<b>2.62 (1.33, 5.17)</b>	1.56 (0.90, 2.69)	1.44 (0.73, 2.84)	1.31 (0.61, 2.82)	2.14 (0.94, 4.86)	<b>1.71 (1.27, 2.29)</b>
Others <sup>a</sup>	1.15 (0.62, 2.12)	0.69 (0.41, 1.16)	1.34 (0.63, 2.85)	1.66 (0.81, 3.39)	1.59 (0.83, 3.03)	1.15 (0.87, 1.51)
<i>Pitkäranta, women</i>						
Education						
High	1	1	1	1	1	1
Intermediate	1.31 (0.81, 2.12)	1.01 (0.69, 1.48)	1.34 (0.83, 2.17)	1.22 (0.75, 2.01)	0.76 (0.47, 1.24)	1.05 (0.86, 1.28)
Low	<b>2.11 (1.23, 3.63)</b>	0.95 (0.58, 1.56)	<b>1.80 (1.04, 3.13)</b>	<b>1.82 (1.08, 3.08)</b>	0.68 (0.40, 1.15)	<b>1.37 (1.09, 1.72)</b>
Employment status						
Employed	1	1	1	1	1	1
Unemployed	1.14 (0.19, 7.00)	0.97 (0.76, 6.04)	2.14 (0.76, 6.04)	0.46 (0.19, 1.09)	0.86 (0.33, 2.21)	0.87 (0.57, 1.34)
Others <sup>a</sup>	0.78 (0.41, 1.50)	0.96 (0.62, 1.50)	<b>1.81 (1.05, 3.10)</b>	0.91 (0.55, 1.51)	0.69 (0.41, 1.14)	1.00 (0.80, 1.25)
<i>North Karelia, women</i>						
Education						
High	1	1	1	1	1	1
Intermediate	0.85 (0.46, 1.55)	1.14 (0.70, 1.84)	0.96 (0.48, 1.92)	1.40 (0.73, 2.68)	1.03 (0.54, 1.95)	1.07 (0.82, 1.39)
Low	<b>1.96 (1.15, 3.33)</b>	1.26 (0.78, 2.02)	1.65 (0.88, 3.11)	<b>2.54 (1.35, 4.78)</b>	1.10 (0.57, 2.11)	<b>1.61 (1.26, 2.07)</b>
Employment status						
Employed	1	1	1	1	1	1
Unemployed	<b>2.54 (1.25, 5.16)</b>	<b>1.95 (1.13, 3.35)</b>	1.45 (0.63, 3.32)	0.92 (0.42, 2.04)	1.84 (0.81, 4.17)	<b>1.67 (1.22, 2.27)</b>
Others <sup>a</sup>	<b>1.94 (1.10, 3.45)</b>	1.41 (0.86, 2.30)	1.42 (0.73, 2.79)	1.21 (0.64, 2.29)	1.61 (0.82, 3.19)	<b>1.54 (1.18, 2.00)</b>

Values are expressed as OR (95% CI). The figures are adjusted for age. The significant figures are written in bold

<sup>a</sup> Category 'others' includes pensioners, housewives, students and persons on a long-term sick leave

are an important explanatory factor, and simultaneously there is growing evidence on socio-economic differences in mortality in Russia (Plavinski et al. 2003).

As expected, the socio-economic differences were more prominent and more consistent in North Karelia than in Pitkäranta. Using butter in cooking and consumption of fat-containing milk were more common among less educated respondents in both areas. However, the differences in

using butter on bread were the opposite; in North Karelia, men with lower education used more butter on bread, while in Pitkäranta this was more common among more educated men. Similar contrasting educational patterns were observed among women, but these were not statistically significant. Possibly, during difficult economic times Russians may more easily give up using butter on bread because it does not belong to the local cuisine. Our findings

from Pitkäranta appear to support this assumption, as using butter on bread was more common among persons who presumably were in a better economic situation, i.e. those who were employed and had a higher educational level. However, the proportion of respondents reporting use of no bread spread was surprisingly low in Pitkäranta (6–12%, data not shown), given that in Russia, traditionally, no bread spread has been used on most occasions. In a risk factor survey in 1992 in Pitkäranta, 37% of participants reported using no fat on bread (Laatikainen et al. 1996) when the data were collected by interviews while in the same survey as well as in the present study, data collected by self-administered questionnaires point to more common use of bread spreads. In the present study, the respondents in Pitkäranta may also have perceived the question differently from North Karelians, because the way of using bread spread differs between the two areas.

The use of butter in cooking decreased in both areas from 1994 to 2004, but the decrease was more pronounced in Pitkäranta. In Finland, the decrease in the use of butter and the simultaneous increase in the use of vegetable oil and soft margarine are mainly due to rising public health consciousness, as health education campaigns have recommended unsaturated fats like vegetable oil and soft margarine (Puska et al. 1995). In Pitkäranta, the reasons for the marked shift from butter to vegetable oil in cooking are presumably more related to the prices and availability of dietary fats in grocery stores. Vegetable oil has traditionally been used in cooking in Russia. However, during the early 1990s, when kolkhozes (i.e. collective farms) were still working, it may have been easy and affordable to buy butter from them. When the supply of dairy products from kolkhozes ceased, people started to buy vegetable oil from grocery stores instead.

Changes in the type of bread spread used during the study period were also substantial in Pitkäranta. When soft margarine came in the market in 1997, its popularity instantly exceeded that of butter. However, the use of butter and other bread spreads with mainly saturated fat soon outweighed the healthier options again. Similar variation has been observed in Lithuania (Kriaučionienė 2005), where the use of butter on bread decreased considerably from 1994 to 2000 because of a shift to margarine. From 2000 to 2004, the selection of butter-based spreads increased in the Lithuanian market, resulting in a decline in the popularity of healthier margarines. In North Karelia, a more drastic decline in the use of butter on bread preceded the study period in the present study (Pietinen et al. 1996) and from 1994 to 2004, the overall changes were less notable than in Pitkäranta.

As our purpose was to demonstrate socio-economic patterns and time trends in selected relevant food habits in the two areas, we did not include several measures of food

habits in our study. All relevant sources of saturated fat, e.g. meat and meat products and soured milk products were not specified in the questionnaires in adequate detail. Thus, we focused on butter and milk and our results do not give a full picture of saturated fat intake. However, the results give a benchmark and the socio-economic differences were in the same direction for both areas; consumption of fat-containing milk was more common among subjects with a lower education.

Cheese consumption also was not analysed in our study. In previous studies, the consumption of cheese has been more common among persons with a higher educational position in Finland and in several other countries (Petkeviciene et al. 2007; Prättälä et al. 2003; Sanchez-Villegas et al. 2003). Cheese is typically an expensive food and its consumption is likely to be more common among persons in higher socio-economic groups in Russia as well. In Pitkäranta, the overall use of cheese has increased markedly from 1998 to 2004 (Laatikainen et al. 2006), and thus, its importance as a dairy fat source has increased. This might explain the rather stable cholesterol levels observed in the Republic of Karelia (Vlasoff et al. 2008). In North Karelia, the changes in diet have been in line with the observed decline in cholesterol levels (Vartiainen et al. 2008). Thus, the measured biological markers support the results on changes in fat consumption. The socio-economic differences in cheese consumption however remain unknown.

We did not have the possibility to study the effects of income on the consumption of selected sources of fat. This is connected with the difficulties of comparability of income in quite different social conditions. The study covered an economically turbulent period in Russia, when the value of money changed drastically, salaries were not always paid on time and money was not necessarily a decisive factor in obtaining goods (Palosuo 2003; Piirainen 1997; Vågerö et al. 2008). For comparative purposes it was more appropriate to use education and employment status as the indicators of socio-economic position.

The survey methodology in the two areas was as similar as possible during each study round. However, the options in the questions on fat type used on bread or in cooking had to be updated, since new fat products became available in grocery stores during the study period. Thus, the answer alternatives were not identical each year in our study. In addition, in 1994, the sampling method in Pitkäranta differed from other surveys in this study. However, according to our analyses, the results were not affected by the different sampling methods.

This study was limited to two areas and generalizations to other areas must be made with caution. For example, in a more agricultural district, Aunus, located south of Pitkäranta, the use of butter on bread has been more common than in Pitkäranta (Vlasoff et al. 2008).

Although the overall changes in the use of butter and milk have been notable, especially in the district of Pitkäranta, from 1994 to 2004, socio-economic differences have remained stable. As expected, the socio-economic differences were more obvious and consistent in North Karelia than in Pitkäranta. In North Karelia and Pitkäranta, subjects with a lower socio-economic status were more prone to use butter in cooking and to drink fat-containing milk. In North Karelia, the same was true for use of butter on bread, but the opposite was the case in Pitkäranta. As the patterns of socio-economic differences were different in Pitkäranta and North Karelia, different activities to promote a healthy diet are needed in the two areas. In North Karelia, health promotion strategies should be tailored for different socio-economic groups. In Pitkäranta, in turn, the availability and affordability of good-quality margarine and skimmed milk should be improved. Provided that economic conditions improve in Pitkäranta, health promotion will become more important. In the future, similar studies should be carried out in more urban areas of Russia.

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