

ORIGINAL ARTICLE

MORTALITY OF THE SAMI IN NORTHERN FINLAND 1979–2005

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ABSTRACT

Objectives. To describe the mortality of the Finnish Sami population.

Study design. A cohort study. The Sami population living in northern Finland represents a specific genetic background and a way of life that has been different from other Finns.

Methods. A cohort of all 2,091 Sami and 4,161 non-Sami people from the 2 northernmost municipalities of Finland on 31 December 1978 was identified from the National Population Register and followed up for their mortality during 1979–2005.

Results. Altogether 625 Sami died during 1979–2005, while the expected number based on the average mortality rates in the entire Finnish population was 633. The standardized mortality ratio (SMR) of the Sami population was 0.99 (95% confidence interval 0.91–1.06), and for the non-Sami 1.07 (1.00–1.14). The mortality from accidents and violence was elevated both among the Sami, SMR 1.67 (1.32–2.08), and among the non-Sami, 1.28 (1.04–1.53). Snowmobile and water transport accidents were especially common. SMR for disease mortality among the Sami men was 0.88 (0.78–0.98). Half of the decrease was attributable to the low mortality from cancer, SMR 0.69 (0.52–0.90). SMR for circulatory diseases was very similar. The SMRs for dementia and Alzheimer's disease were elevated among the Sami men.

Conclusions. The Sami men had a lower disease mortality as compared with the Finnish population generally and their non-Sami neighbours, although their life habits would suggest a higher mortality rate. Reasons for their lower mortality may be related to their diet that is rich in reindeer meat and fish, their physically active way of life or their genetic background. (*Int J Circumpolar Health* 2008; 67(1):43-55)

Keywords: Sami, Arctic populations, ethnicity, mortality, cause of death, cohort study, record linkage

INTRODUCTION

The Sami, previously known as the Lapps, are one of the most northern Arctic indigenous populations. Their roots are in the oldest known northern Fennoscandian population that date back to prehistoric times. Over the centuries the Sami settled in the northern parts of Norway, Sweden, Finland and Russia, but now they are a minority in these regions (1). The area in which the Sami live today extends from the northern parts of the Kola Peninsula in Russia to the north of Finland, Norway and Sweden, and over both sides of the Kölen Mountains towards the south to Trondheim in Norway and Idre in Sweden.

There are 10 different Sami languages, 3 of which (Inari Sami, North Sami and Skolt-Sami) are spoken in Finland (1). The Inari Sami have lived only in Finland, while the North Sami share their tradition with Sami from other Nordic countries. Skolts migrated to Finland after the Second World War from the municipality of Petsamo, which now belongs to Russia.

The main area where the Sami live in Finland includes the northernmost municipalities of Finland (Utsjoki, Inari and Enontekiö) and the Sami herding co-operative in the northern part of the immediate municipality to their south (Sodankylä). The surface area of this region is about 35,000 km² and it is all rural. Residential density is less than 0.4 per km². If a Sami person is defined as a person for whom the Sami language is his/her mother tongue or who has a parent or grandparent who speaks Sami, then the total Sami population in Finland numbers almost 8,000. According to the Sami Parliament,

the number of Sami in 2003 in Inari was 2,152, in Utsjoki 821, in Enontekiö 397 and in Sodankylä 299.

The Sami culture and life-style differ from those of the general Finnish population. Traditional economic activities of the Sami are primary production activities such as reindeer breeding, fishing, hunting, small-scale farming and picking berries. The traditional nomadic life-style ceased in the 1960s, but delayed effects of that life-style still affect their health patterns. Working conditions in winter are cold and physically demanding.

The aim of this study is to describe the mortality of the Finnish Sami population.

MATERIAL AND METHODS

All persons living in the 2 northernmost municipalities of Finland (Utsjoki and Inari) on 31 December 1978 were identified from the National Population Register. A classification of different Sami groups was made in the 1960s by interviewing all Sami persons in Finland, identifying their language and the language of their ancestors, and studying genealogical sources (2,3). Based on those data, most cohort members could be classified into different subgroups of Sami (North Sami, also called Mountain Sami; Inari Sami, also called Fisher Sami; or Skolt Sami) or to non-Sami. The remaining persons in the cohort (mainly those born after 1962) were classified by the first author of this paper who worked for 14 years as a medical doctor in the municipalities of Inari and Utsjoki. Due to computing problems over the past decades, the non-Sami were restricted to

those born between the 1st and 24th day of any month of any year.

Dates of death and emigration of the cohort members were obtained from the National Population Register. The causes of death during 1979–2005 for the cohort members were achieved through an automatic record linkage by using a personal identifier as the key. All residents of Finland, since 1 January 1967, have used a unique personal identifier that is recorded in all the main registers of Finland. The coverage of the cause-of-death statistics is virtually complete. The determination of the cause of death is based on the medical or forensic evidence, which provides the grounds for the issuing of the death certificate. Forensic determination of the cause of death may be necessary if the death is not the result of an illness, if it is accidental or violent, or if it is caused by a treatment procedure or an occupational disease. In most other cases, the death certificate is based on medical evidence (4).

The numbers of observed deaths and person-years at risk were counted, by sex and 5-year age groups, separately for 3 calendar periods (1979–1987, 1988–1996 and 1997–2005). The expected numbers of cases for total mortality and for specific causes of death were calculated by multiplying the number of person-years in each stratum by the corresponding mortality rate in all of Finland. The list of causes of death included all 53 categories for which Statistics Finland produces routine mortality rates. The list has been formed from the revisions of ICD-8, ICD-9 and ICD-10 (4). To calculate the standardized mortality ratio (SMR), the observed number of cases was

divided by the expected number. Exact 95% confidence intervals (CI) were defined on the presumption that the number of observed cases followed a Poisson distribution.

The analyses were made for broad categories called Sami, non-Sami and “mixed.” A person with at least 75% of any ethnic group of Sami was classified as Sami. A “non-Sami” was a person without any Sami ethnicity, and the remaining persons were classified into the mixed group. The Sami people were further divided into specific subcategories: North Sami, Inari Sami and Skolt Sami. For example, a person representing at least 75% of Northern Sami ethnicity was classified as North Sami.

RESULTS

The cohort included 2,091 Sami and 4,161 non-Sami people, representing 48,000 and 101,000 person-years, respectively (Table I). From the specific Sami subcategories, the North Sami subgroup was largest (1,005 persons; 23,700 person-years), followed by Inari Sami (519 persons; 11,300 person-years) and Skolt Sami (394 persons; 8,700 person-years).

Only 66 cases of deaths were observed in the small group with 1–74% of Sami ethnicity versus 65 expected (Table II), and none of the site-specific SMRs were significantly different from 1.0. There was an increasing trend in the SMR over time.

The observed number of deaths among the Sami was 625 and among the non-Sami, 842. The total mortality of Sami during the 1979–2005 period was the same as the national average, but in 1979–1987, the SMR of Sami was significantly below the national

average. The total mortality of non-Sami was slightly higher than the national average. Their mortality did not change from 1979–2005 (Table II).

The total mortality of North Sami and Inari Sami was close to 1, but that of the Skolt Sami was significantly elevated, SMR 1.22 (95% CI 1.01–1.44).

Disease mortality

The SMR among the Sami men was significantly decreased (Table III), while that of Sami women was not (Table IV). The Inari Sami had significantly lower disease mortality than the general population: the SMR for both genders combined was 0.82 (0.71–0.95).

Table I. Number of persons at follow-up and number of person-years at risk in 1979–2005 by ethnic category and age.

Ethnic category	No. of persons*	Person-years
Sami (75–100% any Sami ethnicity)	2,091	47,972
<30 years	986	12,122
30–59 years	721	24,224
>60 years	384	10,176
Non-Sami (>25% Non-Sami ethnicity)	4,161	101,434
<30 years	2,273	31,878
30–59 years	1,516	52,689
>60 years	372	16,867
Mixed group (North Sami, Inari Sami, Skolts 1–74%)	570	14,632
<30 years	430	6,692
30–59 years	115	6,640
>60 years	25	1,299

*Age of persons as of 1 January 1979.

Table II. Observed (Obs) and expected (Exp) numbers of deaths and standardized mortality ratios (SMR) with 95% confidence intervals (CI) in the study cohort from northern Finland (both genders combined) in 1979–2005, by percentage of Sami ethnicity and time period.

Time period	Percentage of Sami ethnicity															
			75–100%					1–74%					0% (non-Sami)			
	Obs	Exp	SMR	95 % CI		Obs	Exp	SMR	95 % CI	Obs	Exp	SMR	95 % CI			
1979–1987	191	220	0.87	0.75–.99*	12	17	0.70	0.36–.22		254	232	1.10	0.97–.23			
1988–1996	232	223	1.04	0.91–.17	25	24	1.05	0.68–.55		281	270	1.04	0.92–.16			
1997–2005	202	190	1.06	0.92–.21	29	24	1.21	0.81–.73		307	283	1.09	0.97–.20			
1979–2005	625	633	0.99	0.91–.06	66	65	1.02	0.79–.29		842	785	1.07	1.00–.14*			

* $p < 0.5$

Table III. Observed (Obs) and expected (Exp) numbers of deaths and standardized mortality ratios (SMR) with 95% confidence intervals (CI) among the Sami males with 75–100% of Sami ethnicity and among the non-Sami cohort members in 1979–2005. Disease mortality.

Cause of death	Sami males			Non-Sami males				
	Obs	Exp	SMR	95% CI	Obs	Exp	SMR	95% CI
All diseases	294	335	0.88	0.78–0.98*	440	410	1.07	0.97–1.17
Malignant neoplasms C00–C97	53	77	0.69	0.52–0.90**	131	101	1.29	1.08–1.52**
Endocrine, nutritional and metabolic diseases E00–E90	0	4	0.00	0.00–1.04	8	5	1.63	0.70–3.20
Diabetes mellitus E10–E14	0	3	0.00	0.00–1.18	8	4	1.88	0.81–3.71
Dementia and Alzheimer's disease F01, F03, G30, R54	20	11	1.89	1.15–2.91*	16	10	1.68	0.96–2.72
Diseases of the circulatory system I00–I42.5, I42.7–I99	161	174	0.92	0.79–1.07	214	208	1.03	0.90–1.17
Ischemic heart diseases (IHD) I20–I25	99	111	0.89	0.73–1.08	155	139	1.12	0.95–1.29
Other heart diseases excl. rheumatic heart diseases (OHD) I30–I42.5, I42.7–I52	18	15	1.20	0.71–1.89	11	16	0.68	0.34–1.21
IHD + OHD	117	126	0.93	0.77–1.11	166	155	1.07	0.91–1.25
Cerebrovascular diseases I60–I69	39	34	1.15	0.82–1.56	37	38	0.99	0.69–1.35
Other circulatory diseases I00–I15, I26–I28, I70–I99	5	14	0.35	0.11–0.81**	11	16	0.71	0.35–1.26
Diseases of the respiratory system J00–J64, J66–J99	32	34	0.93	0.64–1.31	32	35	0.92	0.63–1.30
Pneumonia J12–J18, J84.9	12	18	0.66	0.34–1.14	11	17	0.65	0.33–1.16
Bronchitis and emphysema J40–J44, J47	17	13	1.32	0.77–2.11	20	5	1.41	0.86–2.17
Diseases of the digestive system K00–29.1, K29.3–K67, K71–K85, K86.1–K93	5	8	0.63	0.20–1.47	11	9	1.10	0.59–2.36
Diseases of the genitourinary system N00–N99	6	4	1.70	0.62–3.69	2	3	0.62	0.08–2.24
Alcohol-related diseases and accidental poisoning by alcohol F10, 31.2, G40.5, K86.00, O35.4, P04.3, X45	7	11	0.62	0.25–1.26	18	22	0.83	0.49–1.31

*p<0.5; **p<0.01.

Table IV. Observed (Obs) and expected (Exp) numbers of deaths and standardised mortality ratios (SMR) with 95% confidence intervals (CI) among the Sami females with 75–100 % of Sami ethnicity and among the non-Sami cohort members in 1979–2005. Disease mortality.

Cause of death	Sami females			Non-Sami females			
	Obs	Exp	SIR	Obs	Exp	SIR	
All diseases	250	249	1.00	293	287	1.02	0.91–1.14
Malignant neoplasms C00–C97	48	51	0.95	53	72	0.74	0.55–0.96
Endocrine, nutritional and metabolic diseases E00–E99	5	4	1.18	11	5	2.12	1.06–3.79
Diabetes mellitus E10–E14	4	4	1.05	11	5	2.44	1.22–4.35*
Dementia and Alzheimer's disease F01, F03, G30, R54	20	17	1.16	30	17	1.80	1.22–2.57**
Diseases of the circulatory system I00–I42.5, I42.7–I99	121	133	0.91	150	140	1.07	0.91–1.24
Ischemic heart diseases (IHD) I20–I25	48	69	0.70	79	74	1.07	0.85–1.33
Other heart diseases excl. rheumatic heart diseases (OHD) I30–I42.5, I42.7–I52	29	15	1.97	26	15	1.79	1.17–2.62**
IHD + OHD	77	84	0.92	105	89	1.18	0.97–1.43
Cerebrovascular diseases I60–I69	38	36	1.05	33	39	0.85	0.59–1.19
Other circulatory diseases I00–I15, I26–I28, I70–I99	6	13	0.47	12	13	0.91	0.47–1.59
Diseases of the respiratory system J00–J64, J66–J99	22	19	1.17	16	19	0.82	0.47–1.33
Pneumonia J12–J18, J84.9	12	14	0.88	5	13	0.38	0.12–0.88*
Bronchitis and emphysema J40–J44, J47	3	2	1.28	7	3	2.30	0.93–4.74
Diseases of the digestive system K00–K93	9	8	1.08	3	1	2.13	0.44–6.22
K71–K85, K86.1–K93	6	4	1.55	9	9	0.98	0.45–1.86
Diseases of the genitourinary system N00–N99	0	2	0.00	4	4	1.03	0.28–2.63
Alcohol related diseases and accidental poisoning by alcohol F10, 3 I.2, G40.5, K86.00, O35.4, P04.3, X45	0	2	0.00	4	4	1.03	0.28–2.63

*p<0.5, **p<0.01.

SMR for ischemic heart disease (IHD) among the Sami men was 0.89 (0.73–1.08) and among the women 0.70 (0.51–0.92). The SMR for ischemic heart disease among the North Sami women was significantly decreased, 0.51 (0.29–0.84). Mortality from “other heart diseases” was significantly elevated among both Sami and non-Sami women (Table IV) but not among the men (Table III).

Cancer mortality of the Sami men was significantly lower than that of the general population, SMR 0.69 (0.52–0.90). The differ-

ence is largely attributable to prostate cancer (SMR 0.47; 0.15–1.09), colon cancer (0.27; 0.01–1.47), pancreatic cancer (0.22; 0.01–1.24) and lymphomas (0.46; 0.09–1.33). Cancer mortality of the non-Sami men was significantly elevated (SMR 1.29, 1.08–1.52; Table III). Mortality from “other malignant neoplasms” (which includes malignancies of the nervous system, connective tissue, bone, endocrine system) was significantly elevated among the non-Sami and Skolt Sami men, SMRs 1.68 (1.03–2.59) and 6.22 (2.69–12.3), respectively. Cancer mortality

Table V. Observed (Obs) and expected (Exp) numbers of deaths from accidents and violence and standardised mortality ratios (SMR) with 95 % confidence intervals (CI) among the Sami (males and females combined) with 75 – 100 % of Sami ethnicity and Non- Sami cohort members in 1979-2005.

Cause of death	Sami				Non-Sami			
	Obs	Exp	SMR	95% CI	Obs	Exp	SMR	95% CI
Accidents and violence								
V01-X44, X46-Y89 ¹⁾	78	47	1.67	1.32-2.08***	104	81.4	1.28	1.04-1.53*
Accidents total								
V01-X44, X46-X59, Y85-Y86	47	28	1.69	1.24-2.24**	72	44.2	1.63	1.28-2.05***
Land traffic accidents ²⁾	10	6	1.65	0.79-3.03	16	11	1.41	0.81-2.29
Other land transport accidents ³⁾	5	0.4	12.7	4.12-29.6***	6	0.77	7.84	2.88-17.1***
Water transport, V90-V94	10	1	8.40	4.03-15.4***	9	2.31	3.89	1.78-7.38**
Accidental fallings W00-W19	11	11	0.98	0.49-1.75	13	13	0.99	0.53-1.69
Drownings W65-W74	5	2	2.94	0.96-6.86	6	3.25	1.84	0.68-4.01
Accidental poisonings								
X40-X44, X46-49, Y10-Y15	2	2	0.85	0.10-3.06	4	5	0.85	0.23-2.17
Suicides	24	15	1.55	0.99-2.31	27	30.8	0.88	0.58-1.27

* $p < 0.5$, ** $p < 0.05$, *** $p < 0.005$

1) Excl. accidental poisonings by alcohol

2) ICD 10 codes: V011, V021, V031, V041, V051, V061, V092, V093, V199, V299, V399, V499, V599, V699, V799, V81-V833, V843, V853, V863 (4).

3) ICD 10 codes: V010, V019, V020, V029, V030, V039, V040, V049, V050, V059, V060, V069, V090-V091, V099, V192, V292, V392, V492, V592, V692, V792, V80, V839, V849, V859, V8690-V8698, V89 (4).

among the Inari Sami and non-Sami women was significantly decreased, SMRs 0.60 (0.29–1.09) and 0.74 (0.55–0.96). The mortality from breast cancer among Sami women was low, SMR 0.25 (0.03–0.92), while mortality from ovarian cancer was elevated, 2.35 (0.94–4.84). The Skolt Sami had high mortality from stomach cancer, SMR 4.06 (1.63–8.37) and “other malignant neoplasms,” SMR 3.46 (1.66–6.36).

The SMRs for dementia and Alzheimer’s disease were elevated among the Sami men (Table III) and the non-Sami women (Table IV). Non-Sami women also showed excess mortality from diabetes (SMR 2.44, 1.22–4.35). Their pneumonia mortality was significantly decreased (Table IV).

Accidents and suicides

The mortality from accidents and violence was high among both the Sami and non-Sami groups (Table V). Both had significantly elevated mortality from “other land transport accidents,” which in Lapland mainly refers to snowmobiles. Both categories of men also had highly significant SMRs for water transport accidents.

The suicide mortality of the Sami men was significantly elevated (SMR 1.67, 1.04–2.57), while that of the non-Sami men was not.

DISCUSSION

Data quality

The study base was the total population of the Utsjoki and Inari municipalities at the end of 1978, which was extracted from the complete Finnish Population Register. The classification of Sami into 3 subtypes was

mainly based on language, but it has also been shown that the Sami languages also correspond to the differentiation of several genetic markers among the Sami groups (5). The follow-up for vital status was complete and the computerized record linkage procedures were precise (6). Therefore, shortcomings in the cohort selection or the follow-up procedure do not bias our results.

The distance from the northern border of Utsjoki to the nearest central hospital in Rovaniemi is over 500 km, but to reach the Inari Health Centre Hospital, it is 300 km. Therefore, old people are not always brought to the central hospital; instead, their diseases are diagnosed in the local health centre hospital. Only 12% of the diagnoses in Inari and Utsjoki were based on autopsy (7). It has been stated that the discrepancy between clinical and autopsy diagnoses can vary from a few percents to several tens of percent, depending on the disease (8). The clinical diagnosis of coronary heart disease was usually good, but a lack of correct ante-mortem diagnosis of other heart diseases was relatively common (8).

General

A low mortality from disease and a high mortality from external causes of death among the Sami compensate each other. A high mortality from accidents among the non-Sami people in northern Finland elevates their total mortality significantly above the mortality of average Finns.

Cardiovascular diseases

The total cardiovascular (CVD) mortality was at about the same level as that of the general population. The mortality rate from

ischemic heart disease (IHD) of the Sami women was lower than that of the general population, but the mortality rate from other heart diseases (OHD) was instead statistically significantly higher than that of the general population. The pattern for the non-Sami was similar. There are doubts that the OHD group might include some IHD diagnosis and could explain the low SMR of IHD. The group of OHD includes infections, conductive disturbances, arrhythmia of the heart, insufficiency of the heart and other poorly classified and non-specific heart failures. Hence, it was an easy solution to use this group for uncertain heart failure diagnosis. Years ago, in the far North, the general practitioners diagnosed IHD with very simple tools: electrocardiograms, X-rays of the thorax and clinical examinations, and later ergometer exercise electrocardiograms. The diagnosis of heart disease in an old person, especially the IHD of a woman, is not easy even today (9). All the Sami women who died from OHD were more than 75 years old. The SMR of OHD of Sami women has decreased during time, possibly due to more exact diagnoses.

Similar to our finding from northern Finland, mortality from OHD among arctic Native populations in Alaska, Canada and Greenland was higher than among the non-Native comparison population (10–12). IHD has been found to be traditionally rare among Indigenous populations in the North, that is, among the Sami (7,13–16) and the Inuit (10–12,17,18).

The degree of arteriosclerosis in arteries of Native populations in Greenland and Alaska has been studied in autopsies and by ultrasonography and found to be the same as that of the non-Native populations (19,20). It has been

repeatedly postulated that the reason for low IHD mortality on IHD is because of uncertain mortality statistics (10,19,20). However, the living habits and environmental circumstances of earlier generations favoured a lower incidence of IHD. People were more physically active and ate healthier foods. There were only a few roads, no motor vehicles and no shops where one could buy modern foodstuffs rich in saturated fats and carbohydrates. When there were no snowmobiles, more physical exercise was needed and people had to spend much more time outside in the wilderness herding the reindeer. It has been stated that physical exercise has preventive influence on IHD risk factors (blood lipids, blood pressure, blood clotting, obesity, diabetes and diseases of the connective tissue and blood vessels) and, hence, on IHD (21). The traditional Sami food consisted of reindeer, fish, game and berries, and later, potatoes, vegetables and dairy products (22). The Skolt Sami are an exception because they were very poor and suffered malnutrition (23).

Cerebrovascular diseases

In this study, cerebrovascular diseases as the cause of death were no different among the Sami from the general population. The same applies to the Native populations in Canada (11).

Cancer

It has been reported that the Finnish Sami experience a substantially decreased incidence of breast, prostate, bladder and skin cancers (24). It has been suggested that their exceptionally low cancer rates are partially related to their unique life-style, but some of the SIRs are so low that genetic factors

may play a role. Radioactive fallout or other features of their physical environment do not seem to affect their cancer risk. The SMRs for cancer mortality reported in present paper are similar to the respective ratios for cancer incidence reported from the same cohort before (24). This is an indication that the risk of cancer is truly low and not an artefact related to less active diagnostic activity among the Sami than in the reference population. The mortality from cancer was similarly low, SMR 0.70 (0.56–0.87), among the Swedish Sami (25,26).

The Sami men had low mortality rates from cancer of the prostate, colon and pancreas, and there were no deaths at all from esophageal cancer, skin melanoma or cancer of the urinary organs. North Sami and Inari Sami had very low cancer mortality rates. On the contrary, the Skolt Sami have high cancer mortality, especially from stomach cancer, which may reflect their low standard of living.

For women in the Arctic areas, the risk of cervical cancer has been elevated (18,26,27). Among the Finnish Sami, the screening for early stages of cervical cancer has been as beneficial as in southern Finland and, respectively, their SMR for cervical cancer is close to 1. The reasons for the elevation in the rates of ovarian cancer mortality in both Sami and non-Sami groups are not known.

Other diseases

The high mortality of non-Sami women from smoking-related diseases such as bronchitis, emphysema and chronic obstructive pulmonary disease is in line with Lappish smoking habits. The proportion of 45–54 years old female smokers in Lapland was 30%. That is the highest in Finland (28). Elevated

SMR of respiratory diseases was found among Swedish Sami, especially women (29). The SMR from pneumonia of the non-Sami women was significantly decreased as compared with the general population. It was also low in all other groups of our cohort. The reason for that could be that another simultaneous disease was named as the main cause of death.

One reason for the excess dementia mortality could be that previously the diagnosis "dementia" was misused as the main cause of death instead of old age, senility, because senility was not accepted as a cause of death. However, there has been excess mortality from dementia in both Sami and non-Sami groups in recent years as the diagnosis of dementia has become more exact as a result of more exact examinations. Hence, the elevation in this mortality during last few years could be real.

Injuries

The mortality from injuries was high among both the Sami and the non-Sami. Transport on terrain or on lakes is very dangerous. The number of terrain vehicles has been increasing. According to the snowmobile register in 2003, there were 18 snowmobiles per 1,000 inhabitants in Finland, but 113 snowmobiles per 1,000 inhabitants in Lapland (30). Snowmobiles contribute directly to the excess of "other land transport" accidents. Snowmobile accidents also account for death by drowning because people often drive onto bodies of water that are insufficiently frozen, so when the ice breaks, the driver drowns: 70% of fatal snowmobile accidents in Finland occur on ice and 70% of those fatalities are from drowning (30).

Snowmobile driving is common in the region, where snow covers the ground most time of the year and the snowmobile is an important tool in reindeer herding. Swedish reindeer-herding men had the SMR of 7.34 (95% CI 3.16-14.5) for snowmobile and other terrain vehicle accidents during 1961–2000 (31).

The risk of dying in a boat accident was 8-fold for the Finnish Sami and 4-fold for the non-Sami as compared with the general population. The mortality from water transport accidents was elevated in all Sami groups, but was highest among the Inari Sami also known as Fisher Sami. These Sami fish in the large Inari Lake in often hard weather conditions. Best fishing times are in the spring and fall. During the fall, the weather changes quickly and storms can start up during a fishing trip. If the boat capsizes, swimming in the cold water is impossible. Not only are the waters cold throughout the year, the Sami's swimming skills are poor. Boat accidents and drownings are also common in other arctic areas (31–34).

Traffic accidents were approximately 70% more common among our cohort than among the population of Finland generally, irrespective of ethnicity or gender. Because of long distances and limited public transportation, people use private cars that in the remote areas tended to be old and poorly repaired. Risk-taking behaviour has traditionally been common in Arctic areas, and this behaviour applies often to fatalities (35).

Suicides

Mortality from suicides among the Sami men was 70% more common than in the general population. Traditionally, suicides have taken place among Inuit groups, including their

older members who, once they felt they had become a burden on society, decided to freeze to death out on the ice (36). Nomadic life for old people was exceedingly difficult among the arctic Natives. Sometimes in Lapland, old people simply disappeared, but it was not called suicide. The suicides among the Finnish Sami were concentrated in 2 families who believed to be predestined to suicide because their ancestors had done so many evil things that the following generations had to commit suicide (37).

Suicides among the Indigenous peoples in the Arctic before 1960 seem to have been very rare, but they have become more common in recent years (17,37-41). As the traditional social community or network break down, the number of suicides increase and have begun to occur in the young age groups. In the present study, the males committed suicide from the 15–29 age group up. One of the reasons for the hopelessness of young men may be that many girls and women leave the community (42). The Skolt Sami had the highest SMR of suicides. Their acculturation (43) has been the most difficult (42,44). The orthodox religion of the Skolts may have once protected them from suicides (38), but its power in that sense has diminished. Skolts have had a very difficult life ever since the end the Second World War. They had to leave their traditional living area and way of life and were resettled by the state in new areas where they were given small houses to live in. They lost their reindeer during the war, and although they were given new herds, reindeer herding was not easy in the new area. Then, the so called “snowmobile revolution” disturbed their social and economy system (44). That has had impact to their mortality in many ways.

Conclusions

The total mortality rates of the Sami do not differ from that of the general population, but there are rather big differences in the details of the mortality patterns. Cancer mortality is low, especially in men, and accidents and suicides are common. The mortality statistics indicate that the overall health of the Skolt Sami is worse than other Sami groups and reflects the negative effects that acculturation has had on them.

Within the acculturated Sami groups, mortality from disease seems to approach general rates of mortality. Arteriosclerosis, IHD, OHD and cerebrovascular diseases, accidents and suicides are being researched in the Arctic. It seems that the incidence of cardiovascular disease has increased among the Sami in recent years, a phenomenon recently seen among the Inuit (10,45). Hence, careful surveillance of future mortality risks among the Finnish Sami would be important.

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