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ORIGINAL ARTICLE

Diet and lifestyle of the Sami of southern Lapland in the 1930s–1950s and today

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ABSTRACT

Objectives. To describe the lifestyle of the Sami of southern Lapland 50 to 70 years ago in relation to the present-day Sami and non-Sami populations and, thereby, to provide a basis for future studies of culturally related determinants of health and illness.

Study design. A qualitative analysis, and a quantitative comparison of Sami and non-Sami groups.

Methods. Semi-structured interviews were conducted with 20 elderly Sami concerning their parents' lifestyle and diet 50 to 70 years ago. Questionnaire data from 81 reindeer-herding Sami, 226 non-reindeer-herding Sami and 1,842 sex-, age- and geographically matched non-Sami from the population-based Västerbotten Intervention Project were analysed by non-parametric tests and partial least squares methodology.

Results. Surprisingly, fatty fish may have been more important than reindeer meat for the Sami of southern Lapland in the 1930s to 1950s, and it is still consumed more frequently by reindeer-herding Sami than non-reindeer-herding Sami and non-Sami. Other dietary characteristics of the historical Sami and present-day reindeer-herding Sami were higher intakes of fat, blood and boiled coffee, and lower intakes of bread, fibre and cultivated vegetables, compared with present-day non-Sami. Physical activity was also a part of the daily life of the Sami to a greater extent in the 1930s to 1950s than today. Sami men often worked far from home, while the women were responsible for fishing, farming, gardening (which was introduced in the 1930–1950 period), as well as housework and childcare.

Conclusions. For studies investigating characteristic lifestyle elements of specific ethnic groups, the elements of greatest acknowledged cultural importance today (in this case reindeer meat) may not be of the most objective importance traditionally.

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Keywords: Sami people, traditional food, traditional lifestyle, indigenous, the VIP cohort

INTRODUCTION

Studies of the Sami peoples have consistently reported lower risks of total cancer compared with non-Sami, except in Swedish Sami women (1). Though only minor ethnical differences are present in cases of heart disease, a reduced risk for stroke in reindeer-herding Sami men and an increased risk in non-reindeer-herding Sami men, compared to the non-Sami population, have been shown (2). The reason for these differences is unclear, but diet and lifestyle are likely involved.

Reindeer herding, fishing, hunting and small-scale farming are generally considered to be part of a traditional Sami lifestyle (3). A traditional diet is described as being high in fat and protein and low in carbohydrates, with reindeer and wild game as main sources of animal protein (4). A century ago, lake and river fish were also important in the Sami diet, especially compared to other reindeer-herding circumpolar peoples (5). Other typical features include a relatively high intake of boiled, unfiltered coffee and a low intake of cultivated vegetables and fruits (6–11).

The past few decades have been a time of great change both in the Sami population and in the surrounding society of southern Lapland. To improve dietary habits during the 1930s, locally tailored dietary and lifestyle advice, prepared by the state, was provided to the women of northern Sweden (12). In 1938, as a result of health promotion legislation, consultants were employed by the county administrations to introduce gardening in rural areas (13). Also during the 1930s, reindeer-herding Sami from northern Lapland were relocated by force to the mountainous areas of southern Lapland (14). Because of stiff competition from these groups – in combination with a number of harsh winters with heavier snow cover than usual, which caused a large reduction of the reindeer stock (15) – many indigenous Sami in southern Lapland abandoned reindeer-herding. During the Second World War, 1939–1945, many everyday commodities such as sugar, coffee, alcohol and ham were rationed. Since then, southern Lapland has undergone a great expansion of common welfare as well as depopulation and extensive emigration to more urban, coastal and southern regions of Sweden.



Figure 1. Southern Lapland in the Sami region of Norway, Sweden, Finland and Russia.

Today, reindeer herding is a modernized large-scale meat industry (16,17), small-scale farming hardly exists and a vast majority of the Sami population have non-traditional occupations (18). The local Sami culture of southern Lapland is thus characterized by seasonal reindeer movements over great distances, even from a Sami perspective (up to 400 km one way), as well as by a large number of settled Sami and Sami who cannot speak the Sami language. Assimilation to a non-traditional, more Western lifestyle is especially pronounced among the forest Sami, partly as a consequence of a national assimilation policy for Sami people not involved in reindeer herding. However, the forest Sami have a long history of discrimination in relation to the mountain Sami. For example, Swedish authorities recognized the forest Sami lifestyle as a degenerated type of Sami culture not worth supporting (19). Not until 1971, were these two groups considered equal according to Swedish Sami legislation (20–23).

Despite the major shift away from reindeer herding among the Sami of southern Lapland, both the non-herding and reindeer-herding Sami in this region retain a traditional Sami diet and lifestyle to a greater extent than the non-Sami (6). In Norway, similar findings have been reported for those Sami who speak the traditional language (24).

This report describes the lifestyle and diet of the Sami of southern Lapland 50–70 years ago in relation to those of the present-day Sami and non-Sami populations. A secondary aim is to provide a basis for future study of the characteristics of the traditional Sami diet and lifestyle as determinants of health and illness.

MATERIAL AND METHODS

Design

The study was based on the questionnaire employed in the large, population-based Västerbotten Intervention Project (VIP) (25). In the VIP project, the residents of Västerbotten County are invited to participate in an extensive health examination upon turning 40, 50 and 60 years of age, at which time they also complete a lifestyle questionnaire, including a food frequency questionnaire, and donate a blood sample for future research. In semi-structured interviews, elderly Sami were asked how they believed their parents (historical Sami) would have answered the VIP questionnaire. In addition, present-day VIP data from sex-, age- and geographically matched groups of non-Sami, non-reindeer-herding Sami and reindeer-herding Sami were analysed by non-parametric tests and partial least squares (PLS)-methodology, in order to identify diet and lifestyle characteristics that varied between these groups. The study groups for these quantitative analyses were largely the same as in previous studies from southern Lapland (6,26).

Study subjects

For the interviews, 37 Sami women and men over 60 years of age were invited by posted letter in 2008. All were suggested either by local reindeer-herding associations, local Sami associations or the management of the forest commons Tärna/Stensele, in which many settled Sami are active. Of these, 11 men and 9 women, aged 63–89 years, from the communities of Lycksele, Storuman, Sorsele, Malå and Arvidsjaur participated; 8 were mountain Sami, 7 forest Sami and 5 settled Sami.

Questionnaire data, described more in detail below, were available for 35,499 non-Sami, 263

non-reindeer-herding Sami and 97 reindeer-herding Sami from the VIP cohort (25). The definition and classification of Sami subjects within the VIP, described in detail elsewhere (26,27), were based on Sami electoral registers and registers of reindeer-breeding companies. An additional 26 reindeer-herding Sami completed the VIP questionnaire in 2001, as part of research conducted by the Southern Lapland Research Unit in Vilhelmina, Sweden (28).

Operationalization of some important variables

The food frequency questionnaire in the VIP questionnaire has been modified over the years. The versions used in the present study were from the years 1990–1996 and included 84 food items common in the present-day northern Swedish diet, with a 9-level frequency scale ranging from never to ≥ 4 times/day (29). Food items included in the 84-item food frequency questionnaire are listed in Appendix 1. Dietary habits were also assessed by questions on portion size, breakfast habits and general dietary preferences (e.g., vegetarianism), and the intake of nutrients was calculated from the food frequency questionnaire and portion size responses according to methodology described elsewhere (29). The lifestyle questions considered in the present study included physical activity (recreational, occupational and transportational), tobacco and alcohol use and consumption of filtered and boiled coffee.

Interviews

In June and July 2008, a first round of interviews was conducted, in which the informants were asked how they believed their father or mother, generally the father for men and the mother for women, would have completed the 64-food item

VIP questionnaire of 2008 at the age of 40–50 years. The time period assessed in the interviews thus ranged from the 1930s to the 1950s. The informants were also asked about foods consumed by the parents on special occasions and about the parents' body proportions in relation to those of the interviewer (height 161 cm, body mass index 25 kg/m²). The interviews were recorded. All relevant interview dialogue was transcribed according to the items of the VIP questionnaire and thus already sorted into categories during the transcription phase, which was performed by the first author. Issues not covered by the questionnaire were transcribed at the end of the document.

When summarizing the interviews of 2008, some follow-up questions arose. Thus, a second interview round was performed in spring 2009. This time, 20 additional food items from the 84-item food frequency questionnaire and 11 traditional food items not included in the VIP questionnaire were added to the interview as follows: animal fat for cooking, coffee-cheese, wheat porridge, wild herbs, reindeer steak shavings (*renskav* in Swedish), meat soup, dried meat, dried fish, brain, buttermilk and eggs from wild birds. The availability of food items was also specified in months per year. Finally, 2 open-ended questions on fishing were added: "Who did most of the fishing in your family?" and "What role did gender play in the fishing in your family?"

During the second round of interviews, the transcription from 2008 was updated, so that the final, written summary of the interviews could be approved and signed together with the informant. Each informant was offered a copy of his/her interview summary.

The interviews were performed in the homes of the informants or at other locations of their

choice. The Swedish language was used, although some traditional herbs and foods were referred to by their Sami names. In two cases, siblings, differing in age by about 10 years, were interviewed about the same parent. In both cases, only the interview with the older sibling was used for box plot comparisons in the quantitative analyses. Before submitting the final paper for publication, the informants were invited to share and discuss the results. Eight of the informants (4 women and 4 men) participated in this discussion.

Qualitative analysis

All interviews were included in the qualitative analysis. The responses, both fixed and open-ended, were sorted according to the items of the VIP questionnaire or according to new categories that arose during the interviews or data analysis. Meaning units such as “Do you really think that we celebrated Christmas? We didn’t” were marked and condensed to “no Christmas celebration” and categorized as “no Christian holidays.” Interpretations of the transcribed interviews were done by the first and second authors. The qualitative analysis focused on concepts rather than on concrete, *in vivo* expressions; for example, when several synonyms could be used, as was the case for the traditional herb *jomo*. The responses were analysed and discussed from temporal, gender and cultural perspectives.

Present-day VIP-questionnaire data

Present-day VIP-questionnaire data were available for 35,499 non-Sami, 263 non-reindeer-herding Sami and 97 reindeer-herding Sami. Limits for realistic food intake levels were calculated according to methodology described elsewhere (29). The exclusion criteria were as follows: more than 10% missing data in food

frequency questionnaire and/or missing data in portion sizes (2,380 subjects); missing data on body weight, necessary for the calculation of food intake level (416 subjects); and subjects with an unrealistic food intake level (2,165 subjects), calculated as described elsewhere (29). After exclusions, a non-Sami group, matched to the Sami group for age, sex and geographical area, was selected. Thus, the final analyses included 1,842 non-Sami, 226 non-reindeer-herding Sami and 81 reindeer-herding Sami. The large reduction in the number of non-Sami was due primarily to the geographical matching.

Partial least squares (PLS) analysis was performed to identify variables associated with Sami culture in the present-day study population (Fig. 2). In the PLS analyses, variables were logarithmically transformed, auto-scaled to unit variance and then modelled on three *y*-variables; reindeer-herding Sami, non-reindeer-herding Sami and non-Sami. Factors with a “variable of importance in projection” value ≥ 1.0 were considered influential. For pair-wise comparisons between groups, the Kruskal-Wallis test was used. Ordinal differences between non-Sami, non-reindeer-herding Sami and reindeer-herding Sami, reflecting hypothetical increasing adherence to traditional Sami diet and lifestyle, were tested by the Jonckheere-Terpstra test, which is a non-parametric rank sum test developed from the Kruskal-Wallis test. Before testing, all intake variables except alcohol and coffee were energy adjusted according to the nutrient density method, which is nutrient intake per 1,000 kcal of energy consumption (30). All tests were two sided, and a *p*-value < 0.05 was considered significant. Statistical analyses were performed with SPSS software, version 17.0, or for the PLS analysis with SIMCA P+ (version 12.0, Umetrics AB, Umeå, Sweden).

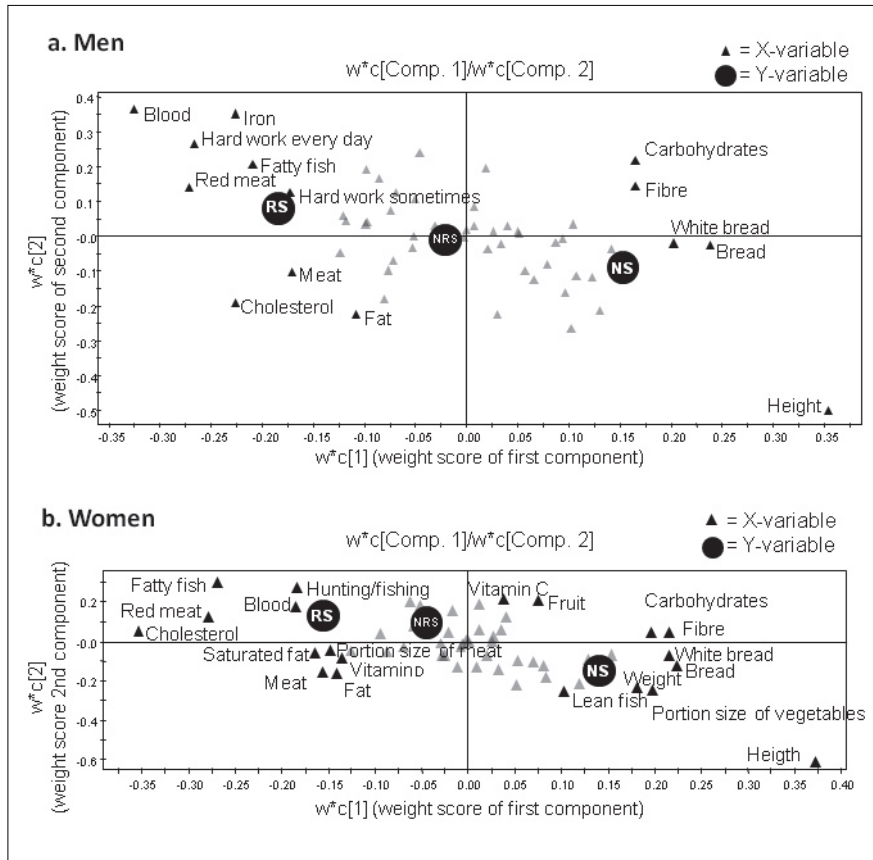


Figure 2. Scatter plot of partial least squares (PLS) weights for lifestyle variables in men (a) and women (b), modelled on reindeer-herding Sami (RS), non-reindeer-herding Sami (NRS) and non-Sami (NS) as y-variables. Only x-variables with a “variable of importance in projection” value ≥ 1.0 are labelled. Variables on the left side of the graph are positively associated with reindeer-herding Sami (RS), whereas variables on the right side are negatively associated with reindeer-herding Sami. A larger distance from the outcome y-variable indicates a stronger influence. Non-labelled, grey points indicate non-influential variables (“variable of importance in projection” value < 1.0) and include in both men and women the following: age, body mass index, obesity, smoking, smokeless tobacco use, biking, dancing, gardening, berry picking, shovelling snow, sedentary lifestyle, walking, portion sizes of potatoes, and intake of boiled coffee, filtered coffee, tea, alcohol, berries, dairy products, fish, liver/kidney, potatoes, sugary foods, vegetables, whole grain bread, calcium, carotene, energy, protein, saccharose, selenium, vitamins C and D. In men, they also include body weight, hunting/fishing, portion sizes of meat and vegetables and the intake of fruit, lean fish, saturated fat, and vitamins A and E; and in women they also include hard work every day, hard work sometimes and the intake of iron.

Ethical approval

The study protocol and data handling procedures were approved by the Regional Ethical Review Board of Northern Sweden (D.nr 07-165M). All study subjects provided written informed consent.

RESULTS

Results from the semi-qualitative interviews are presented with respect to sustenance, physical activity, meal patterns, food consumption and alcohol and tobacco habits. Results from quantitative analyses are summarized in the results section.

Sustenance

Of the 18 historical Sami described, 4 were not involved in reindeer herding. All but 2 historical Sami were engaged in small-scale farming, which typically involved having 1 to 4 cows and/or goats and poultry, mostly parallel with reindeer herding. Women also participated in reindeer herding, but after children were born, men commonly took the main responsibility for all the work far away from home, which aside from reindeer herding could include hunting, fishing, forestry, timber fletting, transportation and construction work. Thus, historical Sami women had a greater responsibility for the work of the small farms, as well as childcare and housekeeping.

The role of fish and fishing

A transition over time was apparent from the interviews, in which fishing shifted from a shared or primarily female-dominant responsibility in the 1930s and 1940s to a male-dominant responsibility in the 1950s. In one interview, reflecting the 1950s, the mother did not fish at all.

Some historical Sami also fished commercially.

These Sami, both women and men, were sometimes called fishing-Laps in a contemptuous manner and forced to quit reindeer herding, but according to some informants, commercial fishing was locally accepted. Household fishing was not looked down upon in the same way.

Gardening

During the 1930s and 1940s, national health promotion campaigns encouraged people in rural areas to construct gardens, sow seeds and use vegetables in cooking. Half of the historical Sami, 7 mothers and 2 fathers, were described as being involved in gardening. An additional 4 families had a garden, but the father, who was the historical Sami described, was not involved. Among those with gardens, carrot, lettuce and turnips were the most common vegetables. Potatoes existed in the Sami area even before the gardening campaigns and were grown on small islets to avoid frost in the mountain areas. One informant recalled his father inviting dinner guests to begin their meal by saying, “Eat plenty of meat, we are short of potatoes.”

Rhubarb, which is not included in the VIP questionnaire, was mentioned frequently in association with gardening. It was prepared and eaten in the same way as the traditional Sami herb jomo (sorrel), which was to boil it with sugar and milk. The taste is also rather similar, though the rhubarb is a larger and much coarser plant.

Picking berries and mushrooms

Wild berries, primarily cloudberries and lingonberries, were widely picked and stored. They could be kept in wooden boxes or glass bottles and were often boiled with sugar before eating. One informant defined a good berry season as one when the family was able to collect more than 60 kilograms, and a bad season as one when no more than 10 kilograms of berries were picked. Only one

of the interviewed Sami recalled a parent picking mushrooms. Her mother was taught to recognize yellow chanterelles by a local hotel manager, who wanted to buy them for the hotel restaurant.

Physical activity

To walk or ski 10 to 30 km or more on a daily basis for reindeer herding, purchasing food and supplies, or for harvesting hay for cattle in remote pastures, was normal for the historical Sami. Yet many of the informants found the question on physical activity during work irrelevant and difficult to apply, stressing that they did not believe that their parents would have considered their lifestyle to be strenuous.

Of the specific leisure time activities listed in the VIP questionnaire – walking, dancing, biking, shovelling snow, gardening, hunting, fishing and berry picking – all but dancing were not considered to be recreational for the historical Sami in the 1930s to 1950s. One informant recalled that her mother walked to church occasionally, which might be defined as leisure time walking, though her mother did so mainly out of social duty. Another possible exception could be hunting and fishing, which some informants believed might have been somewhat relaxing for their fathers. Seining, a method of fishing in which nets are pulled from two points on shore, was also mentioned in relation to leisure time. This was mainly a Saturday night event; the men fished while the women cooked the fish by the shore and socialized with neighbours and children.

Meal patterns and portion sizes

Regular meals were described as being more common among women who stayed at home than among men who were more mobile while out at work. Among historical Sami women, a common meal pattern was coffee at 6 a.m., breakfast at 10

a.m., dinner at 4 p.m. and an evening meal at 9 p.m., with coffee breaks in between. In contrast, there were many stories about reindeer-herding historical Sami men walking for days without a real meal, except maybe some cups of coffee. But the informants also recalled that it was common to add sugar and combinations of dried meat, animal fat and cheese into the coffee cup which could make it resemble a quick meal to some extent. Picking and eating herbs and berries and eating packed foods, such as dried reindeer meat, along the way were also common.

The interview informants generally found the smallest vegetable portion size in the VIP questionnaire to be larger than the portions of carrots and lettuce consumed by their parents in the 1930s–1950s. The portion sizes for meat and potatoes were more applicable.

Food consumption

Cereals and bread

Grain foods such as bread and oats, which had to be purchased, were generally considered to be finer than foods produced at home. The farmers' habit of eating porridge before bedtime was adopted by most of the historical Sami, though the evening porridge could sometimes be replaced by fish for economical reasons. Bread had also become a basic food item by the 1930s–1950s and was consumed as homemade soft flat bread (kakun in local dialect), commercially produced rye or wheat crispbread (knäckebröd in Swedish, Mensträsk-kakun, klyvja-kakun) and Norwegian soft bread (stompen in Norwegian).

Vegetables, fruits and berries, and herbs

The arguments for adding vegetables to the diet were based on health, rather than taste, and there were negative connotations attached to vegetables, such as food more suitable for birds and cattle

than for humans. Some historical Sami women put cream and sugar on lettuce to get the children to try it, or marinated it in vinegar to improve its taste.

In successful seasons, carrots could be saved in boxes of sand over the autumn, but none of the informants could remember that their parents ate carrots year round. One informant recalled that carrots could be purchased in the 1940s, but that his parents never bought any, because that would have been too luxurious.

Whereas fruits were not described as contributing more than occasionally to the diet of the historical Sami, 12 of the informants recalled berries as commonly available year round, and 8 of them did not. Among the latter, the most common estimation of how long collected berries could be kept was to the end of the winter season.

As cultivated vegetables and rhubarb were introduced, Sami traditional herbs such as jomo (sorrel), jierja (*Mulgedium alpinum*) and kvanne (*Angelica archangelica*) were gradually abandoned. Only 2 historical Sami, one in the 1940s and one in the 1950s, collected substantial amounts of wild herbs and preserved them according to traditional practices. The others only ate wild herbs, mostly jomo, during the early part of the growing season. One informant said that in the 1940s, her grandmother used to make jomo, but her mother never did. Wild herbs were also eaten outside the context of a meal. For example, some informants described a habit of picking and eating during wanderings outdoors. In one story, from the 1950s, a father was preparing a fish meal for his daughter. He asked her to wait, disappeared into the forest for a while, and returned with some herbs, which he added to the fish. It was very tasty, but he did not tell her which herbs he used. And she did not ask. Her father never told her about traditional herbs, and her mother never used them in cooking.

Dairy products

Milk, butter and cheese were described as being important, especially among small-scale-farming historical Sami, though men working far away from home had limited access to milk. Among mountain Sami it was not uncommon to have “summer cows” or goats, which were kept by settled relatives during the winter.

Fish

Many historical Sami had at least one meal of fish every day. Some present-day informants described an increasingly negative attitude that fish consumption is considered a sign of unsuccessful reindeer herding. However, other informants stressed the continued importance of fish in their diets even today.

Meat, blood, intestinal fat and fowl

Meat, especially reindeer meat, was described as frequently being eaten in the winter and during the autumn slaughter. Imported and relatively cheap American salted ham was also common during outdoor winter work in the 1930s–1950s. In the summer, however, meat was difficult to preserve, and fresh fish was noted as the predominant source of protein in the diet. Settled Sami ate meat from their cattle, but also considerable amounts of reindeer meat that was obtained, for example, by exchanging butter in the spring for a share of the reindeer meat in the autumn, when reindeer-herding relatives were passing through. The meat was preserved by freezing, sun drying, smoking or pressure canning. The latter method, mentioned in 2 stories about the 1950s, allowed meat to be eaten any time of the year, even before electricity and freezers became widely available. According to the informants, the much more common dried or smoked reindeer meat was not typically eaten at regular meals, but rather

snacked on as packed food during travel or at home between meals. Smoked meat seems to have been more common among mountain Sami than among forest Sami.

Animal fat, dried and preserved, was used like butter in cooking. In the summer, dried blood was ground to a powder, mixed with water and boiled in lumps called palt. Palt could also be made from fresh blood during the autumn slaughter. Only one of the historical Sami was described as never eating blood. She was Pentecostal and was convinced that eating blood was against the will of God. There were also some historical Sami who never ate fowl or poultry, not even if they had poultry of their own. One explanation given by the informants was that according to the Bible, one should not eat animals with claws. Another given explanation was that birds, especially wild ones, could be sold for a good price to tourists and hotels.

Food for special occasions

Meat, marrowbone, meatballs and steak were the most common responses to the question of what the historical Sami ate on special occasions in the 1930s–1950s. Waffles and cabbage rolls were also mentioned, as well as ham and rice porridge at Christmas. In many cases, a special occasion was directly based on access to food rather than to a festive event. Two examples noted were “when there was meat” and “when we caught the Tjektjauere sik” (a rare reddish whitefish).

Swedish festive occasions like Christian holidays and the Midsummer (June 24–25th) were not traditionally celebrated or associated with special foods, though some informants recalled elements of Swedish holiday food being introduced by their parents.

Other foods

Some food items not included in the VIP questionnaire were mentioned as frequently consumed by the historical Sami. Aside from the intestinal fat and traditional herbs already mentioned, there was buttermilk, coffee-cheese, wheat porridge, reindeer steak shavings (renskav), meat soup, dried meat, dried fish and brain. One informant recalled that her mother occasionally made sweet cakes from wild bird eggs, but she did not use them in ordinary cooking.

Alcohol and tobacco

Alcohol consumption was described as being very low among the historical Sami. The most common reason given by the informants was a very limited availability. Alcohol was expensive and, during the Second World War, it was even rationed. Furthermore, the informants described alcohol as primarily being consumed in larger amounts by single, rather than married, men. Among the fathers, only one had known alcohol abuse problems. Among the mothers, only one drank any alcohol at all. Alcohol in small amounts could also be used as medicine, especially for coughs and colds. Smoking was uncommon, but a smokeless tobacco (snus in Swedish), which is held under the upper lip, was reported as being used by most of the men and none of the women.

Differences in diet and lifestyle in the present day

Lifestyle factors and median intakes of food, nutrients and portion sizes among present-day non-Sami, non-reindeer-herding Sami and reindeer-herding Sami, representing hypothetical increasing adherence to a traditional Sami lifestyle and diet, are presented in Tables I to III and in Figure 3. PLS analyse of these variables in women and men, respectively, are shown

in Figure 2, in which influential variables are labelled. Box plots in Figure 4 illustrate intakes of six influential food items, as identified by the PLS analyses, for the non-Sami, non-reindeer-herding Sami and reindeer-herding Sami, as well as for the historical Sami as estimated from the interview data.

A statistically significant ordinal difference was found for gardening in both sexes, with the lowest proportion found among reindeer-herding Sami, the intermediate among non-reindeer-herding Sami and the highest among non-Sami. Hunting and fishing demonstrated no differences in men, but a statistically significant ordinal difference in women with the higher proportions found among reindeer-herding Sami, the intermediate among non-reindeer-herding Sami and the lowest among non-Sami. For men, there was also an ordinal difference

in the proportion of physically strenuous work, which was lowest among non-Sami, intermediate among non-reindeer-herding Sami and highest among reindeer-herding Sami.

Although total protein, vegetables and boiled coffee intakes were significantly different among reindeer-herding Sami, there was no ordinal difference among the groups. Neither was there an ordinal difference in the consumption of fish. However, there was a statistically significant ordinal difference for fatty fish, with the highest intake among reindeer-herding Sami ($p \leq 0.001$), and for lean fish in the opposite direction ($p \leq 0.001$). Other foods and nutrients for which statistically significant ordinal differences were observed included meat, blood and fat, of which the reindeer-herding Sami had the highest intakes, and bread, dairy products, carbohydrates and fibre, of which the reindeer-

Table 1. Lifestyle-related factors among groups of present-day non-Sami, non-reindeer-herding Sami and reindeer-herding Sami.

Lifestyle variables ^a	Sex	Median (25 th -75 th percentile) or frequency (%)			Mann-Whitney P	Ordinal difference ^b P
		Non-Sami n=1842	Sami Non-herding n=226	herding n=81		
Obese (BMI ≥ 30)	Men	82 (10.4)	5 (5.7)	6 (13.6)	0.278	0.543
	Women	138 (13.1)	13 (9.4)	3 (8.1)	0.328	0.137
Current smoking	Men	214 (27.7)	27 (30.7)	11 (26.2)	0.812	0.746
	Women	302 (29.1)	44 (31.9)	10 (27.0)	0.760	0.668
Smokeless tobacco use	Men	215 (27.8)	26 (30.6)	16 (38.1)	0.321	0.199
	Women	54 (5.5)	6 (4.6)	2 (6.1)	0.908	0.786
Alcohol (g/day)	Men	4.6 (2.4-7.5)	5.0 (2.6-7.8)	5.1 (2.7-7.3)	0.621	0.338
	women	2.2 (1.1-3.7)	2.6 (1.2-3.5)	2.0 (1.0-3.7)	0.380	0.447
Gardening	Men	0.2 (0.1-1.0)	0.2 (0.1-1.0)	0.1 (0.0-0.2)	0.010	0.024
	Women	1.0 (0.1-1.0)	0.2 (0.1-1.0)	0.2 (0.1-1.0)	0.062	0.019
Hunting/fishing	Men	0.2 (0.1-1.0)	0.2 (0.1-1.0)	0.2 (0.2-1.0)	0.454	0.563
	Women	0.1 (0.0-0.2)	0.1 (0.0-0.2)	0.2 (0.1-0.2)	≤ 0.001	≤ 0.001
Picking berries/mushrooms	Men	0.2 (0.1-0.2)	0.1 (0.1-0.2)	0.1 (0.1-0.2)	0.714	0.430
	Women	0.2 (0.1-1.0)	0.2 (0.1-1.0)	0.2 (0.2-1.0)	0.657	0.537
Hard work sometimes ^c	Men	326 (42.3)	38 (44.2)	34 (77.3)	≤ 0.001	0.002
	women	437 (42.1)	51 (37.0)	20 (55.6)	0.125	0.839
Hard work every day ^d	Men	117 (15.2)	11 (12.8)	15 (34.1)	0.003	0.107
	Women	178 (17.2)	18 (13.0)	4 (11.1)	0.319	0.134

^a Occasions/week unless otherwise indicated.

^b Jonckheere-Terpstra rank sum test, extended from the Kruskal-Wallis test, showing if there is a significant ordinal left to right difference between the groups.

^c Physically strenuous work sometimes or most of the time.

^d Physically strenuous work most of the time.

herding had the lowest intakes. There was also an ordinal difference in the portion sizes of vegetables consumed by women, with smaller portion sizes among reindeer-herding Sami.

In the PLS analyses, men and women showed similar patterns (Fig. 2). However, while blood was the most influential food item among reindeer-herding Sami men, fatty fish was most influential among reindeer-herding Sami women. Other influential variables were red meat, fat, cholesterol, bread, fibre, carbohydrates, hard

work (men) and hunting/fishing (women).

As illustrated in the box plots in Figure 4, the results for the historical Sami, based on the interview data, generally followed the ordinal trends of the present-day subject groups, with the historical Sami most closely resembling the present-day reindeer-herding Sami. Notable exceptions included meat, with a lower consumption, and fatty fish, with a much higher consumption, in the historical Sami than in any of the present-day subject groups.

Table II. Intake of food items and nutrients among groups of present-day non-Sami, non-reindeer-herding Sami and reindeer-herding Sami in Västerbotten County.

Intake variables ^a	Median (25 th -75th percentile)			Kruskal-Wallis P	Ordinal difference ^b P
	Non-Sami	Sami Non-herding	Herding		
	n=1842	n=226	n=81		
Energy (Kcal/day)	1930(1569-2393)	1943 (1558-2421)	2070 (1632-2573)	0.275	0.234
Meat ^c	0.69 (0.57-0.88)	0.74 (0.57-0.91)	0.86 (0.62-1.18)	≤ 0.001	0.016
Blood	0.03 (0.03-0.08)	0.03 (0.03-0.08)	0.08 (0.08-0.08)	≤ 0.001	≤ 0.001
Liver/kidney	0.03 (0.03-0.03)	0.03 (0.00-0.04)	0.03 (0.03-0.08)	0.196	0.664
Fish	0.16 (0.11-0.22)	0.16 (0.11-0.17)	0.16 (0.11-0.22)	0.687	0.403
Fatty fish	0.08 (0.03-0.08)	0.08 (0.03-0.08)	0.08 (0.08-0.14)	≤ 0.001	≤ 0.001
Lean fish	0.08 (0.03-0.14)	0.08 (0.03-0.14)	0.08 (0.03-0.11)	≤ 0.001	≤ 0.001
Vegetables	1.28 (0.75-2.00)	1.33 (0.83-2.04)	1.00 (0.52-1.72)	0.012	0.223
Fruit	1.08 (0.58-1.78)	1.08 (0.58-1.78)	0.86 (0.34-1.76)	0.058	0.116
Berries	0.08 (0.08-0.14)	0.08 (0.08-0.14)	0.08 (0.08-0.14)	0.714	0.668
Bread	3.50 (2.41-4.62)	3.28 (2.10-4.38)	2.78 (1.92-3.74)	≤ 0.001	≤ 0.001
White bread	2.50 (1.08-2.86)	2.00 (1.06-2.70)	1.08 (0.81-2.56)	≤ 0.001	≤ 0.001
Whole grain bread	1.14 (0.58-1.84)	1.14 (0.58-1.58)	1.08 (0.48-2.00)	0.378	0.262
Potatoes	0.93 (0.68-1.22)	0.92 (0.63-1.22)	1.12 (0.82-1.37)	0.778	0.498
Dairy products	3.17 (2.20-4.28)	3.17 (2.25-4.26)	2.70 (1.98-4.04)	≤ 0.001	0.024
Coffee	2.58 (2.50-4.03)	2.58 (2.50-4.03)	2.58 (2.52-4.08)	0.917	0.683
Filtered coffee	2.50 (0.08-2.50)	2.50 (0.36-2.50)	1.00 (0.08-2.50)	0.036	0.737
Boiled coffee	0.36 (0.03-2.50)	0.36 (0.03-2.50)	1.00 (0.08-2.50)	0.006	0.255
Protein (g/day)	68 (55-83)	68 (56-84)	76 (55-102)	0.014	0.202
Fat (g/day)	73 (56-95)	74 (57-103)	86 (58-103)	0.008	0.004
Saturated fat (g/day)	31 (23-40)	31 (24-44)	36 (24-45)	0.027	0.013
Carbohydrates (g/day)	232 (187-284)	227 (187-282)	225 (176-293)	≤ 0.001	≤ 0.001
Carotene (mg/day)	2.5 (1.4-4.8)	2.6 (1.5-4.8)	2.0 (1.2-3.8)	0.144	0.263
Vitamin C (mg/day)	80 (56-116)	85 (61-122)	76 (54-113)	0.174	0.686
Saccharose (g/day)	33 (24-46)	33 (24-46)	30 (21-45)	0.019	0.109
Fibre (g/day)	20 (16-25)	19 (16-24)	18 (14-22)	≤ 0.001	≤ 0.001

^a Occasions/day unless otherwise indicated.

^b Jonckheere-Terpstra rank sum test, extended from the Kruskal-Wallis test, showing if there is a significant ordinal left to right difference among groups. All intake variables except coffee were energy adjusted by the energy-density method before testing.

^c Including ground meat dishes, beef stew, steak, cutlet, bacon, pork, sausage, hamburger and poultry.

Table III. Portion sizes (see Fig. 3) among groups of present-day non-Sami, non-reindeer-herding Sami and reindeer-herding Sami.

Intake variable ^a	Sex	Median (25 th -75 th percentile)			Kruskal-Wallis p	Ordinal diff ^b p
		Non-Sami n=1842	Non-herding n=226	herding n=81		
Meat	Men	3.0 (2.0-3.0)	3.0 (3.0-3.0)	3.0 (3.0-3.8)	0.167	0.078
	Women	2.0 (2.0-3.0)	2.0 (2.0-3.0)	3.0 (2.0-3.0)	0.008	0.098
Potatoes	Men	3.0 (3.0-3.0)	3.0 (3.0-3.0)	3.0 (2.0-4.0)	0.872	0.770
	Women	2.0 (2.0-3.0)	2.0 (2.0-3.0)	2.0 (2.0-3.0)	0.881	0.775
Vegetables	Men	2.0 (1.2-3.0)	2.0 (2.0-3.0)	2.0 (1.0-3.0)	0.043	0.195
	Women	3.0 (2.0-4.0)	2.5 (2.0-3.0)	2.0 (2.0-3.0)	0.002	≤ 0.001

^a Participants were asked to specify portion sizes separately for each item on the plate (Fig. 3).

^b Jonckheere-Terpstra rank sum test, extended from the Kruskal-Wallis test, showing if there is a significant ordinal left to right difference between the groups.

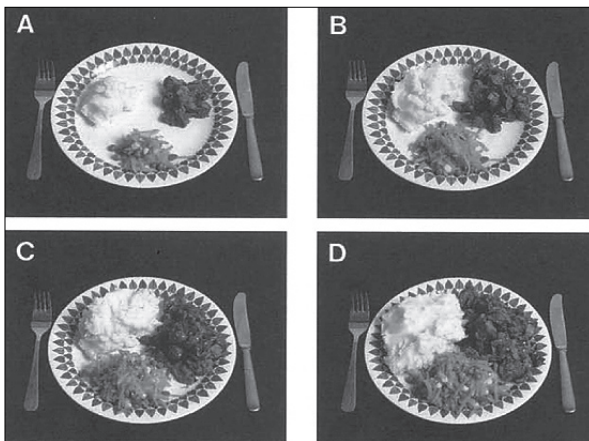


Figure 3. Given portion sizes for the participants, A=1.0, B=2.0, C=3.0 and D=4.0.

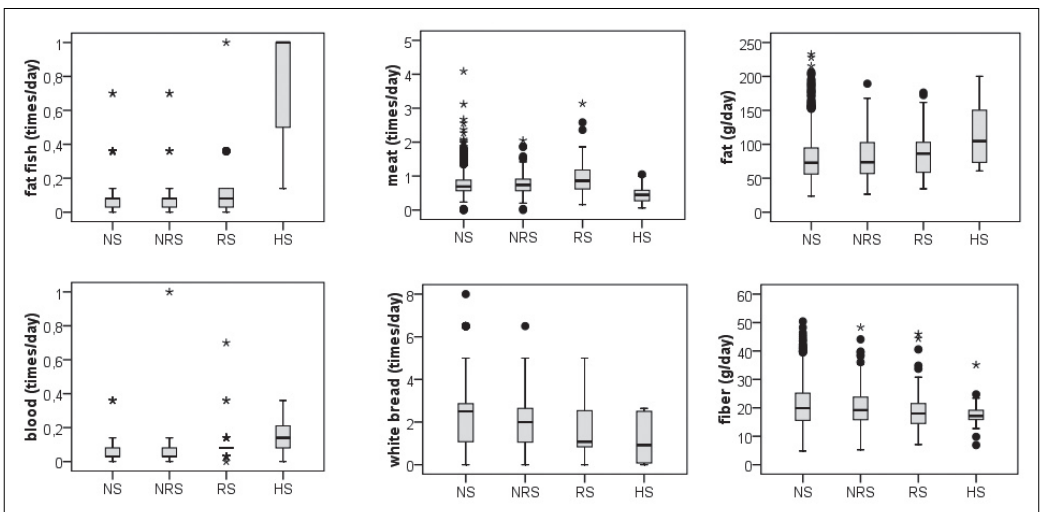


Figure 4. Intake of food and nutrients found to be influential in PLS-analyses. Results are shown for present-day non-Sami (NS), non-reindeer-herding Sami (NRS) and reindeer-herding Sami (RS), and as estimated from the interview data for the historical Sami (1930–1950) (HS).

DISCUSSION

In the 1930s–1950s, we found, somewhat surprisingly, that fatty fish may have been more important than reindeer meat for the Sami of southern Lapland, and it is still consumed more frequently by reindeer-herding Sami than non-reindeer-herding Sami and non-Sami. The results for other dietary variables were consistent with previous studies (6,9–11,24). With respect to sustenance, Sami men in southern Lapland in the 1930s–1950s, had the main responsibility for work far from home, while the women had the main responsibility for work close to home, including fishing, farming and gardening, which was introduced during this time period, as well as childcare and housekeeping. Physical activity was also a part of the daily life of the Sami to a much greater extent in the 1930s–1950s than today, although physically strenuous labour appears to be more common among present-day reindeer-herding Sami compared to non-reindeer-herding Sami and non-Sami.

The interviews with elderly Sami concerning the lifestyle and diet of their parents provided unique and valuable information about the daily life of the Sami of southern Lapland during the 1930s–1950s, a period of great change in the region. Follow-up interviews and feed-back before publishing gave the informants an opportunity to comment on the results and discuss issues that they had in common, which likely improved the dependability and reliability of the data. Concerning confirmability (neutrality of the data, the degree to which the results could be confirmed or corroborated by others), it would have been preferable if a person with no connections to Sami culture, and not only the first author, had been involved in all of the interviews. However, in the analyses of the interview transcripts, and

in the feedback meetings with the informants, the second author took an active part in communication and interpretation.

The opportunity to relate the interview results to data from present-day groups of reindeer-herding Sami, non-reindeer-herding Sami and non-Sami from the large, population-based VIP cohort was an important strength of the study. In particular, the geographically matched, non-Sami group allowed for the differentiation of characteristics of the traditional Sami diet from characteristics of the diet in rural areas of southern Lapland. However, the VIP questionnaire was not constructed to reflect a Sami lifestyle, especially not a Sami lifestyle of 50–70 years ago. This may limit the suitability of the VIP questionnaire for future investigations of the traditional Sami diet as a determinant of health and illness. For example, reindeer meat, like fatty fish, is rich in omega-3 and omega-6 fatty acids, which may contribute to ethnical differences in risk patterns for heart disease (2,4,31,32). Reindeer meat also contains substances suggested to be protective against cancer (31,33–35). In the VIP questionnaire, however, reindeer meat cannot be distinguished from other types of meat. Furthermore, some traditional Sami food items and meal patterns, such as foods eaten outside the context of a meal, which constitute a substantial proportion of the food intake in the traditional Sami diet, could not be assessed by the VIP questionnaire. The credibility and internal validity of the questionnaire for the historical Sami and for present-day reindeer-herding Sami is thus questionable. Yet the contrast between the modern VIP questionnaire and the elderly Sami informants' memories of the past fostered a dynamic dialogue and contributed to the breadth and depth of the interview results, and was thus not only a weakness but also a strength of the study.

The time period assessed by the interviews, the 1930s–1950s, captured the introduction of vegetables to the Sami diet in southern Lapland, which had been encouraged by local and state authorities (12,36). The interviews revealed a widespread and deliberate effort among many Sami mothers to increase vegetable consumption in their families. Stories about parents never using wild herbs, or keeping their names untold to children, suggest that there may have been a deliberate normative strategy not to pass the knowledge of traditional herbs on to the children. Perhaps the parents of the informants did not have the same positive attitudes towards traditional herbs as the informants have today, 50–70 years later.

In contrast to both previous studies (6,9) and to our results for present-day reindeer-herding Sami, our interviews suggest that although meat was indeed a central component of the traditional Sami diet of southern Lapland, fatty fish seems to have been even more important. There are a number of possible explanations for this. During the 1930s–1950s there may have been a decrease in meat consumption because of a series of severe winters and resultant reindeer-herding crises (15), and because of the Second World War, when rationing may have led to more reindeer meat being exported and less being consumed locally, a trend which may have begun several years earlier (37). Meat consumption may also have been underestimated by the informants, who unintentionally reconstructed their fathers into having a hegemonic masculinity (38), for example in the stories about historical Sami walking for days without eating anything but some dry meat, animal fat and cheese in their coffee. The general lack of recognition of the importance of fatty fish may also represent an effect of a normative gender

power structure, by which Sami culture has been defined from a meat-producer's perspective (a sustenance dominated by the Sami men), as is the case today (39). However, it might also reflect the culture of the mountain Sami, who historically ate less fish than the forest Sami (40), and who have benefited from Swedish Sami legislation (23). Furthermore, if differences between ethnic groups are stressed when defining ethnicity (41), then fishing was not a factor of interest in the 1930s–1950s, when fishing was central to the survival of all inhabitants of southern Lapland.

As noted above, meats eaten outside the context of a meal, in coffee for example, are likely to have been insufficiently estimated by the VIP questionnaire. However, the interview observation that availability of meat was strongly associated with festive events, and not available all year around, indicates that intakes of meat among the Sami of southern Lapland 50–70 years ago may, in fact, have been much lower than in present-day Sami and non-Sami populations in the same region.

In conclusion, fatty fish may have been more important than reindeer meat for the Sami of southern Lapland in the 1930s–1950s. An important implication of this finding is that for studies investigating characteristic lifestyle elements of specific ethnic groups in relation to health outcomes, the elements of greatest acknowledged cultural importance today (in this case reindeer meat) may not be of the most objective importance traditionally. Based on our findings, the factors assessable by the VIP questionnaire that are most representative of a traditional Sami lifestyle in southern Lapland include high intakes of fatty fish, fat, blood, boiled coffee and low intakes of bread, fibre and cultivated vegetables.

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Appendix 1. Items included in the original validated food frequency questionnaire of the Västerbotten Intervention project.

	In Swedish	In English	In Swedish	In English
1	Bregott på smörgås	68% butter/32% canola oil, on bread	43	potatissallad
2	smör på smörgås	butter on bread	44	rice
3	lättmargarin på smörgås	light margarine (40% fat) on bread	45	baked beans, pea soup
4	margarin på smörgås	margarine (80% fat) on bread	46	broth + flat bread
5	smör till matlagning	butter in cooking	47	pancakes, waffles
6	margarin till matlagning	margarine (80% fat) in cooking	48	potato dumplings
7	olja till matlagning	oil in cooking	49	pizza
8	salladsdressing med olja	salad dressing with oil, vinaigrette	50	ground meat dishes
9	grädde, crème fraîche, gräddfil	cream, crème fraîche, sour cream	51	beef stew
10	hårt bröd, ex husman	whole grain, high-fibre crisp bread (rye)	52	steak, chop, cuts of meat
11	grovt mjukt fullkornsbröd	whole grain high-fibre soft bread	53	bacon, pork belly, ham
12	vitt bröd, limpa	white soft bread	54	sausage dishes
13	ljusgnsbröd, tunnbröd, veteknäcke	white crisp/flat bread (northern Swedish type)	55	hamburger
14	bullar, skorpor	sweet buns, rusk	56	poultry
15	mellanfett hårdost 28% (ex Grevé)	hard cheese, 28% fat (medium fat)	57	blood dishes
16	mager hårdost 10-17% (ex Drabant)	hard cheese, 10-17% fat (low fat)	58	liver, kidney
17	mjukost	cream cheese, soft cheese spread	59	lean fish (perch, cod)
18	messmör	wheny cheese	60	fatty fish (herring, whitefish, salmon)
19	korv som pålägg	sausage as sandwich topping	61	seafood (shrimp, mussels/clams)
20	kött som pålägg	meat as sandwich topping	62	salted fish (herring)
21	leverpastej	liver paté	63	smoked fish/smoked meat
22	gröt av havre	porridge, oatmeal	64	ice-cream
23	gröt av graham, råg eller korn	porridge, graham-, rye- or barley	65	sweets, e.g. chocolate, candy
24	nyponsoffa, saftsoppa, kräm	rosemary or juice soup, fruit cream	66	sugar cubes, sugar, honey
25	fil, yoghurt, kefir	soured milk, yoghurt, 3% fat	67	marmalade, jam
26	lättfil, lättoghurt, hälsofil	soured milk, yoghurt, 0.5% fat	68	cakes, cookies, pastry
27	fiberrika flingor ex musli	whole grain cereals, e.g. musli	69	salted snacks (chips, popcorn, nuts)
28	cornflakes, K-special, mm	corn flakes, low-fibre cereals	70	milk, $\leq 0.5\%$ fat
29	bär, färska eller djupfrys	berries, fresh or deep frozen	71	milk, 1-1.5% fat
30	äpplen, päron, persikor	apples, pears, peaches	72	milk, $\geq 3\%$ fat
31	apelsin, mandarin, grapefrukt	orange, mandarin, grapefruit	73	syrops of fruit or berries
32	banan	banana	74	carbonated soft drinks, coca cola
33	vitkål	cabbage	75	juice
34	rotfrukter, morötter	root vegetables, carrots	76	drip-filtered coffee
35	tomat, gurka	tomato, cucumber	77	boiled, unfiltered coffee
36	sallad, salladskål	lettuce, Chinese cabbage	78	tea
37	spenat, grönkål	spinach, kale	79	beer, $< 2.25\%$ alcohol
38	frysna grönsaksblandningar	frozen mixed vegetables	80	beer, 2.8-3.5% alcohol
39	kolt eller bakad potatis	potato, boiled or baked	81	beer, $\geq 4.5\%$ alcohol
40	stekt potatis	fried potatoes	82	wine
41	pommes fritas	french fries	83	spirits
42	potatismos	mashed potatoes	84	