Fatal accidents and suicide among reindeer-herding Sami in Sweden

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ABSTRACT

Objective. Over the last decades, reindeer-herding management has experienced dramatic changes, e.g. increased motorization and socio-economic pressure. The aim of the present study was to investigate whether these changes have increased the risk of fatal, work-related accidents and suicide between 1961 and 2000. Study design and methods. A cohort containing 7,482 members of reindeer-herding Sami families was extracted from national population registers. Information on fatal accidents and suicide was obtained from the Swedish Causes of Death Register, and compared to the expected number of deaths in a demographically matched control population of non-Sami. Results. The male reindeer herding Sami showed a significantly increased risk of dying from accidents such as vehicle accidents and poisoning. No significant increased risk of suicide was observed. A comparison between the periods of 1961-1980 and 1981-2000 showed non-significant differences in risk, although a trend towards increased risks was observed for most types of external causes of death except suicide. Conclusions. It is suggested that the increased socio-economic pressure and the extensive use of terrain vehicles have increased the risk for fatal accidents among Swedish reindeer herders, and that commercial reindeer management is one of the most dangerous occupations in Sweden.

Key words: Fatal accidents, work-related death, suicide, reindeer herders, Sami, Sweden

INTRODUCTION

Together with the Sami languages, reindeer herding is considered to be the core of the Sami culture. It is believed that the semi-domestication of the reindeer in the Sami region in the northwestern part of Europe started during the first millennium BC. Early, reindeer husbandry was a supporting activity to the fishing, hunting and collecting of weeds and berries. In the eighteenth century, reindeer herding became increasingly important and replaced hunting and collecting as the main sources of livelihood. This was the start of the nomadic lifestyle of the reindeer herders that is still present today to some extent (1,2).

In the twentieth century, and especially during the last four decades, reindeer-herding societies has experienced dramatic changes, with transition into a monetary system from a primitive economy based on trading of goods (2). The commercialization of reindeer-herding management, along with the development of systems of governmental (and lately European) subsidies and regulations, has created market conditions similar to those of the agricultural sector (3). Rationalisation has forced herders with smaller herds to either quit or to merge with other herds to generate enterprises that are competitive in size. The present situation in reindeer-herding management is to some extent a result of the law that has created competition between the enterprises within the reindeer herding communities (Sameby), and at the same time restricted the herding enterprises’ business opportunities to commercialisation of reindeer breeding, hunting
and fishing (4). Taken together, this has encouraged more cost and personnel effective ways of running the reindeer-herding businesses, with less personnel and more vehicles (2).

Excess mortality among men due to external causes of death, such as accidents and suicide, has been observed in several native populations (5,6,7). Similar information regarding the Sami people is limited, however (9). The aim of the present study was to investigate the risk of fatal, work-related accidents and suicide among reindeer-herding Sami between 1961 and 2000.

MATERIAL AND METHODS

It is not possible to separate different ethnic groups directly in the national population registers in Sweden. Therefore, a cohort of reindeer herders together with their spouses and children was constructed based on the national kinship registers (8). Altogether 2,777 reindeer herders and reindeer owners were identified in the occupational registers of Statistics Sweden of 1960 through 1990, and in the national register of reindeer herding enterprises. Spouses and children to these index herders were extracted from the kinship registers of Statistics Sweden and added to the cohort. In total, the cohort contained 7,482 individuals (4,451 men, 3,031 women).

The earliest start of the follow-up was 1 January 1961, and end of follow-up was 31 December 2000, or death, whichever came first. A total of 191,492 person-years were recorded for the cohort during the follow-up (Table I). Information on fatal accidents and suicide was obtained from the Swedish Causes of Death Register, and compared to the expected number of deaths in a control population of non-Sami. This was constructed in a similar way as the study cohort. A group of index controls was matched to the index herders for gender, age and area of residence (i.e. by parish or municipality). Spouses and children to the index-controls were identified in the kinship registers, creating a control population that was demographically very similar to the study cohort (Table I). The demographically matched control population (DMC) contained a total of 31,349 persons (18,429 men and 12,920 women).

The expected number of deaths was calculated by applying the standard annual sex-, age- and cause-specific mortality rates of the DMC to the cohort of reindeer herders. Standard mortality ratios (SMR) were calculated for the main categories of external causes of death such as vehicle accidents (ICD10: V01-V89), drowning (ICD10: V90; V92; W65-W74), poisoning (ICD10: X40-X49), falling (ICD10: W00-W19) and suicide (ICD10: X60-X84). Re-coding between ICD7, ICD8, ICD9 and ICD10 was done accordingly.

RESULTS

Over the entire follow-up period, a total of 150 externally caused deaths occurred among reindeer-herding Sami (136 among men, 14 among women). The herding men showed a significantly increased risk of dying from external causes of death in general, while non-significant differences were observed for the women (Table II). Of the cause-specific mortality, men showed an increased risk of dying from vehicle accidents, snowmobile accidents, drowning, poisoning and ‘other causes’ (Table II). Although the incidence of suicide was
higher among the reindeer herders, the increased risk was not significantly increased.

Comparison of the deaths that occurred in the periods of 1961-1980 and 1981-2000 revealed a non-significant increase of externally caused deaths over time (Table III). This trend was most pronounced for accidents directly or indirectly caused by vehicles (i.e. cars, snowmobiles, motorcycles and helicopters) and for poisoning. The number of deaths caused by snowmobiles and terrain vehicles tripled between the two time periods.

For the reindeer herders, the deaths were fairly evenly distributed over the year (Figure 1). A distinct peak of fatal accidents was observed during the holiday months (June and July) among the DMC, but not among the reindeer herders.

**DISCUSSION**

In agreement with an early study (9), the present data show that external causes of death are over-represented among male reindeer herders in Sweden. Whereas acculturation, alcohol abuse and socio-economic poverty are main causes of the excess mortality in most other indigenous people demonstrating excess mortality from accidents (5, 6, 7), fatal accidents among the reindeer herding Sami are mostly work-related. This conclusion is supported by observations that alcohol consumption among reindeer herding Sami was similar to that among Swedes and Finns in the same region (10, 11), as well as the present finding that suicide among the Sami was only non-significantly increased. The high risk of dying from vehicle accidents, drowning and poisoning suggests that there is a strong relation between the fatalities and the herding, fis-

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**Table II.** Observed and expected number of externally caused deaths for reindeer herders, 1961 to 2000. Standard mortality ratio (SMR) based on a comparison with a population of demographically matched non-Sami controls. Confidence intervals (CI) are shown at 95 % level.

|                  | Men       |            |            | Women      |            |            |
|------------------|-----------|------------|------------|------------|------------|------------|
|                  | Obs | Exp | SMR (95% CI) | Obs | Exp | SMR (95% CI) |
| 1. Vehicle accidents |     |     |           |     |     |            |
| 1.1 Snowmobiles and terrain vehicles | 29 | 17 | 1.74 (1.16-2.49) | 4 | 3 | 1.36 (0.37-3.49) |
| 2. Drowning | 15 | 8 | 1.80 (1.01-2.97) | 1 | 1 | 1.53 (0.02-8.52) |
| 3. Falling | 10 | 10 | 0.96 (0.46-1.77) | 1 | 1 | 0.83 (0.01-4.61) |
| 4. Poisoning | 7 | 2 | 4.32 (1.73-8.90) | 0 | 0 | 0.00 (0.00-9.80) |
| 3. Suicide | 33 | 24 | 1.38 (0.95-1.94) | 5 | 5 | 1.03 (0.33-2.41) |
| 4. Other causes | 42 | 19 | 2.18 (1.57-2.94) | 3 | 2 | 1.23 (0.25-3.61) |
| Total | 136 | 80 | 1.69 (1.42-2.00) | 14 | 13 | 1.10 (0.60-1.85) |

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**Table III.** Time trend for externally caused deaths among reindeer-herding men. The mortality ratio (SMR) and 95 % confidence intervals (CI) were calculated using the non-Sami control population as the standard.

|                  | 1961-1980 |            | 1981-2000 |            |            |            |
|------------------|-----------|------------|-----------|------------|------------|------------|
|                  | Obs | Exp | SMR (95% CI) | Obs | Exp | SMR (95% CI) |
| 1. Vehicle accidents |     |     |           |     |     |            |
| 1.1 Snowmobiles and terrain vehicles | 13 | 9 | 1.43 (0.76-2.45) | 16 | 8 | 2.04 (1.16-3.31) |
| 2. Drowning | 7 | 5 | 1.54 (0.62-3.18) | 8 | 4 | 2.10 (0.91-4.15) |
| 3. Falling | 4 | 5 | 0.78 (0.21-2.01) | 6 | 5 | 1.13 (0.41-2.46) |
| 4. Poisoning | 2 | 0 | 4.20 (1.47-15.15) | 5 | 1 | 4.37 (1.41-10.20) |
| 3. Suicide | 12 | 8 | 1.43 (0.74-2.49) | 21 | 15 | 1.35 (0.84-2.07) |
| 4. Other causes | 16 | 9 | 1.82 (1.04-2.95) | 26 | 10 | 2.48 (1.62-3.63) |
| Total | 54 | 36 | 1.48 (1.11-1.94) | 82 | 44 | 1.86 (1.48-2.31) |
hunting and hunting lifestyle of the reindeer-herding Sami.

Reindeer herding implies many hazardous situations, especially during the gathering of the reindeer for migration or slaughter. During these periods the herders use vehicles to gather the reindeer (i.e. motorcycles, snowmobiles, helicopters, airplanes and boats), and the work is often executed during long working hours in harsh climate. For instance, it has been shown that most reindeer-herding men spend approximately 800 hours per winter on snowmobile (12). The increasing number of work-related fatal accidents among the reindeer herders is probably related to an increasing pressure from the Swedish society to develop profitable reindeer herding companies with less dependence on governmental support. This has resulted in external socio-economic pressure and competition between the family companies within the Sami communities, which in turn has forced the enterprises to make costly investments in vehicles to save time and personnel expenses.

According to self-reported data on the division of working time among reindeer herders in Finland, the slaughtering, gathering and reindeer separation in late autumn are the most labour-intensive periods (13). More than half of the annual work-related accidents occurred during those periods (14). A similar distribution pattern was not observed in the present study, however (Figure 1). Among the Swedish reindeer herders, the fatal accidents were fairly evenly distributed over the year. The distribution was different in comparison to the non-Sami control population of the same region. The lack of a peak of accidents during the holiday months suggests that the vast majority of fatalities among the herders were work-related. This is also in agreement with the herders’ attitudes, which imply e.g. that they do not make any strict distinction between labour and leisure time. For instance, hunting and fishing, as well as ‘hiking’, are regarded as natural elements of their work, but for others, these are typically leisure-time activities.

![Figure 1. The monthly distribution of all external causes of death except suicides among male reindeer herders, compared to the adjusted number of accidents among non-Sami controls in the same area of residence, during the follow-up period 1961 to 2000.](image)

![Figure 2. Fatal accidents among reindeer herders, 20-64 years of age, between 1982-1998, presented as deaths per 100,000 persons in five-year moving averages. For comparison, incidence of officially registered work-related accidents in the agricultural (includes farming, reindeer herding, forestry, fishing and hunting) and building-construction sectors of Sweden (15).](image)
The high number of work-related accidents among reindeer herders puts reindeer herding at the top among the most hazardous occupations in Sweden. A comparison of the present results and official statistics on work-related accidents in different occupations shows that work-related fatal accidents are more than twice as common among reindeer herders than within the agricultural (including farming, forestry, fishing industry, hunting and reindeer herding) and the building-construction sectors (Figure 2) (15). A preliminary comparison between reindeer herders and different occupations within the DMC, using the same selection criteria of work-related accidents, strengthens the conclusion that reindeer herding is one of the most hazardous occupations in Sweden.

It should be quite possible to reduce the number of both fatal and non-fatal work-related accidents by suitable adjusted preventive measures, e.g. education, modified work organisation, technical improvement on vehicles, clothing and communication equipment. Promising attempts to bring down the high number of accidents and musculoskeletal pain conditions among reindeer herders have been reported previously (12,13). An obstacle for the implementation of such measures, however, is the poor financial situation within the reindeer-herding sector, at a time when the need for investments in occupational health-promoting activities is very high.

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