

## Fatalities and personal injuries from the use of ATVs and snowmobiles in Northern Norway in 2013–14

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ORIGINAL ARTICLE

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## **BACKGROUND**

Previous studies have shown a high occurrence of injuries and deaths related to the use of snowmobiles and other off-road vehicles in Northern Norway. No public statistics are available to permit monitoring of these findings over time. The objective of our study was to provide new figures for the prevalence of injuries and deaths from the use of snowmobiles and other off-road vehicles, and assess the consistency between different sources of data.

## **MATERIAL AND METHOD**

Information on registered deaths and personal injuries requiring hospitalisation in Northern Norway in the period 1 January 2013–31 December 2014 was collected from the police and hospitals. We also searched through open online sources.

## **RESULTS**

We found 7 deaths and 87 personal injuries requiring hospitalisation: 13 incidents with ATVs and 81 involving snowmobiles. Median age was 31.5 years, and 41 (44 %) victims were below 30 years of age. All the fatalities and 66 (76 %) of those injured were men. Altogether 42 (45 %) of the incidents had occurred in Finnmark county. Of the seven fatalities, the police found six in their records and the hospitals found two. In searching through open online sources we found one further ATV-related and three snowmobile-related fatalities in the same region and period.

## **INTERPRETATION**

No reliable records of fatalities and personal injuries resulting from the use of snowmobiles and ATVs are available. The findings of this study may serve as a reference point for preventive efforts by the police and health services and for purposes of further study.

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## Main message

We registered 7 deaths and 87 hospitalisations after the use of ATVs and snowmobiles in Northern Norway in 2013–14

Obtaining an overview of the number of injured persons and fatalities was difficult

The police and hospitals did not have identical information on fatalities

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Injuries are the most common cause of death among persons under 45 years in Norway and represent a major challenge to public health (1). More injury-related deaths occur in rural than in urban areas (2–4), and Northern Norway is characterised by sparse settlements with long distances between hospitals. Finnmark county has the highest rate of injury-related deaths in Norway irrespective of cause, for both men and women (2). Previous studies have shown that in international comparisons, Western Finnmark and Svalbard rank highly in terms of personal injuries (including deaths) resulting from use of snowmobiles: Western Finnmark had a rate of 2.8/1 000 snowmobiles/year, and Svalbard had an equivalent rate of 4 in 2002–04 (5). Moreover, Svalbard has a growing tourist industry that uses snowmobiles widely (8).

The population in Northern Norway including Svalbard was approximately 480 000 in 2013–14 (9, 10). More than one-half of all registered snowmobiles (11) and approximately one-quarter of all registered off-road vehicles, so-called 'all-terrain vehicles' (ATVs) (12) are found in this region. In various registries in Norway, snowmobiles and ATVs are categorised under 'other vehicles', along with e-bikes, water scooters, Segways etc., and various designations are used for both ATVs and snowmobiles. Snowmobiles are also referred to as half-track motorcycles, and ATVs are similarly referred to as four- or six-wheelers, four-wheel mopeds or motorcycles, Side-by-side (SBS), quadbikes, quadcycles or tractors (12). Some ATVs are registered for driving legally on public roads (13). Insurance companies (14) and the Norwegian Public Roads Administration (15) register only personal injuries resulting from road traffic accidents.

The Norwegian Institute of Public Health has noted that Norway lacks a complete picture of personal injuries and deaths, because the registries in the various sectors are of insufficient quality. The registries do not provide sufficient details to be statistically useful for targeted preventive efforts (1, 16). In their reports, the Institute of Transport Economics and the Norwegian Public Roads Administration point out that we have no data on fatalities and personal injuries associated with the use of off-road vehicles (12, 17).

The new Act relating to Motorised Traffic on Uncultivated Land and in Watercourses of May 2015 authorised all Norwegian municipalities to regulate snowmobile traffic locally. The intention was to provide for more freedom of traffic by permitting the establishment of new routes. This was done to reduce the amount of illegal driving and thereby hopefully reduce the occurrence of deaths and injuries (18). The effects of this legal amendment are unknown.

The very few studies available in Norway in this area stem only from smaller geographic areas (5–7). No systematic registration of these types of fatalities and personal injuries in the terrain has previously been undertaken in Norway over larger geographic areas, and no data are available to constitute a complete picture and credible statistics. The objective of this study is therefore to report the frequency of fatalities and serious injuries resulting from the use of snowmobiles and ATVs in Northern Norway by collating data from the police and hospital registries and assessing their consistency.

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## Material and method

The study is based on retrospective data from the registries of the six police districts and eleven hospitals with an accident and emergency function in Northern Norway, including Svalbard, for the years 2013 and 2014.

The sample includes children and adults in Northern Norway who died or were hospitalised in connection with the use of ATVs or snowmobiles during this period. From the police we collected information on fatalities, and from the hospitals on both fatalities and injuries (hospitalisations). Injured persons who were treated by the primary health services or in outpatient departments were not included. Incidents that occurred near the borders with Sweden and Finland were registered in the county where the injured person was hospitalised.

Police officers retrieved data on fatalities in a manual review of their records, and the trauma registrars in the hospitals retrieved data on fatalities and injuries from all trauma registries and patient records. The trauma reporting forms were reviewed manually, and patient records were consulted for further information as required. Some hospitals also had overviews of hospitalisations associated with the use of ATVs and snowmobiles in which the injured person had not been admitted as a trauma patient. These were included. To avoid double entries, personal ID numbers were used to collate data, in accordance with the approvals for the study, while later analyses were undertaken on a de-identified data file. In addition, we used Google to search for media reports on deaths linked to the use of ATVs and snowmobiles, with the search terms ATV, firjhjuling [four-wheeler], snøscooter, snøskuter [snowmobile], dødsulykke [fatal accident], dødsfall [fatality], døde [died], omkom, omkommet [killed]. To exclude double entries, we collated the media information on vehicles, dates, gender and accident location with the data from the police and hospitals. Fatalities discovered by internet searches were not reported among the other fatalities in our study, but were included as a separate group.

The number of injuries and fatalities in snowmobile-related incidents in 2013 and 2014 were seen in relation to the number of registered snowmobiles in these years (11). We thereby found an average number of injuries/1 000 snowmobiles/year, that could be compared to the figures from a previous study conducted in Western Finnmark (5).

In compliance with the approvals for the study, the following variables were included: fatalities; personal injury with hospitalisation; ATV or snowmobile; gender; age; county; year; month; and day of the week. The study had no approval for collection of information on degree of injury, helmet use, whether the injured person was the driver, passenger etc., weather, light conditions, time of day, driving on- or off-piste, driving on a public road or off-road, driving under the influence of alcohol, hypothermia, drowning or avalanches.

The material is presented descriptively. SPSS version 23 was used for data processing. The study obtained prior approval by the Norwegian Centre for Research Data (reference no. 49099/4/AMS), the Regional Committee for Medical and Health Research Ethics (reference no. 2016/709/REK Nord), the Council for Confidentiality and Research and the Police Directorate (reference no. 201601958–8–641). The request for data was also given prior approval by the personal data officials in the various health enterprises concerned.

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## Results

We registered a total of 94 incidents: 7 fatalities and 87 personal injuries that resulted in hospitalisation (Table 1). All the seven fatalities were men, and they had all been killed while driving a snowmobile. Among the personal injuries, 13 were related to ATVs and 74 to snowmobiles.

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**Table 1**

Deaths and personal injuries requiring hospitalisation caused by use of ATVs and snowmobiles in Northern Norway 2013–2014. Number, unless otherwise specified.

	<b>Deaths (n = 7)</b>	<b>Personal injuries (n = 87)</b>	<b>Total (N = 94)</b>
Gender			
Man	7	66	73
Woman	0	21	21
Age in years, median (interquartile range)	31 (21–43)	32 (20–49)	31.5 (21–49)
Vehicle			
ATV	0	13	13
Snowmobile	7	74	81

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The police reported six fatalities and the hospitals two, whereof one fatality was reported by both the police and the hospital, and one fatality only by the hospital. By searching through open online sources we found four further fatalities in 2013 and 2014 in Northern Norway including Svalbard: one ATV-related and three snowmobile-related. These are not included in the study's dataset.

Seven of the 13 ATV-related incidents had occurred in Nordland, 4 in Finnmark. Finnmark had the highest number of snowmobile-related incidents, with 38 of 81 (47 %), followed by Svalbard with 22 (27 %), Troms with 11 (14 %) and Nordland with 10 (12 %) incidents. Of the total of 81 snowmobile-related incidents, 11 (14 %) occurred in the areas bordering Sweden and Finland.

For all fatalities and personal injuries as a whole, median age was 31.5 years (Table 1). Five of the seven fatalities occurred in the age group 21–40 years, no victims of fatalities were younger than 20 years. Of the 87 injured persons, seven were under 16 years and 38 (44 %) were younger than 30 years.

Twelve of a total of 21 personal injuries among women occurred in Finnmark, while five were injured in Svalbard. Altogether 30 of a total of 73 incidents (41 %) involving men occurred in Finnmark, followed by Svalbard with 17 (23 %), Nordland with 16 (22 %) and Troms with 10 (14 %) incidents. The number of snowmobile-related incidents per year per 1 000 snowmobiles is reported in Table 2.

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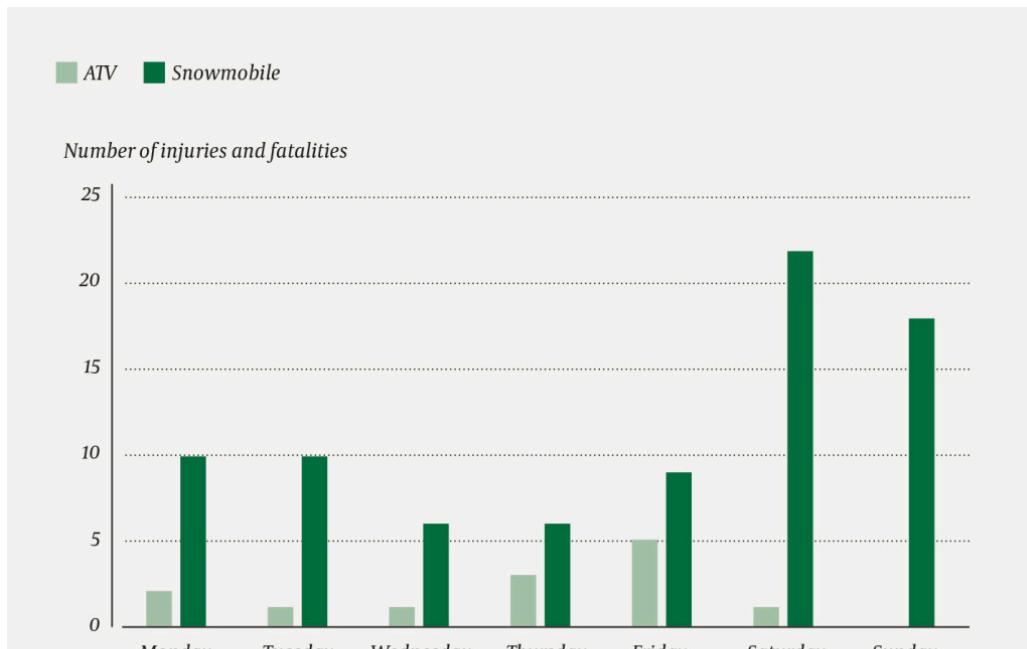
**Table 2**

Number of fatalities and personal injuries requiring hospitalisation per 1 000 snowmobiles per year in 2013–2014 (11). ATV-related incidents are not included.

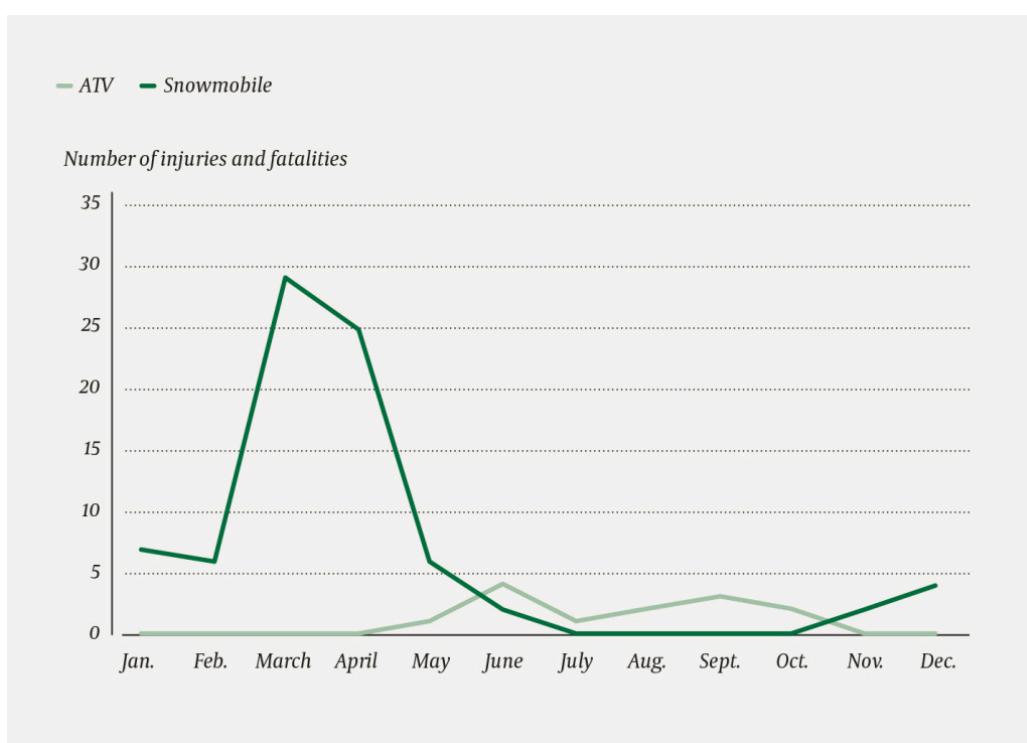
	<b>Svalbard</b>	<b>Finnmark</b>	<b>Troms</b>	<b>Nordland</b>	<b>Total</b>
Number of snowmobiles	2 147	17 845	10 548	11 533	42 073
Number of registered fatalities and injuries	22	38	11	10	81
Number of fatalities and injuries per 1 000 snowmobiles per year	5.1	1.1	0.5	0.4	1

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Of the 81 snowmobile-related incidents, 40 occurred on Saturdays and Sundays (Figure 1), and 54 occurred in the months of March and April (Figure 2). For 2013 we registered 56 incidents for both ATVs and snowmobiles combined. In 2014 there were 38 incidents, i.e. a decline of 32 %. We registered 48 snowmobile-related incidents in 2013 compared to 33 in 2014, and 8 ATV-related incidents in 2013 compared to 5 in 2014.



**Figure 1** Number of fatalities and personal injuries requiring hospitalisation, by day of the week, resulting from the use of ATVs and snowmobiles in Northern Norway 2013–14 among the total of 94 cases registered in the study



**Figure 2** Monthly number of fatalities and personal injuries requiring hospitalisation resulting from the use of ATVs and snowmobiles in Northern Norway 2013–14 among the total of 94 cases registered in the study.

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## Discussion

In this study, we have found that neither the police, nor the hospitals have a complete overview of fatalities related to the use of ATVs and snowmobiles, and that the media have reported four fatalities that did not appear in the police or hospital records. In other words, it is no simple task for the politicians, authorities or the public to obtain an overview of the risks involved in driving ATVs or snowmobiles, not to mention assessment of possible preventive efforts.

The registration for the period 2013–2014 may serve as a basis for observing any possible changes after the introduction of the new Act Relating to Motor Traffic on Uncultivated Land and in Watercourses in 2015.

### Risks in driving snowmobiles and ATVs

We have found that the number of snowmobile-related incidents in relation to the number of snowmobiles is high in Svalbard and Finnmark when compared to the other counties. Finnmark, with the smallest population in the northern counties, has the largest snowmobile fleet, and we know that the number of serious injuries increases in pace with the number of snowmobiles [\(5–7\)](#).

When comparing the number of injuries, including fatalities/1 000 snowmobiles/year in our study with a study from Western Finnmark [\(6\)](#), we found a decline from 2.8 serious injuries and fatalities in Western Finnmark in the years 2002–04 to around 1 injury or fatality for the whole of Finnmark county in 2013–14, a decline of as much as 64 %. However, it is difficult to draw any conclusions from this result. It might, for example, mean that more incidents occur in Western Finnmark per snowmobile per year than in Eastern Finnmark, that more people have been hospitalised in Western Finnmark in previous studies, or that there has been a real decline in the number of incidents in Finnmark as a whole. It might also be that more incidents were detected in the study from 2002–04 referred to above [\(6\)](#).

To draw any conclusions, we need further studies that can register exactly where in the county the incidents occurred to be able to compare Western and Eastern Finnmark. In our study, Svalbard has approximately five incidents/1 000 snowmobiles/year, against four previously [\(6\)](#). A reasonable explanation for this increase could be the considerable growth in tourism, with more inexperienced drivers among the tourists [\(8\)](#). The corresponding number is approximately 0.5 for Troms and Nordland counties. Approximately one-half of all snowmobile-related incidents occurred during weekends, and we may assume that this is a result of an increase in such driving for leisure purposes, as shown in previous studies [\(6, 7\)](#).

Only 13 ATV-related incidents were registered by the study. An explanation for this low number may be that winters are long in Northern Norway, and the season for driving ATVs is short. Seven of the 13 incidents involving ATVs occurred in Nordland, the southernmost county.

The variables in this study can identify risk factors only to a certain extent. It would be desirable to include further variables, but privacy regulations and the approvals for the study imposed limitations. It was also a concern to avoid overburdening the police and hospitals with work in retrieving data.

### **Lack of consistent statistics**

Many reports show that considerable resources will be required to identify these incidents involving off-road vehicles and establish good-quality accident statistics with data from the police and hospital databases (12, 17). For this study, both the police and the hospitals have stated that finding these incidents in their records is complicated. The fact that incidents involving ATVs and snowmobiles are registered under 'other vehicles' by the police and the hospitals, sometimes specified in free-text fields and with a variety of names (1), (14–16), further complicates the retrieval of these incidents. Fatalities and personal injuries that have evaded detection by our study may have occurred. One fatality was reported only by the hospital concerned. In all likelihood, this fatality was also registered by the police, but not found during the data retrieval. This is also likely to apply to the four other fatalities that we found through online searches and that were not reported to the study. Media information about these four fatalities was collated with the data we received on fatalities registered by county, date of the incident, type of vehicle and gender. These data did not correspond to the data that had been reported to us. This finding illustrates the absence of reliable data on fatalities and personal injuries related to the use of ATVs and snowmobiles.

### **Limitations of the study**

Although the study does not include degree of injury, data on injured persons and fatalities from the trauma registries of all hospitals are included. We are thus likely to have included the majority of the most seriously injured victims in 2013 and 2014. In addition, trauma registrars in eight of the eleven hospitals included have reviewed other records and included injured persons who were admitted to a regular ward without a trauma reception. There is a risk that we might have overlooked patients in those three hospitals where no search was made for patients who had been admitted without going through a trauma reception. Our figures are therefore minimum figures.

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## **Conclusion**

Each year, many people are injured, some fatally, as a result of driving ATVs and snowmobiles, but there are no reliable statistics available in this area. The police and hospitals need data tools that can provide for more detailed registration of incidents involving ATVs and snowmobiles. If society wants to monitor this trend, a more detailed registration of these deaths and personal injuries must be implemented, and collaboration to produce a consistent statistical format must be initiated.

Nearly one-half of all incidents in Northern Norway including Svalbard occur in Finnmark county. The majority of those involved are men, and most incidents occur during weekends. The causes have not been clarified, nor was this the intention behind this study. The registrations in this study could serve as a reference point for preventive efforts undertaken by the police, health services and cross-sectoral collaboration. It may also serve as a basis for further studies, for example to investigate developments following the entry into force of the new Act Relating to Motor Traffic on Uncultivated Land and in Watercourses in 2015.

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