

Back to the North Japan Alps: A Comparative Investigation of Incident Causes and Risk Profiles of Different Alpine Areas

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Introduction

Against a backdrop of increasing incidents and rescues across Japan's mountains, Kobayashi and Jones (2016) investigated the profile of vulnerable segments, especially older climbers, via the case study of the North Japan Alps. This paper revisits the same site: known as the birth-place of modern mountaineering in Japan, trends in this national park have national relevance (Murakoshi, 2010). Drawing on a longitudinally expanded database extracted from police reports, this paper extends previous research by comparing incident cause factors and risk profiles of different Alpine areas.

Methodology

Case study site

Nagano, Toyama and Gifu prefectures form the mountainous central region of Japan. Located at the crossroads of the North, Central and Southern Japan Alps, and Mt. Yatsugatake range, the area includes several peaks over 3000m and some of the steepest V-shaped valleys in the country. 2016 police records reveal that the three prefectures accounted for 21% of all recorded incidents in Japan, with a fatality ratio (1.59 times) and injury ratio (1.46 times) much higher than the national average.

Research method and sources

Police incident records were compiled from Nagano (2001-2016); Toyama (2004-2017); and Gifu (1999-2014) prefectures respectively. A database was created from annual reports, pooling the following 14 variables: prefecture; year; date; hour; weather; area; gender; age; extent of injury; cause factors; group number; surface conditions; action at the incident; incident trigger. Commercial motives such as foraging for herbs were excluded, leaving 5,391 incidents. Findings were triangulated via follow-up interviews with the police, NGOs and research organizations.

Findings

Extent of injury in the North Japan Alps

13.5% of all incidents involved a fatality, with an additional 1.4% missing (presumed dead). Amongst the non-fatal accidents, 31.3% were classified as "severe" injuries with a recovery diagnosis of one month or more. 26.7% were classified as "non-severe" injuries with an expected recovery time of less than one month. The proportion of fatalities declined from 16.7% (1999-2002) to 12.2% (2015-17). Conversely the proportion of mountaineers "rescued" increased from 21.2% (1999-2002) to 32.6% (2015-17). Mountaineers aged >50 displayed more fatalities (50s 17.4%, 60s 13.9%, over 70s 15.2%) while those aged under 20s had less fatalities (10.7%). Chi squared tests showed statistically significant relations between

the extent of the injury and all 12 other variables. Above average frequencies were found for fatalities in winter (Nov.-Mar.); morning 6:00AM-12:00AM); weather (snowy); gender (male); age (50s or 70s); group size (single or 3-4 members); incident cause factors (rolling or sliding down, or falling rocks or avalanche), surface conditions (ice or snow, wet soil or plants); acting near summits or rock climbing; incident trigger (heart diseases, avalanche, stream crossing, fatigue or rock falls).

Differences of incident severity among different routes and areas

Features of incidents were geographically clustered in certain areas. For example Mt. Hodaka-Yari; Mt.Goryu-Kashimayari; Kurobe Gorge; and Mt. Tsurugi areas had a significantly higher fatality ratio, whereas Mt. Tateyama and Mt. Yakushi areas had a lower ratio. Chi squared tests showed statistically significant relations between areas with all the 12 other variables. Regarding the cause factor, the ratio of falling down was higher in Mt. Tsurugi and Kurobe Gorge areas. Sliding down had a higher ratio in Mt. Hotaka & Yari, and Mt. Goryu & Kashimayari areas. Sickness was higher in Mt. Tateyama area. For surface conditions, the ratio of ice or snow was higher in Mt. Hakuba, Mt.Goryu & Kashimayari and Mt. Hotaka & Yari areas; unstable gravel in Mt.Tsurugi, Mt. Hotaka & Yari, and Mt. Tateyama areas; rocks and stones in Mt.Tsurugi, Kurobe Gorge, and Tateyama areas; chains and ladders in Mt. Hotaka & Yari, and Mt. Tsurugi areas. Amongst incident triggers, the ratio of slipping was higher in Mt. Hakuba, Kurobe Gorge, and Mt. Yakushi areas; loss of balance in Mt.Goryu & Kashimayari, Mt. Hotaka & Yari, and Kurobe Gorge areas; stepping out in Mt.Goryu & Kashimayari areas; mountain sickness in Tateyama area. By age, 10s ratio was higher at Mt. Tateyama; 50s in Mt. Hotaka & Yari, 60s at Mt. Hakuba. A lower proportion of climbers in their 70s was observed in Mt. Hotaka & Yari, and Mt.Goryu & Kashimayari areas.

Discussion

In a follow-up to the paper presented at MMV8, this study investigated the increase in incidents in different areas of the North Japan Alps. Police records from Nagano, Toyama and Gifu prefectures provide insight into incidents showing statistically significant differences between incident trends and risk profiles in different areas. Identification of the incident profile, could help improve risk management by facilitating a targeted response to regional incident characteristics. Results could facilitate creation of a response plan targeted to the incident features of the respective areas. For example, on the Hodaka-Yari route, resources should be focused on older climbers; precautionary measures taken to prevent sliding down; and climbers' attention raised against slips and loss of balance. Counterstrategies may involve 'hard' solutions such as more maintenance of trails located on unstable slopes; set-up of rescue stations for acute mountain sickness. In addition, 'soft' tactics related to risk communication could help prevent incidents, and pre-registering route information with local authorities, could facilitate search and rescue operations. It's necessary to take targeted steps to mitigate accidents according to the incident profile of respective areas in the North Alps.

References

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Table 1. Percent differences by geographical area crossed with extent and cause of injury

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Extent of injury	A1	A2	A3	A4	A5	A6	A7	A8	A9	Total
<i>fatality</i>	10.1	24.5	11.8	10.0	18.1	14.7	16.3	4.5	4.5	13.2
<i>missing</i>	2.0	1.5	0.9	1.5	1.5	1.6	3.1	0.0	1.5	1.4
<i>severe</i>	36.6	31.3	36.0	29.4	30.9	33.3	34.9	24.1	38.3	31.3
<i>non-severe</i>	22.1	24.2	24.6	25.2	27.8	27.7	15.5	31.4	30.4	26.7
<i>rescued</i>	29.3	18.5	26.8	33.9	21.7	22.8	30.2	39.9	25.4	27.4
Total incidents	358	265	228	520	1196	430	129	576	201	3903
Cause factors	A1	A2	A3	A4	A5	A6	A7	A8	A9	Total
<i>slip</i>	1.7	7.6	4.9	3.9	13.9	20.8	24.0	7.1	4.5	10.1
<i>trip</i>	36.3	25.8	29.5	30.3	18.8	23.1	24.0	31.3	51.5	27.2
<i>slide</i>	17.9	28.8	22.0	16.8	32.7	14.0	10.9	7.1	5.5	20.4
<i>lost the way</i>	9.5	6.4	3.1	6.4	5.0	7.9	11.6	5.6	9.0	6.4
<i>fatigue</i>	11.2	8.7	10.1	14.1	5.1	6.5	7.8	3.7	10.0	7.7
<i>illness</i>	10.6	10.2	19.4	19.3	13.7	13.8	7.0	39.0	11.0	17.6
<i>rock fall</i>	5.6	2.3	2.6	1.7	3.8	3.5	0.8	1.4	1.0	2.9
<i>other</i>	4.2	7.6	6.2	7.3	6.8	9.3	14.0	4.0	7.0	6.8
<i>avalanche</i>	3.1	2.7	2.2	0.4	0.2	1.2	0.0	0.9	0.5	1.0
Total incidents	358	264	227	519	1190	429	129	575	200	3891

p<0.001

Index of areas in the North Japan Alps

- A1 Hakuba
- A2 Goryu & Kashima Yari
- A3 Jigatake-Mitsumata
- A4 near Yari-Hodaka
- A5 Yari-Hodaka
- A6 Tsurugi
- A7 Kurobe gorge
- A8 Tateyama
- A9 Yakushi