

ONLINE APPENDIX/SUPPLEMENTARY MATERIAL

A. Hypothetical terrain choices survey

1. Instructions

We would now like to know about the type of runs that you prefer to ski. Below, we describe a hypothetical situation. Imagine it as if it was real, that you are standing on the summit, and that you are about to make a choice. Your task is to use the information given on the next pages to decide on the following two questions. Assume that you are in a group of two or more:

- 1. If you were the one to first express your preference, would you have chosen to ski the slope?**
- 2. If someone else in the group expressed their preference to ski the slope, and no one voiced an opinion against skiing it, would you accept skiing the slope?**

To help aid this choice, you have access to some information regarding the avalanche and weather conditions. As different people have different habits concerning stability tests and observations, and because we don't know what kind of habits you have on the mountain, you will be provided with the avalanche danger on each particular slope in addition to the general avalanche forecast. Your decision should be based on the assumption that you cannot get more information than the one provided.

2. Terrain choice scenario

It is a national holiday in late March. You know that many of your friends will be out backcountry touring during the day, and you expect to see lots of nice pictures on social media by the end of the day of your friends' exploits.

You are touring with a group of people that you most commonly tour with (if you usually tour alone, the group is just you). You are carrying the same gear that you (personally)

normally carry on a tour like this. It is noon and you, and your group have just finished your ascent. You ascended the mountain on a low angled (20°- 23°) and very safe north-east facing ridge (below called "the ridge"), where you followed a well-defined skin track. The snow on the ridge mostly consisted of loose powder, and in few places soft windslabs.



The mountain offers several alternative runs down. All runs are about 1000 vertical meters, and all runs offer untracked snow. You are presented with descriptions of the alternatives on the next page. Your task is to choose your most preferred run, and which of the runs that you would accept to ski down.

3. Weather and avalanche hazard information

Current weather:

The sky is clear and it is sunny. The temperature is - 10°C. The wind is blowing 10 m/s from the south.

Weather history:

During the past week, the region received 20-40 cm of new snow. Winds were relatively calm during the snowfall. Cold temperatures for the season, - 5°C to -15°C. The snowfall ended two days ago. Yesterday, average temperature was - 7°C. Winds from the south 10 m/s on

altitude.

Avalanche forecast for the region:



Avalanche problem: Wind slabs and a poor bonding between new and old snow on **NW, N** and **NE** aspects. A persistent weak layer on all aspects. The persistent weak layer is not expected to be currently active.

The forecasted avalanche danger is **moderate** (level 2). The snow is generally well bonded, but may be unstable on some steep slopes. Triggering of small to medium size avalanches is possible at large additional load, particularly on steep slopes. Avalanches are most easily triggered on convexities and where the windslabs are soft. Beware that small avalanches step down to the persistent weak layer.

4. Terrain alternatives

Note that all slopes offer untracked snow

THE FIELD



Photo: Marius Lund

Guide book description:

A nice and fun run. Nice view from the summit. Easy going skiing from top to bottom.

Characteristics:

Maximum / average slope: 35° / 25°

Aspect: NW

Vertical drop: 1000 meters

Terrain: Simple - A 100 wide concave snowfield with small ridges on each side. The first 20 vertical meters of the field have slope 33° - 35°. The rest of the field has slope 20° - 27°. The difficulty level is similar to easier "Expert" runs at a resort.

Snow: Soft. Mostly loose powder, but in some areas the wind may have created soft windslabs.

Dangers: The avalanche danger **on the upper part of the field** (20 vertical meters with slope 33°-35°) is **moderate** (level 2). In this section, human triggered small (size 1 - 2) avalanches are **possible**, especially at a large additional load (a group of skiers standing/skiing within 10

meters of each other or one skier falling).

Below the top 20 vertical meters of the run, the avalanche danger is **low** (level 1). On this part of the run, human triggered avalanches are **unlikely**. The expected avalanche type is a slab avalanche. The level of **exposure on the field is low**. There are several safe spots on the ridges that surround the field on both sides. There are no cliffs or trees, and the run gets progressively flatter until it ends on a wide field.

THE BOWL

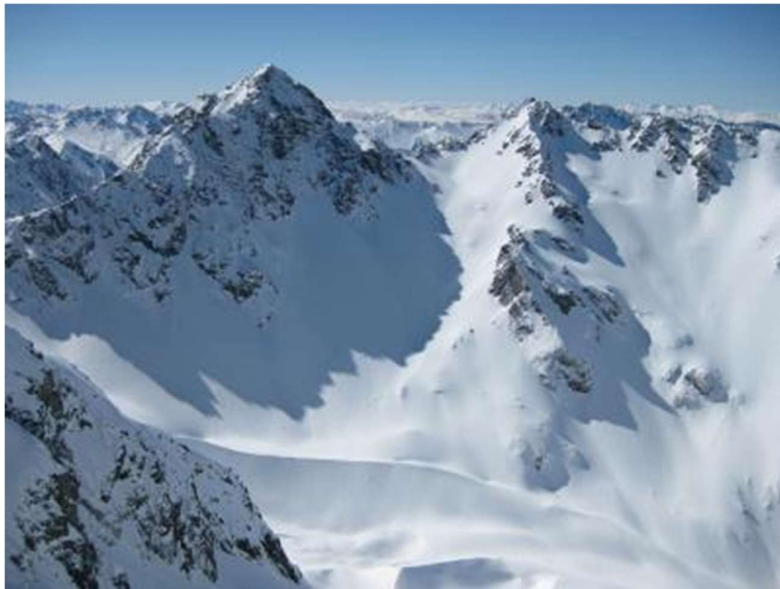


Photo: Jordy Hendrikx

Guide book description:

A very scenic run with great views. Nice and consistently steep for about 400 vertical meters.

Characteristics:

Maximum / average slope: 40° / 30°

Aspect: N

Vertical drop: 1000 meters

Terrain: Challenging - A 500 m wide bowl that ends in a narrow gully at 300 masl. The run follows the bowl to the start of the gully, then traverses up on a ridge at 400 masl. The first

400 vertical meters of the bowl has slope 35° - 40°. The bowl is generally concave but has a few convex rollovers. The lower part of the bowl and the ridge has slope 25°-30°. The difficulty level is similar to "Expert" runs at a resort, but the terrain is more challenging because of longer steep sections and some roll-overs.

Snow: Soft. Mostly loose powder, but in some areas the wind may have created soft windslabs.

Dangers: The avalanche danger in the bowl is **moderate** (level 2). In the bowl, human triggered small to medium (size 2) avalanches are **possible**, especially on the convex roll-overs at a large additional load (a group of skiers standing/skiing within 10 meters of each other or one skier falling). When you reach the ridge, the avalanche danger is **low** (level 1), and human triggered avalanches are **unlikely**. The expected avalanche type is a slab avalanche. The level of **exposure in the bowl is moderate**. The snowfield gets progressively more narrow and ends in a gully. The first safe spot is on the ridge at 400 meters.

THE CHUTE



Photo: Antti Pohjola

Guide book description:

Is this the run of all runs? It is certainly an adrenalin rush, and extremely scenic! As this is a no fall zone, the run is for expert skiers only.

Characteristics:

Maximum / average slope: 45° / 37°

Aspect: NW

Vertical drop: 1000 meters

Terrain: Complex - a winding chute from the summit (1000 masl) to the fjord. The width of the chute varies between 5 and 35 m. There is a convex rollover in the middle of the chute.

The difficulty level of the run is above that of an "Expert" run at a resort. The slope is steeper, and terrain (narrow chute) is more difficult to handle.

Snow: Mostly loose powder, but in some areas the wind may have created soft windslabs.

Dangers: The avalanche danger in the chute is **moderate** (level 2). Small to medium (size 2 - 3) avalanches are **possible**, especially on the convex rollover, at a large additional load (a group of skiers standing/skiing within 10 meters of each other or one skier falling). The expected avalanche type is a slab avalanche. Sluff avalanches are **likely**. The level of **exposure in the chute is high**. There are no safe spots until you are down by the fjord, there are cliffs on both sides of the winding chute, and the run ends in the fjord.

5. Questions

Q1 Keep the information about terrain and snow conditions in mind: which of the above alternatives would you prefer to ski?

- The Ridge
- The Field
- The Bowl
- The Chute

Q2 Given the information at hand, which of the runs do you think that you would accept to ski if someone else in the group expressed a desire to ski the run, and no one else expressed any concern? If you are touring alone, you just choose which runs you find to be acceptable.

	YES	NO
The Ridge	<input type="radio"/>	<input type="radio"/>
The Field	<input type="radio"/>	<input type="radio"/>
The Bowl	<input type="radio"/>	<input type="radio"/>
The Chute	<input type="radio"/>	<input type="radio"/>

Q3 The above questions are hypothetical, and therefore only have limited resemblance with a real life situation. Some may therefore find it difficult to answer. If you would have needed more information to make your choices, please describe what kind of additional information this would be, and how your choices would be affected.

B. Self-assessed backcountry skills

- **Level I** - Beginner backcountry traveler. Working to develop balance, body position and speed control with backcountry equipment on flat to moderate terrain.
- **Level II** - Intermediate backcountry traveler. Can negotiate all moderate runs confidently with backcountry equipment. Can negotiate most out of bounds terrain with confidence.
- **Level III** - Strong backcountry traveler. Can negotiate most all terrain on backcountry equipment. A Level III backcountry skier/rider should be able to negotiate a variety of terrain all day using a variety of skills such as traversing, side slipping and kick-turns if necessary. Proficient at self arrest.
- **Level IV** - Advanced/Expert backcountry traveler. Can negotiate 90% of the terrain encountered on backcountry excursions with confidence. Can handle all snow conditions in all weather. Proficient with terrain management skills such as ski cutting. Can negotiate all terrain including steep chutes (up to 50 degrees).
- **Level V** - Extreme backcountry traveler. Can negotiate extreme terrain in all conditions. Completely comfortable and confident on long descents up to 50° with other potential challenges such as highly variable snow conditions and extreme weather. Proficient with rope skills and moderate climbing.

C. Tables

Table C.1. Output from factor analysis

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.713	2.270	1.018	1.018
Factor2	0.443	0.242	0.166	1.184
Factor3	0.201	0.242	0.075	1.259
Factor4	-0.041	0.050	-0.015	1.244
Factor5	-0.091	0.077	-0.034	1.210
Factor6	-0.168	0.015	-0.063	1.147
Factor7	-0.183	0.027	-0.068	1.079
Factor8	-0.210	.	-0.079	1.000

LR test: independent vs. saturated: $\chi^2(28) = 688.85$ Prob> $\chi^2 = 0.0000$

Table C.2. Factor loadings and scoring coefficients after Varimax rotation

Variable	Factor1	Uniqueness	Scoring coefficients	KMO
BSSS_1	0.584	0.659	0.180	0.807
BSSS_2	0.450	0.798	0.111	0.824
BSSS_3	0.701	0.508	0.256	0.807
BSSS_4	0.510	0.740	0.127	0.833
BSSS_5	0.547	0.701	0.146	0.855
BSSS_6	0.667	0.556	0.208	0.857
BSSS_7	0.495	0.755	0.119	0.763
BSSS_8	0.655	0.571	0.203	0.875
Resulting variable	Mean	Std. Dev.	Min	Max
BSSS	0.043	0.881	-2.711	2.387

Table C.3. Marginal effects, estimated at means, from Logistic regression. The outcome variable takes the value 1 if the risk of the runs was ranked per our intentions, and 0 otherwise.

	"Consistent"
Age	-0.005* (0.002)
Male	-0.081+ (0.046)
Education (ref is primary or secondary)	
University (Bachelor)	0.177** (0.062)
University (MSc, PhD)	0.223*** (0.062)
BSSS-8	-0.048+ (0.025)
N	467
Chi 2	24.630
Pseudo r2	0.044
AIC	543.514

Table C.4. Bivariate analysis

	Obs	Test	Prefer		Accept	
			Test statistic	P-value	Test statistic	P-value
BSS-8	333	t-test	-5.013	0.000	-5.971	0.000
Perceived risk	333	Mann-Whitney	5.915	0.000	7.516	0.000
Self-assessed skills	333	Mann-Whitney	-5.326	0.000	-3.555	0.000
N ski days	333	Mann-Whitney	-4.031	0.000	-1.882	0.060
N ski years	333	Mann-Whitney	-2.201	0.028	-1.240	0.215
Avalanche experience	333	Proportion	-3.796	0.000	-1.941	0.026
Admiration of steep skiing	333	Proportion	-4.284	0.000	-4.815	0.000
Gender	333	Proportion	-1.884	0.030	-0.758	0.448
Age	333	t-test	2.234	0.013	3.246	0.001
Education	333	Mann-Whitney	-0.784	0.433	-1.100	0.272

Table C.5. Preferred run – backcountry skills and experience – marginal effects, estimated at means, from Logit regressions

	I	II	III	IV	V
Perceived risk	-0.097*** (0.021)	-0.098*** (0.021)	-0.081*** (0.020)	-0.081*** (0.020)	-0.081*** (0.020)
BSSS-8	0.075** (0.024)	0.073** (0.023)	0.051* (0.023)	0.053* (0.022)	0.051* (0.022)
Self-assessed skills					
Level 3			0.128** (0.038)	0.128** (0.038)	0.129** (0.038)
Level 4 or 5			0.202*** (0.057)	0.186** (0.055)	0.192** (0.057)
BC experience: 5 or more years	0.036 (0.043)		-0.011 (0.041)		-0.013 (0.041)
Skidays > 40 days/season		0.078 (0.060)		0.040 (0.052)	0.042 (0.052)
Formal avalanche education	-0.041 (0.041)	-0.050 (0.042)	-0.063 (0.039)	-0.065 (0.039)	-0.066 (0.040)
Experience of avalanche incident	0.089 (0.047)	0.090+ (0.045)	0.085 (0.045)	0.074 (0.042)	0.079 (0.045)
Admire people who ski steep	0.115** (0.041)	0.113* (0.040)	0.093* (0.039)	0.095* (0.038)	0.094* (0.038)
N	333	333	333	333	333
Chi 2	68.72	70.03	79.20	79.82	79.93
Pseudo r2	0.12	0.20	0.23	0.23	0.23

AIC	295.54	294.24	289.06	288.44	290.33
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+ $p < 0.10$ (0.05), * $p < 0.05$ (0.025), ** $p < 0.01$ (0.005), *** $p < 0.0001$ (0.0005),

Bonferroni corrected p-values (two tests). Standard errors estimated by Delta method.

Table C.6. Accepted run – backcountry skills and experience – marginal effects, estimated at means, from Logit regressions

	I	II	III
Perceived risk	-0.224*** (0.033)	-0.234*** (0.033)	-0.226*** (0.033)
BSSS-8	0.163*** (0.037)	0.168*** (0.036)	0.168*** (0.036)
Self-assessed skills			
Level 3	0.043 (0.082)		
Level 4 or 5	0.057 (0.092)		
BC experience: 5 or more years		-0.046 (0.060)	
Skidays > 40 days/season			0.037 (0.078)
Formal avalanche education	-0.209** (0.062)	-0.200** (0.060)	-0.206** (0.061)
Admire people who ski steep/exposed	0.160* (0.057)	0.161** (0.056)	0.163** (0.056)
Education			
University (Bachelor)	0.183* (0.066)	0.193** (0.066)	0.182* (0.066)
University (MSc, PhD)	0.182* (0.066)	0.195** (0.066)	0.182* (0.066)

	(0.065)	(0.065)	(0.065)
N	333	333	333
Chi 2	115.90	116.10	115.74
Pseudo r2	0.27	0.27	0.27
AIC	336.26	334.05	334.41

+ p < 0.10 (0.05), * p < 0.05 (0.025), ** p < 0.01 (0.005), *** p < 0.0001 (0.0005),

Bonferroni corrected p-values (two tests). Standard errors estimated by Delta method.

Table C.7. OLS (robust standard errors in parenthesis) and Ordered Logit estimates on four hypothetical terrain choices (the ridge =1, field =2, bowl=3, and chute=4).

	OLS		OLOGIT	
	PREF	ACPT	PREF	ACPT
Perceived risk	-0.134*** (0.035)	-0.225*** (0.039)	-0.650*** (0.133)	-0.794*** (0.127)
BSSS-8	0.094* (0.041)	0.168*** (0.043)	0.387* (0.143)	0.524*** (0.136)
Self-assessed skills				
Level 3	0.162+ (0.074)		0.526 (0.332)	
Level 4 or 5	0.287* (0.109)		0.819+ (0.392)	
Formal avalanche education	-0.137 (0.071)	-0.207** (0.072)	-0.429 (0.247)	-0.680** (0.234)
Avalanche experience	0.134 (0.074)		0.486 (0.260)	
Admire people who ski steep	0.168* (0.069)	0.191* (0.073)	0.754** (0.263)	0.637* (0.243)
Education				
University (Bachelor)		0.068 (0.094)		0.271 (0.334)
University (MSc, PhD)		0.135 (0.095)		0.486 (0.332)

N	333	333	333	333
Chi 2	12.11	19.50	85.41	90.69
Pseudo r2	0.17	0.20	0.13	0.13
AIC	619.48	663.79	576.02	621.91

+ p < 0.10 (0.05), * p < 0.05 (0.025), ** p < 0.01 (0.005), *** p < 0.0001 (0.0005),

Bonferroni corrected p-values (two tests). Standard errors estimated by Delta method.

Table C.8. Heteroscedastic Probit estimates

	PREFER	ACCEPT ^A	ACCEPT ^B
Perceived risk	-0.083*** (0.022)	-0.264*** (0.034)	-0.259*** (0.034)
BSSS-8	0.051 (0.032)	0.207*** (0.040)	0.197*** (0.041)
Self-assessed skills			
Level 3	0.137** (0.040)		
Level 4 or 5	0.213** (0.063)		
Formal avalanche education	-0.073 (0.050)	-0.236*** (0.061)	-0.221*** (0.062)
Experience of avalanche incident	0.084 (0.045)		
Admire people who ski steep/exposed ^A	0.100* (0.042)	0.115 (0.066)	
Admire people who ski steep/exposed ^B			0.071* (0.027)
Education			
University (Bachelor)		0.199* (0.076)	0.204* (0.076)
University (MSc, PhD)		0.185* (0.075)	0.190* (0.075)

N	333	333	333
Chi 2	53.60	65.41	66.93
Chi 2 ln sigma	0.08	4.21**	5.49**
AIC	289.79	329.75	325.84

+ p < 0.10 (0.05), * p < 0.05 (0.025), ** p < 0.01 (0.005), *** p < 0.0001 (0.0005),

Bonferroni corrected p-values (two tests). Standard errors estimated by Delta method.

^A Dichotomous variable (0=Disagree, 1=Agree), ^B Measured on a continuous scale (1 = strongly disagree, 7 = strongly agree)