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Representations of the Avalanche Risk Among Winter Outdoor Activities Practitioners in the Vosges Mountains

Florie Giacona and Frédérick Guyon

Introduction

- Recent references describe risks as the combination of three components: hazard, vulnerability and exposure. Exposure is defined as the existence of stakes likely to be damaged. Vulnerability encompasses the relationship between the intensity of the hazard and the level of damage (IPCC 2014). This distinction is particularly important, as it is now widely accepted that in order to reduce the risk, one must act on the exposure first. In this context, the Sendai Framework recommends nurturing a true 'culture of prevention' (UNDRR 2019). Thus, it is now essential to focus on 'the factors that influence the way people perceive and represent danger' (Devès *et al.*, 2019). In fact, knowledge and representations play a part in influencing behaviours and action strategies (Glatron, 2009), and thereby affect exposure and vulnerability. Our questioning challenges these dimensions among those who practise winter leisure activities in the Vosges Mountains, a field left untouched by any research so far.
- In mountain areas, gravitational hazards and floods are the main natural threats to humans and their activities. Thus, the avalanche risk is taken care of through two distinct forms of management: one related to the infrastructure located mainly in valley bottoms (mapping of exposed areas, protective structures), the other to those who practise winter leisure activities (prevention, social dimensions of risk) (Jarry, 2010). We focus here on this second aspect. The specificity of avalanche accidents lies in the fact that they result from environmental and human factors (Marengo *et al.*, 2017). In the vast majority of cases, the victims themselves triggered the avalanche that

impacts them (Boudières, 2007). Since the 2000s, many studies focused on the human factors which lead to accidents, in particular the decision-making mechanism responsible for 'errors in judgment' (McCammon, 2003; Haegeli *et al.*, 2010; Marengo *et al.*, 2017), the effect of the size of the group of practitioners (Zweifel *et al.*, 2016) as well as their experience and socioeconomic background (Mannberg *et al.*, 2018). Other studies examined the aspects of communication and preventive action (Poizat, 2001; Boudières, 2007), as well as the individual relationship to risk and its management by local actors (Corneloup and Soulé, 2002, 2007; Soulé and Corneloup, 2001). Finally, some research focused more broadly on the perception of risks in skiing resorts (Vermeir, 2008), on the individual determinants involved in the perception of avalanche risk (Leiter, 2011) and more specifically on representations of the avalanche risk among young off-track practitioners (Gletty, 2017).

- However, all of these studies consider almost exclusively high mountains. The finding 3 is the same for institutional and scientific knowledge on avalanche risk. In France, high and medium-high mountains¹ are spaces clearly differentiated by specific values, attributes and images (Rieutort, 1997), by degrees of accessibility and by different levels of hazards (intensity of phenomena). Thus, for scientific, political and administrative actors, medium-high mountains are defined by opposition to high mountains using depreciative attributes in terms of topography and natural processes (Bozon et al., 1980; Sacareau, 2003). In this context, avalanches represent the only 'major natural hazard' for which a distinction is made between high and medium-high mountains in France, which thus leads to a territorialized management of the risk (Giacona et al., 2017a). In this context, medium-high mountain avalanches are somewhat invisible. Thus, according to Goetz (2011), 'When the problem of avalanches is tacked in France, we first think of the Alps, then of the Pyrénées, but rarely of the more modest mountain ranges such as the Vosges, Jura and Massif Central²². However, although the hazard is overall less intense and stakes lower in these areas than in high mountains, avalanches are regularly responsible for damage (Giacona, 2014).
- 4 However, does this mean that there is no individual and local representation of the problem? In other words, is the risk recognised and integrated, i.e. is it understood as an objective phenomenon (Decrop, 1997) by those it affects? Thanks to a questionnaire-based survey, this paper challenges the knowledge and perception of the risk associated to avalanches among those who practise winter leisure activities in the Vosges Mountains (North-East of France). Do they have any knowledge of the hazard? Where does such knowledge stem from? Do they identify the risk inherent to avalanches in their activities in the Vosges Mountains? After presenting our case study in detail, the paper highlights the importance of the role played by *mountain culture* and *sports culture* in terms of knowledge, perception and awareness of avalanche risk. Finally, it insists on the importance of representations in the absence of any link between avalanche and the Vosges Mountains.

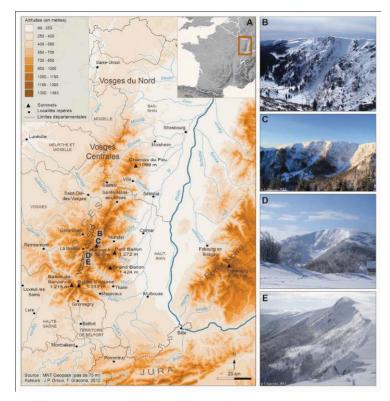
Description of the case-study

⁵ The Vosges mountains form the first orographic barrier encountered by air masses coming from the Atlantic (Fig. 1). The topography (steep slopes on the Alsace region side) and the cold and humid climate are likely to trigger avalanches, which can be important (Flageollet, 2003; Wahl *et al.*, 2007). Thus, a geohistorical study has identified corridors (Giacona et al., 2017b). The avalanche risk affects sectors where the stakes are low from a collective point of view, but avalanche risk can be very high from an individual standpoint. More than half of the victims registered since the early 1990s were involved in winter leisure activities (Fig. 2) (Giacona et al., 2017b). With some exceptions, avalanches occur mainly in glacial cirques³, used for backcountry skiing⁴, mountaineering and snowshoeing. These circs used to be left pretty untouched during winter, and mostly were areas of summer pasture. In winter, it is now 'easier' to access them because of the existence of snow-cleared roads and parking lots in the immediate vicinity of the summits. This evolution in the use of the mountain range can be explained by the mainstreaming of leisure and sports activities in natural spaces and by the development of adventure, off-track and off-trail practises, particularly during the last thirty years (Pociello, 1981; Bessy, 2005). It is thus interesting to question the representations of these 'new' practitioners who see unorganized nature as a playground. Indeed, the expansion of the practice space leads individuals to frequent the most remote, the most adventurous places and the most chaotic spatial organisations.

⁶ The avalanche risk in the Vosges Mountains is hardly publicised. For instance, the *Dossiers Départementaux des Risques Majeurs du Haut-Rhin, du Territoire de Belfort et des Vosges* [Departmental Files of Major Risks of Haut-Rhin, Territoire de Belfort and Vosges] do not mention avalanche risk (Giacona *et al.*, 2017a). By conveying an unclear message oscillating between alarm raising and risk minimisation, local media do not participate in its objectification (Giacona *et al.*, 2017c). Finally, the Vosges Mountains are described by socio-economic actors using the lexical fields of gentleness, accessibility and warmth, nature and landscape diversity, authenticity as well as cultural identity (Giacona, 2014). However, these images are far from the constraints and the inherent dangerousness of the mountain environment. They suggest that the territory and its surrounding relationships play a role in the mechanism which results in an absence of perception of the risk linked to avalanches in the Vosges Mountains (Giacona *et al.*, 2017a).

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Figure 1: Location of the Vosges Mountains (A) and glacial cirques located in the Southern Vosges (B: Forlet, February 2010; C: Frankenthal, February 2012; D: Rainkopf, February 2010 and E: Rothenbachkopf, February 2010).



Credits : (A) J.P. Droux, F. Giacona, 2012 ; (B) F. Giacona, 2010 ; (C) F. Giacona, 2012 ; (D et E) F. Giacona 2011.

Figure 2: Snowshoe practitioners near an impressive snow cornice (Wormspel, Vosges Mountains, January 2016).



Failure of cornices are a common cause of avalanche triggers in the Vosges Mountains. Credit : F. Giacona, 2016

Questionnaire-based survey among practitioners of winter leisure activities in the Vosges Mountains

Assumptions and questioning

- ⁷ The survey was carried out through a self-administered questionnaire, drafted on the basis of exploratory semi-structured interviews with managers of the mountain and of the risk, professionals and recreational users of the mountain range, members of historical societies, people interested in the natural environment of the mountain or the avalanches that occur. These interviews led to the formulation of the assumption that knowledge and representations of avalanche risk are influenced by both the *sports culture* and the *mountain culture* of the practitioners. We focus on the link between knowledge, representations, type of practice and uses of space.
- ⁸ Considering that the social construction of risk (in other words its social reality) may be partially or completely disconnected from its objective existence (Kmiec and Roland-Lévy, 2014), knowledge and representations are at the centre of our analysis. Knowledge is built upon experience through the transmission of information, soft skills, know-how and upon the acquisition of technical skills, through learning, observation and experience in the field as well than socialisation and official and media communication (Lahire, 2002). To qualify knowledge, it is thus necessary to refer to the experience, the frameworks (groups the practitioners belong to) and the conditions it stems from. Representations are the result of perceptions, knowledge, ideas, beliefs, behaviours and emotions. They constitute a 'framework for interpreting the reality, locating perfect places for action and are systems generating new realities' (Jodelet,

1984). Mental patterns, psychic, sensorimotor and emotional behaviours are the basis for selecting and qualifying information about the environment one's evolves in. Thus, 'space' is a material reality which exists independently from the opinion of the practitioners. However, the latter makes its own selection based on his knowledge and representations. Each individual is in a way the 'recipient' of thinking, feeling and acting rules, which are the products of its socialising experiences, more or less lasting and intense, in various groups and in different forms of social relations (Lahire, 2002). As a consequence, the notions of culture and socialisation are intertwined.

- 9 Sports cultures should be construed as a system made up of practices, techniques, knowhow, uses of the body and of space, symbolic values and beliefs. In this sense, practitioners do not identify themselves so much by the type of activity, but by their sports logic (objectives, type of practice, understanding and making use of space, etc.), their social positioning, the 'social uses' (sociability, comprehension, etc.) and 'dominant representations' (conception of practice) (Corneloup, 2004). They will organise both the practical activity and the thoughts and emotions (Descola, 2005). The relationship between the individual and the environment lies between practices and spaces. Spaces, which are the physical medium of activities, are loaded with meaning, values, significance and representations. This logic of interaction between sports cultures and action spaces is part of the mountain culture and refers to the cultural identity of a place built upon 'uses and social representations' (Bourdeau, 2003).
- The mountain culture is defined as all the knowledge and experiences related to mountain environments (direct or indirect, contextualised or generic), which result from theoretical, actual and factual information (observations and field studies). Mountain culture thus arises as a result of a construction and is likely to be transmitted. It is considered that humans act in their natural environment 'depending on perceived hints' and their sensitivity, but that their 'judgement is exercised in relation to a model which is acquired', to symbols, norms and social and cultural speeches which are supposed to shape ways of thinking, being and acting (Guyon, 2004). We assume that the territory, through the mountain culture, plays a significant role, and we believe that the relationships between humans and space influence their way of understanding avalanche risk. As such, we add that the representations of the Vosges Mountains influence the perception of avalanche risk, either through a simple transposition or through some sort of minimisation. Our main assumption is supplemented by two secondary hypotheses:
 - The forms of socialisation of practitioners could constitute a determining variable as 'modes of transmission or construction of culture' (Lahire, 2001). We construe socialising as families, friends and professional circles, associations, as well as social outings, such as training or the media. As such, we think that it is possible to identify segments of shared memory among certain groups of practitioners.
 - However, we presume that facing the materiality of the risk (whether through observation or experience) plays an essential role in the process of appropriation and construction, and therefore that practice can influence knowledge and representation.
- The questionnaire addresses the social identity of individuals, their types of practice, representations, knowledge of avalanches, behaviours as well as attitudes (Fig. 3). A wide range of practices and uses of space were targeted: mountaineering, ice climbing, winter hiking, snowshoeing, cross-country skiing, backcountry skiing (ski touring), snow kiting, snowboarding, downhill skiing and off-track skiing⁵. The reference sports

population is not known in the mountains (Corneloup *et al.*, 2004) because a majority of people practise without belonging to clubs and associations. Therefore, we focused on the implementation of an approach which aims at disseminating the questionnaire (digital and paper) as widely as possible. Practitioners were also approached directly on the field as well as during winter events such as the Nordique des crêtes (cross-country ski race), the Journée nationale de la raguette à neige and L'Alsacienne de la raguette à neige. We tried varying sectors and temporality (week, weekends, holidays and outside school holidays). Coincidentally, work was done with the union of mountain guides to approach practitioners supervised by professionals. Some organisations which offer winter leisure activities were also contacted⁶. Thanks to these, we were able to collect 376 usable questionnaires. The choice of a self-administered anonymous written questionnaire (respondents are not interviewed by an interviewer but answer alone) was made for material and technical reasons. The questionnaires collected were processed using the SPHINX Plus²-V5 survey and analysis software⁷. The flat sorting was followed by a bivariate analysis and a factorial analysis, making it possible to determine the existence of relationships (of dependence or independence) between variables and their intensity, the significance of which was assessed using the Chi2⁸ test.

Representations of avalanche risk in the Vosges Mountains
Representations of the Vosges Mountains
vidual trajectory
Social identity Age, gender, family status, economic condi- tion, place of residence, place of birth, indi-
off-track practice, type of terrain practised
Type of practice Nature of the activity, frequency of practice,
Practice framework
Learling framework
ranges
Empirical knowledge Avalanches/accidents direct observation, status as victim, practice in other mountain
es, places of occurrence
Factual knowledge Avalanche occurrences, frequency, damag-
Theoretical knowledge Mountain/snow/avalanche training courses

Figure 3: Variables making it possible to characterise *mountain culture, sports culture,* socialisation and representations of respondents.

Description of the corpus: social characteristics and practices of the respondents

12 The corpus is made up of two thirds of men⁹. Twenty-one percent of respondents are under 30, 62% between 30 and 59 and just over 17% are over 60. On-track practices are

Crédit : F. Giacona, 2020.

the most represented as a main activity (respectively 38% for downhill skiing and 23% for cross-country skiing), followed by snowshoeing (16%), winter hiking (9%), backcountry skiing (9%), snowboarding (3%), mountaineering (1%) and ice climbing (less than 1%) (Appendix 1).

- ¹³ More than two thirds of practitioners have more than 10 years of experience in their main practice in the Vosges Mountains. The majority of respondents go out once a week during the winter season (Appendix 1). Four fifths go to other mountain ranges to exercise their main practice (84.9%), mainly the Alps (70.2%) and, to a lesser extent, ranges near the Vosges (32.7% for Jura and 22.9% for the Black Forest). Thus, at least 70% of the respondents have some sort of experience of the high mountains (Appendix 1).
- 14 Half of the respondents may be affected by avalanche risk in the Vosges Mountains, as they roam the hiking area (backcountry skiing, mountaineering, ice climbing) or practise off-track (Appendix 1). Their activities cover the whole Vosges Mountains, therefore both in sectors with frequent (75.5%) or occasional (73.7%) avalanche activity and those in which no avalanche has been documented (74.5%)¹⁰. Finally, the investigation examined a significant number of direct victims of avalanches in the Vosges Mountains (4.8%) and in other mountain ranges (10.2%).
- With regards to learning practices, 40.7% took place within an association and 37% in the family structure. Friendly relationships represent one quarter of the population (28.2%) and are followed by courses with professionals (15.2%). At the end of the initial phase, the practice framework evolves. Respondents engage in their activities both individually (53.5%) and in groups (47.3%), with a significant part for skiing clubs (Appendix 2)¹¹.
- ¹⁶ Out of five practitioners, two decided to get information about avalanche risk, in particular through specialised books and magazines (Appendix 3)¹². However, it is to be noted that, on the contrary, only a third of the respondents (32.7%) and only half of those practicing off-track and backcountry (52.6%) are aware of the main local risk management system, which is a snowfall and avalanche warning broadcasted in particular by the regional daily press and local radio stations. Perhaps we could highlight the weakness of risk prevention information proceedings, which are 'modelled on a top-down pattern' as well as on a mechanistic conception of communication (Soulé *et al.*, 2009). A recent survey among young off-track practitioners indeed showed that they take weather conditions into account more than the avalanche risk bulletin (Gletty, 2017).

Knowledge and representations of Winter Leisure Activities Practitioners

17 Seventy-nine percent of practitioners say they are aware that avalanches can happen in the Vosges mountains and more than half (58.6%) of them know that accidents have already occurred there. However, they underestimate their dangerousness, since 16.7% consider that they do not cause damage. In addition, while 88% of users think that avalanches occur in the mountain range, only two out of five practitioners consider that they happen every year (41.7%) and a quarter of them (26.6%) think that their occurrence remains exceptional (Appendix 4). Finally, sectors in which avalanches occur regularly are mentioned by 63% of respondents, but 13.8% consider sectors for which no avalanche has been documented as potentially at risk. Learning and practice frameworks do not influence the fact of having heard of avalanche phenomena or accidents in the Vosges Mountains (non-significant relationship). In relation to the 'avalanche memory', only one accident is found (Gaschney, 1984), but it is mentioned by only 4% of respondents.

- As for the three keywords/phrases that best characterise the Vosges Mountains, references to the landscape (43.9%) and to the natural heritage (38.3%) are predominant, followed by the accessibility (22.6%), and the peaceful effect of the mountain (21.3%), its softness (17.3%) and its proximity (17.3%). In this context, the perception of avalanches in the Vosges Mountains focuses primarily on their scarcity (21.8%) or their association to specific areas/sites (21.5%) (Appendix 5).
- 19 37.8% of respondents feel potentially concerned by the risk of avalanches during their journeys in the Vosges Mountains, while they are twice as likely to feel concerned in other mountain areas, in particular the Alps (68.3%), (Appendix 5). Very few (7.7%) see avalanches as the main risk they face during their outings in the Vosges Mountains. Thus, a difference seems to be made between two types of environment (high and medium-high mountains). By comparison, in a skiing resort, the avalanche and off-track topics are particularly linked to the question of 'risk in a winter sports resort', but it should be noted that practitioners also find it difficult to think that this is an actual risk they are facing in their activities (Vermeir, 2008).

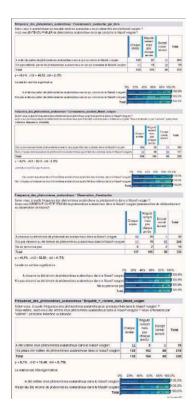
Social construction of avalanche risk, at the crossroads of sports and mountain cultures

The weight of mountain culture

- ²⁰ The analysis shows the existence of specific mountain cultures where knowledge and skills (whether theoretical, factual, empirical, contextualised or generic skills) play an important role. Being aware of avalanches and accidents, having observed or experienced them may result in representations that are closer to material reality. Indeed, in such a case, respondents are proportionally more likely to think that avalanches occur every year (Fig. 4). That same effect applies to those who have followed a training course on the mountain and its dangers (p = <0.1%) or who sought information about avalanches (p = <0.1%) as well as to victims of avalanches in the Vosges mountains (p = 0.1%) (Fig. 4 and Appendix 6).
- 21 Knowledge, representations and confrontation with reality and risk also have an effect on the way practitioners perceive danger. There is indeed a significant relationship between feeling affected by avalanche risk and knowing about avalanches and accidents (p = <0.1%), as well as having observed such phenomena (p = <0.1%) (Appendix 7). Respondents who have followed training courses on avalanches (p = 0.0%) or who have read on the topic (p = <0.1%) also feel more concerned (Appendix 8). The same variables emerge in relation to the representation of avalanche risk in the Vosges Mountains (Appendices 9 and 10).
- 22 The simple fact of being aware of the occurrence of avalanches is not enough to make the association between avalanches and the Vosges Mountains. Thus, although more than three quarters (88%) of respondents know that avalanches occur in the Vosges

mountains, and that nearly nine tenths believe that such phenomenon is real, only 44.1% answer 'yes' to the question, 'Would you relate the Vosges Mountains to the avalanche phenomenon?" Yet, three quarters of people who observed avalanches *in situ* makes such a connection (Appendix 11). This confirms our assumption that the body is a sensitive organism, a source of sensations as well as of motor and visual patterns. The body represents an organ of interactions with the environment and an 'instrument of knowledge' (Descola, 2005). Respondents who do not relate the Vosges Mountains to avalanches are proportionally more likely to consider avalanches as rare (78.8% against 21.2%) or even non-existent (100% against 0%). Indeed, the arguments highlighted to explain that there is no relation between avalanches and the Vosges Mountains refer to the image of an 'average' mountain range: a localised hazard that does not affect the entire range (19.6%), a poor topography as a result of the low elevation of the summits and the small number of steep slopes (13.8%). The scarcity of the hazard (13.2%), and the lack of knowledge of such phenomena in the mountain range (12.2%) are also mentioned (Appendix 12).

Figure 4: Cross-analysis of the understanding of the frequency of avalanches in the Vosges Mountains with knowledge and experience of such events



Credit : F. Giacona, 2020.

The weight of sports culture

²³ There are specific mountain cultures among those who frequent particular sites, such as avalanche paths or cornices which require a good understanding of the space. For example, 72% of the respondents use avalanche paths in winter (skiing, mountaineering) and make a connection between avalanches and the Vosges Mountains. More broadly, 86.8% of those who frequent unmarked, adventurous, offtrack areas make this association. The more the 'search for natural and wild spaces of freedom' is asserted, the stronger the connection will be (p = 0.04). Thus, the more the bodily experiment requires a deep engagement, the stronger is the association. Finally, when the respondents are regular in their off-track journeys, they tend not to consider that avalanche risk in the Vosges Mountains is low (p = 0.2%) (Appendix 13). Likewise, individuals who frequent backcountry or off-track areas in the Vosges mountains are proportionally more likely than average to feel concerned by avalanche risk during their practice, 84.2% and 57.4% respectively (71.7% for those practising systematically or almost off-track) (Appendix 14). On the contrary, practitioners who only use secured trails and tracks (skiing, snowshoeing) do not make this connection (60.8%, p = <0.1%) (Appendix 13). Among the respondents who think that avalanches occur on a yearly basis in the mountain range, users of the backcountry areas are overrepresented (79% against 42% on average) and only 3% of these users think that Vosges avalanches are exceptional (against 27% on average for all respondents) (Appendix 15).

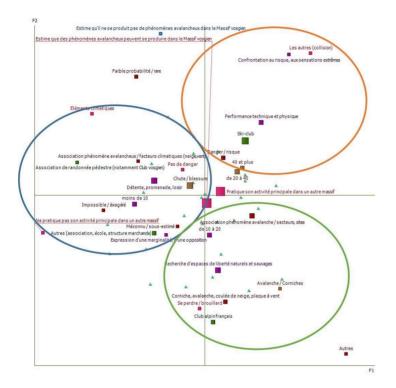
- The individuals' experience, measured by their seniority in their mountain activity, has an influence on their representations. Thus, the greater their experience, the more they make a connection between the Vosges mountains and avalanches (p = <0.1%) (Appendix 13). The summer activities exercised in the mountains (climbing) seem to have an influence on the perception of avalanches in the Vosges mountains (p = <0.1%) (Appendix 14). Thus, direct (winter) and indirect (summer) local experiences would criss-cross. Related to the practice area, the nature of the activity plays a significant role in the knowledge and representations of the mountain.
- 25 Practising in other areas (in the context of off-track) also seems to favour the identification of avalanches as the main risk existing in the Vosges mountains (p = 0.1%) (Appendix 15). There is thus a transposition to the Vosges Mountains of knowledge relating to other mountain areas, which confirms the role of general schemes of analysis and representation of oneself in space.

Influence of Secondary Socialisation

- It immediately appeared that certain social characteristics (age, household structure, professional categories, places of residence) have little influence on knowledge and representations of the risk. Although socialisation does not favour any transmission of memory, familiarisation and experience influence the assessment of avalanche risk, thus demonstrating the importance of learning and education, even out of context¹³. It is to note, however, some differential impact depending on the type of club attended. Indeed, members of the *Club alpin français* (French Alpine Club), who tend to occupy avalanche terrains (paths, cornices), are proportionally more likely to make a connection between avalanches and the Vosges mountains (Appendix 16).
- 27 The factorial analysis reveals three groups of practitioners, in three distinct frameworks of practice (Fig. 5). Factor F1 relates to the organisational framework and Factor F2 to the natural space. They respectively account for 8.6% and 8.3% of the variability in answers. Thus, members of the *Club alpin français* (French Alpine Club) have an average experience of mountains (between 10 and 20 years) and look for natural and wild freedom spaces in their practice. In this sense, the relationship to space helps shaping the way avalanche risk is understood. Practising within a structure

and evolving in avalanche sectors contribute to the development of a territorial knowledge connected to specific areas/sites. These members associate avalanche risk in the Vosges mountains with elements relating to its materiality (cornice, wind slab, etc.).

Figure 5: Factor analysis

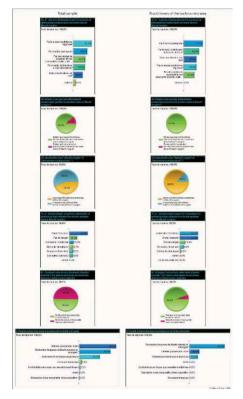


Credit : F. Giacona, F. Guyon, 2020.

Importance of the dynamic link between sports culture and mountain culture

28 The analysis reveals the existence of specific mountain cultures where knowledge and field practice play an important part. This reflects both a territorial knowledge and the importance of the link between sports culture and mountain culture in the appreciation of the risk. The type of practice, the sites visited, and thus the relationship to space, are said to significantly shape knowledge and approach of avalanche risk. The values the individuals share influence their conception of risks and the meaning they give to them: 'Risks, values and practices cannot be taken apart' (Raveneau, 2006). The respondents capitalise on cultural resources of various origins: training, knowledge of events, but above all journeys in mountain areas during winter. Some connections exist and are being built between 'culture' and geomorphological information. Representation is like a form of practical knowledge, which connects a topic and an object. It is thus in the relationship between bodily capital, cultural capital and the land that knowledge and representations are built. In this sense, the comparison between the overall sample and the category of practitioners in backcountry area is insightful and describes the various existing mountain cultures (Pociello, 1995; Corneloup, 2016) (Table 1). This category stands out as it connects for the very majority, but not unanimously, avalanches and the Vosges Mountains as well as because sociability plays an important role as a channel of communication on the avalanche topic. The mountain experience both stems from the practice of open spaces in the Vosges mountains and off-track in other mountain ranges.

Table 1: Source of information for knowledge of the occurrence of avalanches, representations of risks in their activity and avalanche phenomena in the Vosges mountains according to the total sample and for the sole practitioners of the backcountry area (backcountry skiing, mountaineering, icefall)



Credit : F. Giacona, F. Guyon, 2020.

Conclusion

²⁹ Our analyses show that even if avalanches in the Vosges Mountains are not an unknown subject for those who practise winter leisure activities, their knowledge and representations of the related risk are contrasted and characterised by a lack of temporal and spatial understanding. Indeed, few of the respondents seem to base their knowledge on detailed information about the local avalanche activity. Moreover, the only effective preventive measure – avalanche and snowfall warnings – is little known. Locally and punctually known, avalanches are not automatically connected to the Vosges Mountains, but depending on the personal representations and analysis of practitioners. We started with the assumption that the perception of the avalanche risk in the Vosges Mountains would be influenced both by the representations of avalanche phenomena in general and by those in the examined mountain range. We found that not all relationships are meaningful, which deepened our initial idea. In addition, we have established that territorialised knowledge, types of practice, winter and summer use of the terrain as well as the representations of the Vosges Mountains, play a significant role in the connection between avalanches and the Vosges Mountains. This study thus confirms that avalanches do not appear as something that characterised the Vosges mountain territory because they are not perceived as an 'integrated, inherent' component (November 2007) of the spatial dynamics and its representation depends on the cultural capital of individuals. This reveals the importance of non-reflexive patterns and techniques of the body (Mauss, 1950).

- 30 A more in-depth study of the relationships between the variables shows that knowledge and representations lie at the crossroads of the *mountain culture* and the *sports culture*. Indeed, sites and types of practice are closely linked within the framework of activities on off-track and backcountry areas where the frequency of the journeys, in the Vosges Mountains and elsewhere, allows the development of some knowledge on avalanches, as well as the creation of representations which focuses on their materiality. The awareness of risk is favoured by the understanding of avalanche activity and by some representations of the potential dangerousness of avalanches. Thus, the decision-making process would be based on knowledge, experience and representations. Avalanche risk cultures therefore exist among some users and originate in the individual and/or shared logic within limited social circles.
- ³¹ The lack among practitioners of a risk culture and of the perception of their vulnerability constitute factors of vulnerability¹⁴ that can 'hinder the implementation of preventive measures' (Boudières, 2007; Leone and Vinet, 2007). This finding is all the more questionable as the registered number of avalanche accidents has been increasing since the middle of the 20th century. In a context where the lack of shared knowledge that we have established can contribute to disseminating the perception of an absence of risk, this is an interesting subject of analysis for future work. Thus, getting a refined understanding of the memory issue, of the weight of the relationship between practitioners and space, and more broadly of *sports culture* and *mountain culture* on knowledge, representations and the appropriation of avalanche risk would now require in-depth oral interviews. Finally, it would be interesting to question the evolution of accidents in the Vosges Mountains, which does not correspond to the pattern observed in the Alps where the number of accidents has been stable for the last twenty years while exposure has increased.

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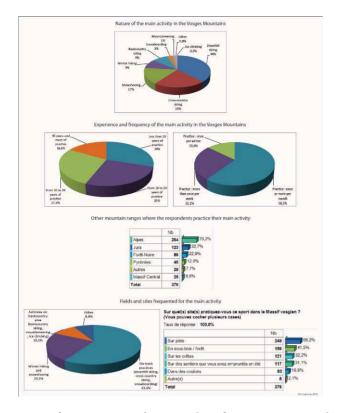
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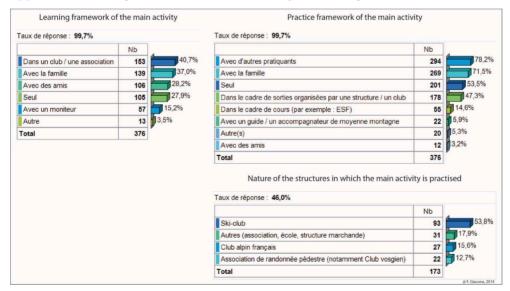
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APPENDIXES

Appendix 1: Type of practice and types of terrain on which the main activity is practiced



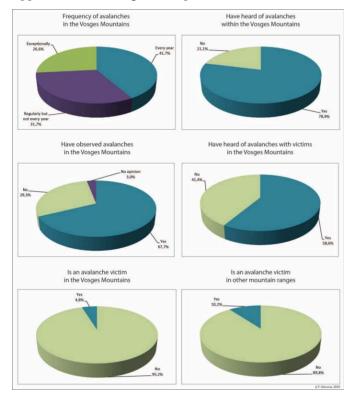
Appendix 2: Learning framework and main activity in the Vosges Mountains



Appendix 3: Types of media used to document avalanches

	Taux de réponse : 98,4%	1.00		
		Nb	4	
	Ne s'est pas documenté sur la question des avalanches	222	60,0%	
	S'est documenté sur la question des avalanches	148	40,0%	
	Total	370		
	vonse : 30,1%		Nb	19,7
	vres spécialisés		Nb 74	19,7
Revues/li		Nétéo Fran	74	7,4%
Revues/li	vres spécialisés	létéo Fran	74	
Revues/li Conféren Internet	vres spécialisés	1étéo Fran	74 ce 28	7,4%
Revues/li Conféren Internet	vres spécialisés ce / stage / documentation émanant de formations/clubs/ANENA/N	létéo Fran	74 ce 28 16	7,4% 4,3%
Revues/li Conféren Internet Documen	vres spécialisés ce / stage / documentation émanant de formations/clubs/ANENA/N	létéo Fran	74 ce 28 16 11	4,3% 2,9%
Revues/li Conféren Internet Documen DVD	vres spécialisés ce / stage / documentation émanant de formations/clubs/ANENA/N	létéo Fran	74 ce 28 16 11 9 6	7,4% 4,3% 2,9% 2,4%

Appendix 4: Knowledge and experience of avalanches in the Vosges mountains



Appendix 5: Representations and feeling of being concerned by the avalanche risk in the Vosges Mountains

Parages Death, diversité) 166 1,16 144,007 30,3% Hater Essaya, forên 144,007 22,6% 22,6% 22,6% Cotente depayant/resourcent 80 0,4# 17,3% 17,3% Proximité 68 0,4# 17,3% 17,3% Aménagérécurité 68 0,4# 17,3% Aménagérécurité 68 0,4# 17,3% Aménagérécurité 64 0,20 12,4% Autres 4# 0,2# 17,7%	3%
Accessibility Fit <	
Concentrative Concentr	
Concentration of part of the analysis 0	
Proximité 66 0,45 17.3% Aménagéisécurisé 64 0,38 14.4% Autres 48 0,29 12.8%	
Ambagé/sécurisé 64 0,30 14,4% Autres 48 0,29 12,8%	
Autres 48 0,29 12,8%	
Familial/convival 44 0.27	
Pratique de sports et loisirs 28 0,14 17,4%	
Total 376	
The probability rate	67 21,8%
Faible probabilité / rare 67	e es pt) 67
Faible probabilité / rare 67 21 Association phénomène avalanche / secteurs, sites 66 21	e es pt) 67 66 66 21,8%
Faible probabilité / rare 67 Association phénomène avalanche / secteurs, sites 68 Corriche, avalanche, coulée de neige, plaque à vent 60	e es pt) 67 68 60 16,3%
Faible probabilité / rare 67 Association phénomène avalanche / secteurs, sites 86 Corniche, avalanche, coulée de neige, plaque à vent 60	e es pt) 67 66 66 66 16,3% 16,3% 46
Faible probabilité / rare 67 21 Association phromème avalanche / socieurs, sites 66 21 Corriche, avalanche, coulée de neige, plaque à vent 60 15.0 Danger / risque 46 15.0 15.0 Autres 27 15.0 15.0 Junger / risque 46 15.0 15.0 Junger / risque 23 10.1% 10.1%	e es b b c c c c c c c c c c c c c c c c c
Faible probabilité / rare 67 Association phonomine avalanche / socieurs, sites 68 Corniche, avalanche, coalée de neige, plaque à vent 60 Danger / régule 46 Adries 27 Impossible / ékaginé 60 Adres 27 Manon phonomine avalancheux / facteurs climatiques (neige vent) 9.6%	21,8% 5 5 5 5 5 5 5 5 5 5 5 5 5
Faible probabilé / rare 67 22 Association primorinéme avalanche / socieurs, sites 66 22 Comche, avalanche, coulée de neige, plaque à vent 60 19.0 Danger / ricque 64 19.0 Autres 27 0.1% Stérie 26 19.0	e 5 67 67 68 60 10.3% 44 40 40,6% 21,6% 50 10.3% 45,0% 40,
	es
Faible probabilité / rare 67	e es pt) 67
Faible probabilité / rare 67 Association phénomène avalanche / secteurs, sites 66	e es pt) 67 66 66 21,8%
Faible probabilité / rare 67 Association phénomène avalanche / secteurs, sites 86 Corniche, avalanche, coulée de neige, plaque à vent 60	e es pt) 67 68 60 16,3%
Faible probabilité / rare 67 Association phonomène avalanche / socieurs, silos 68 Combe, evalenche, coulée de neige, plaque à vent 60 Danger / risque 60	e es pt) 67 66 66 66 16,3% 16,3% 46
Faible probabilité / rare 67 Association phinomère avalanche / secteurs, sites 68 Corriche, avalanche, couée de neige, plaque à vent 50 Danger / riegue 46 Autres 27	e es pt) 67 67 68 66 69 15,0% 46 15,0% 46 9,6%
Faible probabilité / rare 67 Association phinomène avalanche / socieurs, sites 68 Corriche, avalanche, coulée de neige, plaque à vent 50 Danger / risque 46 Autres 27	e es pt) 67 67 68 66 69 15,0% 46 15,0% 46 9,6%
Fable probabilité / rare 67 Association prémoméne avalanche / secteurs, silos 66 Corriche, avalanche, coulée de neige, plaque à vent 60 Danger / réquie 46 Autres 27 Tropostible / éxceleré 25 0,1% 28	e 5 67 50 50 50 50 50 50 50 50 50 50
Fable probabilité / rare 67 21 Association prénomme avalancher / secteurs, sites 66 22 Corriche, svalanche, coulée de neige, plaque à vent 60 15.0 Danger / risque 46 15.0 15.0 Autres 27 0.1% 0.1%	e 5 67 50 50 50 50 50 50 50 50 50 50
Fable probabilité / rare 67 21 Association phénomère avalancher / secteurs, sites 68 97 21 Conche, avalanche, coulée de neige, plaque à vent 60 19.0 16.0 Danger / risque 46 19.0 3.8% 3.8% Autres 27 0.1% 3.1%	e 5 67 50 50 50 50 50 50 50 50 50 50
Fable probabilité / rare 97 Association phonomène avalanche / socieurs, sites 68 Comiche, avalanche, ouale de neige, plaque à vent 60 Danger / risque 46 Autres 27 Impossible / Araginé 28 Autres 29 Impossible / Araginé 29 Association phonomène avalancheux / fasteurs climatiques (neige vent) 19	e 5 67 67 68 60 10.3% 44 15.0% 27 8.6% 9.6%
Faible probabilité / rare 67 Association phinomère avalanche / secteurs, sites 68 Comche, avalanche, coulée de neige, plaque à vent 60 Danger / risque 46 Autres 27 Impossible / éxagéré 28 Association phinomère avalancheux / facteurs climatiques (neige, vent) 19	e es 57 67 68 68 64 64 77 21,8% 68 64 64 10,3% 44 5,0% 27 20 9,0,1% 9,0,1% 9,0,1% 9,0,1% 9,0,1% 9,0,1% 9,0,0% 9,0,0% 9,0,0% 9,0,0% 9,0,0% 9,0,0% 9,0,0% 9,0,0% 9,0% 9

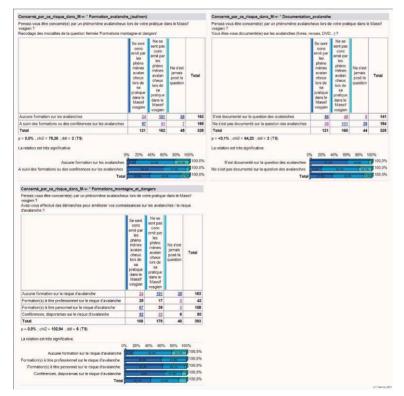
Appendix 6: Cross-analysis of the understanding of the frequency of avalanches in the Vosges mountains with training and documentation

Selon vous, à quelle fréquence des phénomènes avalanche ? Avez-vous effectué des démarches pour améliorer vos conr				
d'avalanche ?				
	Chaque année	Règulié rement mais pas chaque année	Except ionnel lement	Total
Aucune formation sur le risque d'avalanche	<u>42</u>	59	<u>62</u>	16
Formation(s) à titre professionnel sur le risque d'avalanche	24	12	5	4
Formation(s) à titre personnel sur le risque d'avalanche	<u>66</u>	29	14	10
Conférences, diaporamas sur le risque d'avalanche	47	19	14	8
Total	179	119	95	39
= <0,1% ; chi2 = 60,14 ; ddl = 6 (TS)				
La relation est très significative.				
	% 20%	40% 60%	6 80%	100%
Aucune formation sur le risque d'avalanche	20.8%	38.2%	35.0%	- · · · ·
Formation(s) à titre professionnel sur le risque d'avalanche	38.5	ii ii	23 35 12	
Formation(s) à titre personnel sur le risque d'avalanche	69.0	1	26.0M 12	
Continuous discourses and a dama discolaraba				
Conférences, diaporamas sur le risque d'avalanche	39.7	9	22.09 12.5	
Conterences, diaporamas sur le risque d'avaianche Total	39.0 2 20.66	30.3	22.0H 17.8 H 24.2N	
Total	2 38 P 2 20 58	9 1 32,3		
	tation_avai	anche		
Total	eux se prodi	uisent-ils da	9 24.29	100,0
Total Fréquence_des_phénomènes_avalancheux * Documen Selon vous, à quelle fréquence des phénomènes avalanch vosgien ?	eux se prodi	uisent-ils da)?	9 24.29	100,0
Total Fréquence_des_phénomènes_avalancheux * Documen Selon vous, à quelle fréquence des phénomènes avalanch vosgien ?	eux se prodi	uisent-ils da	ns le Mass	100,0
Total Fréquence_des_phénomènes_avalancheux * Documen Selon vous, à quelle fréquence des phénomènes avalanch vosgien ?	eux se prodi vues, DVD. Chaque	uisent-ils da) ? Réguliè rement mais	9 24.29	100,0
Total Fréquence_des_phénomènes_avalancheux * Documen Selon vous, à quelle fréquence des phénomènes avalanch vosgien ?	eux se prodi	uisent-ils da) ? Réguliè rement mais pas	ns le Massi Except	f
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Total Fréquence_des_phénomènes_avalancheux " Documen Scion vous, à quelle fréquence des phénomènes avalanch vous êtes-vous documenté(e) sur les avalanches (livres, re	eux se prodi vues, DVD. Chaque année	uisent-ils da) ? Régulié rement mais pas chaque année	except lement	f Total
Total Fréquence_des_phénomènes_avalancheux "Documen Selon vous, à quelle fréquence des phénomènes avalanch vorgien ? Vous étes-vous documenté(e) sur les avalanches (livres, re Siest documenté sur la question des avalanches	eux se prodi evues, DVD Chaque année <u>83</u>	uisent-ils da .) ? Régulié rement mais pas chaque année 37	Except lement	f Total 141
Total Fréquence_des_phénomènes_avalancheux " Documen Seion vous, à quelle fréquence des phénomènes avalanch vous étes-vous documenté(e) sur les avalanches (livres, re Srest documenté sur la question des avalanches Srest documenté sur la question des avalanches Total	eux se prodi vues, DVD Chaque année <u>83</u> <u>54</u>	uisent-ils da)? Régulié rement mais pas chaque année 37 64	Except ionnel lement	Totai 141 184
Total Fréquence_des_phénomènes_avalancheux " Documen Seion vous, à quelle fréquence des phénomènes avalanche vous étes-vous documenté(e) sur les avalanches (livres, re Si est documenté sur la question des avalanches Ne s'est pas documenté sur la question des avalanches Total p = <0,1%, chi2 = 31,49, ddl = 2 (TS)	eux se prodi vues, DVD Chaque année <u>83</u> <u>54</u>	uisent-ils da)? Régulié rement mais pas chaque année 37 64	Except ionnel lement	f Total 141 184
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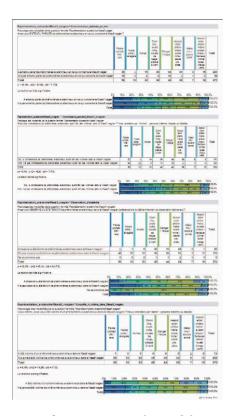
Appendix 7: Cross-analysis of the feeling of being concerned by the risk with the knowledge of avalanches occurrence in the Vosges Mountains

Arez-ross ENTENDU PARLER de phéromènes avalandraux et de qui concerne la Massif	PORCESSION?			
	Sa sati tzec ané par las phino roknes system	Ne se semples cont per les phiero ménes sester	Ne cett James	Iolar
	chous loss de 52 protigue cana le Massif voig en	cana la	șccă u question	
A enfersitio parter de phénomènes avaparacheux en ca qui concerne le Massil vaugem	517		23	25
N's pas actions parter de phêrmenênes soutendraux et campa concerna la Macoit acagier. Texal		40	27	7
p = 40,1% chQ = 38,39 dd = 2 (TS)		g. av		~
La residue en la és accollication				
	PN 20%	405 60	6 60% 1	01%
À esteccia pader de phénomènes avalancheux en ce sui conteste la Massif volgies	-		10	108.0
Na pas emendo parter de pliénomères avalancheux en de qui concaine le Masal' voagen	1	0.14	- 100	930.0
Toul	-		255	100.0
Concerne your, or young stores, We- * Concernences, positiont, Maanif, proglem Hences, con the concernent post-angle for other and post-times as a device of any other stores and the New Your concernent dependences in a colorer sectory of his fair watters of any influence memory, consistive advectories	rivoso en 1 an 1 Visus an	manda na pai		r10014
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Non- ma pas com a ssance de un énomères avalante eux aunit de la victimes densie Massilvo	sarer.	26	28 34	61
s = 40,1% ; cht2 = 52,66 ; dt1 = 2 (75)		124 0		
н на ум. (на) на 2001, как и 2013 Алибион на так срабски н Од и самити на так срабски на изметники притит са на изметни са на Малат и са по "та за самити са прититити на изметники срап Со се и на так се по се са се са се са се са се са се са се с	25 25 gint	124 0	01 40 03 80% 1	22 10 20076 20076
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	en 22 gan gan san	s 454 0		000% 100.9 100.9 100.9
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	ers er gen gen trea trea trea trea trea trea trea trea	s Aps a s Aps a sil voxple Visioner lar No se surt pos		000%. 100.5 100.5 100.5
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na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	ers co gan son tea tran in Man voogten (pr Se seet conc wrié par los tota	ail vorgin distriction bistore lar bistore	ca con toat	000%. 100.5 100.5 100.5
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	trea province and the second s	s 455 e s 455	en kin i no no no no no no no no no no no no no	chemon
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	Big 22 gan be tase to the vocgos (pr big phino montos autum theta	all vorgine s 405 s all vorgine bisnes lar bisnes lar bisnes conc. amb par bisses	re ere t ne ere t ne ere t ne f ne f ne f ne f ne f ne f ne f ne f	000%. 100.5 100.5 100.5
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	eng an gan gan gan teta bera le Vase dosplot (pr los phino monos augus	all concept- estates and been and been been and been been and been been phone and been been been been been been been been	en ten t nu fam fam fam fam fam fam fam fam fam fam	chemon
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	the state game in the sport of	all complexity of the second s	re ere t ne ere t ne ere t ne f ne f ne f ne f ne f ne f ne f ne f	SS Chemcal
na mitra, que a KAM, de la PB. La salada esta esta constante en la constante de la constante de la constante de la constante de la constante de la constante de la constante de Constante de la constante de la Constante de la constante de la Constante de la constante de l	ere is the providence some some some some bit philano mintes aution chera is have los de some some some some some some some som	ail congi- es aces e esence lar No se Sert pas amé parti- las photos citeux loss de ail photos a	re ere t ne ere t ne ere t ne f ne f ne f ne f ne f ne f ne f ne f	chemon
(a) 40%, (α) 40.84, (α) 44.79.25 (b) 40.8 and (a) 40.8 (c) 40.	ers at Man son and a Man concerning at Man concerning at Man biological and an philos of philos of philos of these da and an of these da and an of the of the office da and an office da an office da	all congle state of states	re ere to a	33 mon from from top
Lead No. (1994). Biol. (1994). The second	sen in Max sen in Max cost in Max cost in Max cost in Max cost in phano monto aution dents fars da sa sa cost in cost	all conspire state of the second of the part of the second of the second of the second of the second	en etca : en etc	Source Source Total
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14 40% (REV. BM. (In 44 (TE))). States are set to provide a provide a subschedung with the effects of the filles of the intervidence of the in	sen in Max sen in Max cost in Max cost in Max cost in Max cost in phano monto aution dents fars da sa sa cost in cost	all conspire state of the second of the part of the second of the second of the second of the second	en etca : en etc	30 100 m 100 m
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en - range samplement gebrundtes andersten an anders des einer einere einer ei	Pig 20 gen rese viscel phano conc wini par conc wini par conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel viscel phano conc viscel viscel viscel phano conc viscel	ns dee n ns dee n he descret la best descret l	r ee ee ee ee ee ee ee ee ee ee ee ee ee	2000 200 2000 2
 And Sha, Mickell and Y B. And Sha, Mickell S	Pig 20 gen rese viscel phano conc wini par conc wini par conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc wini par do phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel phano conc viscel viscel phano conc viscel viscel viscel phano conc viscel	ns dee n ns dee n he descret la best descret l	r ee ee ee ee ee ee ee ee ee ee ee ee ee	Total 50 10 10 10 10 10 10 10 10 10 10 10 10 10

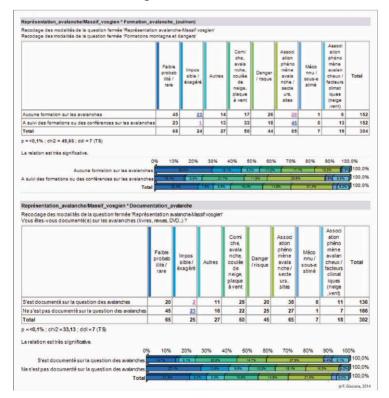
Appendix 8: Cross-analysis of the feeling of being concerned by the risk with training and documentation



Appendix 9: Cross-analysis of the representation of avalanches in the Vosges Mountains with knowledge and experience of such events



Appendix 10: Cross-analysis of the representation of avalanches in the Vosges Mountains with training and documentation



Appendix 11: Cross-analysis of the connection between 'Avalanches' and the 'Vosges mountains' with knowledge of the occurrence of events and accidents as well as their observation

N'a pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien 84 137 221 Ne se prononce pas 4 6 10	Associeriez-vous "Massif vosgien" et "phénomènes avalancheux" ? Avez-vous OBSERVÉ OU ÉTÉ TÉMOIN de phénomènes avalancheux dans le Massif v déclenchement ou observation de traces)?	vosgien (pré	ésence lors	du
N'a pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien 84 137 221 Ne se prononce pas 4 6 10 Total 163 164 327 p = <0,1% ; chi2 = 43,48 ; ddl = 2 (TS) . . La relation est très significative. 0% 50% 100% A observé ou été témoin de phénomènes avalancheux dans le Massif vosgien 100,0% 100,0% N'a pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien 100,0% 100,0%		phéno mènes avalan cheux et Massif	ocie pas phéno mènes avalan cheux et Massif	Total
Ne se prononce pas 4 6 100 Total 163 164 327 p = <0,1%; chi2 = 43,48; ddl = 2 (TS)	A observé ou été témoin de phénomènes avalancheux dans le Massif vosgien	<u>75</u>	21	96
Total 163 164 327 p = <0,1%; chi2 = 43,48; ddl = 2 (TS)	N'a pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien	84	137	221
 a relation est très significative. A observé ou été témoin de phénomènes avalancheux dans le Massif vosgien N'a pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien 	Ne se prononce pas	4	6	10
La relation est très significative. A observé ou été témoin de phénomènes avalancheux dans le Massif vosgien N'a pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien 100,0%	Total	163	164	327
A observé ou été témoin de phénomènes avalancheux dans le Massif vosgien				
A observe ou été témoin de phénomènes avalancheux dans le Massif vosgien	- 09	6 50	0% 10	00%
va pas observe ou ete temoin de prenomenes avaiancheux dans le massir vosgien	A observé ou été témoin de phénomènes avalancheux dans le Massif vosgien	78,1%	21,9%	100,0%
Ne se prononce pas		28.0%	62,0%	100,0%
	Va pas observé ou été témoin de phénomènes avalancheux dans le Massif vosgien	00,078		

Appendix 12: Cross-analysis of the connection between 'Avalanches' and the 'Vosges mountains' with the representation of avalanche risk in the Vosges mountains

Association_avalanche_et_Massif_vosgien * Représentation_ava Associatiez.vous "Massif vosgien" et "phénomènes avalancheux" ? F. Si on vous d'Iphénomène avalancheux dans le Massif vosgien", et par ordre d'importance, les 3 mots (ou expressions) qui vous vienne	donnez le plus		ossible,
	Associe phéno mènes avalan cheux et Massif vosgien	N'ass ocie pas phêno mènes avalan cheux et Massif vosgien	Total
Faible probabilité / rare	14	<u>52</u>	66
Impossible / éxagéré	9	25	25
Autres	13	14	27
Corniche, avalanche, coulée de neige, plaque à vent	35	15	50
Danger / risque	31	14	43
Association phénomène avalanche / secteurs, sites	35	31	66
Méconnu / sous-estimé	6	1	7
Association phénomène avalancheux / facteurs climatiques (neige ve	ent) 15	4	15
Total	149	156	305
Faible probabilité / Faible probabilité / Faible probabilité / éxag Impossible / éxag Au Corniche, avalanche, coulée de neige, plaque à v	are 12.2%	095 10 74.04 100%	100,09 100,09 100,09
Impossible / éxag Comiche, avalanche, coulée de neige, plaque à v Danger / ris Association phénomène avalanche / secteurs ; si Mécorur / sous est Association phénomène avalancheux / facteurs climatiques (neige, ver T	are 12%	72.0% 51.9% 51.9% 51.9% 51.9% 51.9%	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Imposibile / éxag Comiche, avalanche, coulée de neige, plaque à v Danger / ris Association phénomène avalanche/ secteurs, si Mécomu/ sous est Association phénomène avalancheux / facteurs climatiques (neige, ver Si vous n'associez pas "Massif vosgien" et "phénom pourquoi ?	are 12%	72.0% 51.9% 51.9% 51.9% 51.9% 51.9%	0095 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Faible probabilité / r Impossible / éxag Au Comiche, avalanche, coulée de neige, plaque & w Danger / ris Association phénomène avalanché exetcurs, si Méconru / sous-est Méconru / sous-est Méconru / sous-est Si vous n'associez pas "Massif vosgien" et "phénom	are 2326 dres 794 es 794 es 794 es 795 fotal atam atam atam atam atam atam atam a	72.0% 51.9% 51.9% 51.9% 51.9% 51.9%	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Impossible / éxag Corniche, avalanche, coulée de neige, plaque à v Danger / ris Association phénomène avalanche / sectaurs, si Mécoruri / sous est Association phénomène avalancheux / facteurs climatiques (neige, ve T Si vous n'associez pas "Massif vosgien" et "phénom pourquai ? Taux de réponse : 60,3%	are \$12% péré 42 m ares 75% fues 55.6% fues 10 10 10 10 10 10 10 10 10 10	78.0% 2019x 20	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Imposibile / éxag Comiche, avalanche, coulée de neige, plaqué av Comiche, avalanche, coulée de neige, plaqué av Association phénomène avalanche/ secteurs, si Mécorrur / sous est Mécorrur / sous est Mécorr	are \$15% deré 42 m. res stant que 55% stans tres stans tres stans tres stans tres stans tres stans tres stans tres stans tres stans stans tres stans tres stans tres stans tres stans tres stans tres stans tres stans tres stans tres stans tres stans tres tres stans tre	78.04 50% 50% 53% 53% 53% 53% 53% 53% 53% 53	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Impossible / éxag Au Comiche, avalanche, coulée de neige, plaque à w Danger / ris Association phénomène avalanche / secteurs, sit Méconru / sous set Si vous n°associez pas "Massif vosgien" et "phénom pourguel ? Taux de réponse : \$0,3% Localité / seulement certains secteurs concernés Autres	are state	78.0% 50% 50% 53% 53% 47.0% 47.0% 51.0% 60.1% 51.0% 19,6% 19,6% 19,6%	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Impossible / éxag Au Comiche, avalanche, coulée de neige, plaque à v Danger / ris Association phénomène avalancher / secteurs, si Médoemu / sous est Médoemu / sous est Si vous n°associez pas "Massif vosgien" et "phénom pourquoi ? Taux de réporse : 50,3% Localité / sectement certains secteurs concernés Radres Ratis altitude des sommets / peu de pentes raides	are 1124	78.04 50% 50% 53% 53% 53% 53% 53% 53% 53% 53	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Imposibile / éxag Au Comiche, avalanche, coulée de neige, place à M Dampar / ris Association phénomène avalanche / sectars, si Méconnu / sous est Association phénomène avalancheux / facturs (simatiques (neige, ve Si vous n'associez pas "Massif vosgien" et "phénom pourquei ? Tux de réponse : 50,3% Localisé / seulement certains secteurs concernés Adves Fable altude des sommets / peu de pentes raides Peu de neige	are 228	28.94 29.94 29.94 29.94 29.95 29.55 29	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Impossible / éxag Corniche, avalanche, coulée de neige, plaque à v Darger / fa Association phénomène avalanche / sectaurs, si Méconur / sous est Méconur / sous es	are 232 defe 213 tres 213 que 313 que 314 37 31 26 25	78.94 59.94 59.94 59.95 59.95 59.95 59.95 59.95 59.95 19.095 10.095 10.495 13.0% 13.2%	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabile / r Impossible / éxag Comiche, avalanche, coulée de neige, plaque à v Danger / ris Association phénomène avalanche/ secteurs, si Mécomir/ isous est Si vous n°associez pas "Massif vosgien" et "phénom pourquoi ? Taux de réponse : 60.3% Locaisé / seulement certains secteurs concernés Autres Patie atitude des sommets / peu de pentes raides Patie atitude de fevenement Rareté de l'évenement	are 224 prefeté 1 1 1 1 1 1 1 1 1 1 1 1 1 1	19.04 29.94 29	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09
Fable probabilité / f Impossible / éxag Corniche, avalanche, coulée de neige, plaque à v Darger / fa Association phénomène avalanche / sectaurs, si Méconur / sous est Méconur / sous es	are 224 press 225 press 225 pr	19.0% 20	100,09 100,09 100,09 100,09 100,09 100,09 100,09 100,09

Appendix 13: Cross-analysis of the connection between 'Avalanches' and the 'Vosges mountains' with the nature of the activity, the type of terrain practised and the practical experience

							et Massif vosgien*									
Association avalanche et Massif vosgien →	Associe phénon avalancheux et l vosgien	ènes N'a Assif a	ssocie pas phénon valancheux et Ma: vosglen	nènes ssif	1	otal	Association avalan Massif vosgie		Associe alancheux	phénomé et Massif			tie pas phénor eux et Massif			Tota
ictivité principale 🗸	Eff. % Rep.	Ecert E	ff. % Rep.	Ecart	Eff.	% Rep.	Site(s) de pratique		EM.	% Rep.	Ecart	EII.	% Rep.	Ecart		2.03
ctivités sur domaine randonnée ki de montagne, alpinisme,	33 86,8%	+ TS	5 13,2%	- TS	38	100%	Sur piste Dans des couloirs		96	39,2%	- TS	149 17	60,8% 27.9%	+ TS	245	
ascade de glace)							Sur les crètes		70	58.8%	+ PS	49	41.2%	PS	119	
andonnée (pédestre, en raquette)	44 45,8%	3	52 54,2%		96	100%	Sur des sentiers que								1000	
ctivités sur piste (ski, ski de ind, snowboard)	86 36,6%	• TS 14	19 63,4%	+ TS	235	100%	avez empruntés en ét		62	53,4%		54	46,6%		116	
utre	1 33,3%		2 66,7%		3	100%	En sous-bois / forêt		86	55,5%		69	44,5%		155	
otal	164 44,1%	21	38 55,9%		372		Autre(s)		4	50%		4	50%		8	1
s pourcentages sont calculés par i					-	-	Total		362	51,4%		342	48,6%		704	
Croisement de la question " Massif vosgien" Association avalanche et Mas	Associo sif phénomènes	N'associe p	85 15 Tate		inchi	e et	risque de 5%). Réponses effectives : p-value = < 0,01 ; Khi2 Croisement de la c	1 = 28,99 ; question	idi = 5,00. "Pratiqu	e hors-p	est très s	ignificative				
vosglen	Massif vosgier	Massif vosgi	et en				"Association avala									
Expérience 4							Association avalance Massif vosgien		Associe j lancheux e	hénomèn t Massif v	es osgien	avalanche	le pas phénon sux et Massif v	iènes losgien		Tot
Moyenne	2,4 'de 10 à 20	2,2 'de 10 à 2	0° 2,29 'de 10 à 20	r			Pratique hors-piste		Eff. 0	at the set	Foart	Eff.	% Rep.	Ecert		
Ecart-type	1,0	1/	07 1,0	6			Massif vosglen 🕹		Eur .	% Rep.	Ecert	En.	% нер.	Ecen	Eff.	1
Médiane	1	1	2	2			Pratique du hors-piste		113	52,8%	+ TS	101	47,2%	• TS	214	1
Min - Max	1		2). A	8			Jamais		49	31,4%	- TS	107	68,6%	+ TS	156	1
Somme	39		53 84				Total		162	43,8%		208	56,2%		370	
Effectif	16:	3 2	05 36	9			Les pourcentages son				and an is		No.			
Association avalanche et Mar vosglen	-> avalancheux e	s phénomèn	es et		Total		Les valeurs en bleu / risque de 5%). Réponses effectives :	rouge so	nt significa		sur repré	esentées / s	10.00			de
Expérience J							p-value = < 0,01 ; Khi2	= 16,78 ;	fdl = 1,00.	a relation	est très s	ignificative				
Etendue		3	3		3		Association_avalanch	e et Mass	if vosgien	•	La rel	lation est trê	is significative.			
	1,0		16		1,13		Activités_estivales						0%	50%	100	
Variance	0.4	3 0,	40		0,46		Associenez-vous "Mas	sif vosgier	i et "phéno	ménes	Rand	lonnée péde		5.05		10
Coefficient de variation												Vélo de n	pute state	116.0		10
Coefficient de variation Concentration	0,8	5 0,	87		0,86		avalancheux" ? R - Activités pratiquées	en-dehors	de la pério	de						
Coefficient de variation Concentration Skewness	0,8 0,0	5 0, 6 0,	87 33		0,18			en-dehon		de			VIT NIT	200		
Coefficient de variation Concentration Skewness Kurtosis	0,8 0,0 -1,	5 0, 4 0, 2 -1,	87 33 21		0,18 -1,25		R - Activités pratiquées	Associe	de la pério N'ass ocie pas	ide		Esca	lade 197	-		10
Coefficient de variation Concentration Skewness Kurtosis Normalité	0,8 0,0 -1, 0,5	5 0, 6 0, 2 -1, 8 0,	87 33 21 49		0,18 -1,25 0,54		R - Activités pratiquées	Associe phéno ménes	N'ass ocie pas phéno			Esca Parape	lade 197	1 25	101-	10
Coefficient de variation Concentration Skewness Kurtosis Normalité Quartiles (25-76)	0,8 0,0 -1, 0,5 1,5 - 2 -	5 0, 4 0, 2 -1, 5 0, 3 1 - 2	87 33 21 49 - 3	. 1	0,18 -1,25 0,54 - 2 - 3		R - Activités pratiquées	Associe phéno mônes avalan	N'ass ocie pas phéno ménes zvalan	Total		Esca Parapi A	lade ente	1 25	10%	10 10
Coefficient de variation Concentration Skenness Kartosis Normalité Quartiles (25-76) Moyenne corrigée (10-90)	0,8 0,0 -1, 0,5 1,5 - 2 - 2,	5 0, 4 0, 21, 8 0, 3 1 - 2 4 :	87 33 21 49 - 3 2.2		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activités pratiquées	Associe phéno mônes svalan cheux et Massif	N'ass ocie pas phéno ménes avalan cheux et			Esca Parapi A	lade 102	1 20 1 20 1 20 1 20 1 20 1 20 1 20 1 20	10%	10 10
Coefficient de variation Concentration Skewness Kurtosis Normalité Guartiles (25-76) Moyenne corrigée (10-90) Réponses effectives : 389	0,8 0,0 -1, 0,5 1,5 - 2 - 2, Non-réponse(s	5 0, 4 0, 2 -1, 8 0, 3 1 - 2 4 ; 1 : 7	87 33 21 49 - 3		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activités pratiquées	Associe phéno mônes avalan cheux et	N'ass ocie pas phéno ménes zvalan			Esca Parapi A	lade 102		10%	10 10
Coefficient de variation Concentration Skenness Kartosis Normalité Quartiles (25-76) Moyenne corrigée (10-90)	0,8 0,0 -1, 0,5 1,5 - 2 - 2, Non-réponse(s	5 0, 4 0, 2 -1, 8 0, 3 1 - 2 4 ; 1 : 7	87 33 21 49 - 3 2.2		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activités pratiquées	Associe phéno mônes avalan cheux et Massif vosgies	N'ass ocie pas phéno ménes zvalan cheux et Massif	Total 329		Esca Parapi A	lade 102		10%	10 10
Coefficient de variation Concentration Skewness Kurtosis Normalité Guartiles (25-76) Moyenne corrigée (10-90) Réponses effectives : 389	0,8 0,0 -1, 0,5 1,5 - 2 - 2, Non-réponse(s	5 0, 4 0, 2 -1, 8 0, 3 1 - 2 4 ; 1 : 7	87 33 21 49 - 3 2.2		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activités pratiquées hivémale Randonnée pédestre Vélo de route	Associe phéno ménes avalan cheux et Massif vosgien 150 29	Nasa ocie pas phéno ménes zvalan cheux et Massif vosgien 179 42	Total 329 71		Esca Parapi A	lade 102		10%	10 10
Coefficient de variation Concentration Skewness Kurtosis Normalité Guartiles (25-76) Moyenne corrigée (10-90) Réponses effectives : 389	0,8 0,0 -1, 0,5 1,5 - 2 - 2, Non-réponse(s	5 0, 4 0, 2 -1, 8 0, 3 1 - 2 4 ; 1 : 7	87 33 21 49 - 3 2.2		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activités preliquées hivernaie Randomée pádestre Vélo de route VTT	Associe phéno ménes svalan cheux et Massif vosgies 150 29 84	Nasa ocie pas phéno ménes zvalan cheux et Massif vosgien 179 42 87	Total 329 71 171		Esca Parapi A	lade 102		10%	10 10
Coefficient de variation Concentration Skewness Kurtosis Normalité Guartiles (25-76) Moyenne corrigée (10-90) Réponses effectives : 389	0,8 0,0 -1, 0,5 1,5 - 2 - 2, Non-réponse(s	5 0, 4 0, 2 -1, 8 0, 3 1 - 2 4 ; 1 : 7	87 33 21 49 - 3 2.2		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activides pratiquées hevernaie Randonméé pádeatre Véto de toute VTT Escalade	Aspocie phéno ménes avalan cheux et Massif vosgien 150 29 84 61	Nass ocie pas phéno ménes zvalan cheux et Massif vosgien 179 42 87 26	Tatel 329 71 171 93		Esca Parapi A	lade 102		10%	10 10
Coefficient de variation Concentration Skewness Kurtosis Normalité Guartiles (25-76) Moyenne corrigée (10-90) Réponses effectives : 389	0,8 0,0 -1, 0,5 1,5 - 2 - 2, Non-réponse(s	5 0, 4 0, 2 -1, 8 0, 3 1 - 2 4 ; 1 : 7	87 33 21 49 - 3 2.2		0,18 -1,25 0,54 - 2 - 3 2,31		R - Activités preliquées hivernaie Randomée pádestre Vélo de route VTT	Associe phéno ménes svalan cheux et Massif vosgies 150 29 84	Nasa ocie pas phéno ménes zvalan cheux et Massif vosgien 179 42 87	Total 329 71 171		Esca Parapi A	lade 102		10%	10

Appendix 14: Cross-analysis of the nature of the activity practised and the practice sites and the frequency of practice with the feeling of being concerned by avalanche risk



Appendix 15: Cross-analysis of the nature of the activity practised and the frequency of off-track practice with the knowledge of accidents and the frequency of avalanche occurrences in the Vosges mountains

Selon vous, à quelle fréquence des phénomènes avalancheux se produisent-ils dar Recodage des modalités de la question fermée 'Sport principalement pratiqué'	Chaque année	Réguliè rement mais pas chaque année	Except ionnel lement	Total
Activités sur domaine randonnée (ski de montagne, alpinisme, cascade de glace)	30	7	1	38
Randonnée (pédestre, en raquette)	26	28	28	82
Activités sur piste (ski, ski de fond, snowboard)	81	70	58	209
Autre	1	0	1	2
Total	138	105	88	331
p = <0,1% ; chi2 = 28,67 ; ddl = 6 (TS) La relation est très significative. Activités sur domaine randonnée (ski de montagne, alpinisme, cascade de glace)		40% 60%	5 80% 11 18.4%	00% 100,0%
Randonnée (pédestre, en raquette)	31,7%	34,1%	34,1%	100,0%
Activités sur piste (ski, ski de fond, snowboard)	38,8%	33.5%	27.8%	100,09
Autre	50%		50%	100,09
		1	26.6%	100.0%
Total	41,7%	31,7%	20,0%	,

Appendix 16: Cross-analysis of the connection between 'Avalanches' and the 'Vosges mountains' with the nature of the association within which the activity is practiced

Association avalanche et Massif vosgien →		cie phénomè ncheux et Ma vosgien		N'assoc avalanche	Total			
Précision nature cadre associatif ↓	Eff.	% Rep.	Ecart	Eff.	% Rep.	Ecart	Eff.	% Rep.
Ski-club	39	43,3%	- S	51	56,7%	+ S	90	100%
Club alpin français	22	81,5%	+ TS	5	18,5%	- TS	27	100%
Association de randonnée pédestre (notamment Club vosgien)	10	45,5%		12	54,5%		22	100%
Autres (association, école, structure marchande)	17	54,8%		14	45,2%		31	100%
Total	88	51,8%		82	48,2%		170	
Les pourcentages sont calculés p Les valeurs en bleu / rouge sont risque de 5%).	significa	tivement su	r représe	ntées / sou	us représenté	•	euil d	e
Réponses effectives : 170	Non-re	ponse(s) : 20)6	Та	ux de réponse	: 45,2%		
p-value = < 0,01 ; Khi2 = 12,58 ; dd	1 - 3 00 1	a relation est	très siar	ificative				

NOTES

1. The distinction between high and medium-high mountains does not exist *de facto*. It was introduced in the 1970s in the context of questioning the high mountain development model (Gumuchian, 1984).

2.

3. Quaternary glaciations helped shape the Vosges landscape, such as glacial cirques (depressions surrounded by steep slopes) (Flageollet, 2003).

4. *Backcountry skiing* or *cross-country skiing* 'differs from off-track because [it] requires the use of one's own means to climb a summit' (Gletty, 2017).

5. The Association pour l'étude de la neige et des avalanches [Association for the Study of Snow and Avalanches] defines off-track as « all snow-sliding activities practised by gravity outside open slopes » (Boudières, 2007). According to Brunot (2005), this definition could, however, be extended 'to slopes accessible after a slight climb (a few metres) over a short distance (less than 50 m)'. It is to be noted that no definition of off-track was included in the questionnaire, so we cannot ascertain that the answers relate to any of these definitions.

6. Associations, clubs and collectives (whether or not affiliated with the *Comité régional de ski du massif des Vosges* [Regional skiing committee of the Vosges Mountains], the *Fédération française de montagne et d'escalade* (FFME) [French mountain and climbing federation], the *Club Alpin Français* (CAF) du Grand Est [Grand Est French Alpine Club], the *Club Vosgien* [Club of Vosges] and the *Fédération Française de Randonnée Pédestre* [French Federation of hiking).

7. To know more about the analyses and statistical results, see Giacona, 2014 (vol. 2).

8. The relationship is considered as very significant for a risk of error (p-value) <1% and significant for a risk of error between 1 and 5%.

9. Ninety-four percent of them live in the surrounding areas: Haut-Rhin, Bas-Rhin, Moselle, Meurthe-et-Moselle, Meuse, Vosges, Territoire de Belfort and Haute-Saône.

10. This diagnosis was carried out by crossing places of practice of the surveyed with the avalanche activity documented by Giacona *et al.* (2017b).

11. The high proportion of users registered in a skiing club is to be examined taking into account their large number in the Alsace region (Stumpp, 2007).

12. A study carried out at the end of the 1990s showed that 26.4% of those who practise alpine skiing, 38.2% of those who practise snowboarding and new ways of sliding and 80% of cross-country skiers seek information about avalanche risk (Poizat, 2001).

13. The weight of self-training, confirmed by the large proportion of individuals who have taken training courses and sought documentation on avalanches, refers to the general weakening of the 'transmission of so-called "popular" knowledge' in new modes of urban life where 'new learning methods use passive tools: books, magazines and exhibitions' (Guyon, 2004).

14. In this sense, we choose an endogenous approach to risk, taking vulnerability in its 'active' dimension, as opposed to an approach centred only on the passive exposed stakes where the risk appears to be exogenous (Pigeon, 2005).

ABSTRACTS

Whereas numerous studies questioned the risk concept in France, few so far have focused on medium-high altitude avalanches, even though those occur on a regular basis. This article studies how winter outdoor activities practitioners apprehend avalanche risk in the Vosges Mountains (North-East of France). Our survey demonstrates that their perception of both the mountain environment and the avalanche risk is influenced by their culture of sports and mountains in general. Our analysis shows a diversity in knowledge and perception of the risk. However, a significant number of practitioners (including hikers, skiers or mountaineers) seem to have no culture at all of the avalanche risk, which prevents them from realising that they are exposed. As a consequence, one can say that this lack of feeling vulnerable has led to an absence of mental construction of the avalanche risk in the Vosges mountains.

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Keywords: risk, risk perception, outdoor winter activities, snow avalanche, medium-high mountains

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