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Florie Giacona and Frédéric Guyon

Introduction

- 1 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.
- 2 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).

- 3 However, all of these studies consider almost exclusively high mountains. The finding 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 Central'². 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

more than 700 avalanches in the area since the end of the 18th century in 128 avalanche 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 cirques 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.

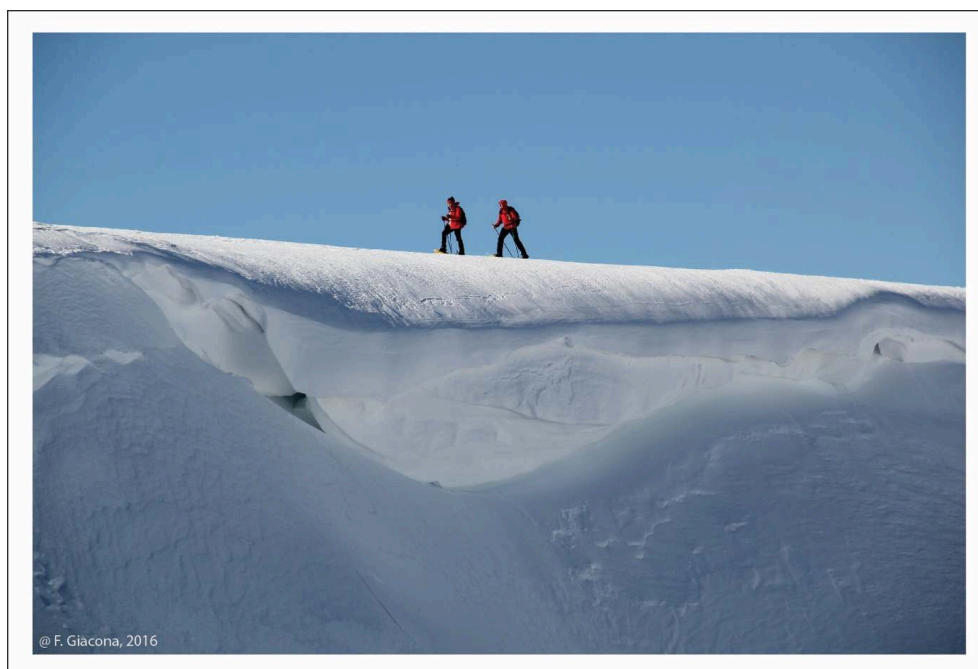
- 6 The avalanche risk in the Vosges Mountains is hardly publicised. For instance, the *Dossiers Départementaux des Risques Majeurs du Haut-Rhin, du Territoire de Belfort et des Vosges* [Departmental Files of Major Risks of Haut-Rhin, Territoire de Belfort and Vosges] do not mention avalanche risk (Giacona *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).

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, know-how, 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).
- 10 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.
- 11 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 raquette à neige* and *L'Alsacienne de la raquette 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 *Chi*²⁸ test.

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

Mountain culture	Theoretical knowledge Mountain/snow/avalanche training courses Factual knowledge Avalanche occurrences, frequency, damages, places of occurrence Empirical knowledge Avalanches/accidents direct observation, status as victim, practice in other mountain ranges
Socialisation	Learning framework Practice framework
Sport culture	Type of practice Nature of the activity, frequency of practice, off-track practice, type of terrain practised Social identity Age, gender, family status, economic condition, place of residence, place of birth, individual trajectory
Representations	Representations of the Vosges Mountains Representations of avalanche risk in the Vosges Mountains Vosges Mountains - avalanche linkage Feeling of being concerned by avalanche risk

Crédit : F. Giacona, 2020.

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

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%).
- 15 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.

- 18 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).

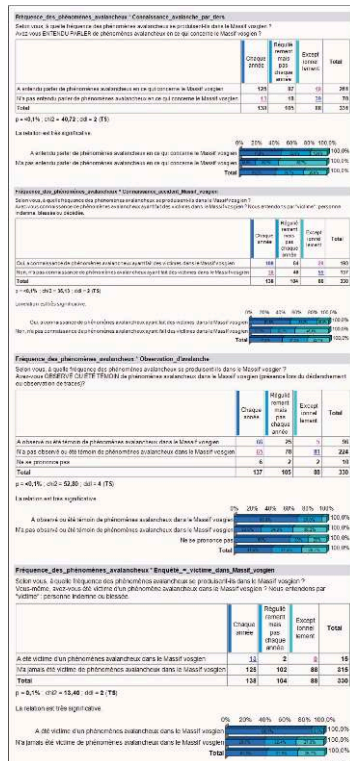
Social construction of avalanche risk, at the crossroads of sports and mountain cultures

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, off-track 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).

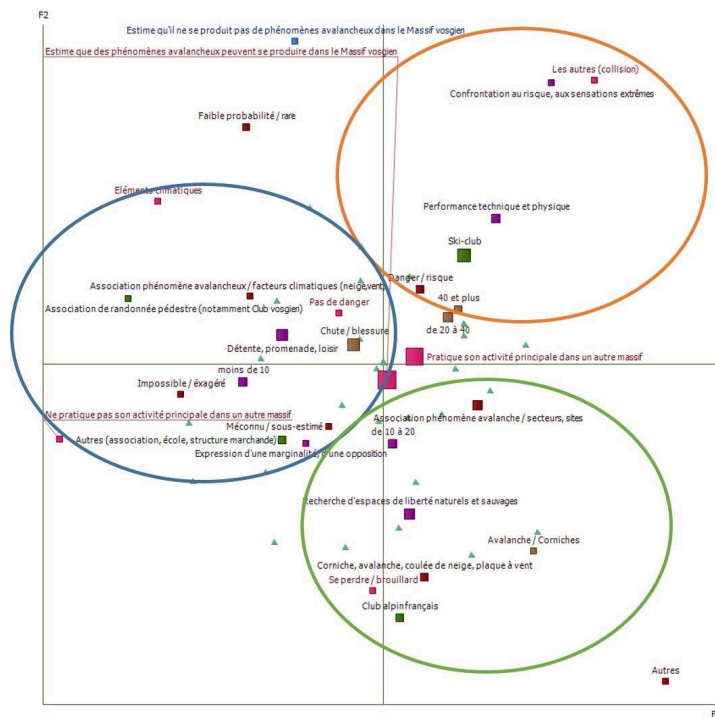
- 24 The individuals' experience, measured by their seniority in their mountain activity, has an influence on their representations. Thus, the greater their experience, the more they make a connection between the Vosges mountains and avalanches ($p = <0.1\%$) (Appendix 13). The summer activities exercised 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

- 26 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



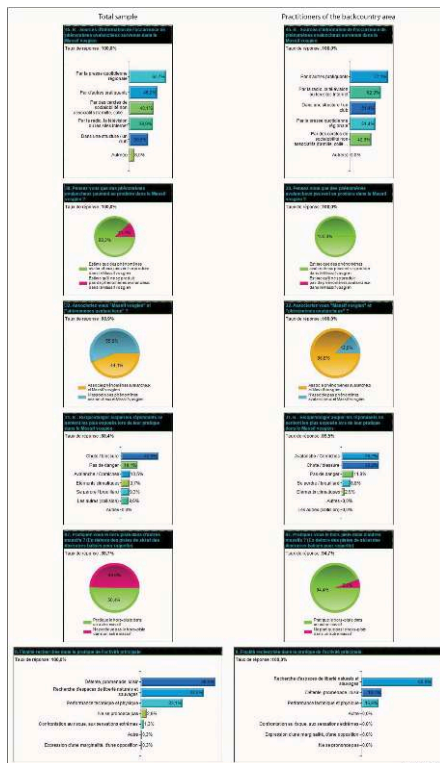
Credit : F. Giacona, F. Guyon, 2020.

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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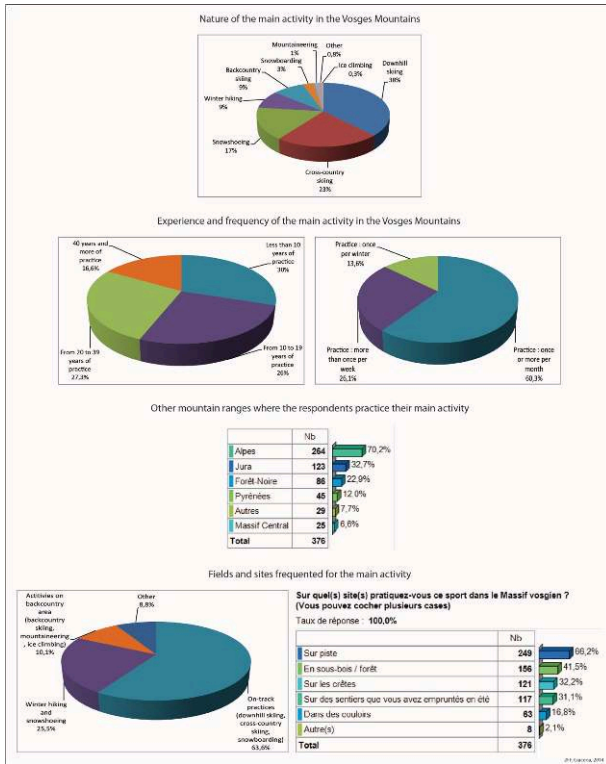
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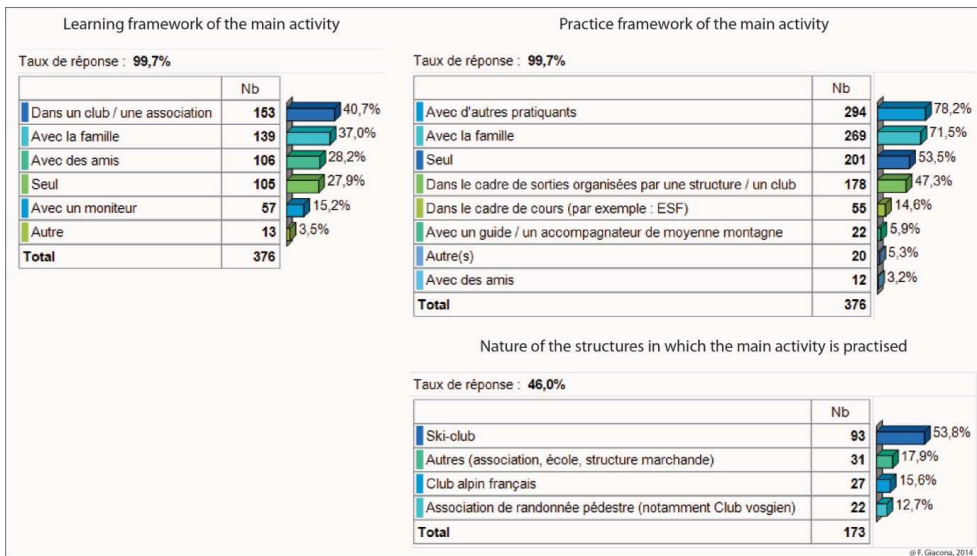
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APPENDIXES

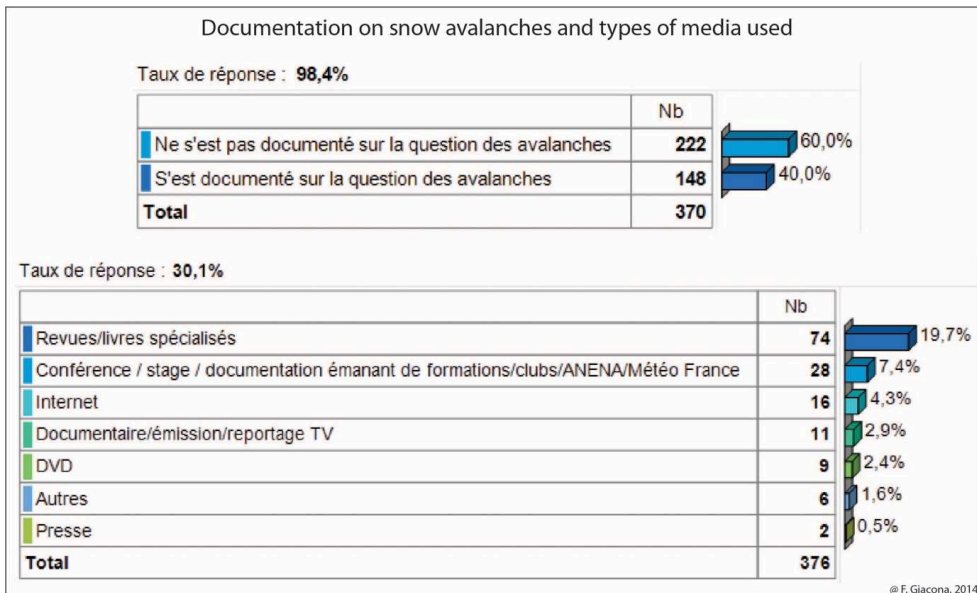
Appendix 1: Type of practice and types of terrain on which the main activity is practiced



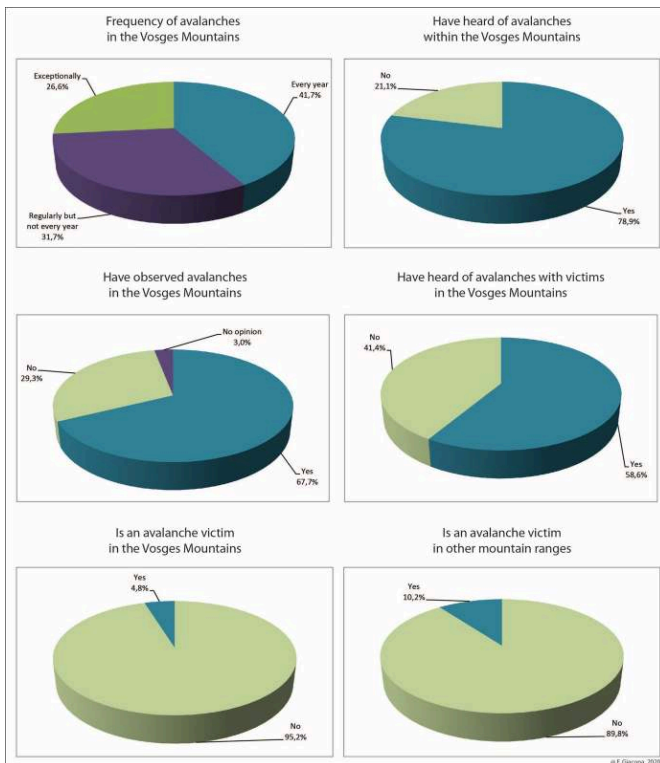
Appendix 2: Learning framework and main activity in the Vosges Mountains



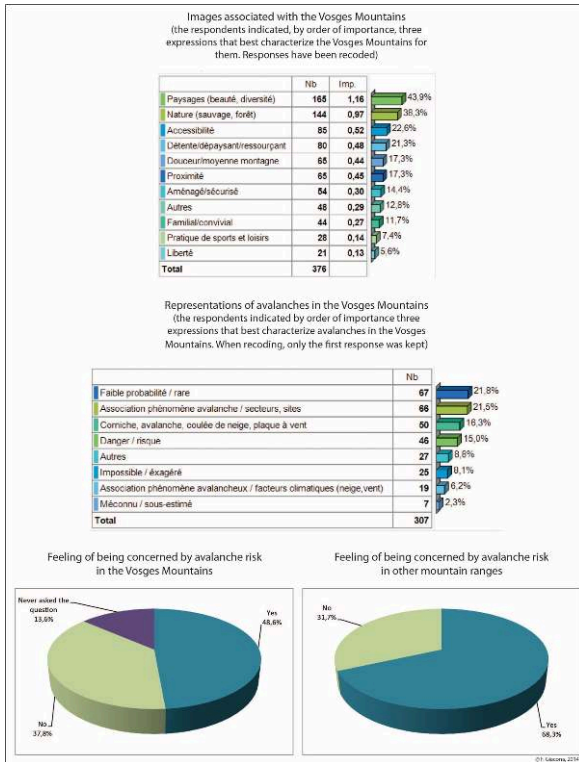
Appendix 3: Types of media used to document avalanches



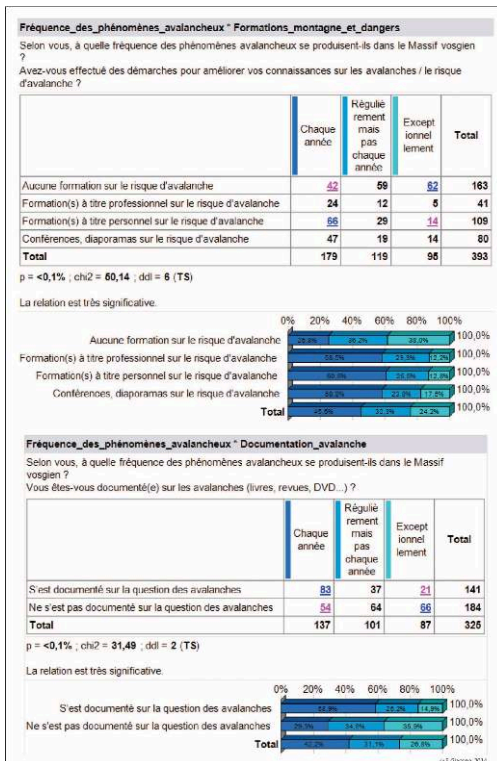
Appendix 4: Knowledge and experience of avalanches in the Vosges mountains



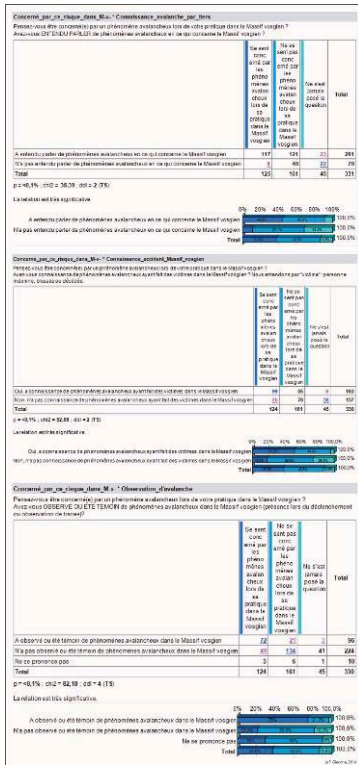
Appendix 5: Representations and feeling of being concerned by the avalanche risk in the Vosges Mountains



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



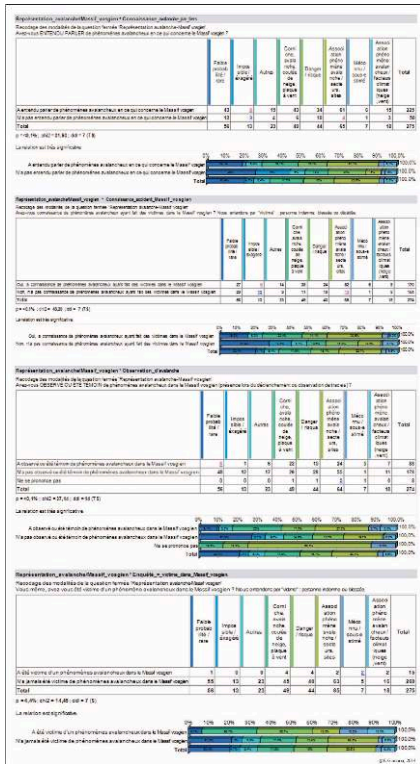
Appendix 7: Cross-analysis of the feeling of being concerned by the risk with the knowledge of avalanches occurrence in the Vosges Mountains



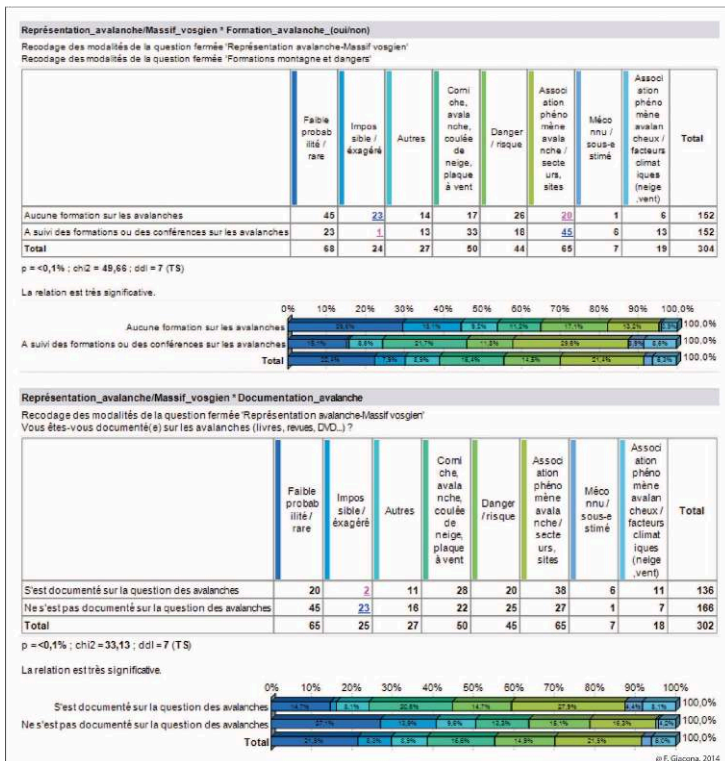
Appendix 8: Cross-analysis of the feeling of being concerned by the risk with training and documentation



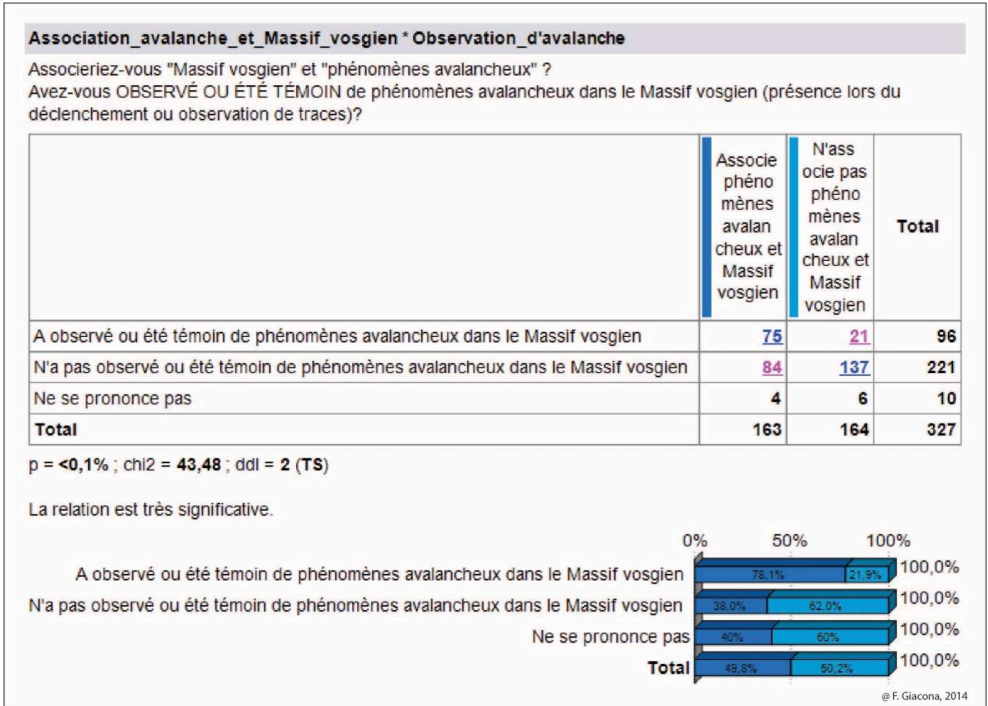
Appendix 9: Cross-analysis of the representation of avalanches in the Vosges Mountains with knowledge and experience of such events



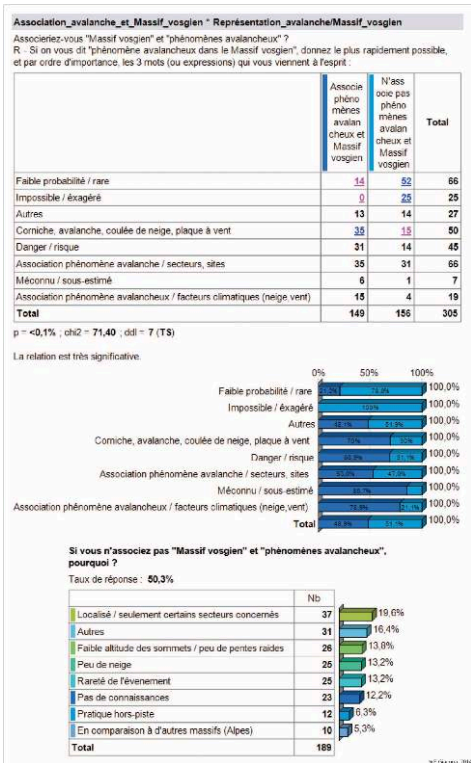
Appendix 10: Cross-analysis of the representation of avalanches in the Vosges Mountains with training and documentation



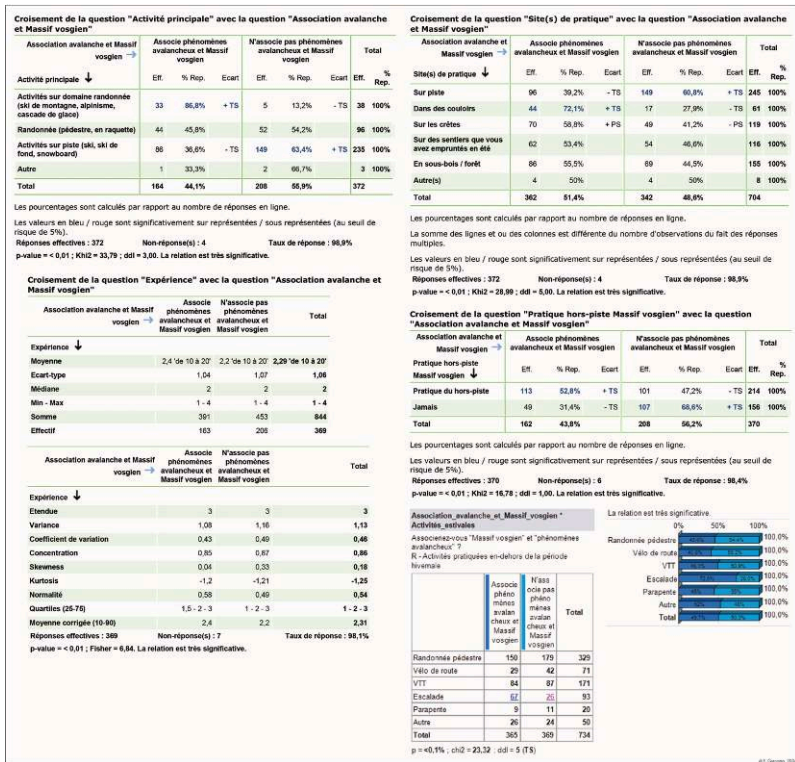
Appendix 11: Cross-analysis of the connection between 'Avalanches' and the 'Vosges mountains' with knowledge of the occurrence of events and accidents as well as their observation



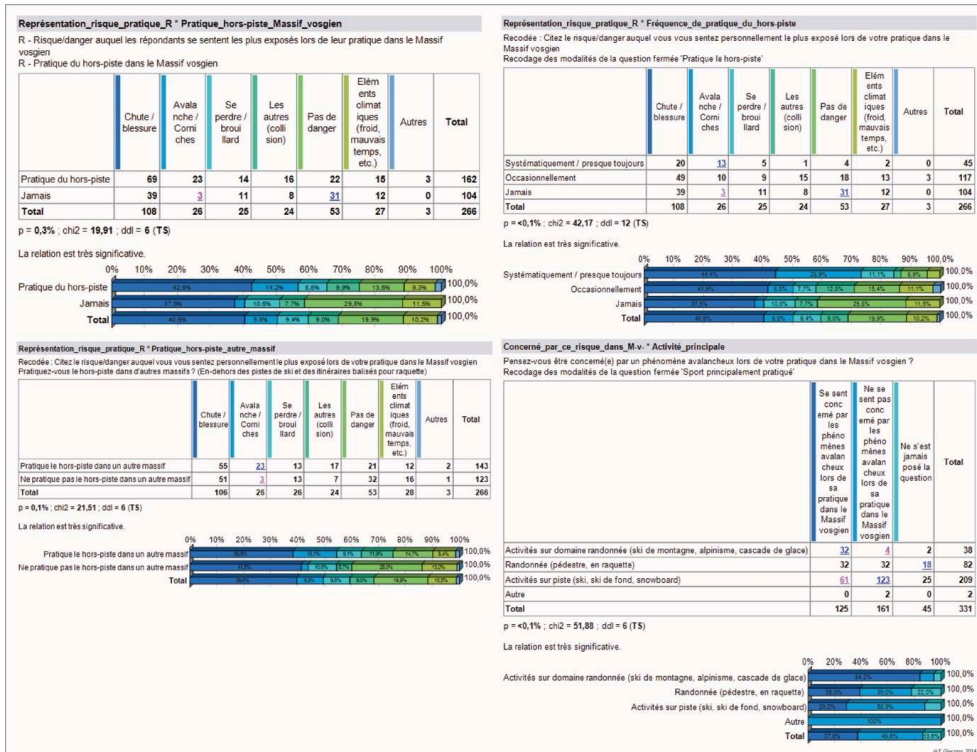
Appendix 12: Cross-analysis of the connection between ‘Avalanches’ and the ‘Vosges mountains’ with the representation of avalanche risk in the Vosges mountains



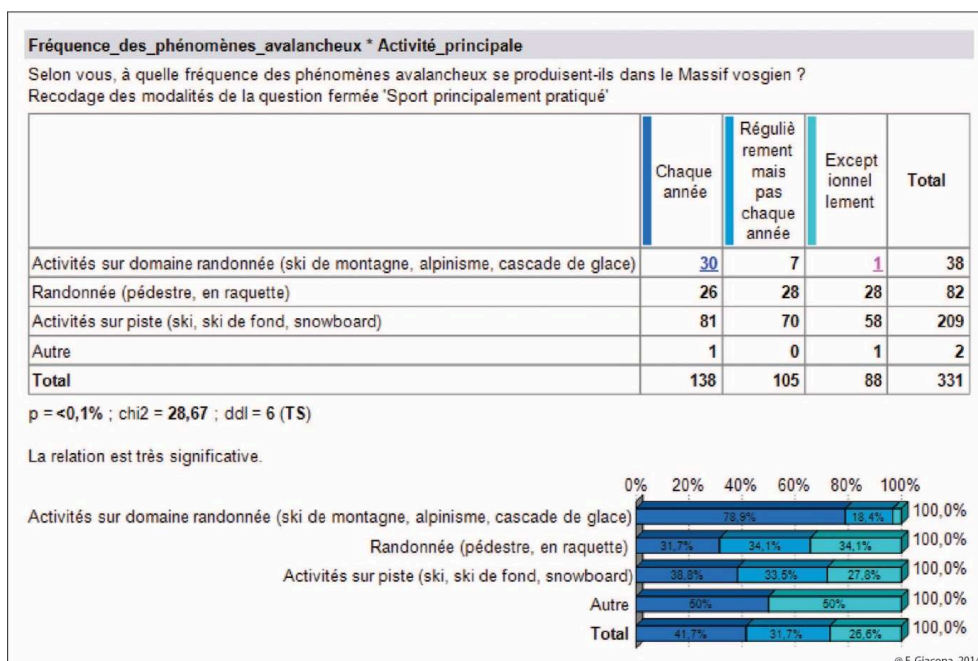
Appendix 13: Cross-analysis of the connection between ‘Avalanches’ and the ‘Vosges mountains’ with the nature of the activity, the type of terrain practised and the practical experience



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



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

Croisement de la question "Précision nature cadre associatif" avec la question "Association avalanche et Massif vosgien"

Association avalanche et Massif vosgien →	Associe phénomènes avalancheux et Massif vosgien			N'associe pas phénomènes avalancheux et Massif vosgien			Total	
	Eff.	% Rep.	Ecart	Eff.	% Rep.	Ecart	Eff.	% Rep.
Précision nature cadre associatif ↓								
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 par rapport au nombre de réponses en ligne.

Les valeurs en bleu / rouge sont significativement sur représentées / sous représentées (au seuil de risque de 5%).

Réponses effectives : 170 Non-réponse(s) : 206 Taux de réponse : 45,2%

p-value = < 0,01 ; Khi2 = 12,58 ; ddl = 3,00. La relation est très significative.

Valeurs supplémentaires

V de Cramer : 0,27

@ F. Giacona, 2014

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

AUTHORS

FLORIE GIACONA

Researcher in geohistory of natural hazards, Université Grenoble Alpes, INRAE ETNA, 2 rue de la Papeterie-BP 76, F-38402 St-Martin-d'Hères, France
florie.giacona@inrae.fr

FRÉDÉRIC GUYON

Lecturer, Université de Franche-Comté – Laboratoire C3S, 31 rue de l'Épitaphe, F-25000 Besançon
fredguyon@gmail.com