

The Roots of Avalanche Fatality Rates:

An Exploration of the Differences between Skiers and Snowmobilers

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ABSTRACT

Avalanches have been a concern of people recreating in the backcountry for a long time. Both skiers and snowmobilers are at risk of being involved in avalanches, however in recent years it has become apparent that while the fatality rate of skiers involved in avalanches has slowed, the rate for snowmobilers is currently rising. Although there is concern over this trend, there has not been much research to help learn how to address it. Therefore, this study uses a grounded theory approach to investigate internet resources relating to backcountry skiing and snowmobiling and find data that point to possible causes of this shift. The results present key concepts that help to explain this shift in fatality rates. These are the cultural, attitudinal, community and awareness differences between the two user groups. While this research allows for some initial insight into the causes of the rise in snowmobiler avalanche fatalities, it is by no means a complete theory. This study is meant to be a starting point on which to base further exploration in order to create a concatenated theory that will help explain and remedy the deaths of snowmobilers in avalanches in future years.

Over the years, people have put a great effort into studying avalanches, and have become quite proficient at predicting when and where they are likely to occur. The conditions for avalanches are greatly dependent on the weather and terrain, including terrain aspect, elevation and incline, current temperature, cloud cover, snowfall and the effects of these on the snow layers over time. From this information, the Canadian Avalanche Centre puts together area bulletins that report to the public a rating of the avalanche danger for the day. These bulletins, along with the correct training and knowledge of how to put them to good use, help individuals to minimize their risk while still recreating in the backcountry.

While knowledge, training and the use of avalanche bulletins allow individuals to minimize their risk of avalanche involvement in the backcountry, predicting avalanches is not an exact science. Unfortunately, this has resulted in avalanches taking the lives of people recreating in the backcountry for decades. With a steady increase of backcountry recreation, there comes the danger of an increase in the number of avalanche fatalities (Canadian Avalanche Centre, 2010). However, the risk of avalanches is not solely controlled by science; there is another factor in avalanche risk management that has only recently begun to attract the attention it deserves.

The one factor when considering avalanches that does not follow the rules of predictive science are the humans who are involved. Human factors are the plot of a capricious storyline that relates to the risk of avalanche involvement. The plot is definitely based on science, but people bring in their own experience, cognitions, and emotions to the table when making decisions about where to ride. "Since most avalanche accidents result from human errors, no description of avalanche forecasting is complete unless the human component is addressed." (McClung, 2002. p. 1.) Each person's evaluations of the risk and understandings of it are dependent on their past, the culture of the sport they participate in and their personal goals and motivations for the sport. It is these variables of human factors that interplay

with the difficult science of avalanche prediction. Teaching these factors to individuals is a complicated task, yet it is important for people to understand how their interactions with the mountains can be managed to ensure their safety, because the premise of all avalanche education is this.

Targeting education to reach all of these people is difficult. The Canadian Avalanche Centre is a not for profit organization that has excellent awareness, training and education programs in place that are available for interested individuals to access over the internet. Consumer marketing has also helped to create awareness by the marketing of avalanche safety gear.

Despite these efforts in avalanche awareness, education and training, there are still many people dying in Canada every year due to avalanches triggered by people during recreational pursuits. Interestingly, over the past ten years, there has been a decrease in the number of skier fatalities; this rate has levelled off to about 5 fatalities per year since 2004 (CBC, 2011). This promising trend, however, is overshadowed by the increase in the number of snowmobiler fatalities, which has led to some of the highest fatality years in history (CBC, 2011). This rising trend for snowmobiler fatalities has caused an increase in concern and a change in focus for many avalanche professionals. This rise seems counterintuitive to the constant increase in awareness efforts that are put forward by the Canadian Avalanche Association. However, upon close examination, there are large differences between the backcountry user groups of skiers and snowmobilers, and this is affecting the reaches of avalanche awareness and education efforts.

Although there have been some studies that offer valuable insight and information to the story between avalanches and recreational backcountry users, they are by no means an all encompassing study of the factors involved. Especially when it comes to the differences between snowmobilers and skiers, a more large based exploration model would be more appropriate to allow some insight as to where to begin to target education and awareness to change the behaviours leading to these fatalities.

In an area with such little background information and research, it is important to start at the beginning. It is evident that people make bad decisions that lead to avalanche fatalities. It is also known that not all people make their decisions according to formally acquired avalanche training; half of snowmobilers and one fifth of skiers do not have avalanche training. Good questions to begin to ask are why aren't people entering into this sport which is largely affected by avalanches, getting the gear they need (skis and snowmobiles) and not the training they need? Is the education not reaching the recreationalists or are they not reaching out to the education? What can education efforts do differently to reach and influence more people? The biggest question of all is what can we do to reduce the avalanche fatalities due to backcountry recreational pursuits in Canada? And to help with this, a lot more research beginning at the source of the problem, the recreationalists themselves, will allow a greater understanding of what can be done to assist in their decision making.

Methods

This study aims to ignite interest about the roots of avalanche decision making. Originally, it was planned to interview actual recreationalists in the backcountry; however, due to time constraints as part of a Master's program, this was not attainable. The wealth of resources for both skiers and snowmobilers that exist on the internet were quickly realized as a suitable substitute. There was more than enough information available to explore and create the first sprouts of an emerging theory about the avalanche fatality rates in Canada. Using solely information found on the internet may seem limiting; however, it was difficult to find any print based, television or other sources that could be used without requiring ethics approval. Aside from a couple pamphlets, and a poster or two, there was no data outside of the internet to analyze. Furthermore, as shown by Longland et al. (2006), most snowmobilers checked the avalanche bulletins on the internet, which gives a hint that the internet is a source used by conscientious snowmobilers.

Once the target of resources was selected, internet searches were used to locate every bit of education related avalanche data of use on the internet. It soon became apparent that there is an abundance of avalanche related information on the internet; the majority are videos and photos of avalanches. There are also many media reports of avalanche fatalities, as well as a large amount of education and awareness specific material that is aimed at skiers, snowmobilers or both. The resources found on web magazines, snowmobiler and skier associations, clubs and organizations were collected and tracked, using a combination of methods that resulted in a complex chart used to capture and analyze concepts. Using grounded theory methodology these concepts were elaborated and five major themes emerged, which highlight important concepts in avalanche education for skiers and snowmobilers.

Avalanche Education Influences

Culture

The culture of skiing is one built on learning from experience and mentorship. Learning about avalanches takes place through the stories and experiences of others, which are embedded in the culture, mentorship, and history of the sport. Most of the resources include reports of avalanche incidents, both of fatalities and near misses. Many include information regarding their occurrence, signs that were present and unique details of the situation. There are also interesting reports of rare avalanche events that inform readers about situations that are primed for learning about different avalanche situations. Another support to the culture of learning from experience is the number of articles that discuss avalanche incidents and fatalities that involve individuals with high levels of training and avalanche experience. The culture of mentorship represented takes these as an opportunity in most articles to stress the importance of being safe in the mountains and the importance of humbleness

despite avalanche experience and training. Furthering this concept is the presence of stories from experienced mountain professionals from as far back as the 1920s, sharing their stories and experiences with avalanches. The rich history and culture of mentorship projected from skier resources online projects a culture of avalanche education embedded in the sport of backcountry skiing.

The culture of snowmobiling evident in the resources studied is consumer based culture that feeds on the advertising of action and thrill. The majority of snowmobile resources, magazines and club websites are filled with flashy action advertisement based graphics, have a lot of space for advertisements of new sleds and hot products. Slogans like “get all the action and “get out there” are highlighted. There were sometimes advertisements of new avalanche gear, however backcountry safety and avalanche links were more hidden on the sites and by no means highlighted. Supporting this view, an opinion highlighted the problems with this cultural trend saying that, “risks must be reduced and avoided, not embraced and romanticised.” There is a difficulty with the high amount of advertising in the snowmobiling culture as it helps to promote action and thrills through advertising to sell products. Although sales represent what a community wishes to buy, the advertising also helps determine what people value in their sport. This circular reasoning makes it difficult to determine if advertising is the root of this culture or if the advertising reflects the culture. Either way, action and adrenaline are part reinforced by the abundance of advertising in snowmobile resources. Unfortunately, the culture’s focus on avalanche gear and products is much the same. They are mostly represented on the site as accessories or hot products. There are not many resources that discuss avalanche gear as essentials to the sport, which is a definite shortcoming in the cultural support of avalanche safety and education.

Attitude

Among the skier resources analyzed, there is an overall attitude of respect for avalanches, especially among those with experience and training. Many articles and blogs were written about avalanches from people with experience. Respect was noted and included in these write-ups, particularly in the experiences of trained, knowledgeable professionals. These professionals demonstrated wholehearted respect for the mountains, avalanches and their own recreational pursuits. This understanding of the risks and importance of respect allows these people to dispel the myth that avalanches are an “Act of God.” Instead of using nature as an excuse for close calls with avalanches, these stories tell of a respect for the danger and an acceptance of the mistakes that have been made that lead to avalanche incidents. The recognition of these mistakes in their stories allows the attitude of respect to be presented through the articles and stories written in these skier resources.

The attitude towards avalanches that is represented in the resources studied is one of an external locus of control and mutually exclusive division between safety and fun. Many of the articles make implications about avalanches being out of the control of people; they are portrayed as an unknown force of nature or an “Act of God.” Despite the scientific research pointing to the contrary, this attitude seems predominant in the majority of resources. Much of the information about avalanches focuses on the reaction to, rather than the prevention of avalanches. Others demonstrate the attitude held by some that safety is mutually exclusive to fun, hard riding. In fact, one snowmobiler took his experience with an avalanche burial and is now working to raise snowmobilers’ awareness that “riding hard and being safe don’t have to be mutually exclusive.” The attitude that avalanches cannot be controlled and that one must choose to either stay safe or ride hard represent an external locus of control. And attitude that focuses on the inability to manage risk is not one that is conducive to a desire to gain knowledge and training about the risk. By targeting education towards creating a sense of

control against the risk of avalanches, snowmobilers may be more interested in learning and being safe because they will learn that safety does not have to be mutually exclusive to the riding that makes them passionate about their sport.

Community

The community surrounding backcountry skiing has been intimately intertwined with avalanches for decades, which has resulted in an experience, informed, and supportive learning community. Several stories within the resources discuss the history of avalanches and how people have dealt with them through history. The Canadian Avalanche Education has its roots in skiing and mountaineering; all members of the executive and board have a history in these pursuits. Although this is not as evident on the CAA website, most avalanche education resources have photos from mostly a skiers' point of view. There were several instances in the resources analyzed where backcountry skiing organizations donated sums of money to assist in avalanche bulletins, communication, organized backcountry skiing festivals and events to promote the sport and avalanche awareness. Articles from interested student research projects about various aspects of avalanche education were present. Major ski companies also demonstrated an investment in avalanche safety by links and backcountry resource pages on their websites, ranging from community and experienced focuses, to links to CAA pages and courses as well as one extensive backcountry resource page including exhaustive reading from the K2 website. The wide range of avalanche education and support that can be found from different skiing organizations shows the investment of the community in avalanche education for all its members.

Snowmobilers have a strong community and history of recreation as well. Snowmobiles have been used for winter recreation for about sixty years and the resources demonstrate a rich community of gatherings, fun rides, poker runs, and safety events. Through the history of snowmobiling, however, snowmobiling has changed rapidly due to great changes in technology gained by snowmobile

manufacturers, which have vastly remodelled the face of the sport. In the past two decades and more specifically since 2003, snowmobiles have become largely more capable of travel in difficult snow conditions, turning them into the powder specific hill-climbing machines they are now. Snowmobilers can be seen jumping their sleds from large cliffs, high marking on steep slopes and effortlessly travelling through deep, soft powder; all of these are remarkably different from the riding that took place a short time ago. Due to these advances in the ease of travel, snowmobiles have launched users into more dangerous avalanche terrain and moved the community deeper into danger than they have had time to realize. While the snowmobile community shows significant efforts for safety in regards to helmet wearing and alcohol free riding, avalanches have only become a significant safety risk relatively recently. The generally safe community has not yet recognized and developed methods to minimize this risk and advertise its importance to its members of the community. Much of the safety information in resources and organized events focus on safe riding and do not address avalanches. Sites that do mention avalanche safety either have links to the Canadian Avalanche Association, or many seem to use the same few pamphlets and resources that are incomplete, unorganised and not credited to an accountable author. While these provide a limited level of education to the community, their use in place of the more recent and complete sources is a disservice to the readers. There is also the lack of avalanche education support from an important part of the snowmobile community: the manufacturers. Of all four major manufacturers' websites there was limited mention of avalanches outside the sale of avalanche safety gear. These manufacturers are a major part of the snowmobiling community – many people show extreme loyalty and dedication to these brands. This major source of mentorship is not a factor yet in the promotion of avalanche safety in the community. Although snowmobilers are overall focused on maintaining a safe, involved community, the transition into avalanche safety does not seem to be happening as quickly as the new technology of snowmobiles have taken them into that terrain.

Awareness

From the resources studied, it became apparent that the backcountry skiing community had a high salience of avalanche accidents. Of the ski resources studied, the most prominent mention of avalanches was reports of avalanche incidents and fatalities. Every fatality, near miss, injury and rare event was reported in detail on many sites. All of these reports made the salience of avalanche accidents highly publicized on the websites. The high visibility and awareness of accidents shown by the sources makes a highly primed environment for learning about accidents and understanding what can be done to avoid the mistakes of others. By creating awareness and salience of accidents, skiers are able to take advantage of their peers and make learning from experience even easier.

Contrary to skier resources, snowmobile resources had no significant amount of articles or reports of avalanche incidents or fatalities. In fact, besides links to education and some articles on awareness, there was no mention of avalanches really taking place. Without this salience of real avalanche accidents, there is not much of a situation available for learning from others mistakes. Without this ongoing discussion of avalanche accidents and learning from others, the ability to use these accidents to demonstrate the prevention and avoidance of avalanche accidents is not possible. By reporting avalanche accidents to the public, the snowmobiling community would be able to increase the awareness of its members and allow for increased learning by experience and example.

Discussion

From the internet skiing and snowmobiling resources studied, it is evident that the culture, attitude, community and awareness of these two sports differ greatly. As a result, some general theory

can be developed to assist in explaining the change in fatality rates in the recent winter seasons. The recent development of the snowmobile technology increases the ease in access to avalanche terrain, and therefore increases potential for the number of avalanche accidents. Due to the slower reaction of the culture and attitudes in regards to avalanches, there is a gap between the access to this higher risk and the education of the community of this higher risk. Because of this, the education necessary to stay safe is less accessible to participants than the terrain is for their sleds. This theory becomes more grounded when taken into account in terms of the actual fatality rates. Figure 1 shows the avalanche fatalities in the past 20 years by skiers and snowmobilers.

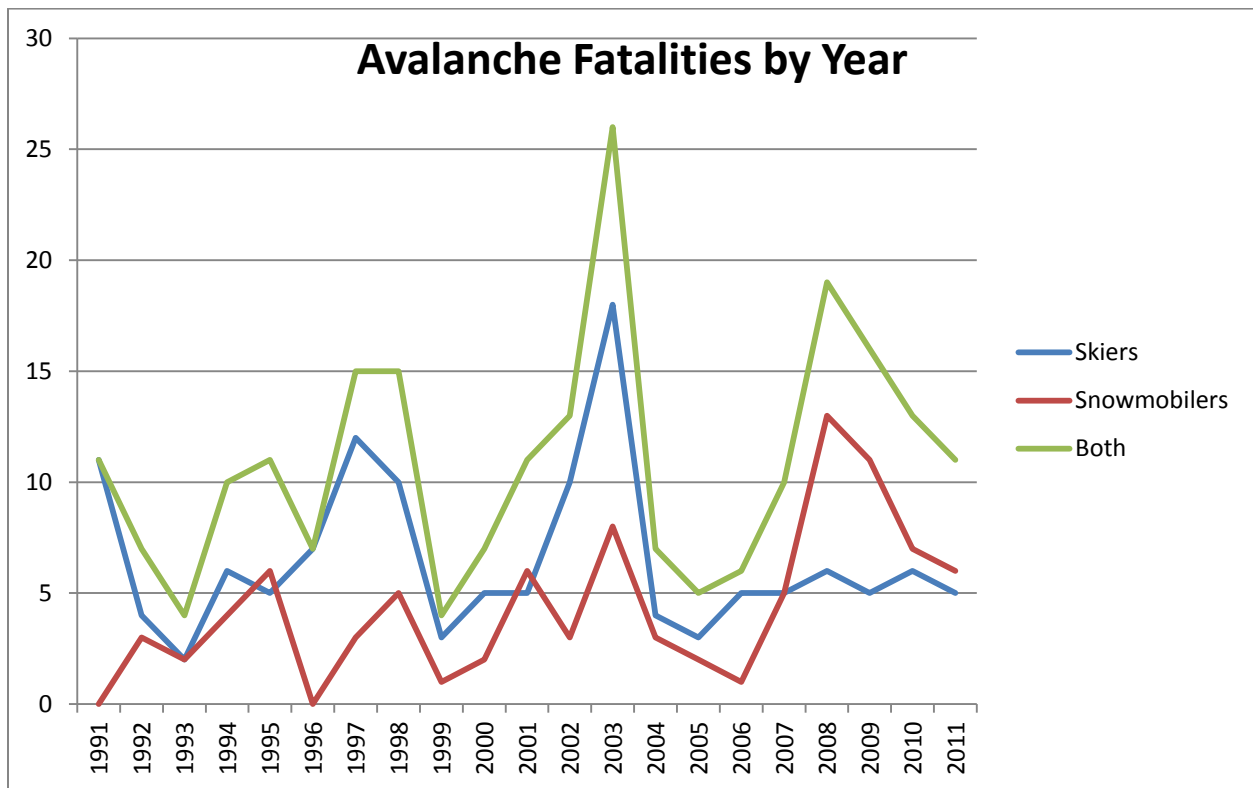


Figure 1 (CBC, 2011)

While this chart shows the fatalities by year, the rises and falls in data are difficult to interpret. The number of fatalities is affected by the potential for avalanches to be triggered in a particular snow year, as well the high number that sometimes occur in a single incident (Canadian Avalanche Centre,

2011). The high number of fatalities in 2003, for example, was a result of two incidents killing seven individuals each. This year, in fact, is mentioned by many research articles, as it sparked a new interest in recreationalist decision making by avalanche professionals, resulting in new research on human factors and the ADFAR (Avalanche Decision Framework for Amateur Recreationalists) project which produced the Avaluator decision support tool. It is interesting to note that after this tragic year, the trend in skier avalanche fatalities has dropped off and levelled. There is no way of knowing for sure, but the increased effort and investment in public avalanche awareness that took place after 2003 may have had a large impact on the community. In order to take a look at the data with less influence from these extreme years as well as effects from particular snow conditions, it is interesting to take a look at a chart highlighting a five year rolling average of fatalities in Figure 2.

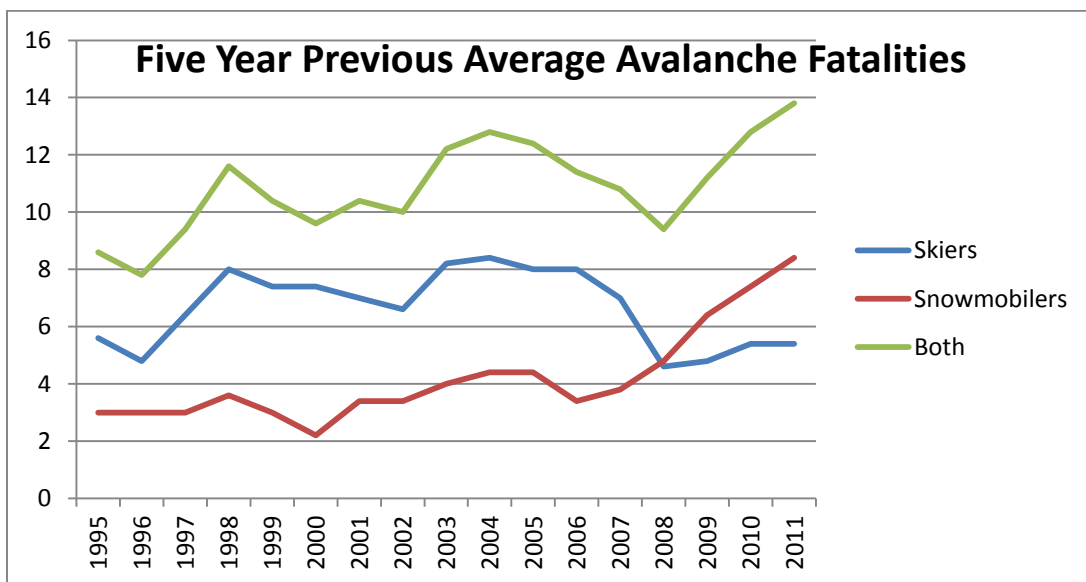


Figure 2 (CBC, 2011)

In this chart, it is easier to see the trends changing between skiers and snowmobilers. The definite levelling off of skier fatalities is noticeable; however the interesting piece of information from this chart is the beginning of an increase in five year average snowmobiler fatalities around 2002 to 2003. Beginning in 2003, Skidoo introduced a new snowmobile platform, called the Rev, which

significantly improved the manoeuvrability and performance of snowmobiles, and literally began helping more riders reach the next level of snowmobiling (Ski-doo, 2003). This information begins to show the possibility of consequences with these sudden advances in technology, when the same effort is not put in to carry forward the avalanche education and awareness of the people using these machines. However, like the tragic events for skiers in 2003, there have been a few years recently that have created a large amount of attention for snowmobilers. The years 2008 and 2009 both had many tragic events that were captured by the media. The media attention culminated in March 2010 when a large avalanche came down upon over 100 spectators at an annual unsanctioned community event, and although it only claimed the lives of two people, it had the potential to take many more. The media's attention, the public's attention and the snowmobile community's attention was caught by this event and there have already been great leaps forward by the CAA in targeting avalanche awareness and education for snowmobilers (CAC, 2011). In fact, the CAA website was the one that held the most information tailored directly to snowmobilers overall. Hopefully, with this surge of avalanche education efforts, the fatality rate of snowmobilers will begin to mirror the trend of skiers after the highly publicized winter of 2003.

In addition to the targeted education that is already taking place, much can be recommended from the data that has become a focus in this study. Instead of using data and information that has been developed by skiers for skiers, this study gives a unique insight into the culture and community of snowmobiling and helps to highlight distinct areas that could be focused on to make improvements in avalanche awareness. By working with the existing culture of snowmobiling instead of working to inject skier targeted education will help snowmobilers to more easily accept and adopt the standards of education.

One of the foremost areas to focus on would be increasing the investment of major snowmobile manufacturers in the avalanche industry. The highly consumer based culture of snowmobiling would be an easy and efficient method of transferring information to the majority of snowmobile riders. Yamaha has already begun such a program by offering a free avalanche safety kit with each new sled purchase. However, the marketing and advertisements should focus more on avalanche safety with all brands to increase the necessity of avalanche safety within the culture.

A change in the attitude of snowmobilers towards the causes of avalanches would also make a difference in changing the perception towards avalanche accident prevention. Currently, the attitude most represented in the data is one of an external locus of control in terms of avalanche causation. By working to demonstrate and raise awareness about avalanche forecasting and how individuals themselves can understand the likelihood of avalanches in certain conditions and terrain features would allow individuals to feel more in control of the risks in the backcountry. By changing this attitude, more people may see the value in avalanche training and understand that it does not just exist to teach people how to react to avalanche accidents; it also exists to help people prevent avalanche accidents.

Snowmobilers already have a strong, cohesive community that promotes the sport and encourages events, gatherings and works toward safe riding. However, a major detail that seems to be often left out is the avalanche training aspect of safety. By working with the strong community base from clubs, associations and federations to add avalanche safety into their meetings, trails and events, the community would be reached through avenues that already exist and are valued by members. The community would also do well to rethink their websites; reformatting and redesigning avalanche safety on the websites would help present it as topic of foremost importance in the community instead of its current webpage standpoint as a background topic. Rooting avalanche safety within the community of

snowmobiling would help people to learn about avalanches as a topic intimately linked with snowmobiling.

Lastly, it would be of great value to make avalanche accidents salient within the community in order for people to understand the real impact of avalanches, their frequency and to learn from others' mistakes. Being aware of the actual danger and proximity of avalanches would raise real concern with individuals in the community and command attention at the realness of the problem.

While this study aims to build preliminary theory from data collected from online skiing and snowmobile sources, it is by no means extensive enough to cover all aspects of the snowmobiler culture and community. While the data collection on the internet was thorough and somewhat direct from the source of snowmobiling, there is no substitute to being involved in real conversations about avalanche safety with snowmobilers. In order to work towards concatenation of the theory presented, further research using interviews with snowmobilers would be highly valuable. While the data presented here is representative of the online sources, it may not be particularly relevant or applicable to the real culture, attitudes, community and awareness of snowmobilers. In addition to further research with participant interviews, more focused studies into each of the concepts highlighted would be valuable to target specific action plans to introduce new avalanche awareness and education efforts.

The exploratory nature of this study introduces a wide range of concepts and ideas that come together to begin to build theory as to why snowmobiler avalanche fatalities have been on the rise in recent years. Hopefully this will be the beginning to more exploration into snowmobilers and the factors affecting their awareness of avalanches and overall safety in the backcountry.

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