University of Alberta

Backcountry snowmobilers' risk perceptions, avalanche related information seeking behaviours, preparedness and decision-making processes

By

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Abstract:

Although there has been substantial research on the avoidance of risk, much less has been completed on voluntary risk. This study examined backcountry snowmobilers' risk perceptions, avalanche related information seeking behaviours, and decision-making processes when dealing with avalanches and backcountry risk in Canada. To accomplish this, in-depth, semi-structured interviews were conducted with 17 participants who were involved in backcountry snowmobiling. Interviews were done both in person and by telephone. The results of this study show that, unlike previous research on snowmobilers, the participants of this study were well prepared and knowledgeable about backcountry risks. All 17 participants stated that they carried a shovel, probe, and transceiver with them on each backcountry trip, and 10 participants had taken an avalanche safety course. Group dynamics and positive peer pressure were influential in promoting safe backcountry behaviour.

KEYWORDS: Backcountry snowmobiling, Avalanches, Voluntary Risk, Preparedness, Decision-Making

To my participants:

I want to thank everyone who was kind enough to share their stories and help me through one of the most difficult tasks I have had to complete. I was not aware at the beginning how my participants' reflections and passion of their experiences would affect me. Beyond their love of snowmobiling were the bonds between them and their group members, who were both family and friends. It gave a powerful insight on how working together in a team is important to accomplish a common goal. You will not know how you have all affected me and changed my perception of life. I have always wanted to be a person who was open to taking risk and exploring new experiences. Through this study I was able to get a glimpse of how rewarding it is to take time to learn and prepare for something and be able to use your skills to gain control over a seemingly uncontrollable situation. I will take what I learned from you and hopefully, through my research, spread it to others.

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First and foremost I would like to thank my supervisor, Dr. Tara McGee. Without your guidance and encouragement this process would have been a lot more difficult. Your experience and knowledge, along with your support made this a very positive experience. I will always be grateful for the opportunity you have given me to pursue this goal.

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1.0 Introduction

1.1 Background

High-risk recreational sports are no longer for the few who consider themselves experts (Creyer, Ross & Evers, 2003). The public has now made high-risk recreation mainstream, fueling a growing market to supply the equipment in order to keep up with the demand (Celsi, Rose & Leigh, 1993). Sky diving, hang gliding, scuba diving and snowmobiling, among others, have seen an increase in participation (Jones, Asghar, & Llewellyn, 2008). However, with the influx of people participating in risk sports comes the need to identify how people are preparing to participate in these activities. Not being prepared or understanding the risks involved with the activity could result in an increasing rate of injuries and fatalities.

The growth of snowmobiling in alpine areas, known as 'backcountry snowmobiling', is an activity that only North America has seen grow rapidly over the past ten years (Boyd, Haegeli, Abu-Laban, Shuster, & Butt, 2009). Although snowmobilers have been around from more than 30 years, they are newest group and are emerging as the largest group of backcountry recreationalists due to increased affordability and technical advances in the machines (Boyd, Haegeli, Abu-Lban, Shuster, & Butt, 2009; Stethem et al., 2003). With new technologies, snowmobilers are able to get to extreme heights where snow can be unstable, increasing their risk of being caught in a fatal avalanche. High-marking, a technique used by snowmobilers to drive vertically up a slope, has been criticized by both the media and avalanche officials due to its increased risk of causing human triggered avalanches (Jamieson & Geldsetzer, 1996). High-marking when the avalanche risk is high is very dangerous and the weight of a snowmobile may increase the chance of triggering an avalanche (McClung & Schaerer, 2006). Fatalities while snowmobiling in the mountains can also occur due to collisions, falling off cliffs, and burial due to a naturally triggered avalanche.

A British Columbia coroner's report in 2009 determined that many backcountry snowmobilers do not have the knowledge to reduce their avalanche risk (British Columbia Coroner's service, 2009). It was suggested that unlike skiers and snowboarders, snowmobilers have not benefited from targeted education programs. This does not necessarily mean that snowmobilers are less aware or educated about backcountry risk, only that until recently there have been limited studies done on education campaigns that specifically targets backcountry snowmobilers. A study by Silverton, McIntosh, and Kim (2009) in the United States found snowmobilers and those who snowshoe were more likely to underestimate the avalanche danger, less likely to bring avalanche equipment, travel with a partner, and less likely to take an avalanche safety course.

In the past few years, highly publicized avalanches in Canada have brought backcountry recreation to the public's attention. In 2010, an avalanche during an annual snowmobiling event near Revelstoke, British Columbia called the Big Iron Shootout, injured dozens snowmobilers and killed two (Richards & Pynn, 2010). There was significant criticism directed towards the event organizers for going ahead with the event after being advised to cancel due to the avalanche risk being labeled as 'high' by the Canadian Avalanche Centre. After the disaster, news media coverage criticized backcountry recreationalists for partaking in backcountry snowmobiling when avalanche danger is high.

To date, research on backcountry avalanche risks has predominately focused on the physical aspects of avalanches including the dynamics of skier-triggered avalanches and the snowpack (see for example Grimsdottir & McClung, 2006; Jamieson, 2004; Zeider & Jamieson, 2004). Due to the rapid increase in the number of people participating in backcountry recreation in the past decade, attention has recently shifted to include social science aspects of avalanche safety (Haegeli, Atkins, & Klassen, 2010; McCammon, 2004). A small group of researchers (Boyd, Haegeli, Abu-Laban, Shuster, & Butt, 2009; Haegeli, Atkins, & Klassen, 2010; McCammon, 2004; McClung, 2002) have completed research on backcountry recreation and avalanche safety. McCammon (2004), McCammon & Haegeli (2007) and Spencer and Ashley (2011) used historical data on avalanche fatalities and accidents to determine factors that resulted in fatal

avalanches. Other researchers have used quantitative research methods such as questionnaires and discrete choice experiments to identify how human error in decision-making by backcountry recreationists could result in avalanche fatalities (Furman, Shooter, & Schumann, 2010; Haegeli, Haider, Longland, & Beardmore, 2010; Silverton, McIntosh, & Kim, 2009). Some researchers have studied human error in decision-making from a theoretical perspective (McClung, 2002; McCammon, 2004).

To my knowledge, no qualitative studies have explored backcountry snowmobilers' risk perceptions, preparedness, information seeking and decision-making. A qualitative perspective is important to begin to understand the motivations and reasoning behind perceptions, decisions and actions (Dunn, 2010). It also gives the participant the ability to reflect upon past decisions and think about what leads them to the choices that they make. More research is need since backcountry recreation's popularity has increased over the past ten years and this growth is expected to continue over the next twenty (Campbell, Bakermans, Jamieson, & Stethem, 2007).

1.1 Research Questions and Objections

The aim of this research was to examine backcountry snowmobilers' risk perceptions, preparedness, avalanche related information seeking behaviours, and decision-making processes when dealing with avalanches and backcountry risk. It was driven by the following objectives:

1) To understand backcountry snowmobilers' perceptions of avalanche risk.
2) To identify how prepared snowmobilers are before they go snowmobiling in the backcountry.
3) To examine backcountry snowmobilers' information seeking behaviour regarding avalanche risk and to identify any barriers in obtaining information.
4) To consider how risk perception and preparedness activities affect decision-making when snowmobilers decide to go on a backcountry trip.

To address these objectives, I completed a qualitative study and conducted semi-structured interviews with backcountry snowmobilers who currently reside in Alberta, Canada. Interview participants included both snowmobiling club members and non-club members, to identify if there were any differences in risk perceptions, preparedness, decision-making, and/or information seeking between these two groups.

1.1.2 Structure of this Thesis

This thesis is structured into 6 chapters. Chapter 2 provides background information about backcountry risks, agencies responsible for avalanche rescues and education, and current information sources that are available to be used by snowmobilers. Chapter 3 presents a review of risk perception, preparedness and decision-making literature relevant to this study. Preparedness includes trip planning, tools and equipment, and information seeking. Chapter 4 describes the research methodology, how the data was collected and analyzed, the ethical considerations of this study, and measures taken to ensure rigour in the research process. Chapter 5 presents and discusses the findings of the research and the connection to previous literature. Chapter 6 presents the conclusions and discusses recommendations for future research.

2.0 Context and Background Information

2.1 Backcountry Recreation

In Canada, avalanches are winter hazards that pose significant risks to infrastructure, equipment, and human life. In the early 1900s, avalanche fatalities were mainly transportation related or people working in avalanche zones (Stethem et al., 2003). Today, most fatalities are due to people voluntarily putting themselves at risk by entering avalanche areas for recreation. Backcountry recreation is popular in Alberta, British Columbia, Quebec, Newfoundland, and the Yukon Territory, however most avalanche fatalities occur in the Rocky Mountains and the Interior Ranges and Coast Mountains of British Columbia (Campbell, Bakermans, Jamieson, & Stethem, 2007; Jamieson & Geldsetzer, 1996). This is due to the large amount of people using these areas and a shallow and unstable snowpack (Jamieson & Geldsetzer, 1996).

In Canada, avalanches cause an average of 14 deaths every year, with 92% of these fatalities being backcountry recreationalists (Boyd, Haegeli, Abu-Lban, Shuster, & Butt, 2009). Since 2001 there have been 153 recreational avalanche fatalities, 63 of which were snowmobilers (figure 1). The 2009-2010-winter season was particularly deadly, where Canada experienced 23 avalanche fatalities, 17 of which were snowmobilers (Canadian Avalanche Association, 2011).

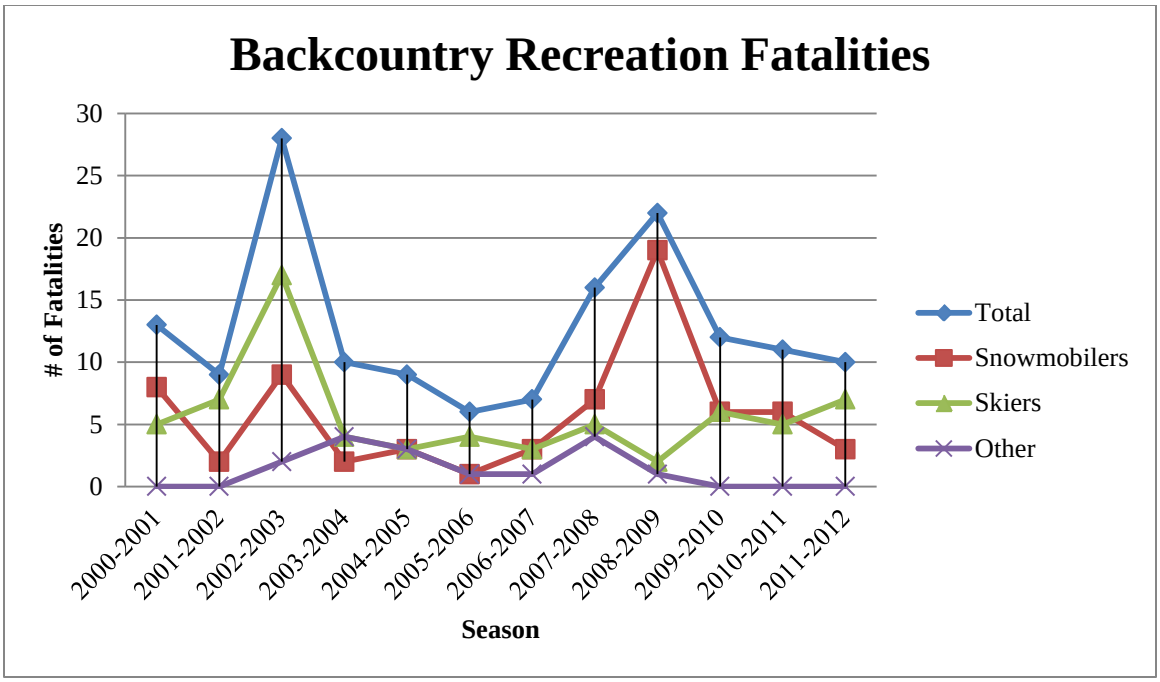


Figure 1 Backcountry Avalanche Fatalities (data from the Canadian Avalanche Centre http://www.avalanche.ca/cac/library/incident-report-database/view

2.2 Avalanches

Two types of avalanches are loose snow avalanches and slab avalanches, both of which can occur in dry and wet snow (Stethem et al., 2003). Loose snow avalanches usually form on the surface of the snowpack and consist of snow that lacks cohesion (Canadian Avalanche Centre, n.d.). This type of avalanche starts from a point and gathers snow progressively in the shape of a fan (figure 2).

Figure 2 loose snow avalanches, courtesy of the Canadian Avalanche Centre by J. Bay http://www.avalanche.ca/cac/training/online-course/avalanche-formation/primary-concerns/loose-dry

Loose snow avalanches are confined to the loose snow on top of the snow pack so they are less likely to result in a fatality. However, the force of a loose snow avalanche may force a person off a cliff or into an object like a tree or a rock.

Slab avalanches are a release of cohesive block of snow due the presence of a weak layer in the snowpack. The size of a slab avalanche is dependent on how deep the weak layer is in the snow. As a result, when triggered, slab avalanches can be larger and more destructive and are responsible for most backcountry fatalities (Jamieson & Geldsetzer, 1996).

2.2.2 Snow Layers

Knowing the science behind understanding the composition of the snowpack is essential to provide an avalanche forecast and understanding the avalanche risk for an area. Each time there is a snowfall, new layers of snow form on the slopes. Weak layers,

which are layers that do not bond, can form between snowfalls due to temperature changes, wind, moisture and heavy snowfall. When a weak layer loses cohesion from the layer beneath it, a slab of snow is released, resulting in an slab avalanche. The presence of weak layers within a snowpack is an indication that the snowpack is unstable and an avalanche could occur (Canadian Avalanche Centre, n.d.). A weak layer that is buried deep in the snowpack is called a persistent weak layer. Persistent weak layers are particularly dangerous, because when triggered, they can result in a large and destructive avalanche due to the volume of snow that can be released.

Hoar frost is a good indication that there is a weak layer in the snowpack. Hoar frost occurs in humid conditions and forms feathery crystals that grow on the surface of the snowpack (figure 2) (McClung & Schaerer, 2006; Chalmers & Jamieson, 2001). Once buried by snowfall, hoar frost forms a weak layer in the snowpack. Weakness caused by hoar frost is easier to predict a few days after a snowfall, however if the weak layer remains for several weeks, it could result in a larger avalanche (Chalmers & Jamieson, 2001; Jamieson & Johnston, 1992; Schweizer & Jamison, 2001; Jamieson & Geldsetzer, 1996). Hoar frost is more common in the interior mountain ranges and the Rocky Mountains (Jamieson & Johnston, 1992).

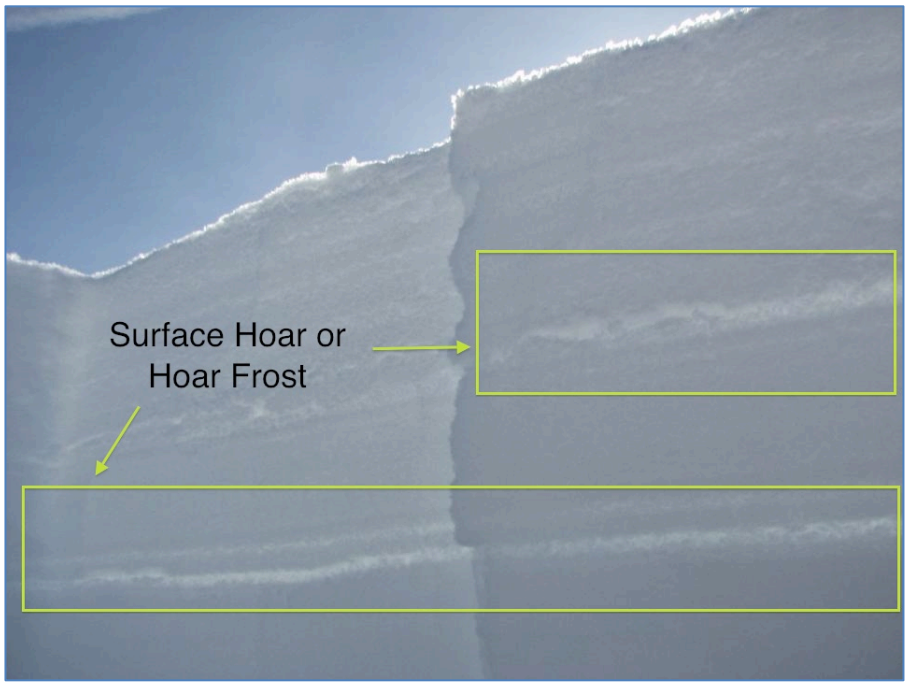


Figure 3 Example Image of Hoar Frost (Image courtesy of the CAC taken by Wren McElroy)

Figure 4 Example of a Fracture Line (Image courtesy of the CAC taken by Cam Campbell)

When a slab breaks away from the layer below it, it leaves a fracture line indicating the origin of the avalanche (Figure 3). Fracture lines on a slope are an indication that the snowpack is unstable and the risk of subsequent avalanches is probable (Jamieson & Geldsetzer, 1996). A 'Whumph' is another common sign of high instability in the area. The word 'whumph' is the sound the snowpack makes when a weak layer within the snowpack collapses and usually causes a slab avalanche (McClung & Schaerer, 2006; Canadian Avalanche Association, n.d).

Wet slab avalanches occur when moisture loosens the bond between the snow layers, causing a dense cohesive slab to release (McClung & Schaerer, 2006; Canadian Avalanche Association, n.d). Wet slab avalanches can be hard to predict due to the many variables associated with the combination of terrain, water, and the weak layer.

2.2.5 Human Triggered Avalanches

Human triggered or artificial avalanches account for around 85% of fatal avalanches in Canada (Schweizer & Jamieson, 2001; Jamieson & Geldsetzer, 1996). Human triggered avalanches occur when a person triggers weak layer in the snowpack causing a slab avalanche (Chalmers & Jamieson, 2001). Weak layers more than a metre in to the snowpack are not normally a threat for self-propelled backcountry users such as skiers or snowboards. However, due to their weight, snowmobilers could trigger these persistent weak layers and generate an avalanche (McClung & Schaerer, 2006).

2.3 Indicators of Risk

There are many different weather and terrain features that affect avalanche risk and snowpack instability. Natural avalanches are be caused by rain, snowfall, wind loading, sudden temperature change, falling cornices, icefall, or an earthquake (Stetham et al., 2003). The slope of the terrain is an important factor affecting avalanche risk. A

slope greater than 25˚ is at risk of a slab avalanche, and slopes with an incline of 30˚ to 40˚ are at risk for large slab avalanches (Stethem et al., 2003).

Cornices, overhangs of snow that form downwind from a ridge (Figure 4) are a potential hazard to backcountry users (Canadian Avalanche Association; McClung & Schaerer, 2006). When cornices break off, the impact onto the slope below can potentially trigger an avalanche. An avalanche caused by a cornice increases with the steepness of a slope and the size of the overhang (McClung & Schaerer, 2006). Cornice-triggered avalanches are often hard to predict, however weather conditions that lead to cornices include steady winds after warm storms (Haegeli, Atkins, & Klassen, 2010).

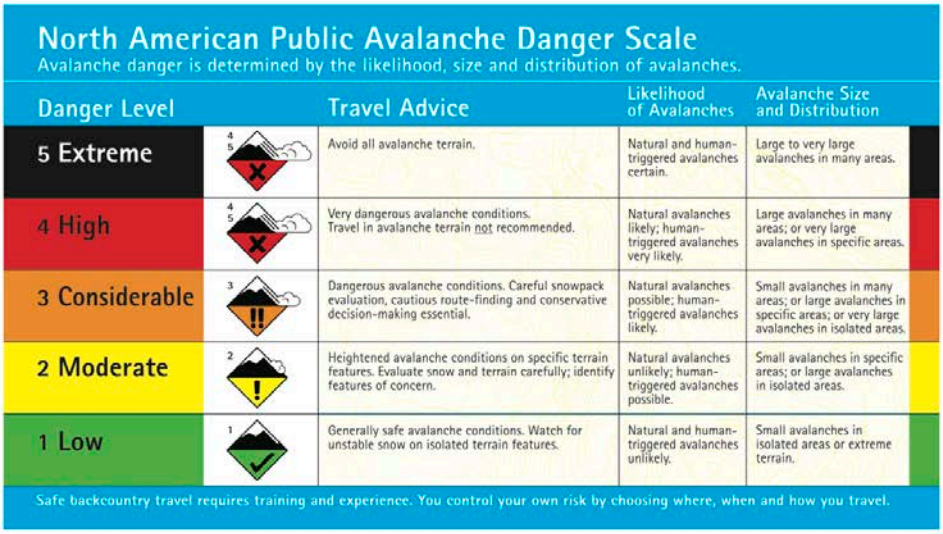
Figure 5: Example of a Cornice (Image courtesy of the Canadian Avalanche Center taken by Cam Campbell)

2.4 Agencies and Organization responsible for managing backcountry risk

Parks Canada and the Canadian Avalanche Centre (CAC) work together to distribute information in order to prevent avalanche fatalities. Both agencies provide avalanche bulletins and other information to inform backcountry users about avalanche risks in National Parks (Parks Canada) and in other backcountry areas (CAC). Since snowmobilers cannot ride in National Parks, they must use areas outside of park

boundaries, therefore would use the CAC's website to get their avalanche related information.

The CAC is a non-government and not for profit organization that has taken on the responsibility to promote public avalanche safety (Canadian Avalanche Centre, n.d.). It was created in 2004 and is funded in part by federal and provincial governments, as well as privately through donations from private businesses involved in backcountry recreation. The CAC creates and distributes avalanche bulletins, warnings, coordinates public avalanche safety programs, promotes avalanche awareness and education, provides nonprofessional avalanche training, serves as a point of contact for the public, and encourages avalanche research. The bulletins and warnings are a combination of four components: The Backcountry Avalanche Advisory, Special Public Avalanche Warnings, Avalanche Forecasts, and Avalanche Reports. The Backcountry Avalanche Advisories are distributed to television, radio and print media outlets to give basic information about avalanche conditions and travel advice in a way that can be understood by people with little avalanche knowledge or training (Canadian Avalanche Centre, n.d.). The CAC's Special avalanche warnings are issued when there is an increased risk of avalanches accidents (Canadian Avalanche Centre, n.d.). These messages are distributed in coordination with British Columbia Provincial Emergency Preparedness program and can be distributed through the CAC's website, media, and social media outlets such as Twitter and Facebook (Canadian Avalanche Centre, n.d.).The North American Public Avalanche Danger Scale (figure 6) serves to accompany an avalanche bulletin to provide a very basic measure of avalanche danger (Statham al., 2010).



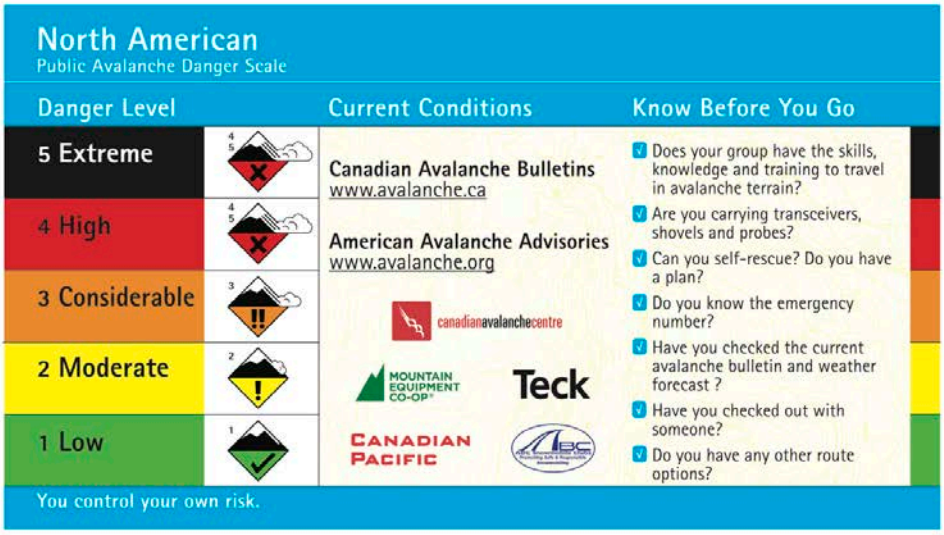


Figure 6: North American Public Avalanche Danger Scale (http://www.avalanche.ca/cac/bulletins/avalanchedangerscaleprintable)

The scale has five levels; extreme, high, considerable, moderate, and low. For each level it gives travel advice, likelihood of avalanches, and avalanche size and distribution. When an area is rated ‘extreme’, the recommendation is to avoid all avalanche terrain and when rated ‘high’ travel in avalanche terrain is not recommended. Understanding the North American Public Avalanche Danger Scale is the first step in understanding the CAC’s avalanche bulletins.

The Avalanche bulletins created by the CAC use the avalanche danger scale rating as well as professional avalanche forecasters’ reports to provide clear information on avalanche activity and snowpack conditions to backcountry users (figure 6)(Canadian Avalanche Centre, n.d.).

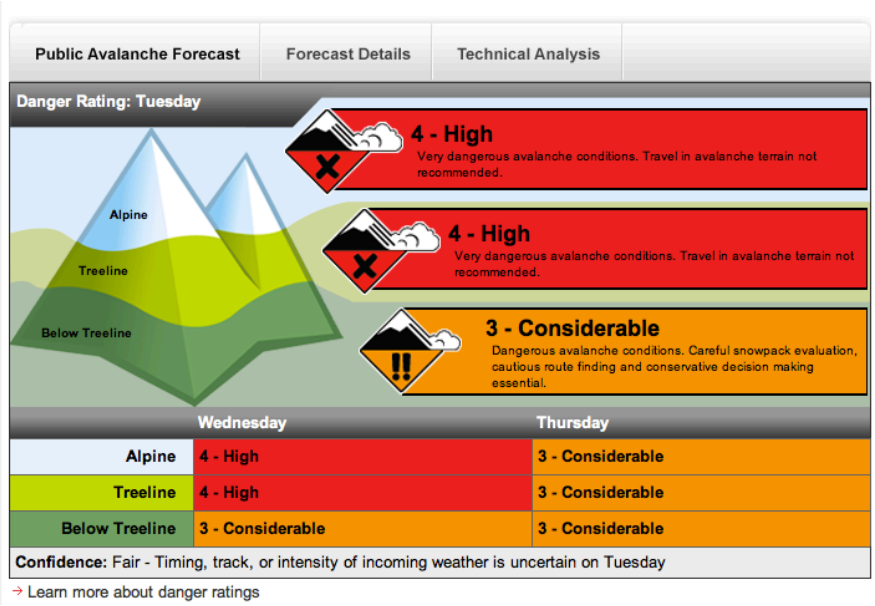


Figure 7 Avalanche Bulletin from the CAC

The avalanche forecasts provided in the bulletin are one of the most important tools used to reduce the risk of being involved in an avalanche (Canadian Avalanche Centre, n.d.), and provide details of the avalanche risk for a region based on the weather, climate, avalanche activity, and snowpack conditions.

The forecast gives you the danger level rating for alpine, tree line, and below tree line for the next three days, indicating a date issued, as well as how long the forecast will be valid. If a forecast indicates there is a high-risk, special messages such as time of

increased risk of avalanches, confidence of the bulletin, weather forecasts, avalanche activity, a travel advisory including areas of concern (for example, wind slabs and cornices), travel advice, and characteristics of the snowpack are provided. The forecasts created by the CAC are very detailed and it has been suggested by the CAC that a basic knowledge from an avalanche-training course is needed to be able to use the bulletins effectively (Parks Canada Agency, 2003; Canadian Avalanche Centre, n.d.).

The CAC urges the public to be prepared and take proper measures in order minimize risk on the slopes. A buried individual has a good chance of survival if uncovered within 15 minutes therefore it is imperative that everyone in the group is trained in rescue techniques (Brugger, Durrer, Adler-Kastner, Falk, & Tschirky, 2001). Professional rescue services most likely will not be able to access the area in time, leaving much of the responsibility on the preparedness and skills of the individuals and groups using avalanche prone environments.

One of the best ways to gain knowledge about backcountry risks is to take an avalanche course. The CAC provides three courses for people that participate in backcountry recreation, the Avalanche Skills Training Level 1 (AST 1), Avalanche Skills Training Level 2 (AST 2) and AST Instructor Training. The AST 1 course provides information about the basics of avalanche release, identifying avalanche terrain, use of the Avalanche Terrain Exposure Scale, how to find and use avalanche bulletins, appropriate travel techniques, how to carry out a rescue, and understanding the limits of the training (Canadian Avalanche Centre, n.d..). The Avalanche Terrain Exposure Scale (ATES) was created by Parks Canada to help assess the avalanche risk in the different types of backcountry terrain (Canadian Avalanche Centre, n.d..). The ATES divides terrain into three categories; simple, challenging, and complex, so backcountry users can get an idea of the risk they face in different types of terrain.

AVALANCHE TERRAIN EXPOSURE SCALE

Technical Model (v.1-04)

	Angles generally < 30º	***Mostly low angle, isolated slopes >35º***	***Variable with large % >35º***
	Uniform	Some convexities	Convoluted
	Primarily treed with some forest openings	Mixed trees and open terrain	Large expanses of open terrain. Isolated tree bands
	Minimal, some creek slopes or cutbanks	Some depressions, gullies and/or overhead avalanche terrain	***Many depressions, gullies, cliffs, hidden slopes above gullies, cornices***
	1:30 ≥ size 2	1:1 for < size 2 ***1:3 for ≥ size 2***	1:1 < size 3 ***1:1 ≥ size 3***
	Limited open terrain	Some open terrain. Isolated avalanche paths leading to valley bottom	Large expanses of open terrain. Multiple avalanche paths leading to valley bottom
	Solitary, well defined areas, smooth transitions, spread deposits	Abrupt transitions or depressions with deep deposits	Multiple converging runout zones, confined deposition area, steep tracks overhead
	Runout zones only	Single path or paths with separation	***Numerous and overlapping paths***
	Numerous, terrain allows multiple choices	A selection of choices of varying exposure, options to avoid avalanche paths	***Limited chances to reduce exposure, avoidance not possible***
	None, or limited exposure crossing runouts only	***Isolated exposure to start zones and tracks***	***Frequent exposure to start zones and tracks***
	None	***Generally smooth with isolated bands of crevasses***	***Broken or steep sections of crevasses, icefalls or serac exposure***

Using this scale:

Any given piece of mountain terrain may have elements that will fit into multiple classes. Applying a terrain exposure rating involves considering all of the variables described above, with some default priorities.

Terrain that qualifies under an ***italicized*** descriptor automatically defaults into that or a higher terrain class. Non-italicized descriptors carry less weight and will not trigger a default, but must be considered in combination with the other factors.

Figure 8 Avalanche Terrain Exposure Scale (http://www.avalanche.ca/resources/cac/attachments/atesmodel)

The class involves a minimum of seven hours of in class training and one day in the backcountry (Canadian Avalanche Centre, n.d.). The AST 2 goes into more detail than the AST 1 course and requires a minimum of 9.5 hours in class training and 3 days field time in the backcountry. In order to take the AST 2 you must first complete the AST 1. There are two types of AST courses for different backcountry groups - one is targeted towards skiing and snowboarding and the other is targeted to snowmobiling. These courses are strongly recommended by the CAC so that people understand how to use the avalanche bulletins correctly. The AST Instructor Training is open to anyone who has taken both AST 1 and AST 2. It is a one-day course that trains people to become Avalanche Skill Training instructors.

2.5 Preparedness Tools and Equipment

The essential tools needed by snowmobilers in the mountain backcountry include a probe, transceiver, shovel, and first aid kit (Canadian Avalanche Centre, n.d.). These pieces of equipment are essential to perform a rescue for a rider that has been buried in an avalanche. The probe is a poll that snaps together to allow you to pinpoint a person by inserting the probe in the snow in a pattern (Canadian Avalanche Centre, n.d.). A transceiver or beacon is an electronic device that sends and receives radio signals. This tool is essential in locating a person buried in an avalanche. When a person is buried, everyone will turn their transceivers on to ‘receive’ so they can locate the signal of the missing person. Some transceivers allow you to find and tag multiple persons buried by an avalanche, improving the chances of a successful rescue. One limitation to the transceivers is if an avalanche buries someone, the other group members must change their transceivers to ‘receive’ in order to locate the buried person. If another avalanche occurs during the rescue and the rescuers get buried while their signals are still on ‘receive’, their transceivers will not be sending out a signal for someone to be able to rescue them. The transceiver must be transmitting a signal to be located. Single antenna transceivers are considered out dated, and the CAC now recommends a three antennae digital transceiver that includes a digital display and audio speaker (Canadian Avalanche

Centre, n.d.). Lastly, a shovel is needed to dig out someone who is buried. Plastic shovels are not recommended, since they can break in cold weather and debris, and instead a metal, extendable shovel is recommended (Canadian Avalanche Centre, n.d.).

Other equipment recommended by the CAC includes airbags, Avalungs, helmets, and RECCO (Canadian Avalanche Centre, n.d.). An Avalanche Airbag is a device that fills with air that is designed to help a person to stay above the snow and keep them from being buried. The Avalung is a device that has an air collector that allows a victim to breathe while buried, increasing the time a person has to be rescued. RECCO is a two-part system designed to locate a person using directional radar (Canadian Avalanche Centre, n.d.). RECCO is used to detect reflectors that are built into some clothing and equipment. This equipment is recommended because they are proven to work or endorsed by the International Commission for Alpine Rescue (Canadian Avalanche Centre, n.d.). The Canadian Avalanche Centre encourages everyone adopt the recommended gear.

2.6 Conclusion

There has been a substantial amount of research dedicated to understanding the snowpack and predicting avalanches. This chapter included a description of some of the physical aspects of avalanches and why they pose a risk to backcountry recreationalists, especially snowmobilers. The agencies responsible for communicating avalanche risk and the information sources that backcountry snowmobilers can use to find out about avalanche and general backcountry risks were also described. Finally, the tools and equipment available to assess snow conditions or to assist during an avalanche were described.

3.0 Literature Review

Traditionally, risk research focuses on avoidance of risk and preparing and mitigating involuntary risks. Less research has focused on voluntary risk, where people choose to put themselves at risk instead of avoiding it. Typically, voluntary risk research has focused on why people participate in risk sports, failing to go deeper to understand risk perceptions, decision-making and behaviours. This chapter reviews the existing risk literature including risk perception and voluntary risk taking, as well as its influence on information seeking, preparedness, and decision-making.

3.1 Risk

Both the cultural theory, developed by sociologists and anthologists, and the psychometric paradigm, developed by psychologists help explain how people form perceptions about risk (Marris, Langford & O'Riordan, 1998). Kasperson (1992) identified 'technical' and 'social or perceptual' as major dichotomies of risk research (Tansey & O'Riodan, 1999). This research aims to understand risk through a social constructionist perspective in which the research relies heavily on the participants' views of the topic being studied (Creswell, 1998). Social constructivism believes meanings are subjective and are influenced both socially and historically. This paradigm is concerned with how social interactions shape an individual's understanding and influences behaviour (Atwater, 1996).

A common definition of risk perception is the set of beliefs a person has about the definition, probability, and outcome of a risk (Lundgren & McMakin, 2009). However, this definition does not account for social influences on an individual's perception of risk. The cultural theory of risk (Cultural Theory) is a framework used to understand how society influences how people think about and reacts to risks (Tansey & O'Riordan, 1999). It dismisses the notion that decisions about risk are entirely rational and instead

stresses the impact of social groups, peer group influences and sources of authority that shape risk perception. Mary Douglas and her colleagues developed this idea and argued that risk perceptions are influenced by different social groups (Dake, 1992).

The cultural theory recognizes the social construction of risk through cultural bias, social relations, and behavioural strategies (Dake 1992). Cultural bias, which are shared beliefs and values, and social relations will help classify what people will believe are hazards and what are not. In saying this, the social construction of risk does not elude that risks are not real, only that it can be problematic when cultural bias can help magnify one danger and attenuate another (Dake 1992).

3.1.1 Risk Perception

Early risk research by Slovic, Lichtenstein, and Fischhoff focused on behavioural theory and risk perception. Their research aims to understand how people perceived certain risks and how that perception affects their decision-making behaviours. In the 1980's Slovic developed the Psychometric Paradigm from Star (1969). The Psychometric Paradigm is a taxonomy that rates hazards due to characteristic including voluntariness, dread, knowledge, controllability, number of deaths per year and number of deaths in a disastrous year (Slovic 1987). It aims to explain people's aversion to some hazards and indifference to others (Slovic, 1987). Slovic explained that hazards that are perceived as voluntary or controllable are seen as less risky. Voluntariness means participation or exposure is voluntary, therefore people have the choice whether to be exposed to the hazard. Controllability is the perception that people can alter or control a hazard in order to make it less of a risk. This is important element of voluntary risk taking, since participants engage in the activity willfully and believe they have the ability to take measures to reduce their risk.

The news media is a traditional source for acquiring risk information about a hazard. However the media has been known to alter the public's perceptions on certain risk by either amplifying or attenuating perceptions. Kasperson et al. developed the Social Amplification of Risk Framework (SARF) in 1988. This framework describes how

risk perception is sensitive to social settings and can be amplified by either heightened or attenuated by social interactions (Kasperson & Kasperson, 1996). Social Stations of risk are social institutions or organizations that play an important role in influencing how the public attach meaning to and interpret risks. The media is an example of a social station of risk, which Kasperson and Kasperson (1996) say has "multiple and often conflicting roles as entertainers, risk watchdogs, gatekeepers, and agenda setters" (p 98). The media is able to frame risks in a certain way, which usually aims to provide 'news worthy' information to the public. The media is usually blamed for heightening risk and sometimes spreading unjustified fear about a situation (Kasperson, Renn, Slovic, Brown, Emel, Goble, Kasperson, & Ratick, 1988). This research will examine what factors alter the participants' perception of avalanche and other backcountry risks.

3.1.2 Risk Taking

Discussions about risk usually center on the negative consequences and focuses on how to reduce risks. Voluntary risk, instead, recognizes that there are positive, as well as negative dimensions of risk. Machlis and Rosa (1990) define desired or voluntary risk as "activities or events that have uncertainties of outcome or consequence, and where the uncertainties are an essential, sought component of the behavior" (162). Some people participate in risk sports because of the uncertainty and loss of control, which causes an adrenaline rush (Flecter, 2008). Others partake in risk taking because it is an opportunity to master a unique skill (Celsi, Rose & Leigh, 1993). Backcountry recreation, including snowmobiling, involves the risk of being involved in an avalanche, which might lure people to participate in the sport to experience sensations only achieved through risk-taking (Fletcher, 2008).

The optimistic bias or unrealistic optimism describes the tendency for people to think they are personally at less risk of being negatively impacted by a hazard than others (Harris, 1996; Weinstein, 1989). It is fairly easy to observe the optimistic bias in a group, however individually it is difficult to identify whether a person is displaying unrealistic

optimism or truly has an advantage over others (Weinstein, 1980). The optimistic bias has been observed in recent research studying risk (Moen & Rundmo, 2005; Trumbo, Lueck, Marlatt, & Peek, 2011; Weinstein, Marcus & Moser, 2005; Rutter, Quine & Albery, 1998; Middleton, Harris, & Surman, 1996). Research by Powel (2007) identified two situations where the optimistic bias could be detrimental to safety. Those with less experience may think they are more capable of handling the risk and get into a situation where they are overwhelmed by a dangerous situation. As well as, accomplishing consecutive successful trips could also boost optimism and leave people less prepared for future negative events (Powell, 2007). The optimistic bias is similar to self-exempting beliefs, where people understand that there is a risk of a negative consequence, but do not believe it would happen to them (Chapman, Wong & Smith 1993). Self-exempting beliefs are a way to reduce cognitive dissonance when there are insistencies between the beliefs a person holds and the behaviour they are engaging in.

People tend to be more optimistic about risks that they view as controllable, showing a connection between the optimistic bias and perceived controllability (Harris, 1996). Activities involving voluntary risks are generally perceived by participants as more controllable and therefore a more acceptable risk than a non-voluntary, uncontrollable risk (Parker & Stanworth, 2005; Lupton & Tulloch, 2002; Klein & Kunda, 1994). Controllability means that people perceive they can avoid negative outcomes by either preparing or mitigating against the risk (Klein & Kunda, 1994). Often people believe that they can control their exposure to risks better than others, therefore are at less risk than others in the same situation (Klein & Kunda, 1994; Celsi, Rose & Leigh, 1993).

There has been limited research on voluntary risk taking and perceived control, however research by Rosa, (2010); Laurendeau, (2006); Parker and Stanworth, (2005); Lupton and Tulloch, (2002); Klein and Kunda, (1994), all show the importance of having the element of control when taking risks. Klein and Kunda (1994) found that people prefer a more dangerous, voluntary risk, to a less dangerous non-voluntary risk. They found that people thought that they were more skilled to manage risks than others, even if this was not supported. Lupton and Tulloch (2002), Rosa (2010), and Laurendeau (2006) all discussed the thrill in being able to control risk with skilled performance or mastery

over the risk. These researchers discussed the attraction people have to try and maintain control using their skills in a risky situation.

Those who take unnecessary risks are seen as irresponsible or even ignorant (Lupton & Tulloch, 2002; Lupton 1999). However, participation in risk sports or voluntary risk taking is increasing and becoming more popular in mainstream culture (Langseth, 2011). Risk sports such as skydiving, backcountry recreation, and climbing have been seen as socially acceptable ways to achieve thrills and elevated experiences (Langseth, 2011).

The affect heuristic also plays a strong role in voluntary risk taking (Dean, 2011). Affect is your intuition about a risk that is experienced as a feeling and occurs automatically without thought (Slovic, Peters, Finucane, & MacGregor, 2005; Slovic, Finucane, Peters, & MacGregor, 2004). If you have a good feeling towards the risk activity, you will perceive it as less dangerous.

Slovic, Finucane, Peters, and MacGregor (2004) identified two modes of thinking in which people process risks: experiential and analytic systems. Experiential systems are based on intuition and instinct, where affect is used to make decisions. Behaviour is influenced by past experiences, where decisions are made fast and lead to immediate action. Analytic systems are based on reason and rational decision-making. Behaviour using analytic systems is based on conscious appraisal, where decisions are made more slowly resulting in a delayed action.

Generally theories to understand voluntary risk taking can be categorized into two categories: cultural and social (Machlis and Rosa 1990). Langseth (2011) identifies two cultural perspectives to explain participation in risk sports, the compensation perspective and the adaptation perspective. The compensation perspective explains the need for risk taking for an escape from the very controlled, routinized modern life. The constraints placed on individuals lead them to seek out ways to participate in risky activities to escape mediocrity.

The second perspective Langseth (2011) describes is the adaptation perspective. The adaptation perspective explains that participation in risk sports is now acceptable and even encouraged in the public sphere. This is supported by the increase in professional extreme videos, showcasing backcountry skiing and snowboarding as a heroic act

(Puchan, 2004; Creyer, Ross, & Evers, 2003). Risk sports embody valued characteristics in modern society including individualism, self-realization, spontaneity, and the search for an exciting life (Langseth, 2011). In summary, the compensation perspective views voluntary risk as a way to escape the constraints of modern society, whereas the adaptation perspective views risking-taking as culturally accepted and encouraged. From a sociological perspective, Machlis and Rosa (1990) describe how those who have less control in their social setting, such as work and home, are more attracted to risk taking.

Other research has looked into the positive feelings or optimal experience associated with performing an activity including Csiksentmihalyi (1990) and Martin and Priest (1986) (as cited by Morgan and Stevens, 2008). A paradigm to describe optimal experience in risk taking was developed by Martin and Priest in 1986 (Morgan & Stevens, 2008). The adventure experience paradigm, describes five stages of adventure experience: exploration and experimentation; adventure; peak adventure; misadventure; and devastation and disaster. Peak adventure is being in a challenging situation, but having the skills to manage the risk. Anything above peak adventure describes a situation where the risk is higher than the skills to control it. This research will examine how controllability and the optimistic bias affect how participants prepare for their backcountry trips and trip planning decisions.

3.2 Preparedness

Information is needed so that people can make informed decisions, but information alone will not always be enough to encourage protective actions (Powel, 2007; Paton, 2003). Johnston, Bebbington, Lai, Houghton, and Paton (1999) report that perceived risk, the amount of information provided, past losses/damages that the individual has experienced, salience of the hazard and knowledge all affect preparedness. However, results from Johnston, Bebbington, Lai, Houghton, and Paton's (1999) study on protective measures before and after a volcanic eruption show that increased knowledge and risk perception will not necessarily result in increased preparedness for future events. Furthermore, those with experience dealing with a risk may think that they

are less at risk than others and fail to take the necessary precautions (Johnston, Bebbington, Lai, Houghton, and Paton 1999;Weinstein, 1989).

Theory and existing literature have identified a variety of factors that appear to influence preparedness decisions and actions. Two theories have attempted to understand what motivates people to prepare: the theory of reasoned action and the theory of planned behaviour (Madden, Ellen, & Ajzen, 1992). The theory of reasoned action aims to predict and explain people's behaviour (Madden, Ellen, & Ajzen, 1992). It theorizes that an intention to perform a behaviour will determine whether the behaviour is made (Becker, Randall, & Reigel, 1995). Intention is based on two things: attitude toward the behaviour and subjective norms (Becker, Randall, & Reigel, 1995; Madden, Ellen, & Ajzen, 1992). Attitude toward the behaviour is the belief that performing the behaviour will have the desired outcome, whereas subjective norms are the social pressure to perform the behaviour. Subjective norms are similar to social norms, which are the rules that govern a society and dictate what is acceptable behaviour in a society (Macionis & Gerber, 2005). However, subjective norms focus on a person's perception of what's expected of them, not necessarily true social norms.

As with the theory of reasoned action, the theory of planned behavior theorizes that performing a behaviour depends on the intention, attitude, and how much effort a person is willing to use (Ajzen, 1991). The difference is that the theory of planned behavior accounts for perceived behavioural control (figure 9). Perceived behavioural control is how easy or difficult a behaviour is perceived to be. If a behaviour is perceived as difficult then it is less likely than a person will attempt it or succeed.

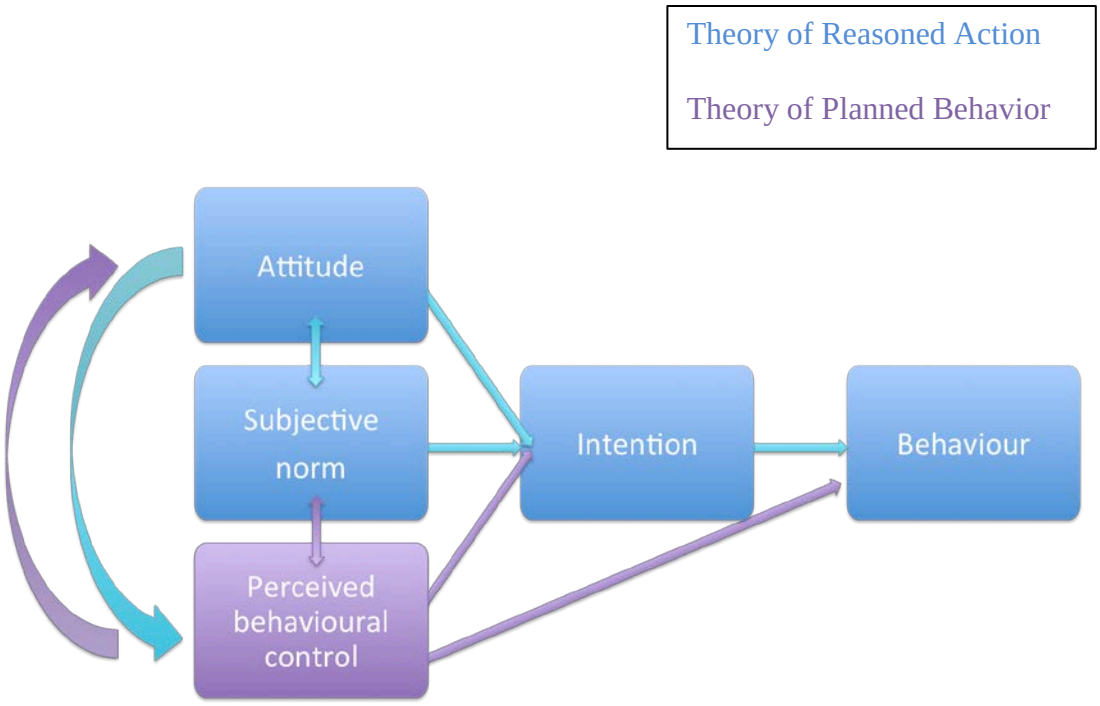


Figure 9 Theory of Planned Behavior and Theory of Reasoned Action (Ajzen, 1999; Ajzen & Madden, 1986)

The theory says that both intentions and perceived behavioural control can be used to predict a behaviour.

The social cognitive preparedness model developed by Paton (2003) describes the process that leads to protective behavior (Figure 10). It identifies a three-phase process that leads people to prepare: motivation to prepare, formation of intentions to prepare, and adjustment adoption/preparation. Factors that motivate people to prepare include awareness of hazards, risk perceptions, and anxiety. Only if a person views a hazard as risky, will they take measure to prepare. Still, although many are aware of the risks that hazards can pose, barriers like unrealistic optimism inhibit these motivators to lead to the next phase of intention formation. The theory explains that a person's intention to prepare is affected by self-efficacy, outcome expectancy, response efficacy, and problem-focused coping. Self-efficacy is the belief in the ability to be prepared. This differs from the theory of planned behavior's perceived behavioural control, which puts more weight on individuals' perception of their ability to prepare, instead of their actual ability to prepare. Outcome expectancy is the belief about whether or not the actions will actually reduce

risk, whereas problem-focused coping is reducing stress by taking measures to solve the problem (Paton, 2001). This includes gathering information and resources to reduce the risk. Intention formation, the intention to take preparedness measures, is influenced by self-efficacy and outcome expectancy (Paton, 2003).

Paton's (2003) social cognitive preparation model describes six factors that ultimately connect how motivations and intentions advance to actual preparedness actions (Figure 10). These factors include sense of community, degree of personal responsibility, normative factors (trust/empowerment), response efficacy, perceived responsibly, and timing/frequency of the hazard are present (Becker, Paton, Johnston, & Ronan, 2012; Paton, Smith, Johnson, 2005; Paton, 2003). Preparedness measures will more likely be taken if a person has strong ties or feelings of belonging to their community, accepts personal responsibility for their own safety and preparedness measures, trusts the responsible agencies involved, and believes their actions will make a difference. If hazard activity is infrequent, there could be a greater disconnect between intentions and actual hazard preparedness. Intentions will proceed to preparation if factors such as sense of community, degree of personal responsibility, normative factors (trust/empowerment), response efficacy, perceived responsibly, and timing/frequency of the hazard are present (Becker, Paton, Johnston, & Ronan, 2012; Paton, Smith, Johnson, 2005; Paton, 2003).

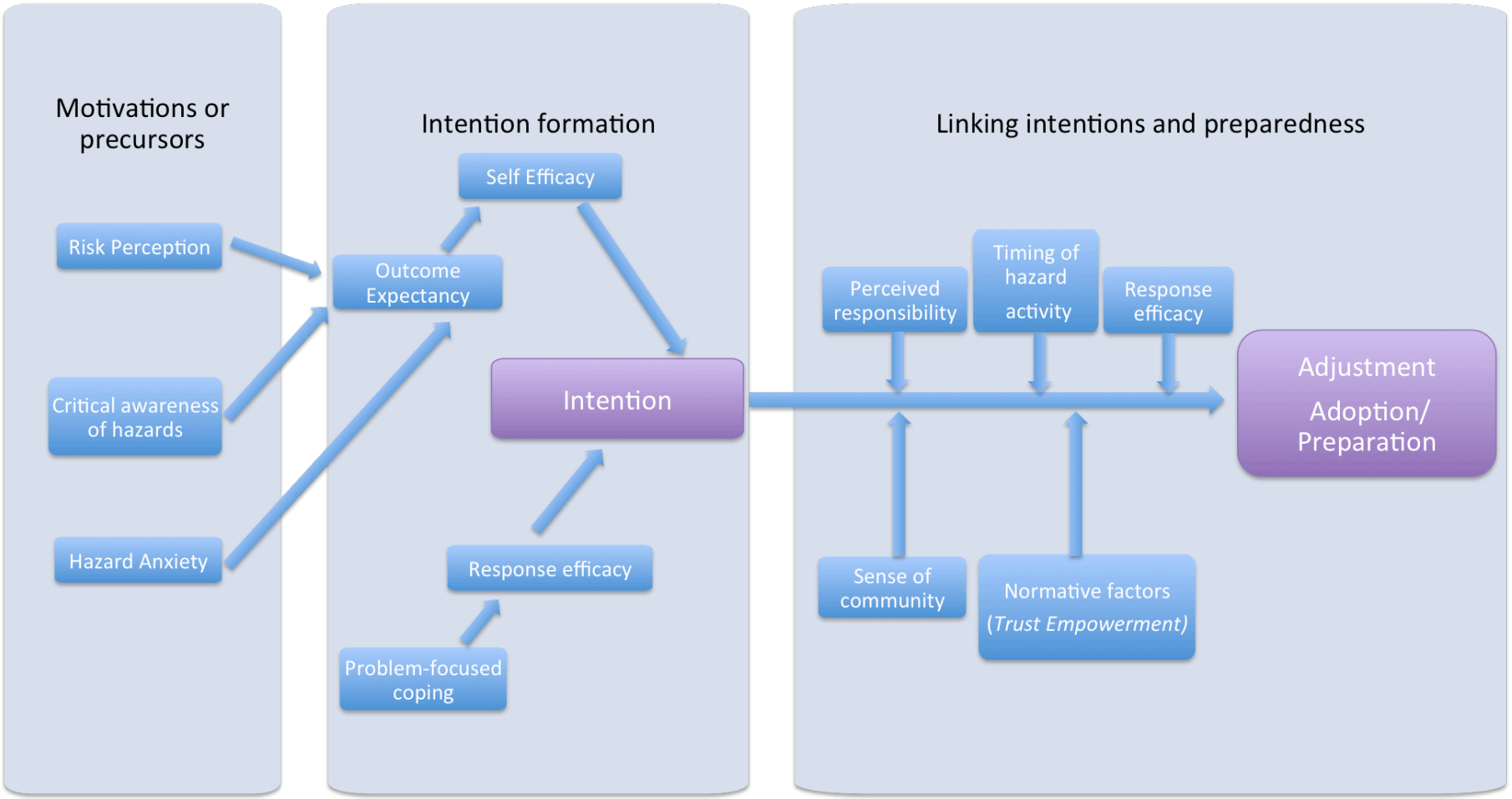


Figure 10 Paton's Social Cognitive Preparation Model (Paton, 2003)

This research will examine whether the factors of Paton's social cognitive preparation model, such as risk perception, critical awareness of hazards and hazard anxiety lead the participants to intention formation and ultimately adoption of protective behaviour or if attitude, norms, and perceived control of the theory of planned behaviour is more influential.

3.3 Information

How people actively seek out information regarding a particular risk is a relatively new topic of research (Kievik, Ter Huurne & Gutteling, 2012). Information seeking can help people to make better decisions in order to reduce their risk to a particular hazard (Brashers, Goldsmith, & Hsteh, 2002; Rimal, 2001). Since participation in backcountry snowmobiling is entirely voluntary, it is up to the participants to seek out the information that will help them mitigate the associated risks. As described previously, the Canadian Avalanche Centre (CAC) is responsible for providing a wide range of information that the public can access to help them prepare for a backcountry trip. Formal education is a popular way to educate the public or a specific group in an interactive environment. Common sources of informal information that people use to seek out information include social networks, which involve family and friends, and the media (Brashers, Goldsmith, & Hsieh, 2002). Hagar (2010) found that in a crisis, when formal sources do not provide enough information, informal sources are then sought. When this happens, information is shared between those affected. People not only seek information, but provide it as well. Hagar also found that during a crisis there is an information overload from both formal and informal sources. This overload of information makes decision-making and identifying trustworthy sources difficult.

Snowmobilers have different avenues to seek information that can help protect them from backcountry risk, including family and friends, news media, books/magazines, the Internet and avalanche courses. Which avenue they choose will depend on the accessibility and perceived credibility of the information (McCallum, Hammond, & Covello, 1991). The information search process model states that a person will search for

information when a gap in knowledge in the subject is recognized (Ter Huurne & Gutteling, 2008; Kuhlthau, 1991).

Griffin, Dunwoody and Neuwirth (1999) developed the model of risk information seeking and processing from Eagly and Chaiken's heuristic-systematic model and Ajzen's theory of planned behaviour to understand what characteristics guide a person taking part in risk information seeking. The model describes how both individual characteristics, including informational subjective norms, perceived hazard characteristics, and affective response, will lead to information seeking and processing if there is sufficient information. The first part of the theory explains how different individual characteristics, which include relevant hazard experience, political philosophy (hazard mitigation regulations and trust in the responsibly institutions) and demographic/ sociocultural factors (age, gender, ethnicity, social status) affect a person's risk perception and perceived controllability of risks. A person will only seek out information if their view the hazard as risky.

The second part of the model focus on informal subjective norms (Griffin, Dunwoody, & Neuwirth, 1999). The influence of others is just as important of a predictor of behaviour as individual characteristics (Ajzen & Fishbein, 1980). The model proposes information gathering norms and affective response (intuitive response to a risk) will guide how much information seeking is necessary. A main point of the model is the understanding that if a person perceives they do not have sufficient information about a risk, they will be more likely to try and close that gap, relying on if they perceive they have the ability to gather the correct information. This research will examine the relevance of the model of risk information seeking and processing in relation to seeking information about avalanche risk and other backcountry hazards, especially the influence of subjective norms and availability of relevant information.

The news media has traditionally been a main source of information regarding risks (McCallum, Hammond, & Covello, 1991). It plays an influential part in framing risks and making technical information understandable to the public (Goodman & Goodman, 2006). However, research shows that news media is not always perceived as the most trustworthy or knowledgeable about risk (McCallum, Hammond & Covello, 1991). The social amplification of risk framework describes how mass media may

amplify the dangerousness of hazards, influencing people's risk perception (Kasperson & Kasperson, 1996). Conversely, emerging research challenges this, finding little evidence in the social amplification of risk from the media (Frewer, Miles, & Marsh, 2002). These researchers found, instead, that media tends to be neutral when reporting on risk. One issue identified in research by McCarthy, Brennan, Boer, & Ritson (2008) was that mass media tended to frame the issue as a political debate, failing to provide details on protective actions about how to reduce the risk.

The political debate surrounding snowmobiling centers around a call to make the backcountry safer and whether regulations should be put in place to reduce the number of fatalities. How the media portrays backcountry snowmobiling may influence to what degree people will use it for their information. The media has a potential to reach a wide audience to provide safety information to those who currently snowmobile, as well as those looking to start. However, if information is being presented in a negative manner, focusing on regulation instead of preparedness and knowledge, the media could be viewed as an untrustworthy source of backcountry snowmobiling information, and thus may limit the potential to reach people through this avenue (McCarthy, Brennan, De Boer, & Ritson, 2008; McCallum, Hammond & Covello, 1991).

The Internet is now a common place for people to begin searching for information about backcountry recreation. It provides quick access to a large amount of information and has the ability to update backcountry information quickly as snowpack and weather conditions change (Lundgren & McMakin 2009). This type of communication method is extremely versatile and can distribute information rapidly, is cost efficient, can be updated quickly and easily and allows an individual to gather the data to make their own perception of risk (Rohrmann 2003). Webpages can include bulletins as well as avalanche information to help strengthen the public's knowledge of backcountry risks. Backcountry users are able to seek out both general information of the risks to increase their knowledge and use it to decipher the information contained in the CAC's bulletins and advisories.

Despite these advantages of Internet information sources, there are some limitations to using the Internet as a primary source of information about backcountry snowmobiling conditions. Although computer and Internet use is growing, it is not yet

universal and there may be some locations in the backcountry where Internet access is not available to get updates on evolving conditions. This may be an issue for multiple day trips. Information provided on the Internet is also expected to updated regularly, if this is not accomplished the public could lose interest or trust in those operating the site. The news media and the Internet are two potential sources of backcountry recreation information. This research will identify what avenues the participants of this study prefer to obtain information about backcountry snowmobiling.

McCallum, Hammond, & Covello, (1991) state that more diverse information sources and consumer interest is needed to engage the public in seeking risk information. Getting people to seek out information in an effort to reduce their exposure to backcountry risks is difficult, especially if they do not perceive themselves at risk (Ter Huurne & Gutteling, 2008). According to the British Columbia's Coroner's Service (2009) backcountry snowmobilers' lack the knowledge to assess avalanche risk. This study will identify what encourages or deters snowmobilers from gathering information.

3.4 Individual Decision Making

It is difficult to apply classical decision-making frameworks to voluntary risk taking, since traditionally it is used to explain the avoidance of risk (Boyer, 2006). Bounded rationality explains how decisions are made based on the availability of information, time, and the ability to process the information (Jones, 1999; Simon, 1979). The theory explains how people intend to make rational decisions but are not always able to do so (Jones, 1999). When there is a lack of adequate time and information to make rational decisions, people may resort to short cuts, like the use of heuristics or intuition (Jones, 1999; Kahlor, Dunwoody, Griffin, Neuwityh, & Giese, 2003).

Heuristics are rules of thumb or mental strategies that people use to make decisions based on similar situations, experiences or decisions made in the past (Slovic, 1987). Using heuristics helps people to make a decision when making a risk assessment is either too complicated or there is limited time to make a decision (Marsh, 2002; McCammon 2004;Tversky & Kahneman, 1973). The use of heuristics in backcountry

recreation is especially persuasive because analyzing the snowpack is a difficult process with a high degree of uncertainty. Three heuristics that could affect decision-making when participating in risk sports include affect, familiarity, and social proof.

The affect heuristic is very influential in voluntary risk taking. The affect heuristic is an instinctive reaction to a risk (Slovic, Peters, Finucane, and MacGregor, 2005). Basing a decision on affect allows a person to make a decision quickly and easily in a complex situation. Having a positive affect to a risk will increase a person's willingness to be exposed to it. Zajonc (1980) argued that affect reactions are the first reactions we have to risk, which will influence our perception of risk and therefore the decisions we make on the risk. Since backcountry snowmobiling is a recreational sport, people participating in it do so because they enjoy it. However, this can make them perceive the activity as less risky. Relying on affect to make decisions is problematic, because like other heuristics, a decision based on affect is made quickly without adequate time to make a logical decision (Slovic, Finucane, Peters, & MacGregor, 2004).

The familiarity heuristic is the tendency to repeat behaviours because a person has done them in the past (McCammon, 2004). These decisions are repeated because we rationalize that since we have done these behaviours before, they must be appropriate in the present situation. The social proof heuristic is basing decisions on what others are doing (McCammon, 2004). A course of action is seen as correct when others are doing the same thing. Previous studies indicate that backcountry users are very susceptible to using heuristics to make decisions, which can lead to poor decision-making (McCammon, 2004; Furman, Shooter & Schumann 2010).

3.5 Group Decision Making

Most decision-making literature has focused on the individual, ignoring group influences on decisions. Peer pressure is discuss in detail regarding adolescents' use of drug and alcohol (Korte, Pieterse, Postel, & Van Hoof, 2012; McKay & Cole, 2012), but is ignored in studies of adults participating in risk sports.

One would think that a decision made by several members of a group would lead to a more accurate assessment of risk and a more conservative action, however, some studies have shown that group discussion leads to a riskier decision, than one made by an individual (Dahlbäck, 2003; Stoner, 1968; Bateson, 1966). The 'risky shift' theory has two explanations to rationalize why groups tend to make riskier decisions. One of those describes how in a group, members are de-individualized and therefore removed from the consequences of their decision in the event of a negative outcome (Bateson, 1966; Festinger, Pepitone, and Newcomb, 1952). Since no individual makes the final decision, no one can be blamed for a negative consequence. The 'risky shift' also theorizes that people who engage in risky behavior are especially charismatic and influential in a group discussion in swaying people to their point of view (Bateson, 1966; Wallach, Kogan, & Bem 1962).

Groupthink is another theory developed to explain how group dynamics can impede normally effective decision-making (McCauley 1998, Janis 1982). This theory was coined by Janis (1982) and aimed to explain why groups tended to make riskier decisions than individuals. Janis observed that conformity pressures were evident in social groups and clubs (1982). At first there is a lot of communication within the group to try and tone down any deviant views, next the deviant member is left out of the decision-making process and finally excluded from the group. Janis described eight symptoms of groupthink that can be divided into three types: overestimation of the group, closed-mindedness, and pressure toward uniformity.

The first type, overestimation of the group, includes an illusion of invulnerability and an unquestioned belief in the group's inherent morality. Illusion of invulnerability alludes to the feeling of invulnerability to a hazard that may result from a decision made by the group to partake in a risky behaviour (Janis 1982). Janis explains that when the decision is made there is euphoria and optimism that the group will succeed. When this euphoric feeling occurs, Janis explains that good decision-making will likely be compromised and extreme risk taking is likely to occur. Closed mindedness includes the two groupthink symptoms: collective efforts to rationalize, and stereotyped views. A collective effort to rationalize means the tendency to discount any evidence against the decision (Janis 1982). Only information that supports the decision is accepted, whereas

information that goes against the decision is ignored or discounted. The third type, pressures toward uniformity, describes the difficulty individuals may have trying to voice their opinions, especially if they deviate from the group's (Janis 1982). Voicing a different opinion can be especially difficult if there is an illusion of unanimity within the group or if group members apply peer pressure to force everyone's opinions to align.

Janis (1972) also explains the conditions that make groupthink more likely. These conditions include a high level of group cohesion, insulation of group members from opinions or information from outside the group, an inefficient procedure for gathering and interpreting information, leadership is both directive and influential, and a high degree of stress and a tendency to avoid challenging the first acceptable alternative suggested by an influential member (as referenced by Callaway and Esser, 1984).

Nevertheless, studies that tried to recreate the risky shift or groupthink actually found a shift towards caution instead (Stoner, 1968). This indicates group polarization, where a group will make a decision to one extreme or the other, instead of a shift towards the riskier choice (Turner, 1991). This study will try to identify whether the participants exhibit signs of groupthink, such as of illusion of invulnerability, closed-mindedness, and pressure toward uniformity or a shift towards safety when making decisions about exposing themselves to risk in the backcountry.

3.6 Chapter Summary

Deciding when it is safe to venture off into the backcountry can be a difficult decision. Conditions can change dramatically day-by-day or even within a few hours. Even when conditions are static, making a risk assessment is a difficult process. Even though the Canadian Avalanche Centre provides forecast and avalanche bulletins, the areas that are covered by these bulletins are quite large and you must be able to apply that knowledge to the specific areas accessed by snowmobilers. To be able to accurately identify weak layers in the snow where avalanches may be triggered you must dig a snow pit, and take in account the slope angle and the consistency of the snow. Trying to keep all the factors in mind to make an effective risk assessment is challenging.

Previous voluntary risk research discusses how perceived controllability and unrealistic optimism can influence risk perception. Generally, risks that people subject themselves to voluntarily are perceived to be less risky, and unrealistic optimism describes the tendency for people to believe they are better capable of dealing with risks than others. When trying to understand what factors lead people to complete preparedness actions, the theory of reasoned action and the theory of planned behavior both state that an intention to prepare is required, which is dependent on attitudes towards the risk, subjective norms, and perceived behavioral control. Paton's (2003) model goes into more detail describing three phases in preparedness: motivations or precursors, intention formation, and linking intentions and preparedness. Motivators in this model include risk perception, awareness of hazards, and hazard anxiety; intention formation depends on outcome expectancy, self efficacy, problem-focused coping and response efficacy; and linking intentions to preparedness depends on perceived responsibility, timing of the hazard, response efficacy, sense of community, and normative factors.

The model of risk information seeking and processing theorizes that if there is sufficient information, both individual characteristics, including informational subjective norms, perceived hazard characteristics, and affective response will lead to information seeking. Decision-making is influenced by heuristics, as well as others in the form of peer pressure and group polarization. This study will identify which model, or combination of models, helps to explain backcountry snowmobilers' risk perceptions, information seeking, preparedness and decision making.

4.0 Methodology

4. 1 Introduction

This chapter describes the research approach and methods used in this study. A total of 17 in-depth, semi-structured interviews was completed with participants who are involved in snowmobiling in the mountains. The sample included two groups within this population; those who were involved in a snowmobiling club and those who were not. All participants were over the age of 18 and had been on multiple backcountry trips. The interviews were then analyzed both inductively and deductively to perform a thematic analysis. Qualitative methodology was used in this research project because it allowed me to obtain detailed information about snowmobilers' perspectives that are not achievable with quantitative methods. Details on how the study was created and implemented are explained below.

4.2 Qualitative Research

A qualitative research approach was used in this study from the development of the study's design and objectives to the analysis and interpretation of findings. Qualitative research seeks to understand how people make sense of their surrounding through social structures, symbols, social roles, and rituals (Berg, 2007). This methodology is primarily concerned with finding meaning and understanding without relying on numbers and statistical analysis (Winchester & Rofe, 2010; Fossey, Harvey, McDermott, & Davidson, 2002). It aims to describe and explain peoples' complex behaviours and subjective experiences (Fossey, Harvey, McDermott, & Davidson, 2002). Qualitative research can also be successful in allowing the participants a chance to reflect on their past experiences and behaviours (Dunn, 2010).

This type of research is especially useful is gaining understanding about a poorly understood research topic. This research study did not aim to generalize the findings to the perceptions and actions of all snowmobilers. However, the results of this study may provide insights into backcountry snowmobiler populations that are similar to the participants in this study.

4.3 Sample Selection

Purposive, non-probability sampling was used in this study due to the sample being a specific group (Neuman, 2007). Snowball sampling was also used, where participants we recruited through referrals from other participants. The sample population was composed of 'backcountry snowmobilers', meaning people who snowmobile in the mountains where avalanche risks are present. Participants were recruited in three ways. In order to get access to the snowmobiling population two snowmobiling clubs were contacted; the Calgary Snowmobiling Association and the Alberta Snowmobiling Association. The presidents of both clubs were contacted and I asked if I could have permission to contact the members of their group. The Calgary Snowmobiling Association has monthly meetings open to all club members. The first recruitment method for members of the Calgary Snowmobiling Association was to post a short introduction of the study in the Calgary Snowmobiling Association's monthly newsletter, which is accessible online, stating that I would be attending their next meeting (Appendix 1). I then attended the meeting in April 2011 and gave a short presentation on my study and invited association members to participate in an interview. The Alberta Snowmobiling Association does not have monthly meetings and instead contacts their members through a listserv. I sent information about my study to the Alberta Snowmobiling Association's listserv and invited members to contact me if they were interested in participating (Appendix 2). In addition to seeking participants that were club members, I wanted to recruit snowmobilers who are not involved in clubs. I recruited non-club members through acquaintances and snowball sampling. Out of the recruitment

methods, giving an in-person introduction and snowball sampling proved to be the most successful methods in recruiting interview participants. Recruiting through the Alberta Snowmobiling Club through its listserv proved to be the least successful method.

4.4 Interview Participants

Due to the lack of previous research on backcountry snowmobiling, I was unable to find a general description of the backcountry snowmobile population. The participants in this study resided in Alberta, but participated in backcountry snowmobiling in both Alberta and British Columbia. Seven participants were snowmobiling club members, while ten were not snowmobiling club members. Club members and non-club members were separated to identity if there were any differences in their risk perceptions, preparedness, information seeking and decision between the two groups. The participants' approximate ages ranged from early twenties to early sixties. One participant was female, while sixteen were male. All study participants had at least 1 year of backcountry snowmobiling experience and had gone on multiple mountain trips, however their experience ranged from being a beginner with a few years of experience, to over twenty years of experience.

4.5 Interviews

Interviews were chosen for this research because they allow the participants to provide detailed responses and describe their experiences and feelings towards the subject. Semi-structured interviews were chosen because it allowed me to ask questions while still allowing for discussion outside of the prepared topics to bring up topics ideas I had not initially identified. Seidman (2006) states, "at the root of in-depth interviewing is an interest in understanding the lived experience of other people and the meaning they

make of that experience" (p. 9). In this research project interviewing was used to investigate motivations, decisions, experiences, and provide participants with an opportunity to express their concerns, ideas, and solutions (Dunn, 2010).

Interviews were conducted in two ways: in person and over the phone. I aimed to complete all interviews in person, however due to recruitment of participants from all around Alberta, the convenience of my participants, as well as security reasons, most of the interviews were done by telephone. In total 6 interviews were done in person and 11 were done over the phone. Interviews ranged between 15 minutes, and 3 hours and 14 minutes, with an average length of 55 minutes. In-person interviews were done at the participant's home or a location of their choice.

At the beginning of the interview the participants were given an introduction letter to read informing them on the study (appendix 3) and then were asked if they had any questions. After the participants had time to look at the information sheet and ask any questions, they were asked to fill out an informed consent form ensuring they understood the intent of the interview (appendix 4). Once the informed consent was filled out the interview commenced. Phone interviews were done in a similar manner. If interviews were scheduled ahead of time the participant was sent an information sheet by email explaining the study. If interview participants wanted their interview to occur right away, the information sheet was read to them over the phone then they were invited to ask questions and then they were asked to give verbal consent to participate over the phone, which was recorded digitally. After consent was given the interview would commence. The length of phone interviews ranged between 21 and 58 minutes, with an average of 32 minutes.

Table 1: Interview Summary

Interview	# of interviews	Average Length (minutes)	Club Members	Non-Club Members	AST 1/2 Course
In-Person	6	54.98	1	5	3
Telephone	11	31.86	6	5	7
Total	17	646.60	7	10	10

All interviews were semi-structured and were guided by an interview script including a list of questions. However I was not restricted to following the exact wording or order of the questions. Instead the interviews were flexible so I could move through the questions based on the participants' responses (Dunn, 2010). Follow up questions were used as a way to explore participants' responses in more depth (Brymer and Gray, 2011). An initial interview script was prepared and used with the first four participants. After these interviews, the script was revised to include new topics and remove questions that did not work (appendix 5).

Both past and recent research has generally seen little different in the quality of data between in-person interviews and phone interviews (Aneshensel, Frerichs, Clark & Yokopenic 1982; Tausig, & Freeman, 1988). Although the telephone interviews that I completed were shorter than the in-person interviews, a similar quality of data was collected in the in-person and telephone interviews. Rogers (1976) also found the quality of data from in person and phone interviews was comparable (also see Aneshensel, Frerichs, Clark & Yokopenic 1982), but found that participants interviewed in person were more likely to give socially desirable answers. However, previous research by Colombotos (1969) found no differences in receiving socially acceptable answers between in person interviews and phone interviews. In my research, there did not appear to be any significant differences in receiving socially desirable answers between the two interviewing styles. Despite this, it could be that participants were generally giving socially desirable answers due to the negative media coverage that often occurs in coverage of mountain snowmobiling. High-marking in particular is criticized and some news articles have suggested regulating recreation in the backcountry.

4.6 Analysis

A thematic approach was used to analyze the interviews. This approach is a popular method to identify and analyze patterns across an entire data set (Braun & Clarke, 2006). It is a way to organize and describe the data in a meaningful way.

Thematic analysis has been successfully utilized in previous natural hazard research to explore preparedness and decision-making (Baxter & Greenlaw, 2005; Brenkert-Smith, 2006; Haynes, Barclay & Pidgeon, 2008). According to Baxter and Greenlaw (2005) this type of qualitative methodology allows for depth, as well as a better understanding and comparison of risk perceptions. According to Braun and Clarke (2006) thematic research can use an essentialist, constructionist, or contextualist method. This research uses a contextualist method, a combination of essentialist and constructionist, which recognizes that individuals make meaning of their experience but are also influenced by broader social context. All interviews were transcribed verbatim and all identifiable information was removed from transcripts to ensure confidentiality. The analysis was mainly inductive, with most themes being identified directly from the data itself. However, analysis was partly deductive to a lesser degree, where concepts from previous voluntary risk taking literature were also used to analyze the data (Haegeli, Haider, Longland, & Beardmore, 2010; McCammon, 2004).

The interviews were each coded thematically to create a codebook in which to analyze the data. To create the initial coding framework, both my supervisor and I took a sample of five interview transcripts and separately created a coding framework based on the content of the selected transcript sample. The two separate coding frameworks were compared and were used to create one coding framework to be use on the remaining transcripts. This approach is similar to other qualitative research studies using semi-structured interviews (Davidson, Haglund, Stayner, Rakfeldt, Chinman, & Tebes, 2001; Fossey, Epstein, Findlay, Plant, & Harvey, 2002). Through my analysis I aimed to follow Fossey, Harvey, McDermott, and Davidson's (2002) two levels of analysis. The first level is the review, identification, and coding of reoccurring themes, while the second level deals with the identification of common themes, but also the areas of variance.

Throughout the analysis process the coding framework was modified to reflect the emerging themes. According to Braun and Clarke (2006), a theme captures an important occurrence in the data set that relates to the research questions. To ensure that my analysis was rigorous I met with my supervisor regularly throughout the data analysis process to discuss my findings and interpretations. Any disagreement on the codes and meaning of the codes were discussed until there was agreement. NVivo was used to help

extract and organize the themes. The coding framework evolved through the analysis and a final coding framework was established after all the interviews were coded (appendix 6).

4.7 Rigour and Reliability

It is important to take steps to maintain the reliability and rigour of qualitative research. Baxter and Eyles (1997) state that ensuring rigourous qualitative research can be a challenge due to a tension between the creativity of the research process and the evaluation of the data which usually involves a set of standardized processes. Rigour is defined by Baxter and Eyles (1997) as "the satisfaction of the conventional criteria of validity, reliability and objectivity within qualitative research" (p. 506). Although there is no recommended or standardized way to interpret qualitative data, there are multiple techniques with which to describe your research methodology and methods in order retain reliability of your results. In order to establish rigor in my qualitative research I used several methods recommended by Baxter and Eyles (1997), which included providing a rationale for my methodology, description of the sample group, providing direct interview quotes, and describing the procedures for analysis.

In order to ensure that the evaluation process of my research was credible it was important to keep the connection between the participants' experiences and my interpretation of them. This was done in two ways. Firstly, according to Braun and Clarke (2006), it is important to immerse yourself in your data. To accomplish this, I personally transcribed the interviews and repeatedly reread the transcripts to achieve an in-depth understanding of the content. Secondly, the coding framework and application of the coding framework was developed closely with my supervisor. This process involved going over the data to ensure that we came to an agreement on the codes, their meaning, and their relation to the raw data. Direct quotes were used to provide a link between the data and the findings. This approach helps to present the results in a way that reflects the perspectives of the participants (Fossey, Epstein, Findlay, Plant, & Harvey, 2002). Quotes were labeled to distinguish each participants' words. The label included an

identifying number (01-17) and whether they belonged to a club (C) or not (NC). An R started the code to identify the participant as a respondent.

4.8 Ethics Approval

This study was approved by the University of Alberta Human Ethics Research Online (HERO) under the Research Ethics Board 1(REB). Ethics approval was needed because the study involved interviewing human participants. To ensure all participants were informed about the details of the study and their participation within the study an information sheet was either given before hand or read verbally before the telephone interviews (appendix 4).

Since there was the chance that participants could discuss their participation in dangerous activities or sensitive information it was important to keep all personal information and identifying information protected. Several techniques were used to ensure this confidentiality. No personal information was used and names were not recorded on the audiotape. All transcripts were kept in a secure location and computer files were password protected, and only I had access to the information during the research. Additionally, I personally transcribed all the interview audiotapes, to ensure confidentiality.

There was a chance that some of the questions could cause some discomfort during the interview. Therefore, it was essential that the participants understood that they did not need to discuss topics that made them feel uncomfortable and different techniques were used to emphasize this. Voluntariness was stressed to the participants that the study and participants could refuse to answer questions that made them feel uncomfortable. Participants were also informed that they could withdraw from the study at any time up to when the data had been analyzed. After the study was explained, I answered any questions that the participant had, and an informed consent was either signed or said over the phone indicating that they wished to participate in the study (appendix 4).

5.0 Results & Discussion

This chapter discusses how the participants of this study perceived the risks of backcountry snowmobiling and the perceived risk of being in an avalanche while snowmobiling. It then describes the participants' motivations to participate in backcountry snowmobiling, preparedness activities, information seeking, and decision-making.

5.1 Perceptions of Backcountry Snowmobiling Risk

The participants of this study had differing opinions on whether snowmobiling was riskier than other backcountry sports like skiing, snowboarding, or mountain climbing. The results found five of the 17 participants believed that snowmobiling was riskier than skiing, five believed it was about the same, while four participants believed that snowmobiling was safer than backcountry skiing. However, all of the participants acknowledged that snowmobiling did involve some risks. Furthermore, 15 out of 17 participants said that they were concerned about being involved in an avalanche while snowmobiling in the mountains. During the interviews participants identified factors that increase risks to snowmobilers. In this study four said that snowmobiling is risky because snowmobilers can now go further into the backcountry than skiers, hikers, and snowboarders. Participants in this study also responded that due to advancements in the machines, people were able to go in to areas that are usually inaccessible by non-motorized backcountry recreation. These areas are further away from help and could potentially have greater risk of avalanche due to an increase in elevation. As one participant said:

> *R11C - Well, one of the main reasons is backcountry skiers for example, can't get back into the alpine as far as what snowmobilers can and its only within the last*

something like 10-15 years that snowmobilers could even get back in those unaccessed areas and so there is a much higher risk when you compare the two activities.

Five participants said that snowmobiling is risky due to the increase in power of newer snowmobiles that are able to take snowmobilers further into the backcountry and at faster speeds. The increase in power and speed of these newer snowmobiles means that they travel at high speeds across a larger span of terrain, and therefore snowmobilers may not notice changes in the snowpack from one area to another and fail to identify a snowpack that is less cohesive. One participant said that since snowmobilers travel across so much terrain, it is not practical to dig snow pits to identify any weak layers, which puts snowmobilers at higher risk. In the words of this participant:

R13C - Well again the low, moderate, high and extremes will differ depending if you are at the tree line, above the tree line, below the tree line, in the valley, you know so again with each area, see this is what makes it kind of tough to with snowmobiling with say a skier. [Skiers] can really focus on one hill and dissect it with doing tests in the snow and you know doing pits and so on, but with us because we have equipment that moves around pretty quickly and [on a] average day we could put in 100-150 kilometres. It's pretty tough right to deal with the snowpack because it could change uh three or four times in the course of the day um simply because we traverse so much of it.

The increase in power and speed is what allows snowmobilers to participate in high-marking. When there is more power to drive higher up slopes, high-marking becomes more dangerous. Seven participants indicated that high-marking was a risky activity that increased the likelihood of being involved in an avalanche. As noted by one of these participants:

R06C - [A] lot of the avalanches are that are uh occur in my perception are from high-marking activities typically when your cross country skiing you're not high-

marking. You're not going into the [high-risk avalanche] areas. I think, I think in recent years the risk of avalanches on snowmobiles have increased because of the technology.

High-marking is considered risky because it is typically done on slopes greater than 30 degrees, where a more dangerous avalanche is more likely to occur (Stethem et al., 2003). A snowmobile can spend more time on the slopes, increasing the probability of causing an avalanche. In addition, snowmobilers in the backcountry may be less experienced now than they were in the past. In the words of one participant:

R16NC - [T]he equipment allows for ready access to the to the high country and you don't necessarily have to be an experienced rider to access those areas and you may be unknowingly or maybe knowingly putting yourself at risk…. Some not too long ago, equipment was less powerful and less able to transport you into those high-risk areas without doing extensive customizing and those who invested in that type of customizing were few and far between and they had more experience and so maybe they weren't as often at risk.

This participant sums up the factors that might put snowmobilers at more risk than non-motorized backcountry users. Today, people can buy a turbo snowmobile with over 200-300 horsepower without any snowmobiling experience or knowledge about the backcountry and avalanche risk, and go straight into the mountains. The participant above explains that 10 years ago, the only way someone would have such a powerful machine would be by customizing it and those who had the knowledge to customize their sled usually had the knowledge to reduce their exposure to backcountry risks as well.

Four participants perceived snowmobiling to be less risky than backcountry skiing or snowboarding. Reasons given for this perceived lower risk was that snowmobilers have more escape routes and the ability to outrun an avalanche. In the words of one participant:

R01NC - Cross-country skiing I think you're slower at it. You can be a little more

aware of your surroundings but it also, you don't have a lot of escape routes with it, where a snowmobile you have more escape routes is you can maybe outrun the avalanche, you can get past it or through it or whatever, surf on top of it until it quits.

Participants who went on either club rides or rides with friends or co-workers acknowledged that the club members were more concerned about avalanche risk and were more knowledgeable compared to non-club members. In the words of one participant:

R10C - Depends on the group… if I go [with] a lot of our club guys they're concerned [about avalanches] but guys from work and stuff they don't know, they don't understand.

5.1.1 Perceived risk to self

In this study, 13 out of the 17 of the participants made it clear that even though backcountry snowmobiling is an inherently risky activity, they perceived their risk to be lower because of how and where they snowmobile. Of these 13, nine said that they would avoid high-risk avalanche areas. Avoiding high-risk areas included sticking to meadows, treed areas, trails, valleys, rolling hills, and low angle slopes (<20°). In the words of one participant:

R04NC - Um well I never put myself in like direct avalanche terrain usually like uh I'm more of a meadows, I go into the meadows and sort of rolling hills I'm not the going on steep slopes and where it's just like a bare face with just snow on it. I like to go where the snows anchored in with trees and things like that.

Two participants indicated that they utilized techniques when they were snowmobiling such as spreading out and only allowing one person to high mark at a time to reduce their

risk of being involved in an avalanche. By spreading out there is less of a chance that multiple snowmobilers will be caught in the same avalanche. Four out of the seventeen participants said that they do not high-mark and were aware that this activity resulted in increased risk of being caught in an avalanche.

Some participants assessed the risk to themselves as lower in comparison to other backcountry snowmobilers who high-marked. One participant when asked what his risk of being involved in an avalanche compared to other snowmobilers responded:

> *R01NC - I just think its lower, 50% lower could even be more. The guys with the machines go up the cliffs basically and do this high-marking stuff they're the ones who are really exposing themselves...*

Two participants perceived their risk to be lower because they felt that they were knowledgeable about snowmobiling. Knowledge could be considered as having taken formal education courses or simply have many years experience participating in backcountry recreation (see section 2.3 for a description of the education programs available to backcountry snowmobilers). The results that the participants see themselves to be less at risk than others because they avoided high-risk areas, did not participate in high-risk behaviour, and perceived themselves to be knowledgeable suggests that they perceive avalanche risk to be controllable. This is consistent with previous studies on voluntary risk taking (Klein and Kunda, 1994; Moen & Rundmo, 2005).

Many participants acknowledged that some backcountry snowmobilers were not knowledgeable enough to reduce their risk of being involved in an avalanche or the skills to perform a rescue. Participants described people who were new to the snowmobiling and did not have the experience or education to reduce their risk, as well as those who did have the experience but enjoyed taking risks. One participant mentioned that some of those who were knowledgeable still took unnecessary risks that could result in injury or death:

> *R11C - [Y]ou're looking at two types of individuals that snowmobile. One of them is educated and knows the risks and has taken courses to mitigate some of the*

risks. And then there's the people who go into the alpine with … no information what so ever and they're the ones who typically get caught in avalanches. And actually there's a third group of people who are knowledgeable and choose to um ignore the risk factors anyways… I think the majority group right now are people who don't have the background and they're just up there because they want to be up there it's fun to do, that type of thing, but I think as time slowly goes by here we're starting to see more and more people realizing the hazards back there and wanting to get some information about it.

Although most participants responded that they were at less of a risk of being involved in an avalanche than other snowmobilers, four said that their risk was either equal to everyone else's or possibly higher. Of these, three perceived their risk to be similar to others' because there was always a risk faced by everyone in the backcountry. This participant said:

What do you think your avalanche risk is compared to others? To other Snowmobilers?

R07NC - Other average snowmobilers um I'd say my risk is higher due to my frequent riding… But um having the experience in the zones and the knowledge of the areas that I'm in and the snowpack and the history of the snowpack … I guess my risk level goes down, due to that. Just because of the exposure limit, the exposure levels um the risk obviously goes up. So. I wouldn't say I'm more at risk or less than anybody else.

Only one participant said that their risk might be higher than most due to their frequent trips to the backcountry. It was interesting that even participants who high-marked still did not perceive themselves as more at risk. This finding could suggest an optimistic bias or unrealistic optimism, where participants perceive they are less risk of being negatively impacted by a hazard than others (Parker & Stanworth, 2005; Lupton & Tulloch, 2002; Janis 1982; Harris, 1996; Klein & Kunda, 1994; Weinstein, 1989). People

tend to be more optimistic about risks that they view as controllable, showing a connection between the optimistic bias and perceived controllability (Harris, 1996). However, since the connection between unrealistic optimism and perceived controllability is so close, it is difficult to identify why exactly participants believed they were less at risk than other backcountry snowmobilers. Since the participants justified their lower risk status by describing how they acted in way to reduce their exposure to risk, it can be argued that this result displays more of perceived control than optimism. Meon and Rundmo (2005) suggested realistic training as a solution to unrealistic optimism. The field component in the avalanche skill training course could give people the realistic training to reduce the optimistic bias.

Although many participants discussed ways in which they took measure to reduce their exposure to backcountry risks, the actions of others were not as easily controlled. As one participant described:

> *R08NC - The rule we have is like if you're doing like high-marking like only one guy at a time and you'll have guys that'll you'll be on the hill climbing and they'll just come out of no wheres and start climbing above you or whatever which is like a massive risk so you get guys like that for sure but the way like I'll just leave that hill like if there's guys that come on and like not giving you your space. Most guys are pretty considerate like you get to the hill and it's untouched powder you stay to one side they'll just kind of leave you alone but you'll get guys that go up and I'll just go find a new spot like it's not worth it that's yah that would be the worst getting killed because someone else's stupidity climbing above you. Same with if you're stuck and sometimes guys will come up and if and they'll go up above you and then come down to stop well that's like a big mistake you don't. I'd rather dig myself out for 2 hours then have someone climbing above me to give me a hand.*

The participant explains above how the actions of others cannot be controlled and that other people's activities in the backcountry can increase their risks (Slovic, 1987). Some participants said that if others were putting them at risk, they would leave the area thus allowing them to regain some control.

A couple of participants mentioned that ultimately avalanche risks are not controllable. As one participant said:

> *R05C - So the people with the education the people with the knowledge and respect, yes they do get caught in avalanches on occasion and it costs them their lives but its … not because of a lack of knowledge its because mother nature holds the upper hand.*

If someone perceives that avalanche fatalities are an act of nature or not controllable, this may mean they will not take the necessary precautions, such as taking a course or bringing avalanche tools to minimize their risk. This could potentially indicate low self-efficacy, which has been shown to reduce preparedness action (Ajzen, 1991). People may not prepare because they view a situation to be out of their control or believe their actions will not reduce the risk (Becker, Paton, Johnston, & Ronan, 2012; Paton, Smith, Johnson, 2005; Paton, 2003). However, no participants in this study said that they had absolutely no control over their exposure to risk, and all took measures to reduce their risk of being involved in an avalanche.

5.2 Preparedness Tools and Equipment

All participants interviewed as part of this study said that they equipped themselves with a transceiver, probe, and shovel, which are considered by the CAC as essential tools in order to perform an avalanche rescue. Participants said that they carried these three tools at all times when travelling in the backcountry, no matter the risk. Other avalanche safety tools that four participants took with them included Avalungs, AirBags, and SPOT (see section 2.4 for description of tools). Some regarded these tools as extra protection to help them survive an avalanche, while others who did not use these tools believed that these tools could contribute to a sense of invulnerability and increased risk taking. In the words of one participant:

> *R13C - [N]o one tool is your life saver…. Some of these items… they're almost counter [productive] because some people view it as a lifeline … you're going to take greater risks because you've spent more money … I don't think we should be trying to look for the magic bullet here, what we're doing here is put as many systems in place of people and equipment working in sync to try and minimize [avalanche incidents].*

The participant above argues that even though these extra tools are designed to save lives, they should not be relied upon as the sole method of protection, but should instead work in combination with training and knowledge to reduce risks. He responded that since he did not partake in risky activities, like high making, he did not need equipment such as Airbags, but would consider buying one if he did.

Most of the study participants said that they required everyone going on snowmobile trips with them to be as prepared as they were, including having a transceiver, probe and shovel. Participants wanted their group members to have the necessary equipment and knowledge to use it in the event they were buried and required a rescue. The participant below discussed how snowmobiling groups are based on their weakest link. A transceiver is the main tool to locate someone who has been buried underneath snow, so when a member of the group does not have a transceiver or the ability to use it, the entire group is in danger. As one participant noted:

> *R17C - Basically in a lot of cases is you're based on the weakest link. So the safety gear is, well that I have to find you. So I better make sure you have the equipment to find me… we've rode with people who have not taken an AST course yet and we encourage them quickly to get that course taken um because it's not just their life, it's our life and I want them there to rescue me if I ever need it.*

Another participant explained that when he went out with a group, he would hide beacons in the snow before starting their trip to make sure that everyone knew how to use their transceivers and that all of the transceivers were working properly. It was also an opportunity to teach people how to use the equipment.

R13C - [W]ell what we do and this is mandatory for me uh it's not a course of anything but uh but I always question the people on their emergency locater transmitters. On their beacons. Not too many people know how to use them. So as part of my program, usually when I go out, I'll bury one and make them find it. So I know they know how to use them. Cause uh it's ok for you to be under the snow with yours going, you might know how to use it but that's not doing any good to find you so. So that's part of our little session we normally always do that.

By requiring people to practice using the equipment, they can regain an element of control by knowing their group members are capable of performing a rescue. This technique was used by two of the participants.

The interaction between participants' awareness of backcountry risks, the preparedness norms of follow group members, and ease of adopting preparedness measures seemed to support the theory of planned behavior and resulted in the participants taking the actions to prepare. However, perceived responsibility and sense of community, which are part of Paton's social cognitive preparedness model were also found to influence preparedness actions in this study. None of the participants relied on others outside of their group, such as the Canadian Avalanche Centre, for their safety and therefore understood that they alone were responsible for their own safety. The sense of community was very strong among both club members and non-club members. As one participant answered "you are only as strong as your weakest link". A group had to be equally prepared to be able to react in a disaster.

5.2.1 Equipment Barriers

Although most of the participants responded that they did not have any concerns about using or carrying their protective equipment two people questioned the usefulness of the probe. These participants wondered if they would be able to properly identify a body, and if the probe was long enough to locate a person. As noted by one participant:

R01NC - I've never, never had to use [a probe] in an avalanche so I can't really say. Like to me … I often wonder, cause the snow, you take the avalanche probe and you poke it in the snow and it doesn't hit the bottom… I often wonder how in the heck would you find somebody because after twelve feet of snow you're dead anyway so maybe what use would that be… I question being able to feel somebody down twelve feet or ten feet like what would be the difference between that and a bough of a tree right? They kind of got the same pokiness to it or sponginess so I don't know…

Importantly, the participants who questioned the usefulness of the probe had not attended an AST course. Therefore, in these cases, not being trained how to use the equipment appeared to affect its perceived usefulness. Not understanding the usefulness of the equipment could also affect the likelihood that a person will carry or use it, however even though these two participants did not understand its usefulness, they still carried a probe with them.

5. 3 Information Seeking

The participants of this study obtained their information on backcountry safety and conditions from a variety of sources and experiences. The extent to which participants sought out information differed from 10 of the 17 participants taking avalanche safety courses every couple of years to one of participants who obtained his information watching videos, and reading snowmobiling articles. Information can be divided into two categories: formal and informal. Formal information sources included Avalanche Skill Training Courses (AST), and the bulletins provided by Canadian Avalanche Centre (refer back to section 2.3 for descriptions). Informal sources include forums, friends/family, clubs, and YouTube. Media and snowmobile clubs fell in the middle, providing information that can be considered both formal and informal.

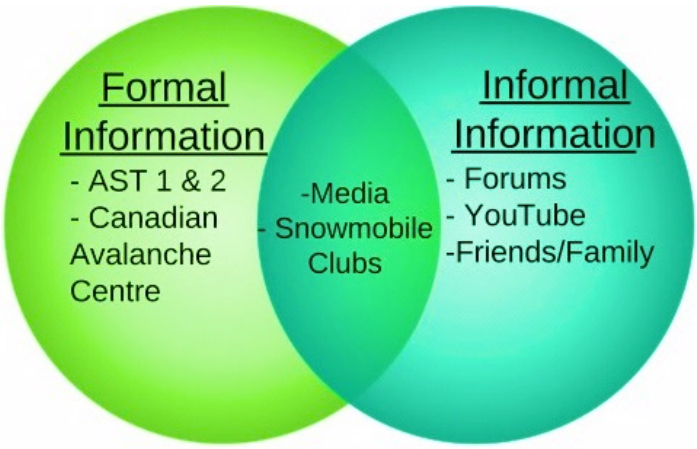


Figure 11 Backcountry Safety and Conditions Information Sources

5.3.1 Formal Information Sources

Formal information, for the purpose of this study, is information from the Canadian Avalanche Centre and the avalanche skill training courses. The Canadian Avalanche Centre is in charge of collecting information about the snow conditions directly from the mountains and presenting in a way that is understandable to the public. As described in section 2.3, snowmobilers can take courses from accredited instructors who have taken the AST instructor-training course or an equivalent. In this study, ten of the seventeen participants in this study had taken an AST avalanche course. Furthermore, two of those ten participants had taken an AST 2 course and one had taken the AST instruction training. Many of the participants who had taken an AST course had taken it more than once.

When asked why these 10 participants took the AST course(s), participants said that the primary reason was they wanted to know the terrain features and snowpack characteristics that would indicate increase the risk of avalanches. The participant below describes how avalanche courses provide knowledge about terrain features, safety gear, and how to read the bulletins to be able to effectively manage avalanche risk. In the words of this participant:

> *R13C - Formal education of avalanche training is key in terms of if you're going to ride in the alpines or areas that are going to be more risky and [if] that's the*

type of flavor you want then at least you need to know what the signs are. Everyone should have the gear, know how to use it um and uh and uh read the reports, need you need to know how to read a report too.

The Canadian Avalanche Centre argues that training is needed to understand the Danger Scale ratings that are part of their bulletins (Parks Canada Agency, 2003; Canadian Avalanche Centre, n.d.). The CAC argue that snowmobilers must not only have to understand the bulletins, but also apply it to the backcountry areas where they snowmobile. The Avalanche Skill Training courses (AST) allows backcountry recreationalists to get the practical in-field experience learning the techniques that are difficult to learn from a book or set of instructions. This was echoed in the opinion of the participants who had taken the course. In the words of one participant who had taken the course:

R04NC - It was pretty useful actually, mainly in reading terrain, so it's hard to, it's hard to learn that in the book, but when you're out in the field and somebody's explaining things to you it was pretty useful.

Other participants said that they took the AST courses because they realized that they were unprepared and unaware of the risks in the backcountry. The participant quoted below started snowmobiling without knowing the risks involved and realized that he needed to go seek out training:

R11C - I took a look at the risk when I first started this and without really knowing what it was I mean you're up there and you hear different sounds coming from the snowpack and the one thing that you do hear about umm when you backcountry ski or when you even downhill ski is the types of sounds that snow masses make um as they're shifting and I experienced those and that was enough for me to say ok I'm inexperienced back here I need some information to find out if I should even be back here or not.

The finding that these participants were concerned about backcountry risks, knew they lacked the education to prepare for the risks, and consequently took measures to acquire the information by taking an AST course confirms the information seeking and processing model (Griffin, Dunwoody & Neuwirth, 1999). Other participants who did not necessarily take a formal avalanche course still sought out information in order to become aware of backcountry risks, especially avalanches.

Only one participant in the study said that they did not need to take a course because they had many years of experience. However three participants who had not taken an avalanche course acknowledged their benefits, but discussed time and cost barriers to taking these courses. The time barrier included both limited ability to take time out of a busy schedule and not wanting to 'waste' time taking a course when they could be snowmobiling. One participant also saw a benefit in completing an AST course, but would rather be out having fun while snowmobiling. In the words of this participant:

> *R08NC - I've looked into that [the AST] course I was going to take it this year but I rather be sledding, it sounds awful but I'd rather be sledding than wasting a weekend doing a training*

One participant brought up cost as a deterrent to taking an AST course. The AST 1 course costs $350.

> *R03NC - I know courses and stuff, I've seen the courses to take for like to figure out avalanche stuff it's just highly costly so, so I don't really feel like spending that money… (Pause) I'd love to take courses on avalanche and that kind of stuff but, but it's not really worth it with the amount of times I go.*

Although the participant above thought that the courses would be useful, financial constraints made taking the course undesirable. This confirms the social cognitive preparation model where the participants above had the response efficacy, believing taking a course would be beneficial, but did not have the self efficacy, the belief that they had the ability to complete the course, therefore preventing intention to lead to the

adoption of protective behavior (in this case taking the AST course).

Snowmobiling clubs can provide both formal and informal sources of information to members. They can be considered a formal source of information because they allow members to access workshops and seminars by experienced snowmobilers that educate the members on how reduce the risks in the backcountry, but also encourage their members to take AST courses. All snowmobile club members interviewed for this research (7 out of 17 participants) had taken an AST course. The Calgary and Alberta clubs encouraged their members to take courses in order to participate in club snowmobile trips, although taking a course was not mandatory. One of the snowmobiling clubs also gave a portion of the course cost back to their club members, which acted as another way to encourage members to take the courses. Encouraging club members to take the courses together most likely contributes to the high number of participating club members having taken an AST course at least once. When asked if they would recommend the AST course to other snowmobilers, one participant replied:

> *R13C - Yes for sure, to take the course to be part of a club because again you've got a network of people to draw from, you got new people, you've got people who have been at it for a while, like myself, then you got people who've been at it for 30 years and you know they can show you beautiful places to play they can tell you some of the things you should avoid, um and again some people are naturally capable when it comes to uh understanding you know, what the backcountry's like or where to go or other people are good with uh first aid, or with cooking you know um planning things, so within the network uh you can draw from several sources and it becomes an incredible asset um but certainly don't want to minimize things like first aid training and uh avalanche courses.*

Most participants believed that the CAC was a good source for information about snow conditions. The avalanche bulletins provided by the CAC were reportedly read by 13 of the 17 participants before they go on a snowmobiling trip into the mountains. Referring to the bulletins gave participants insight on the composition of the snow before getting to the backcountry, whether there were reports of hoar frost or weak layers. The

influence of the snowmobiling club's norms regarding preparedness and information seeking had an obvious positive impact on the snowmobiling club members' actions. This influence of social norms in regards to information seeking and adoption of preparedness is an important factor in both the theory of planned behavior and the social cognitive preparation model (Paton, 2003; Ajzen, 1991).

5.3.2 Informal Information sources

All 17 of the participants mentioned using some informal sources of information about backcountry preparedness and risk, such as Snow and Mud (an snowmobile and ATV forum, http://www.snowandmud.com), local businesses, and family and friends. Two preferred Snow and Mud as an information source because they said it contained up to date information on the snow conditions for a specific snowmobiling area that is provided by people who had recently been in the area, as indicated by the participant below.

> *R08NC - I just go to forums like snow and mud .com they have good forums on conditions and usually local guys that have businesses there put up lots of updates because they want you to come to their town or whatever so they'll put like whether it safe or…*

However one participant who did use forums for snowmobiling information indicated that the second hand material posted on the forums may not be trustworthy.

> *Have you used any forums?*
>
> *R11C – Ya… but … you don't get a lot of information from forums on what the conditions are it's mostly kind of a chat time online, and so occasionally I visit them, but most times I don't.*

Ok do you find all this information trustworthy? On the websites and or is there any information that you don't find trustworthy?

R11C - Most of the information that comes from the sites you get on chat with people its, its second hand information, umm I don't particularly trust that.

This participant instead preferred to rely more heavily on the Canadian Avalanche Centre's website for information.

Some participants asked about local snowmobiling conditions from local businesses and people in the area where they planned to snowmobile. Information sources included hotels, gas stations, or other people in the staging areas.

R02NC - We even talk to a lot of even at the bottom of the hill at uh like where you buy trail passes and stuff usually ask them how the conditions are and if there's anything that we have to be aware of kind of thing right?

These participants used local knowledge of the backcountry conditions because locals were the people that were the most familiar with the area and the evolving conditions in it. Family members and friends were mentioned as a more general source of information where participants learned the basics of snowmobiling to gain experience. When asked about whether there is enough information available that is specific to snowmobiling one participant replied:

R17C - When it comes to just riding a snowmobile, I would have to say it comes a lot to how you were trained or how you learn the sport whether it's from your parents or just learning as friends or what age you learned at.

A few mentioned using both formal and informal information sources. For example, participants would often initially look at the CAC's bulletins and avalanche forecasts online, but when they arrived at the snowmobiling location, would seek out advice from locals to get an idea of the snow conditions in the specific area where they

planned to snowmobile. Hagar (2010) discusses how people turn to informal sources in the situation where information is inadequate. However participants appeared to fill in the gap in information about the snow conditions of specific backcountry areas using informal information sources.

5.3.3 Learning from other snowmobilers

The sharing of information between snowmobilers was a reoccurring theme with both club members and non-club members. Participating non-club members also discussed the importance of learning from experienced friends and family members. One participant described how he learned how to snowmobile at a young age, taught by those around him, and mentioned that it could be difficult to obtain information for those who have recently taken up snowmobiling. According to this participant:

> *R08NC - [I]f you grow up on snowmobiling and then you and the next step like once you're older is going to the mountains and you're around people I think there's lots of information. I think experience is big is key when you're doing that type of thing and so if [you are] 20 years old and you decide you just want to start snowmobiling in the mountains… there wouldn't be so much information because all there is like one or a couple [avalanche] websites and that's it. Whereas where I learned all my [information] I was snowmobiling since I was like 6 years old so…and I'm comfortable with it and then you get to meet people doing that right.*

The sharing of information also occurred between those who have taken courses and those who had not. A few participants mentioned that although they have not taken a course themselves, they had been taught by others who had taken courses. As one participant said:

> *R02NC - [A]ctually my dad has a friend, he is a ski patrol at Marmot and he gets*

avalanche courses all the time and I've met up with him before and he's taught us how to use our beacons properly and given us just pointers like if somebody gets caught in an avalanche always have a metal shovel with you, don't have a plastic shovel because if you got to break out that snow just packs so hard it turns to ice and you got to break it the plastic shovel will just break right.

The participant above described how he learned how the use the equipment from a friend who had taken the avalanche courses. Although this can be a valuable way to obtain information, some information may be forgotten or distorted by the person providing the information.

Information learnt from personal experience is considered more influential in influencing people's behaviours than information from other sources (Weinstein, 1989). Therefore, people will consider information they have gained from experience as trustworthy and use this information to make decisions. This is similar to many of the participants of this study who valued the experiences they have gained over the years of participating in backcountry snowmobiling to be able to reduce their risk of being involved in an avalanche.

5.3.4 News Media

The news media is a source that also provides information about backcountry risks in the form of reporting incidents and fatalities, as well as running special advisory bulletins during periods of increased risk. The news media has traditionally been a main artery for information to the public (Miles & Morse, 2007). However, seven out of 17 participants did not perceive the news media to be a credible source of information about backcountry risks, due to its perceived tendency to sensationalize snowmobiling fatalities. As a result, these participants were not inclined to seek information from the news media about backcountry risks. When asked if they looked for any avalanche information from news media, one participant:

R17C - The only time we will pay attention to the news media is when the CAC issues a special bulletin that crosses the airways and we use that to go in and look further into where we're going and what we plan on doing I find the media to be over-hyped and sensationalized especially when it comes to snowmobiling (laughs).

Some participants mentioned that the media's reporting on snowmobiling fatalities had the benefit of making some snowmobilers more aware of the risks of snowmobiling and the current snowpack conditions in the backcountry. The following participant explains that even though he does not find the news media to be a credible source of information, news reports on snowmobile fatalities keeps him aware of the risks.

R03NC - When I listen to the news … if there is any news on about avalanches I will flip to it and watch it. Radio not so much and newspaper not so much, but news I do watch

Do you find this a credible source for backcountry information?

R03NC - Yes, because usually when its on the news its because there's been a big avalanche so I take it into consideration.

5.4 Decision-Making

Each participant had a different routine for how to prepare for a snowmobiling trip. Some participants carefully monitored the forecasts and bulletins months in advance of their trip, while others said that they would decide to go at the last minute. To demonstrate the differences between participants, I will describe two scenarios, which reflect the variation in how participants made decisions about whether or not to go snowmobiling. Scenario A describes a participant who plans months in advance, while Scenario B describes a participant who lives close to the mountains and does not feel the

need to put as much effort in to trip planning. The two scenarios are based on the responses of two male participants of similar ages.

Participant A: Non-Club Member

Participant A started snowmobiling on flat trails and has been snowmobiling in the mountains for approximately five years. He has four to five snowmobiling trips per season, spending an average of 15 days in the backcountry per year. His group (about 4-5 members) includes family members and friends. Participant A's trip preparation started with taking the AST 1 course to be able to read the terrain and identify risks. For this participant, trip planning starts a few months in advance, booking the hotels. Closer to the date of the trip he starts checking the forecast on the CAC websites to decide whether the snow conditions are favorable for a trip. If conditions are favorable, his group would proceed with the planned trip. In the event that forecast labeled the risk in the area as high or extreme, he will cancel a planned trip.

> *We have cancelled trips in the past when the avalanche hazard has been too high for the area we're going to so actually the big avalanche in [Revelstoke] two years ago where there was, that Turbo hill… We had a trip planned for [that] weekend to Revi but we cancelled and then because of the snow conditions and that huge thing happened and so that was a couple years ago but um ya so after we if all the conditions are good then we just carry through with our full trip so… if everything is high and extreme we're not going.*

Participant A acknowledged it was difficult to cancel a trip but recognizes when the conditions are bad, than cancelling is not a problem.

Participant B Non-Club Member

Participant B has taken both the AST 1 and AST 2 courses and uses snowmobiling as a source of income. Since snowmobiling is a job for this participant, he/she had a different motivation for taking risks including taking a good photo.
This participant lives closer to the mountains than Participant B and has easier access to backcountry areas. Being closer to backcountry areas allows for more flexibility when planning tips.

> *Um pretty much um wake up in the morning, look up at the sky call up my buddies make a call and say "hey, where we going? This way or that way?" and uh I have a couple, I have different crews in different towns so I might call say in the next town over in Revelstoke and call up that crew and get them to look up at the sky and maybe head down that way.*

Unlike Participant A, Participant B does not plan ahead or, consistently look at the bulletins before he goes. This participant does not plan ahead so there is no need to cancel a trip. If the conditions appear unsafe, he/she will not go snowmobiling or will reduce risks by snowmobiling in safer areas.

> *Each area every area has its safe zones so if the avalanche, if the risk is high we always read the reports and if its high we look at the conditions and things are looking like um like the risk is higher than what we thought it might be we might hang out in the safe zone.*

Participant B sees himself as being very experienced and is confident in his ability to manage the risks associated with backcountry recreation in high-risk situations.

An important finding in this research was the participants' reluctance to cancel snowmobiling trips even when conditions were favorable for avalanches. Trips were often planned weeks or months in advance with a considerable amount of preparation. When asked if they would cancel a trip, nine of the 17 said they would, however only three had actually cancelled trips due to poor conditions. Instead of cancelling trips, they would alter their riding styles by sticking to areas they considered low risk and limiting risky activities such as high-marking. However, simply staying in 'safe areas' is likely not a very effective risk reducing strategy in areas with a danger rating of high or extreme.

Even though most participants said they consulted the CAC's bulletin before they proceed with their trip, only a few said that they would cancel a trip if a bulletin had a danger scale rating of high or extreme avalanche risk in the area where they were planning to snowmobile. In this study, seven out of the 17 participants would continue with a trip, even when the risk was higher than they would usually be comfortable with due to new snow conditions and limited opportunities to take snowmobile trips. Different factors that prevent people from taking precautionary measures, even after being aware of a warning, may include the optimistic bias that something bad will not happen to them, cognitive limitations or lack of training to understand the consequences of ignoring the warning, and the use of heuristics that can oversimplify the information by comparing the new risk with more familiar risks (Moen & Rundmo, 2005; Denscombe, 1993). For four participants, the lack of opportunities to get out to the mountains was a motivating factor in proceeding with a trip even when conditions were risky. In the words of one participant:

> *R13C - [S]ometimes we're just impatient. You know we've spent of this time and all this money and we put all this effort in we only have a certain window to do this and I think there's also correlation between the incidences and the season starting up. Sometime the season is late, like this year for example, we've had all those mild days with that tropical storm off the coast and obviously when this hot air is blowing over the mountains we're not accumulating snow, so now we have to wait that much longer before this (laughs) stuff to gather right?*

The reluctance to cancel is most likely influenced by the time, money, and effort spent organizing trips, as well as the lack of opportunities to schedule a trip due to busy schedules. However, one participant, who acknowledged the need to cancel a trip, explained that when the risk was rated at high or extreme on the Avalanche Danger Scale, there was no place in the backcountry that was safe. In the words of this participant:

> R11C - *Well you can, you can change the location but typically if you're having a bad winter and the snowpack is unstable, it's unstable everywhere*

Participants who had cancelled trips due to high or extreme risk conditions acknowledged that it was sometimes difficult to make that choice.

5.4.1 Group Dynamics and Decision-making

Decision-making is neither rational nor irrational (Zinn, 2008). While some decisions are based on fact and analysis, many others are based on feelings and experiences. Snowmobiling is a usually a group activity, therefore decision-making occurs at the group level. Group decision-making can either strengthen decisions by encouraging critical thinking, or lead to situations where groupthink characteristics emerge, challenging sound decision-making.

The participants in this study revealed that their own snowmobiling groups had different ways to make decisions on how to plan trips, whether to cancel a trip and what do while in the backcountry. Some said that there was usually a leader who made most of the decisions, while others said that they made all the decisions for themselves. Others said that all decisions were made as a group. Some participants explained that decision-making processes changed depending on the group that they were in. The presence of family members, club members, friends, as well as less experienced riders changed how decisions were made.

5.4.2 Leaders Making the Decisions

A few participants acknowledged the presence of leaders in their group. Usually the group perceived leaders to be those who were most experienced or knowledgeable about snowmobiling or the most knowledgeable about the area where they were riding. Even when participants acknowledged a leader, they maintained that group consensus was very important when making decisions. When asked if there was a leader in their group, one participant noted:

> *R13C - Uh (pause) I don't know, I'd say I think I've been that person before when there's just two of us going cause I was more experienced than the other guy but for the most part we usually just talk about the night before and just come to a like decision there's not like one person saying we're going to go here because of this or whatever so…*

5.4.3 Group Decision-Making (Positive and Negative Peer Pressure)

Peer pressure may occur in a group decision-making environment. Many groups appeared to utilize positive peer pressure to limit activities not accepted by the majority of the group members. Participants would either make it clear that dangerous activities were not accepted in the group or exclude the snowmobilers engaging in these activities from their rides.

> *R17C - We felt a little bit of pressure … one time we gave them the option, 5 of us wanted to leave and 2 of them wanted to stay and after a little bit of discussion we made the decision that at that moment we were going to go find ourselves a safe*

spot and have lunch where we could keep an eye on them and at the end of the day we told them they weren't welcome to ride with us anymore.

However a few participants also said that they had experienced negative peer pressure that had put them more at risk. In the words of one participant:

R06C –I suppose some it is just uh peer pressure right? So if everybody's doing it than there's a certain expectation. Certainly I have some things that I consider to be too high-risk I don't partake in…I don't know maybe the people you're with if they're kind of pushing you to try new things or whatever that would that would maybe make me do more risky things so

Does that happen?

R06C – Ya cuz it's competition too even if you are just out trying to be safe so there's always competition when it comes to hill climbing and stuff like that

Competition between snowmobilers could result in poor decision-making since the need to win during hill climbing or another competition overshadows normal reasoning. Competition could be viewed as a symptom of groupthink where pressure to uniformity can push people past their limits in order to keep up with the rest of the group (Janis, 1982). The participant quoted below describes how the need to go along with the group can leave you feeling personally compromised in an environment where it is difficult to express doubts on a situation or ability to a group.

R13C - Uh yes its happened to me a couple times uh one time I was actually on running the crests of mountains, we actually worked our way up to this one mountain area and working off crests and at one point I was I was pretty much taxed, just like man if I slip off one side or the other too far I'm you know there's a few thousand feet of pure drop and uh its gone from adventurous to ahhh

(laughter) I can pass um so ya … I felt personally compromised a couple of times…

The participant above described how he felt pressured to follow the group into an area that was beyond his comfort zone. This type of situation supports the social facilitation hypothesis, which is the belief that something is safe or right because others are engaging in the activity (McCammon, 2004; Zajonc, Wolosin, Wolosin, & Wallace, 1970). Peer pressure can encourage those who would normally not participate in high-risk activities to do so when others are present (Furman, Shooter, & Schumann, 2010; McCammon, 2004). Social facilitation in backcountry recreation can impede safe practices by forcing people into a situation that is beyond their abilities to manage.

The two experiences described above also supports the adventure experience paradigm and how a person could progress from peak adventure to misadventure (Morgan and Stevens, 2008). Although group members can help a person reach peak adventure, they could also push a group member beyond their competence like the participant above where their personal safety is compromised.

5.4.4 Personal Decision Making

Although most participants discussed how decision-making was done by either a leader or by a group effort, some said that they were fairly comfortable making their own decisions and going against the group when they thought their personal safety was at risk. In the words of one participant:

R14NC - I make all my own decisions, ok I mean you know the group will say 'let's go here' and I'll say well I'm not it's too steep (inaudible) 'well ok we'll see you later'

If a decision made by the group was perceived as too risky, this individual stated that they had the power to choose not to participate in the activity.

5.4.5 Group Types

Participants mentioned a variety of different situations that will alter how decisions are made, including riding with family, riding with friends, riding in clubs, and riding with less experienced riders.

5.4.5.1 Riding with Family

Participants who went snowmobiling with their kids or siblings expressed that they would take fewer risks when with their family member than with friends. They felt they were responsible for the wellbeing of their family members and would make decisions that would reduce their exposure to risk. Both participants in snowmobile clubs and those not in clubs reported the influence of family when making decisions about where to ride. One participant spoke about trying to protect his children while snowmobiling:

> *Ok. Is there any difference on the decisions you make if you're going with your family members verses just your friends?*
>
> *R06C – Ya I think because I believe that that my children when I'm out with them are looking at me for uh assessing that risk that uh I typically take them to areas where you know I consider the risk to be very minimal.*

The participant describes how with peers, decision are made by the group, however when family members are present he takes sole responsibility for the decisions.

> *R06C - [W]hen it's with my family I'm probably the one who makes the decisions … if it's traveling with the snowmobiling club as I often do, then it's usually more of a group.*

This was not only observed as a parent-child relationship, but also an elder sibling-younger sibling relationship as well. One older sibling took on the responsibility of being the leader in the group when his younger brothers were present.

> *Ok, do you make a lot of the decisions yourself or does your group make a lot of the decisions together?*
>
> *R04NC – Oh ya we all talk about where we want to go and what we want to do as a group so everybody kind of has their opinions and where they want to go and what they want to do so. It's usually a group decision.*
>
> *Is there ever a leader that kind of decides if on a trip or do you pick a leader?*
>
> *R04NC – Um (pause) I don't know if we pick a leader I guess I'd I usually jump into that role um just cuz I go with my two younger brothers so it just kind of naturally happens and then whoever else we're going with they just kind of tag along so.*

5.4.5.2 Riding with Friends

Within a group of friends it appeared that there was more group discussion when it came to decision-making. If a leader needed to be chosen, the group would elect a leader instead of a person appointing him or herself as leader.

> *R01NC - Well we have the risk taker and then you have the conservative. So there is quite a balance in there, but umm when we got lost basically we just told one person, ok look we've been going in circles here ok this isn't working you know where should we go so we dug out the compass we dug out the uh the GPS actually said where we, we didn't put it on tracking so the GPS showed where the waypoint was but it was down some whatever. And so we just assigned … ok*

…you're it (laughs) and that was it. It was kind of a group decision it's not that he wanted it it's just ok your snowmobiles kind of in the front so you're the one. So it's kind of a give and take there a little bit, I don't know if we'd had to spend the night out there what it would have been like but anyway.

The quote by the participant above describes how in his or her group there is no one person who is the leader. The group relies on group decision-making until it is ineffective and a leader needs to be appointed so a decision can be made.

5.4.5.3 Riding with Club Members

Interview results indicate that snowmobile clubs also have an interesting dynamic when it comes to leadership and decision-making. Participants who were members of snowmobiling clubs identified that there was not one main leader on club rides and that group decision-making was essential. The snowmobiling club participants discussed that several of the more experienced club members took leadership roles in leading group rides and decision-making.

R13C - There's usually 6 or 7 key people that have a pretty good idea where things are…so we'll defer to them until we ourselves feel comfortable. I, myself, last year for example have taken a few rides in simpler areas like Cataract, in the Kananaskis Country where we have Cataract and Etherington as staging points … I've led rides, I've had others lead rides, so again a lot of it comes back to skill and knowledge of the area.

Being part of a snowmobiling club allows people to learn from more experienced members. Less experienced snowmobilers can defer to these more experienced snowmobilers to be the primary decision makers. However, even with the presence of leaders, the participant below describes how an open dialogue where group members can

express their concerns and everyone has input on what course of action should be taken is still critical.

> *R17C - We all make decisions together um it's a pretty open dialogue that we have… every different… everyday someone feels something different and everyone has a different feeling about the day and you kind of have to go with that.*

Having an open dialogue allows individuals who may not have the experience to be considered a 'leader' have an opportunity to participate in decision-making, especially when the decision affects their own personal safety. Overall, the snowmobiling club members showed a very strong 'polarization' to safety in a group setting (Turner, 1991).

5.4.5.4 Riding with Less Experienced Riders

Most of the participants who were members of snowmobile clubs seemed to be especially sensitive to the abilities of their club members. Clubs attract people of all skill levels. Clubs can be a place where beginners can learn from more experienced members and improve their skills in a supportive environment. Some club members mentioned that they would only enter areas that the less experienced members of their group felt comfortable in. This means going into areas with less challenging terrain and a lower risk of avalanche.

> *R11C - … the philosophy of the club is we don't we don't take people in any place that they don't feel comfortable going, in other words we ride on a trip to the level of the least experienced person.*

If the snowmobiling club was taking people into areas above their comfort or skill level, this could also be a liability issue, so being aware of the skill levels of the participants in

a group ride would be very important. Ultimately, since snowmobile clubs are a place to learn and develop skills, the importance of keeping members safe was very apparent in my interviews with participants who were club members.

5.4.6 Decision Making and Heuristics

There was some evidence that heuristics influenced the choices participants made when navigating backcountry risks. Some participants had specific places where they would frequently snowmobile that they were very familiar with. This familiarity was acknowledged by these participants as a way to decrease their risk, since they believed they had the ability to manage the risk in a familiar area. One participant mentioned that he only went snowmobiling in one area and was confident that the area was safe and he did not need to consult avalanche bulletins.

> *R14NC - Uh like I say all that stuff [bulletins] is in the Lodge when you get there so it could be that could be posted in the lodge I just never noticed it I don't look at the names who've supplied it, right. If I was going out myself yes I would be looking but when we go there we don't need it.*

In this case it appears that decision-making was influenced by the familiarity heuristic, since this participant snowmobiled safely in their favourite area numerous times when a CAC avalanche bulletin was not consulted, so he felt that he could use the same decision-making process again.

The scarcity heuristic described by McCammon (2004), the tendency to take more risks when there is the chance you may lose an opportunity, was a key factor influencing a few of the participants' decisions regarding snowmobile trips. Seven out of the 17 participants in this study would continue with a trip, even when the risk was higher than they would usually be comfortable with due to new snow conditions and limited opportunities to take snowmobile trips.

Four participants acknowledged would be inclined to take more risks to take advantage of good snow conditions. As one participant described:

> *R08NC - Probably like epic snow would definitely because if your already there and it's snows like three feet over night you're going to want to ride it so that would you know be a big factor and I don't know maybe the people you're with if they're kind of pushing you to try new things or whatever that would that would maybe make me do more risky things.*

Although heuristics are used on a daily basis to make decisions, using them to make decisions while participating in backcountry snowmobiling impedes sound decision-making, since conditions in the backcountry are constantly changing, so relying on past decision can be dangerous.

5.4.7 Motivations to Snowmobile

Although the motivation behind why participants participated in backcountry snowmobiling differed, a common theme was the experience of being in a place that was far removed from the normal urban environment. Participants described the inspiring scenery as a motivation for why they snowmobile in the mountains. As one participate stated:

> *R06C - For the most part I just enjoy getting away and enjoy the scenery and I find it almost a religious experience when you get on top of a mountain and you can see for about 50 miles around you so, quite breath-taking*

Relating risk-taking as a spiritual experience is not unique in research on risk sports (Creyer, Ross and Evers, 2003; Celsi, Rose and Leigh, 1993; Lyng, 1990). Lyng (1990) in his study found 'self-realization' as a goal of some parachute jumpers.

Another participant valued the uniqueness of his experiences, describing how he is one of the few people who have been able to see what he has seen.

> *R09C - 99% of the population will never be to the places I've been to, they will never see the things that I've seen nor do the things that I've done and it is just spectacular it's just an adrenaline rush. It is something to be sitting on top of a continental divide being able to see from Yellowstone Park to the Yukon territories with no obstruction above the clouds, it's great exercise physically demanding and just great time with friends with the same passion.*

Interestingly, the participant above describes the 'adrenaline rush' as a motivation, but not in the usual risk-taking context. The participant describes the view and his surroundings as an adrenaline rush. This is contrary to previous research that links adrenaline rush to the being on the verge of being in control and out of control (Lyng, 1990).

Motivations can affect what kind of risk is tolerable. In this study, the majority of the participants' motivations to snowmobile to experience nature, see scenic views, and in order to spend time with family and friends seemed to lead to more conservative risk decisions.

5.5 Chapter Summary

This chapter described the findings of this research. The aim of the research was to identify how snowmobilers' risk perception of avalanches affects information seeking, preparedness behaviours and decision-making in relation to backcountry recreation. The research found that similar to other risk research, the participants of this study believed they were less at risk of being involved in an avalanche than other backcountry snowmobilers. However, even though the participants saw themselves less at risk than others, all participants stated that they carried the appropriate equipment to perform an avalanche rescue. Furthermore, most interview participants took measures to gather

information about the avalanche and snowpack conditions before entering the backcountry. The findings that more than half of the participants had taken a formal avalanche course were unanticipated due to previous research on snowmobilers, which found snowmobilers were less likely to take a course (Haegeli, Haider, Longland & Beardmore, 2010). Although participants spoke about the ways that they reduced risks, many would not cancel a trip due to high-risk conditions. Instead participants chose to continue with a trip, either altering their behaviour to take less risks or changing locations that were perceived as lower risk. Ultimately, one of the most influential factors that led to conservative decision-making was group dynamics. Positive peer pressure was very successful in promoting avalanche course participation, preparedness, and limiting risky behaviour. However the influence of heuristics such as scarcity seemed to promote risky behaviour.

6.0 Conclusion

Using in-depth, semi structured interviews this research examined (1) how avalanche related risk perceptions influences backcountry snowmobiling behavior, (2) the extent participants sought avalanche and backcountry risk information (3) preparedness measures taken for backcountry trips, and (4) how participants made decisions regarding trip planning. In total, 17 people who snowmobiled in the backcountry were interviewed, including both snowmobiling club members and non-club members. The data was analyzed thematically and compared with previous research on preparedness, voluntary risk taking, and backcountry recreation. The chapter will discuss the major findings, contributions to the research, and suggestions for future research and recommendations for promoting safe backcountry behaviour.

6.1 Research Implications

6.1.1 Risk Perception

A main theoretical contribution of this research was to add to the small amount of research on the interaction between voluntary risks and preparedness. This research (1) examined the dynamics between risk perception and voluntary risk taking (2) identified backcountry snowmobilers' perceptions of avalanche risk, and (3) explored how risk perception of voluntary risks can affect information seeking behaviour, and decision-making regarding snowmobiling actions.

A main finding of this research is although all of the participants were aware of the risks associated with backcountry recreation and viewed avalanches as a serious risk, many still believed they were less at risk than other backcountry snowmobilers. This finding indicates a potential optimistic bias. The optimistic bias has been noticed in other voluntary risk taking research (Moen & Rundmo, 2005; Trumbo, Lueck, Marlatt, & Peek, 2011; Weinstein, Marcus & Moser, 2005; Rutter, Quine & Albery, 1998; Middleton, Harris, & Surman, 1996) and has been tied to perceived controllability, where people feel

they are less at risk because they are more capable of controlling the risk than others (Klein and Kunda, 1994). Since many participants did not believe they were as vulnerable to avalanches compared to other snowmobilers, it is important to educate people on the optimistic bias. Avalanche incidents are not only a result of high-marking, and it is particularly important for backcountry snowmobilers to be aware of the changing snow conditions due the large amount of terrain they are able to cover in a limited time. However, minimizing the optimistic bias so that people's perception of their ability to manage the risk is comparable to their actual ability to manage those risks can be difficult (Moen & Rundmo, 2005).

Activities such as high-marking and continuing with trips during extreme avalanche risk can increase vulnerability to risks even when a person has the proper equipment and education. More research is needed to identify the consequences of unrealistic optimism and develop strategies to reduce this bias.

6.1.2 Risk Perception and information seeking

Although most participants believed they were less at risk of being involved in a fatal avalanche than other snowmobilers, everyone acknowledged there were risks involved with snowmobiling in the mountains. This awareness of the risks could have contributed to the high level of information seeking and participation in avalanche skill training courses. Critical awareness of a hazard, risk perception, and hazard anxiety are the three factors that seemed to encourage the participants of this study to be motivated to prepare for avalanche risks in the backcountry. This supports Paton's social and cognitive preparation model (2003). However, although there was evidence that perceived responsibility, response efficacy, and normative factors encouraged preparedness and timing of the hazard were not observed as factors that link intentions to preparedness. This may be due to the difference between non-voluntary and voluntary risks.

6.1.3 Risk Perception and Preparedness

The participants of this study all stated that they carried the gear identified as essential by the Canadian Avalanche Centre - shovel, probe, and transceiver. It was observed that both club member and non-club members used positive peer pressure to insure all the members of the group were prepared. However, the importance of group preparedness was more salient in the discussion with snowmobiling club members than non-club members.

Most of the participants acknowledged that these pieces of equipment are necessary for rescuing a person buried by an avalanche and it was up to them and their group members to perform the rescue. This supports Paton's model (2003), which theorizes that even if people perceive a hazard as risky and intend to adopt protective behaviour, factors that link the two, such as perceived responsibility, is still needed for people to actually prepare. The fact that the participants carried this equipment, even when believing their risk is lower than other snowmobilers is interesting. This finding contrasts Silverton, McIntosh & Kim's (2009) findings where snowmobilers and those who snowshoe were found to be less likely than other backcountry users to carry protective equipment. Silverton, McIntosh & Kim's (2009) study used a survey, therefore the difference in findings could be explained by assuming those who are well prepared are more likely to participate in an interview.

6.1.4 Decision-Making

The finding that group dynamics played a significant role in encouraging conservative decision-making by promoting participation in avalanche courses, preparedness, and limiting risky behavior has important implications for future research and avalanche awareness campaigns. Participants in this study demonstrated how they utilized positive peer pressure to both limit risky behaviours within their group and encourage their group members to carry the essential avalanche equipment. Group

dynamics were a way that participants could gain some control over backcountry avalanche risks. By making sure their group members were capable of preforming a rescue they protected themselves. This included testing their members on their knowledge and use of avalanche equipment.

Snowmobiling club members successfully demonstrated positive peer pressure by promoting avalanche skill training courses (AST) and encouraging their club members to adhere to the preparedness expectations of the group. Humans are social beings and the finding in this research that people's actions are highly influenced by others is important. Avalanche awareness campaigns that focus on individual behaviour will likely only be moderately successful. To be successful in promoting safe behaviour will involve understand group behaviour and influences.

This study supported previous research by McCammon (2004) on the influence of backcountry recreation and the use of heuristics. The scarcity heuristic, as explained by McCammon (2004), describes how people will take more risks to take advantage of good snow conditions. The participants acknowledged that it was difficult to cancel a trip when the snow conditions were good even if the risk was high. This was also true of the participants who had limited opportunities to take snowmobiling trips. The scarcity heuristic therefore was encouraging participants to go snowmobiling even if the risk was identified as being high. The difficulty in cancelling a trip is also likely due to the time and money invested into trip planning. After putting all the effort into planning a trip, it would be difficult to make the decision to cancel. Future research could involve identifying how to diminish the tendency for people to make a quick decision based on the possibility of losing out on a good experience. This would involve researching other factors that influence how decisions are made, especially conservative risk choices.

6.1.5 Risk perception and motivation partake in voluntary risk taking

The motivations behind backcountry snowmobiling of the participants in this study seemed to center around enjoying scenic views and spending time with friends and family. This is different from previous research that found a link between voluntary risk taking and the need for an adrenaline rush (Lyng, 1990). The motivation to experience

nature and spending time with family and friends seemed to lead to more conservative risk decisions, such as being prepared and when the avalanche risk was high, snowmobiling in areas that they perceived to be safer, that is currently not included in Paton's (2003) preparedness model. The motivations to participate in backcountry snowmobiling identified in this study are a new factor that appears to encourage people to prepare. Future research, including a larger sample of interviews or survey, could expand on this study to explore the different motivations snowmobilers' have for snowmobiling in the mountains where avalanche risks are present.

6.1.6 Methodological Implications

This study used a combination of telephone and in-person interviews. This allowed a comparison between these two interview methods. The results of this study support previous research that found little difference in the quality of data between phone and in-person interviews (Aneshensel, Frerichs, Clark & Yokopenic 1982; Tausig, & Freeman, 1988). Although the phone interviews tended to be shorter than the in-person interviews, a similar high quality of data was obtained. Phone interviews also likely allowed participants who did not have time to meet in person to participate in the study. Phone interviews also allowed more flexibility, permitting me to reach participants from all over Alberta in a short period of time. Only residents of Alberta were selected for this study because it was believed that they would have different experiences regarding planning trips to the mountains as well as cancelling trips due to the greater distance Albertans generally had to travel to get to the mountains.

6.2 Study Limitations

The primary limitation to this study was difficulty in recruiting participants. I was notified at the beginning of my recruitment stage that it might be difficult to recruit participants because of snowmobilers' reluctance to talk with media reporters or the perception that they may be portrayed in a negative light by the study. To try and mitigate this I attempted to emphasize that my project was a master's thesis and that it was not my aim to portray mountain snowmobiling in a negative light.

Even by highlighting these aspects of my research, locating research participants was difficult at times. To address this issue, multiple snowmobiling clubs were contacted and the methodology was adapted to include snowball sampling. The timeline projected at the beginning of the study to conduct the interviews was also extended in the attempt to gather more participants. Since snowball sampled was used and therefore may have contributed to homogeneity within the sample.

6.3 Future Research

Future research is needed in three areas. First, there is a need to complete further research in this area with a larger sample of participants, which would capture more diverse snowmobiling groups and include more of the high-risk takers in the snowmobiling community. Increasing the amount of interviews with the high-risk populations would be helpful in understanding what motivates preparedness and what discourages it in this high-risk group. Second, future research should seek to identify how risk perceptions and behaviour changes with more snowmobiling experience and greater levels of education. A comparative study of how risk perceptions and protective behaviour change after taking an avalanche skill testing course or by contrasting those with experience versus those without experience. This would help to further understand what influences protective behavior and how decision-making changes with increased levels of education and experience. Thirdly, future research needs to examine the usefulness of group dynamics and peer pressure to promote safety. This would include identifying what promotes positive peer pressure and what factors promote negative peer pressure. In this research, group dynamics was one of the main factors to promote safe behaviour, and more research is needed to identify whether group dynamics can encourage safety in other backcountry snowmobiling populations.

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6.4 Recommendations

The results of this study can provide useful information for the Canadian Avalanche Centre and other organizations aiming to help reduce avalanche fatalities amongst backcountry snowmobilers. The first recommendation is to provide as much information as possible to current and future snowmobilers. One avenue that is not being used to its capacity is the news media. If news media took a less critical view on mountain snowmobiling, then they could take a more proactive role in promoting awareness and prevention, which may in turn enhance their credibility as an information source by the snowmobiling community. It was brought up by several of participants that the media sensationalized backcountry snowmobile fatalities. This caused a lack of trust of the information provided by news media. The media can provide lessons learned from avalanche incidents in an attempt to highlight human error in a constructive way to help snowmobilers to learn from others' mistakes. Nevertheless, it should not be assumed that more information will lead to increased self-protective behaviours (Powel, 2007; Paton, 2003).

A second recommendation is to utilize this study's findings on the usefulness of positive peer pressure in education programs such as avalanche training courses and informal training within snowmobiling groups. As demonstrated, positive peer pressure can be used to promote education, preparedness, and conservative decision-making. In this study snowmobiling club members were the main group who utilized positive peer pressure to encourage members to take avalanche courses and be prepared. Therefore encouraging people to get involved with snowmobiling groups or clubs could be a way to increase participation in avalanche courses, along with carrying the essential equipment as recommended by the CAC.

A third and arguably the toughest recommendation, is identifying ways to reduce the optimistic bias and perceived controllability. Meon and Rundmo (2005) suggested that realistic training is a solution to unrealistic optimism. The field component in the avalanche skill training course could give people the realistic training to reduce this bias. Therefore it is recommended that the avalanche skill training courses continue to utilize

field training and emphasize the vulnerabilities, such as being involved in an avalanche that all backcountry recreationalists face.

Lastly, a couple of participants indicated that carrying extra equipment, such as an Avalung or avalanche bag, might encourage them to take more risks. These pieces of equipment are recommended by the CAC because they have been proven to be effective in improving survival during an avalanche using empirical and independent research (Canadian Avalanche Centre, n.d.). Therefore it is important to find a way to encourage the use of extra equipment without the side effect of potentially encouraging people to take extra risks.

6.5 Recommendations by participants

To conclude the interviews, participants were asked if they recommended any improvements to increase the effectiveness of avalanche information. Many participants were content with the amount of information that was available and satisfied with the information provided by the Canadian Avalanche Centre (CAC). Others expressed that CAC did an excellent job with the funds that were available to them but noted that with more funding they would be able to provide more services. The first recommendation was better mapping of avalanche hazard zones. There was a call for more maps that indicate the high avalanche zones for popular areas within Alberta and British Colombia. It was also requested that these maps be readily available to the public on the Internet.

A second recommendation by the participants was for the CAC to create bulletins for more specific areas. Some participants said that the area the bulletins covered were too large and did not effectively describe the hazard in a particular area. However it was acknowledged that barriers, such as funding and other resources, made creating a more specific bulletin difficult. Similar to this, some participants wanted to see more signs indicating the risk for the day at the staging areas. However, the results of this study indicate that these signs may not dissuade people from entering an area if it was labeled as high-risk, only possibly heighten their awareness of the risk and act accordingly by snowmobiling in areas they perceived as safe and limiting activities that increased their risk of being involved in an avalanche.

A third recommendation from the participants was to increase snowmobiling safety awareness. Two participants wanted to see the snowmobile dealerships play a stronger role in promoting avalanche courses and safety when selling snowmobiles. Other participants wanted to see the media help promote snowmobiling avalanche safety through a media campaign that highlighted education and preparedness, as well as to increase avalanche awareness in schools.

One participant recommended lower prices for safety equipment and courses. This participant indicated it was hard to spend money for the few times they travel into the backcountry and indicated that lower costs would encourage them to take courses and purchase additional safety equipment.

6.6 Concluding Remarks

If current trends continue, participation in backcountry snowmobiling will continue to rise. With this increase comes the risk that avalanche related fatalities will increase as well. The first step in attempting to decrease avalanche related fatalities is to try to understand how people make decisions, as well as how these decisions are influenced by different situations and other snowmobilers.

This is an important area of research since a person's actions not only negatively affect them, but their group members, other backcountry recreationalists, as well as the groups that are responsible for performing rescues or recoveries. Those who enter the backcountry must be aware of the danger they are putting themselves in, as well as others around them.

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Appendix

Appendix 1 - April Newsletter Calgary Snowmobile Club

Hello Calgary Snowmobile members,

My name is Jennifer Baker. I am a master's student at the University of Alberta studying in the field of human dimensions of environmental hazards in the department of Earth and Atmospheric Sciences. For my master's research, I would like to learn about mountain snowmobilers' views about avalanche risks, and what they do to prepare before going mountain snowmobiling. For my study, I hope to interview members of the Calgary Snowmobile club members who snowmobile in mountain areas. If you are interested in participating in an interview, or if you would like more information about my project, please contact me by phone at (780) 722-0771 or by email: jab13@ualberta.ca.

Appendix 2 - Club Member Email Letter

Dear _____,

My name is Jennifer Baker and I am a graduate student at the University of Alberta in Earth and Atmospheric Sciences. I am currently designing a study on risk perception and decision-making in regards to backcountry snowmobilers' knowledge of avalanche risks and safety measures. The goal of this study is to identify where snowmobilers get their information from and what decisions they make with this information when planning a trip to the backcountry.

For this study I plan to conduct semi-structured interviews with active backcountry snowmobilers. I order to obtain a varied sample I was wondering if you would be able to assist me in recruiting participants to interview. I am looking to interview approximately 10-15 men or women over the age of 18 in your area.

My goal is to support sound decision making by strengthening the ways people acquire risk information. By understanding how people educate themselves could strengthen risk communication in the future to hopefully reduce the average number of backcountry avalanche fatalities.

I would appreciate any support you can provide.

Thank you.

Sincerely,
Jennifer Baker

Appendix 3 – Information Sheet

UNIVERSITY OF ALBERTA
Earth and Atmospheric Sciences
Faculty of Science

1-26 Earth Sciences Building
Edmonton, Alberta, Canada T6G 2E3
www.ualberta.ca/eas
eas.enquiries@ualberta.ca
Tel: 780.492.3265
Fax: 780.492.2030

University of Alberta Backcountry Snowmobiling Study Information Sheet

My name is Jennifer Baker. I am a master's student at the University of Alberta studying in the field of human dimensions of environmental hazards in the department of Earth and Atmospheric Sciences. This study aims to understand snowmobilers' decision-making and information seeking when planning a trip to the mountains, as well as their perception of avalanche risk. To accomplish this you have been asked to participate in an interview.

The interview is anticipated to last approximately 20-60 minutes and may be completed in your home or by phone. With your permission the interview will be audiotape recorded and all information you provide in the interview will be kept confidential. The names of the interview participants will not be recorded on the interview tape or the transcribed interview notes. The transcribed interview notes will be analyzed and summarized and presented in a final report in the form of a thesis. Any direct quotes will be given codes instead of names and any identifying information will be removed. All interview transcripts and tapes will be kept in a secure locked filing cabinet at the University of Alberta. Only the researchers will have access to the data. The results of the study will be presented in the form of a thesis report, conferences, published in an academic journal, and a summary presented to snowmobiling clubs.

Your participation in this study is voluntary and you are free to provide as much or as little information as you wish. You may withdraw your participation at any time during the data collection phase of the project. If you wish to withdraw your participation we will not use any of the information you provided to us. When the interview is transcript is transcribed you can ask to receive a copy to confirm, clarify, or remove any of the content.

If you have any further questions, feel free to contact either of the researchers below.

Jennifer Baker, Masters Student, University of Alberta
Email: jab13@ualberta.ca Phone (780) 722-0771

Dr. Tara McGee, Associate Professor, University of Alberta
Email: tmcgee@ualberta.ca Phone (780) 492-3042

Appendix 4 – Informed Consent Form

UNIVERSITY OF ALBERTA
Earth and Atmospheric Sciences
Faculty of Science
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Edmonton, Alberta, Canada T6G 2E3
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Fax: 780.492.2030

Informed Consent

Research Project: Backcountry snowmobilers' risk perceptions, avalanche related information seeking behaviours, and decision-making process when dealing with avalanches and backcountry risk

Investigators:

Jennifer Baker, Masters Student, Department of Earth and Atmospheric Sciences, University of Alberta, (780) 722-0771, email jab13@ualberta.ca

Dr. Tara McGee, Supervisor, Department of Earth and Atmospheric Sciences , University of Alberta, (780) 492-3042, email tmcgee@ualberta.ca

	Yes	No
Do you consent to being audiotaped?		
Do you understand that you have been asked to participate in a research study?		
Have you read and received a copy of the introduction letter?		
Have you had an opportunity to ask questions to discuss this study?		
Do you understand that you can withdraw from participation in this project at any time before the data is analyzed?		
Has confidentiality been explained to you?		
Do you understand who will have access to the information that you provide?		
Do you understand what the information you say will be used for?		

I agree to take part in this study:

This study was explained to me by _____

Printed name of research participant _____

Signature of participant _____

Date: _____

Printed name of researcher_____

Signature or researcher _____

Date _____

Appendix 5 - Interview Guide

Backcountry Snowmobiling Interview Guide

Background Information

How many years have you been mountain snowmobiling?

How many times a year do you mountain snowmobile?

Do you do any other backcountry recreation?

How knowledgeable would you say you are about mountain snowmobiling? Range: Beginner, Average, Experienced, Expert

What size of group do you usually travel with?

How did you start snowmobiling?
-Snowmobiling in the mountains?

Risk Perception

Can you explain some of the backcountry risks you would experience on a trip into the mountains?

Are you concerned about being involved in an avalanche?

What is the avalanche risk in the areas that you snowmobile in?

(Do you Usually stay to the same areas, or so to different ones?)
(If same… do you do an assessment each time or feel you know the area
Do you do more of an assessment on a new area then a one your comfortable in?

What do you think your risk of being involved in an avalanche is?
(Compared to others)

Do the people you travel with have the same view of avalanche risk?

How would you describe your confidence in surviving an avalanche?
(Performing a rescue for another rider?)

What factors could increase your likelihood of taking more risks while on the mountain?
Prompts: Snow Conditions, no commitments, etc.

Can you think of anything that could make you to take fewer risks when travelling to the backcountry?

Prompts: Family, job, etc.

Which activity do you find more dangerous? (Vs. snowmobiling in the mountain)

- Driving
- Impact/collision with object while snowmobiling
- Quading
- Skydiving
- Backcountry skiing
- Mountain climbing

Information Seeking

What have you done to educate yourself on Backcountry Risks?

Do you look for information about avalanche safety before going backcountry snowmobiling?

Prompts:
(If yes, where do you look for information?)
(How useful was the information that you obtained?)
(How trustworthy is the information?)

What type of educational sources have you used to become informed about the risks of backcountry snowmobiling?

Have you ever looked for more detailed information about avalanche safety, such as the CAC's online or field based training courses?

Prompt: How useful was the information that you obtained?

Do you have easy access to Backcountry risk information?

Are there any barriers to accessing backcountry risk information?

Prompt: What types of problems did you experience when searching for avalanche information?

In general, do you find there is good information available about snowmobile specific risks? (Why/why not?)

Is the information available relevant to snowmobilers?

Have you ever heard of the Public Avalanche danger scale or the Backcountry Avalanche Advisory (BBA)?

Are you aware that there is a new Avalanche Danger Scale rating system?

Do you look for avalanche related information from the news media (such as television, newspaper and radio)?

Prompts: Do you consider media (such as television, newspaper, and radio) a credible source for backcountry avalanche information?

After reading or listening to a media report do you feel you have learned something about avalanche safety?

Preparedness

What precautions do you take to minimize your avalanche risk?

Avalanche Safety Tools	**Has Tool**	**Uses Tool (Always. Sometimes, Occasionally, Never)**
Shovel		
Transceiver		
Probe		
Beacons		
Helmet		
RECCO		

Which of these tools do you feel are most important?
Why/Why not?

Do you feel that any of these tools are not useful?
Why?

Do the people you ride with use the same tools?

Is there anything that makes it difficult for you to carry these tools with you?

Do you expect your group to be equally equipped?

Decision-Making

Can you explain how you plan a trip?

Do you consult any resources?

Do you consult an avalanche forecast or bulletin before going into the backcountry?

What aspects of an avalanche forecast or bulletin do you pay special attention to?

Is there certain conditions that you think put you more at risk?

Why might you cancel a trip to the backcountry?
Explain your decision.

At what Danger Level rating would you plan an impromptu trip to the backcountry?
Explain your decision.

At what danger rating would you cancel a trip to the backcountry?
(Show Avalanche Danger Scale)

Would this change if the trip was pre-planned?

Would you cancel a trip if conditions appeared to be unsafe in the area you plan to occupy?

Have you ever felt pressured into a backcountry trip by people in your group who wanted to continue with the trip when you thought it was unsafe?

Do you make a lot of the decisions yourself? Or do you follow the decisions of the group?

What is one of the biggest mistakes you see people doing while on the mountain?

The death tolls for snowmobilers have been quite high compared to other types of backcountry recreation in the past few years, why do you think this is the case?

Concluding Remarks

Can you describe why you go backcountry snowmobiling?
(Feelings, experiences etc.)

Do you recommend any improvements to increase the effectiveness of avalanche information?

Would you use a smartphone application specific to snowmobilers?

Do you have anything you want to add?

Appendix 6 - Coding Framework

Risk/Risk Perception

- Risk
    - Snowmobile Specific
    - Risk Conditions
    - Risk Comparison
    - Personal Risk
    - Controllable/Uncontrollable
    - Confidence
    - Attenuate
    - Amplify

- Preparedness
    - Trip Planning
    - Extra Tools
    - Equipment

- Decision Making
    - Types of Riding
    - Cancellations
    - Areas

- Information Sources
    - Trust & Credibility
    - Information Seeking
    - Informal Education
    - Formal Education
    - Access
- Group Dynamics
    - Peer Pressure
    - Leadership

- Recommendations

- Stigma

- Others

- Motivations

- Media