

BACKCOUNTRY GATE SURVEY PROGRAM AT JACKSON HOLE MOUNTAIN RESORT CATALYZES CONVERSATIONS ON HUMAN FACTORS OF RISK MANAGEMENT AND AVALANCHE EDUCATION

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ABSTRACT: The Teton County Search and Rescue (TCSAR) Foundation's backcountry gate survey program in Jackson, Wyoming (WY) is a unique initiative for North America that has been operational for a decade, accumulating extensive data on nearly 2,000 backcountry skiers and snowboarders since its inception in 2013. This program provides valuable insights into user preparedness, behavior and risk management practices in Jackson Hole Mountain Resort's (JHMR) lift-accessed backcountry terrain, where TCSAR's volunteer team is responsible for avalanche and trauma-related incident response. The data collected by volunteer surveyors is instrumental for Backcountry Zero, TCSAR Foundation's education and community outreach arm, aimed at backcountry incident and fatality prevention. While it is impossible to know exactly how many people enter the Teton backcountry every year, volunteer surveyors have enhanced the ability for avalanche forecasters, educators and first responders to understand who is accessing avalanche terrain and the tools they leverage to do so safely. This winter, data collected on 246 distinct parties at JHMR's backcountry gates revealed significant trends in avalanche education, risk tolerance and preparedness that will inform the future of incident response, resort messaging and educational outreach initiatives.

KEYWORDS: Avalanche education; backcountry gate; grassroots initiative; volunteer program; human factors.

1. INTRODUCTION

Backcountry access in Jackson Hole, WY inspires skiers and riders from around the world to flock towards the Tetons every winter in search of unscathed powder, technical lines, and majestic mountain views. One of Jackson's biggest allures is the backcountry terrain at Jackson Hole Mountain Resort (JHMR), which boasts six lift-access gates that serve as a portal from avalanche controlled slopes to 'challenge by choice' terrain where lift ticket liability waivers and mountain ski patrol are no longer obligated to protect its patrons. Such terrain has contributed to 56¹ avalanche or trauma-related Teton County Search and Rescue (TCSAR) callouts between November 2019 and May 2024.

A number that is harder to know: how many people left these gates in the first place, and even more illusive is how many people left the gates without the right tools or decision making, but just got lucky.

Backcountry Zero's backcountry gate survey program, a grassroots education initiative started in 2013 by the TCSAR Foundation, aims to

illuminate not only how many folks leave the gates, but the demographic makeup and preparedness of those choosing to do so. Like research suggests (Ziesler and Pettebone, 2018) monitoring backcountry access typically requires volunteers willing to endure long days standing at trailheads, counting and administering surveys. Since winter 2013-2014, over 100 community volunteers have contributed time to this Backcountry Zero effort, hunkering down at JHMR's gates with a simple ten question survey designed to help avalanche forecasters, educators and first responders alike understand the behavior of those exiting the resort boundary.

Questions they pose are meant to be as objective as possible, seeking honesty instead of inducing shame, and offer direction towards more information while withholding opinions, suggestions, or judgment, even if solicited.

Although we do not know how many folks leave the gates each winter, and have even less information about those who venture into non-lift-access backcountry terrain, our survey program simultaneously enables us to better understand the types of people who are motivated to explore

¹ This does not include the incidents managed by JHMR ski patrol or the Grand Teton National Park Ranger team

avalanche terrain and identify the gaps in community education that contribute to local and regional winter incidents and fatalities.

2. METHODS

To conduct this data collection process, TCSAR Foundation leveraged an existing volunteer network of local 'Backcountry Zero Ambassadors' who were willing to spend at least twenty hours across the 2023-2024 winter at JHMR's backcountry gates. This group of twelve volunteers has been built slowly over the course of this program's tenure and illustrates the importance of fair compensation or incentive as a mechanism for driving voluntary commitment (Mao et al., 2013). For their service, each volunteer gets a free jacket and gloves (\$560 in value) in addition to their free lift tickets (\$191 per day in value) thanks to in-kind donations from supporting local business partners Stio, Flylow and JHMR, respectively.

While the volunteer selection process requires no application, we do seek surveyors who are committed to the mission and privy to the ethics of data collection. Additionally, surveyors with a personal tie to backcountry recreation, safety and access have been found to be the most effective in engaging skiers and riders to not only take the surveys, but answer them honestly.

Despite surveyors receiving perks, which can help the commitment feel more accessible, the majority of surveyors report doing it because it is important work. They appreciate being part of an initiative that is catalyzing reflection, mentorship and preparedness in the mountains. And in many circumstances, they get to see the impact of their presence and non-judgemental questions before their eyes.

Brian Bales, one of the 2023-2024 volunteer surveyors, reported that, "A lot of people don't proceed through the gates when they see us. They either didn't realize what equipment and training they needed to exit the gates safely, or having a final touchpoint of accountability made them think twice about the forecast, their experience, or the terrain they were choosing to enter. When that happens, I remember why I'm doing this work."

Every year, surveyors receive training from TCSAR Foundation's Preventative Search and Rescue Manager on best practices for survey administration. This training includes, among other suggestions, careful coaching of volunteers to not offer advice directing skiers and riders towards specific terrain or forecast interpretation, but rather encouraging them to use existing resources (ie. the Bridger Teton Avalanche Center's daily forecast, JHMR's beacon practice park, local rental shops for avalanche rescue gear, etc.) (Winder et al., 2023). They are also oriented to cultural factors, such as unconscious bias trends, shaming tendencies, and gender identity assumptions to consider as they are surveying to ensure their data is as accurate as possible and the TCSAR brand is well represented.

Our surveys, which ask ten questions² about party size, place of residence, gear, avalanche education and backcountry competence, are either given to users to complete themselves on a smartphone or completed by the surveyor (this decision is dictated by user preference). At the end of volunteers' shift, they ensure all data has been uploaded to the survey database and occasionally offer anecdotes and project testimonials to supplement data.

3. RESULTS

Up to 53 factors have been identified for decision making in avalanche terrain. This number makes human factors and heuristic traps a robust yet complicated matter for even experts to understand (Landrø, Hetland et al., 2019; Landrø, Pfuhl et al., 2019).

"I commonly see folks feeling shy, ashamed, or guarded when asked the question about their avalanche education level, especially if it's none, after disclosing where they plan to ski that day," says surveyor Brian Bales. "Lots of folks without any education don't like answering the question, or feel the need to defend their decisions with their years of local experience, time with educated partners, or that they read the conditions were 'safe or moderate today.' Overall the interactions I have generally provide some good thoughts for people that should really consider their decisions for the day. That I believe to be a positive even if it's providing an

² Questions are asked of each party, not of each individual in the party.

uncomfortable moment of reflection for the skier or rider.”

Over the course of the 2023-2024 winter season, Backcountry Zero Ambassadors like Brian collected surveys from 246 ski and snowboard parties leaving the resort boundaries to attempt tackling, and learning from, this human factor and heuristic trap challenge.

Of the parties surveyed this year, 75.95% consulted the avalanche forecast before exiting the gates, 23.8% exited solo (Figure 1), 62.18% were over 31-years-old, 77.54% rated their competence in avalanche terrain as expert or professional, 95% of groups had at least one male, and 71.59% of users had a Rec Level I avalanche certification or higher.

Analysis of the data revealed intriguing patterns: Backcountry exit rates were highest during ‘considerable’ avalanche conditions and lowest when the rating was ‘high.’ 80% of 18-42-year-olds, 26% of 35+ year-olds, and 20% of 25-35-year-olds did not consult the avalanche bulletin before exiting the gates. It also illuminated the reality of harder to measure concepts like the expert halo, shame and ego – how many of these surveyees inflated their preparedness, education and terrain familiarity while answering the survey so as to not be perceived as stupid, weak or inexperienced? And can we sufficiently detect and track such misinformation? Better yet, can we connect avalanche incidents and fatalities to something more human than snow?

“Accidents are unfortunate incidents that happen unexpectedly and unintentionally. They are, however, not random or unexplainable. The ultimate cause of an avalanche accident is failure of the snowpack and subsequent burial and/or injury or death. The precipitating factor that led to the failure, is that a person or group was in a position of risk with respect to avalanche hazard. Indeed, most avalanche accidents are ‘victim-triggered’ suggesting that some miscalculation preceded the event. Thus, the miscalculation is often due to a failure of decision processes that do not make full use of the victim’s informational assets.” (Johnson et al., 2020)

Uncovering the themes that exist within the aforementioned data proved challenging, predominantly because of the grassroots, low

capacity nature of this project. The limited resources available to the team³ meant that the survey writing and data synthesis components were kept simple. As elucidated in the Discussion, we learned retroactively that the survey’s design (question wording and answer options) could have been strengthened to offer more compelling and statistically significant correlations.

Yet, the data does tell some important stories that at least offer a new list of questions we want to investigate in coming winters. For example, is there a statistically significant correlation between the avalanche forecast’s danger rating and the number of people consulting that forecast (Figure 2)? Do men and women have similar risk tolerances, choosing to enter avalanche terrain at kindred rates for moderate, considerable and high danger days (Figures 3 and 4)? Do the men and women in Teton County who enter backcountry terrain in fact have similar personal and professional competencies (Figures 5 and 6)? And finally, what can the behaviors of tourists and locals tell us about incident prevention and education efforts (Figures 7 and 8)?

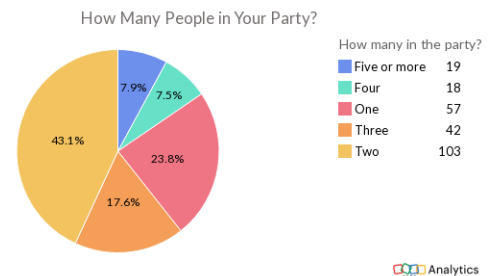


Figure 1: This chart shows the breakdown of party sizes for those exiting JHMR’s backcountry gates.

³ The Teton County Search and Rescue Foundation is a nonprofit team of six staff members, only one of whom was tasked with the oversight of this project. This research was not conducted for the purpose of a Master’s thesis or PHD

dissertation, but rather to serve as a preliminary step towards developing more statistically significant data that could one day inform behavior change and education initiatives.

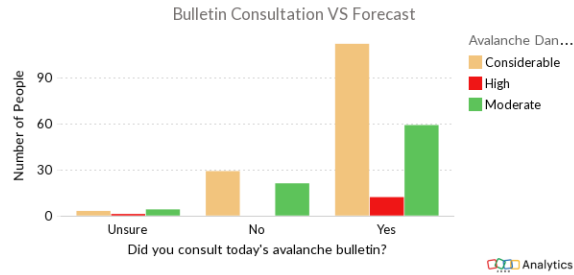


Figure 2: This graph represents the number of people who had consulted the Bridger Teton Avalanche Center's avalanche bulletin prior to exiting the gates on moderate, considerable, and high rating days.

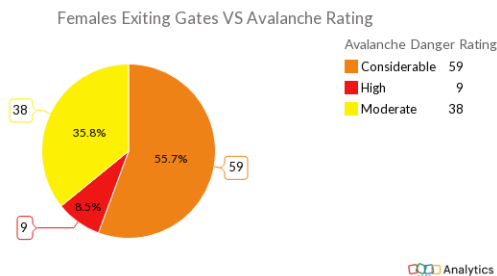


Figure 3: This graph depicts the percentage of females exiting the backcountry gates during moderate, considerable and high avalanche danger days, as posted by the Bridger Teton Avalanche Center.

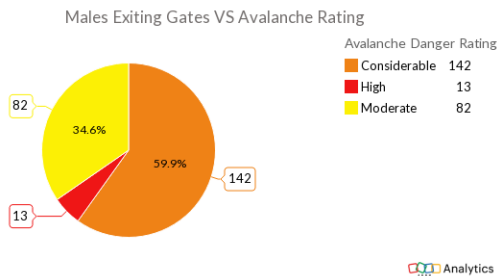


Figure 4: This graph depicts the percentage of males exiting the backcountry gates during moderate, considerable and high avalanche danger days, as posted by the Bridger Teton Avalanche Center.

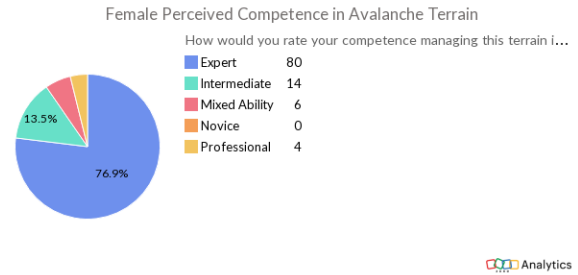


Figure 5: This chart breaks down the avalanche terrain competence levels of the women choosing to exit the backcountry gates at JHMR.

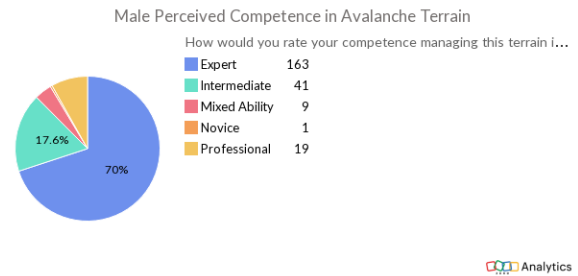


Figure 6: This chart breaks down the avalanche terrain competence levels of the men choosing to exit the backcountry gates at JHMR.

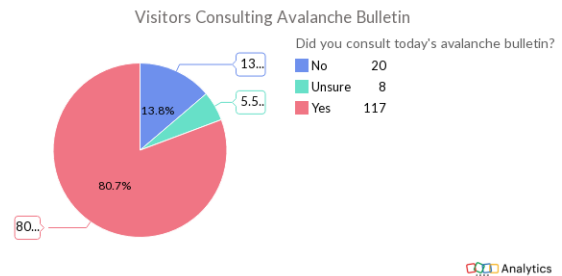


Figure 7: This chart represents the number of visitors who consulted the local avalanche forecast before exiting the gates.

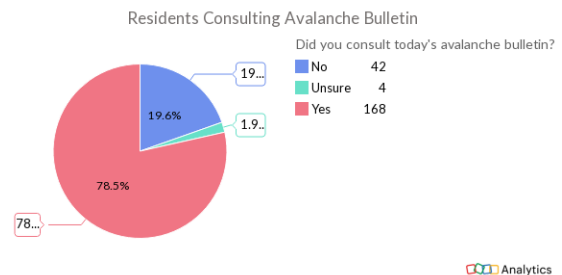


Figure 8: This chart represents the number of residents who consulted the local avalanche forecast before exiting the gates.

While the questions this data has inspired are perhaps as notable as the questions it answered, the biggest learning we are taking forward is as follows: avalanche terrain continues to be explored by enough unprepared folks to make first responders nervous. Beacon and body retrievals cannot be conducted for a solo traveler, or by rescuers unequipped with a beacon, shovel and probe, or by those without the knowledge of how to use their beacon, shovel and probe. Similarly, good judgment becomes objectively harder without consulting an avalanche forecast and can often be clouded with more than five people in a group.

The more we learn about the people entering our backcountry, and the ones our first responders rescue, the more we can create educational opportunities that address real problems, ignite real change and inspire real understanding of the ripple effects backcountry incidents and fatalities can have on a community.

4. DISCUSSION

The goals of the JHMR Backcountry Gate Survey Program incentivized us to have volunteers stationed at backcountry gates every day of the week to ensure the results would sufficiently capture user behavior across every type of avalanche forecast, time of day and day of week. We also wanted an equitable representation of each gate, as some gates access more expert terrain than others.

Unfortunately, this goal was merely aspirational. Limited by volunteer capacity, our data is heavily weighted towards weekend mornings and does not represent an even spread across all gates or avalanche conditions. Going forward, increasing the number of volunteers who can commit to a season of surveying and developing more explicit expectations for surveying parameters should help data reveal more compelling and statistically inviolable trends.

That said, this study contributes to the emerging evidence that community science initiatives can effectively support research and monitoring of recreation in avalanche terrain. In the ten years that this project has been in place, volunteers have asserted that they can in fact gather significant backcountry-use data when surveying, especially when it is combined with conversations.

"I found that when engaging with backcountry users at the gates, folks without proper

knowledge of the area, appropriate gear, or a plan became thoughtful of their decisions to continue out of bounds or not. Some continued even after our conversation politely exposed holes in their plan. And some didn't and returned to inbounds skiing." (Brian Bales)

This success is partly due to the team's development and iterative refinement of a data collection protocol that is both teachable and implementable by volunteers.

Additionally, this study aims to demonstrate how other avalanche centers and search and rescue teams might establish community science programs, integrating them with new or existing outreach and education efforts. More comprehensive and consistent national data on winter backcountry recreation could enhance the forecasting, safety response and resource advocacy of avalanche centers, first response teams and mountain resorts.

5. ACKNOWLEDGMENTS

I would like to express my gratitude to the 12 volunteers of the Backcountry Zero Survey Program who collectively committed over 100 hours to this data acquisition this winter. I also want to thank Stio and Flylow for supporting this project through their donations of high quality jackets and gloves to keep the surveyors warm and help incentivize their participation. This project would not have been possible without the generosity of Jackson Hole Mountain Resort, who supplied our surveyors with lift tickets and open access to their backcountry gates for interviews and learning!

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