

Decades of Progress

What the 2022–23 NSAA Injury Study Reveals About Safety in Snowsports

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For more than four decades, NSAA has tracked injury trends in recreational skiing and snowboarding through the 10-Year Interval Injury Study. First commissioned in 1980, the study analyzes ski patrol injury reports from participating ski areas across the U.S. to help the industry better understand how incidents occur and where safety efforts can have the greatest influence.

One of the largest ski and snowboard injury studies in the world, the first injury study was conducted at a time when many ski states were adopting inherent risk statutes that clarified the responsibilities of both ski areas and participants. NSAA saw value in supporting those conversations with credible research, providing transparent information to the public and media while establishing a baseline for tracking long-term safety trends across the industry.

Since then, the injury studies have served a dual purpose: informing the public about snowsports safety while helping ski areas identify opportunities for improved education, operational practices and guest messaging. Because the study has been conducted at regular intervals since 1980, it provides one of the longest-running datasets examining injury trends in recreational snowsports. The consistent methodology allows researchers to track how injury rates and risk factors evolve as equipment, terrain design, guest behavior and safety practices change over time.

Incident Rates Continue to Improve

The headline finding is striking: The overall incident rate declined to 2.2 incidents per 1,000 visits, representing a 39% reduction since the previous interval study, conducted in 2010–11, and continuing a steady downward trend that has been documented across decades. The authors note that this represents the largest decline in injuries recorded since the study began in 1980.

Study Reveals a Downward Trend

The snowsports industry is experiencing the largest decline in incidents recorded since the study began in 1980.

2.2
incidents
1,000
VISITS

DECLINE
in incidents

39%

Study Methodology

Dr. Irving Scher and Dr. Lenka Stepan, both biomechanical engineers with Guidance Engineering, analyzed the ski patrol incident reports with their research team. As with previous injury studies, there's a typical lag time between the season when the study is conducted and the resulting analysis, and the findings will be submitted for peer review in the *Journal of Science and Medicine in Sport*.



The analysis examined 18,980 (after applying standardized inclusion criteria) ski patrol incident reports from 32 ski areas

representing all six NSAA regions, accounting for 8,642,447 skier visits — approximately one in seven skier visits during the 2022–23 season. Notably, that particular ski season also set an all-time record for skier visits in the U.S., reaching 65.4 million.

Researchers evaluated a wide range of variables within each incident report, including:

- + Participant activity (skiing, snowboarding, other)
- + Ability level and age group
- + Terrain type and trail designation
- + Mechanism of injury (such as loss of control or collision)
- + Equipment factors, including helmet use
- + Environmental and situational conditions

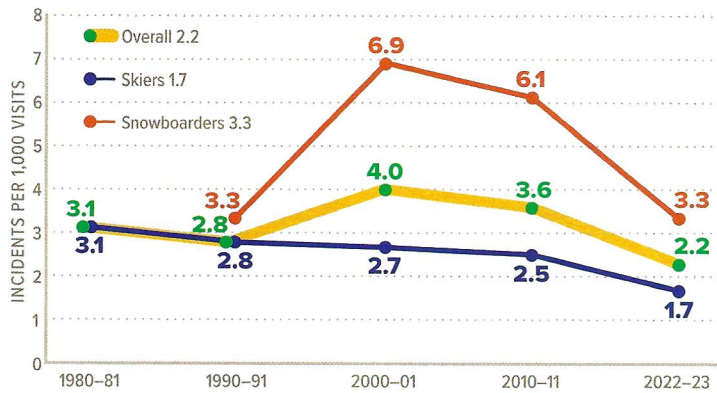
Incident rates are calculated using skier visits as the exposure measure, allowing researchers to compare injury patterns across time and different segments of participation.

While the study confirms long-term safety progress across the industry, it also sharpens the focus on future prevention efforts.

Both snowsports disciplines showed improvement:

- + Skiers: 1.7 incidents per 1,000 visits
- + Snowboarders: 3.3 incidents per 1,000 visits

Incident Rates from 1980 to 2023

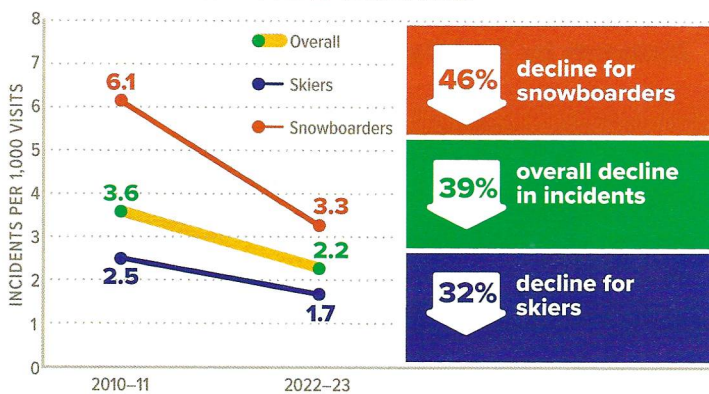


Snowboarding, which historically had significantly higher injury rates during its rapid growth in the 1990s and early 2000s, shows some of the most dramatic long-term injury reduction. Although snowboarders still experience higher incident rates than skiers, the gap has narrowed considerably over time. Those who took up snowboarding during its infancy in the 1990s are aging and may be more risk-averse as they get older.

From 2010-11 to 2022-23

- + 39% overall decline in injury incidents
- + 32% injury decline for skiers
- + 46% injury decline for snowboarders

Incident Rate Decline from 2010 to 2023



Taken together, these results represent one of the strongest long-term safety trendlines documented in the history of the interval study. The 2022-23 study also highlights important context around participation patterns.

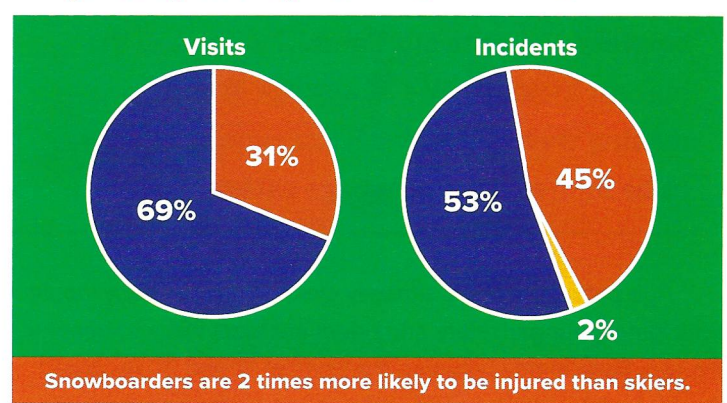
Across the participating ski areas:

- + 69% of visits were skiers
- + 31% were snowboarders

However, incident distribution shows:

- + 53% skiing
- + 45% snowboarding
- + 2% other or unknown

Injuries by Activity



This means snowboarders remain approximately twice as likely to be injured as skiers, but the disparity is far smaller than in earlier decades. The long-term trend suggests that improvements in equipment design, terrain park management, instruction and rider progression have contributed significantly to safer participation in snowboarding. But there are obvious concerns, especially the relatively high rate of snowboarders who become injured in unloading a chairlift — this will be a prime area for targeted guest education in the years to come.

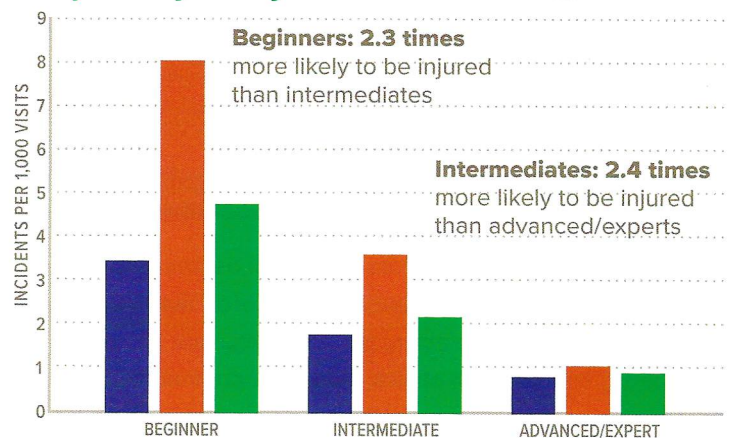
Beginners & Young Adults: Clear Prevention Priorities

Among the strongest predictors of injury risk is ability level.

The study found that:

- + Beginners are 2.3 times more likely to be injured than intermediates
- + Intermediates are 2.4 times more likely to be injured than advanced or expert participants

Injuries by Ability



These findings reinforce the importance of the early learning experience and the role that instruction, terrain progression systems and clear ability-based trail messaging play in helping guests build skills safely.

As many would anticipate, participants between the ages of 12 and 20 recorded the highest incident rate of any age group, making them at least 2.5 times more likely to be injured than other age categories.

Age patterns show a similarly clear signal. As many would anticipate, younger skiers and riders are most likely to become injured. Participants between the ages of 12 and 20 recorded the highest incident rate of any age group, making them at least 2.5 times more likely to be injured than other age categories. This is perhaps a reflection of less ability and more willingness to take certain risks in the sport.

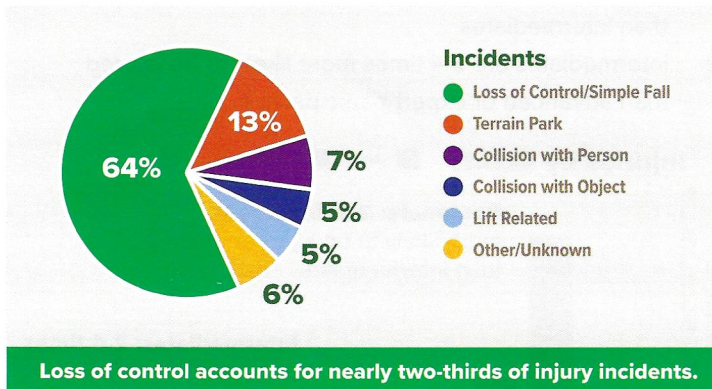
This combination of ability and age suggests several areas where prevention efforts can be particularly effective:

- + Early-stage instruction and beginner progression systems
- + Clear terrain guidance aligned with guest ability
- + Targeted safety messaging for young adult participants

Loss of Control Remains the Leading Cause

Despite the long-term decline in incident rates, the underlying causes of incidents have remained remarkably consistent over time. The vast majority of incidents continue to stem from falls due to loss of control, at 64% overall.

Cause of Injury Incidents



The takeaway is clear: Prevention still begins with the fundamentals of safe participation and shared responsibility. Speed management, selecting terrain appropriate to ability, maintaining spacing from others, increased communication on chairlifts and progressing skills gradually remain the core factors influencing guest safety.

Terrain Parks: A Smaller but Important Share

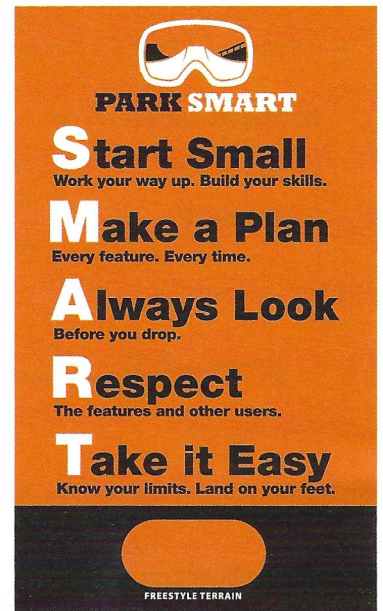
Terrain parks remain an area of continued focus for ski areas, but they represent a smaller share of total incidents than sometimes assumed. Overall, terrain park-related incidents account for about 13% of the total, with an overall rate of 0.28 incidents per 1,000 visits.

Breaking this down by activity:

- + 0.12 per 1,000 visits (ski)
- + 0.63 per 1,000 visits (snowboard)

Importantly, the long-term data show a significant decline in jumping-related snowboard incidents over time:

- + 2000: 1.38 per 1,000 visits
- + 2010: 0.96 per 1,000 visits
- + 2022: 0.42 per 1,000 visits



This sustained reduction suggests that terrain park design standards, progression models and guest education initiatives, such as Park SMART, are helping improve safety outcomes.

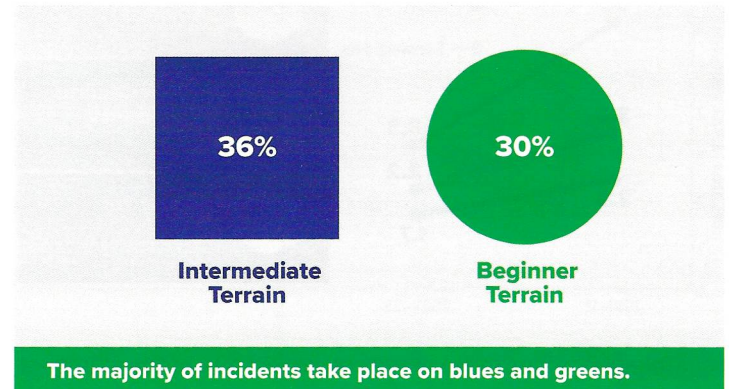
Most Incidents Occur on Everyday Terrain

Another key takeaway is where incidents occur. The majority do not take place on expert terrain or in specialized environments, but rather on the slopes guests frequent.

Trail designation patterns show:

- + Blue terrain: 36% of incidents
- + Green terrain: 30% of incidents

Incidents by Trail Designations



These findings reinforce an important insight for ski areas: The greatest opportunity for prevention lies in everyday terrain environments, where most of our guests spend their time and make routine decisions about speed, spacing, awareness and terrain selection.

Collisions & Lift Incidents: Smaller but Meaningful Categories

Industry-wide initiatives focused on collision awareness and lift safety have contributed to improved outcomes in these areas. Collisions and lift-related incidents now represent a comparatively small portion of total incidents, reflecting the impact of continued operational focus and guest education.

- + Collision with another person: 0.14 per 1,000 visits
- + Collision with objects: 0.11 per 1,000 visits
- + Lift-related incidents: 0.12 per 1,000 visits

With industry input, NSAA is developing guest education initiatives to improve chairlift communication, especially for newer lifts with six and eight seats.

One key area of focus will be on the relatively high rates of injuries resulting from unloading chairlifts. With industry input, NSAA is developing guest education initiatives to improve chairlift communication, especially for newer lifts with six and eight seats. These categories remain important for continued operational focus and guest education, even as they represent a smaller share of overall incident pathways.

Implications for Future Safety & Education Efforts

The 2022–23 NSAA 10-Year Injury Study delivers two complementary messages for the industry.

First, snowsports participation continues to become significantly safer over time by this measure. The steady decline in incident rates across decades reflects the collective efforts of ski areas, instructors, equipment manufacturers, ski patrol teams and guests.

Second, the study highlights where future safety gains are most likely to occur. The data consistently point to three key areas of opportunity:

- + Early-stage participants, particularly beginners navigating skill development
- + Young adult guests, who show the highest incident rates
- + Loss-of-control scenarios on everyday terrain, where most incidents occur

The data show snowsports participation continues to become safer over time, and an investment in instruction and guest education is important to maintain this trend.

For ski areas, these findings reinforce the importance of continued investment in instruction, terrain progression systems, guest education, enhanced slope surfaces and clear on-mountain messaging. As the industry looks ahead, this study provides both direction and strong validation of ski industry efforts. The long-term safety trajectory is especially encouraging, but the findings also remind us that meaningful progress often comes from focusing on the fundamentals of participation and helping guests make better decisions on the slopes.

With decades of trend data now available, the industry is better positioned than ever to align safety initiatives with evidence and continue building a culture where safe participation supports the long-term growth and sustainability of snowsports. For a deeper look at the findings, don't miss Dr. Irv Scher and Dr. Lenka Stepan as they present the results of the 2022–23 10-Year Injury Study during the NSAA National Convention and Tradeshow.

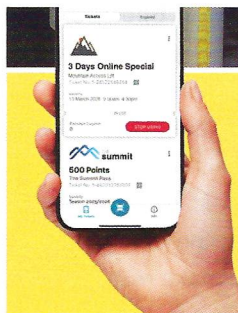
"This dramatic decline in injury rates does not happen by accident — no pun intended," said Dr. Scher. "This is the result of concerted efforts by ski areas (and even guests) to better mitigate the risks of the sport." 📌

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