Proc. International Snow Science Workshop
Sept. 19–24, 2004, Jackson, WY

SEX, DRUGS AND THE WHITE DEATH: LESSONS FOR AVALANCHE EDUCATORS FROM HEALTH AND SAFETY CAMPAIGNS

Ian McCammon, Ph.D.
SnowPit Technologies, Salt Lake City, UT

ABSTRACT:

A common expectation of avalanche education is that it should reduce the frequency of avalanche deaths. But is this expectation realistic? After all, education campaigns aimed at reducing unsafe sex, illegal drug use, unsafe driving and other risky behaviors have met with very limited success, and in some cases have even worsened the problems they were intended to solve.

This paper reviews why some health and safety campaigns are effective, why some aren't, and what this means for avalanche education. A common feature of campaigns that fail is that they assume that recipients' will react to hazard information, skills instruction, or advertising schemes by behaving more conservatively. This assumption is based on largely incorrect beliefs about how people make decisions in the face of risk. In contrast, campaigns that succeed focus on risk management, and provide recipients with simple tools like risk ladders and mitigation measures. Some of these elements are already present in avalanche education, some are emerging, and others remain to be added or modified from existing approaches. Properly implemented, the lessons of health and safety education provide an opportunity for avalanche education to succeed where other programs have failed.

KEYWORDS: avalanche education, risk, decision making, training

1. INTRODUCTION

In the history of American drug education, perhaps no other program has had a better chance of reducing illegal drug use than the National Youth Anti-Drug Media Campaign.

Launched in 1998 and funded at US$195M per year by Congress through the Office of National Drug Control Policy, the campaign was an unprecedented effort aimed at reducing marijuana use among U.S. teens. For the first time, a well-funded and well-coordinated initiative united the best science on drug abuse, human behavior, and education with state-of-the-art creative advertising and enough financial backing to ensure broad dissemination of the message.

Six years into the campaign, its operations were impressive. The government had invested more than US$1B, which had been matched by over $1.2B in donated creative advertising and public service broadcast time. The campaign's messages, carefully crafted by leading advertising agencies working with an expert panel on behavior change, appeared on television, radio, in newspapers, magazines, billboards, transit ads, movie theaters and even rental videos. Ads appeared on six major television networks, resulting in more than 300 million media impressions in more than 100 cities nationwide. The campaign's website accumulated over 35 million hits and each month, the campaign mailed over 4 tons of printed material to parents, students and educators (ONDCP, 2003).

The campaign was extraordinarily successful in getting its anti-drug message to teens in the U.S., but it had an embarrassing problem. Successive studies commissioned by the National Institute on Drug Abuse (the agency officially charged with evaluating the campaign) consistently showed that the campaign was having no measurable effect on marijuana use among teens. Moreover, the study found that as a result of the ads, some teens came to believe that marijuana use was more prevalent among their peers than it actually was. Particularly problematic were data suggesting that some teens were more likely to use marijuana after viewing the ads (Hornik and others, 2002, 2003).[1] As of this writing the campaign continues to be funded by Congress, but criticism of its effectiveness has become widespread (OMB, 2003).

Author address:
3363 S. Plaza Way, Salt Lake City, UT 84109
801-483-2310 imccammon@earthlink.net

The failure of the National Youth Anti-Drug Media Campaign to curb teen marijuana use is disturbing for two reasons. First, the problem that the campaign was intended to solve continues unabated, despite a healthy expenditure of taxpayer dollars. Second, and most relevant to this study, the failure of the campaign represents the failure of a cherished assumption: that helping people to make better choices is a simply matter of good funding, good information and good advertising.

Unfortunately, the story of the Media Campaign isn't unique. Educational programs aimed at issues ranging from driver safety to AIDS prevention, drunk driving to teen violence, and gun safety to teen pregnancy have met with very limited success. Quantitative evaluations of such programs are rare but where they exist, they suggest that failure of these programs is more common than success, and that it is not unusual for these efforts to worsen the very problems they were intended to solve. Successes do occur, but they are sporadic and isolated. And to make matters worse, there is no single body of knowledge that explains what works and what doesn't when it comes to helping people make better decisions in the face of risk.

All of this poses a dilemma for avalanche educators, who have much more modest resources than most health and safety campaigns. How does one teach people to make better decisions in avalanche terrain, when educational programs aimed at developing similar decision skills have been largely ineffective?

In this paper, I review the diverse literature on why risk education programs fail, why some succeed, and how these lessons can be applied to avalanche education.

2. COMPARING RISKS

Before we can look for lessons that tell us how to be better avalanche educators, we have to know where to look.

People face many risks in their lives, from auto accidents to x-rays, from terrorism to winter driving. Each risk has its own unique characteristics, and people have many strategies for assessing and managing these risks (see, for example, Tulloch and Lupton, 2003: Brehmer and Sahlin, 1994; Trimpop, 1994; Yates, 1992; Fox, 1967; Ropeik and Gray, 2002). In order to identify lessons for avalanche education, we need to look at risks that are similar to those encountered in avalanche terrain.

Researchers have differentiated among risks in various ways. Slovic (1987) has shown that risk perception is driven, at least in part, by how familiar we are with the risk and how much control we believe we have over our exposure. His ideas were incorporated by the National Research Council (1996) into one of the current frameworks for assessing risk in public policy (Pidgeon et al, 2003; CSA, 1997:42).

Other approaches to characterizing risk relate to the values, beliefs and emotions of the stakeholders (Rogers and Kincaid, 1981), the degree of outrage prompted by the risk (Sandman, 1987), pre-existing beliefs about the risk (Morgan et al., 2002), the probability of a negative outcome (Tversky and Fox, 1995), the amount of media coverage of the risk (Tversky and Kahneman, 1974), and the emotional response (affect) elicited by the risk (Slovic et al. 2002).

While work on risk perception continues, one thing is certain: the way people make decisions in the face of a hazard has as much to do with their perceptions of the risk as it does with numerical probabilities.

Two characteristics of avalanches help us narrow the search to risks that are operate in similar ways. Most recreational avalanche victims choose to enter avalanche terrain, and in fact usually trigger the avalanche that buries them or members of their party (Tremper, 2001; McCammon 2004). In other words, exposure to avalanche risk is largely voluntary, even for recreationists with only a rudimentary understanding of where avalanches occur.

People are remarkably tolerant of risks that involve voluntary exposure. Starr (1969) found that subjects' tolerance for voluntary risks was several orders of magnitude greater for voluntary than for non-voluntary risks. Other research suggests that this difference is due to people's high level of confidence in their assessments of probabilities over which they have some control (Plous, 1993; Griffin and Tversky, 2002). Confidence in outcomes generally grows with control, but only to a certain point; when people believe they have mastery of a particular skill or knowledge domain, their confidence in predicted outcomes decreases (Ronis and Yates, 1987). Since the vast majority of recreationists never attain such high levels of skill in avalanche assessment, most are likely overconfident in both their skills and their ability to survive an avalanche.

In a study of backcountry skiers, Kobe and Jenkins (1990) found exactly this result. The skiers surveyed felt they were less than half as likely to be caught or killed in an avalanche than the general skiing public. Yet statistically during this period, backcountry skiers were almost twice as likely as lift skiers to be caught or killed in avalanches (Logan and Atkins, 1996). This overconfidence (a factor of four) was likely a consequence of the degree of control these backcountry skiers felt they had over their exposure to avalanche hazard.

A second important characteristic of avalanche risk is that it is typically associated with exhilarating forms of recreation: high marking a steep slope, skiing or riding in deep powder, climbing a snow gully. When no avalanche occurs (the most probable outcome), the experience is intensely positive, perhaps even further amplified by the rush of cheating the forces of nature (Lupton and Tullock, 2002).

As with voluntary risks, people tend not to be very objective about risks that involve highly positive associations. In fact, once an intensely positive experience has become associated with a particular risk, it can be exceedingly difficult for the person to objectively evaluate even simple information about that risk (Slovic, et al. 2002). This "insensitivity to probability" likely plays a role in risky activities such as gambling, unprotected sex, and illegal drug use.

When a person's affective response to a risk is highly positive (euphoria, exhilaration, delight), they tend to underestimate the likelihood of an accident or negative outcome. On the other hand, if their affective response is highly negative (fear, dread, horror), they tend to overestimate the likelihood of an incident (Fischhoff et al. 1993)[2].

Table 1 delineates how risks differ by perceived control and affective response. Here, the horizontal axis reflects the degree of affective response, ranging from intensely negative to intensely positive. The vertical axis reflects the risk taker's perceived degree of control over the outcome, ranging from low to high.

For recreationists, avalanche risk inhabits the portion of the risk spectrum where people perceive a high degree of control over their exposure while experiencing (typically) highly positive emotions. As we've seen, this results in recreationists underestimating their chances of being caught and overconfidence in their abilities to assess the hazard.[3] This same region of the graph contains risks like illegal drug use, unsafe sex, unsafe driving, and smoking.

	Affective Response	
Control	*Strong negative*	*Strong positive*
High	**Overestimate/ overconfident** Shark attack Vaccination Tornado	**Underestimate/ overconfident** Illegal drugs Unsafe sex Unsafe driving Avalanches
Low	**Overestimate/ underconfident** Nuclear waste Terrorism Global warming	**Underestimate/ underconfident** Gambling Stock market Sweepstakes

Table 1. Risks in the context of control and affective (emotional) response. In these two qualities, avalanche risks are similar to those shown in the box. Estimates relate to the probability of a negative outcome; confidence relates to the certainty of those estimates.

Many federal, state, and community efforts have been aimed squarely at risks in this category. Unfortunately, these efforts show a general pattern of ineffectiveness and only sporadic success. If avalanche education is to have an impact, we must understand why these other programs fail. To do this, we need to examine the assumptions that many of them rest on.

3. WHAT DOESN'T WORK

In the United States, there is a common belief that problems such as teen pregnancy, illegal drug use and avalanche fatalities can be addressed, at least in part, by education. Implicit in this belief is the assumption that education has the power to make people take fewer risks in these areas. In this section, we'll review four common elements of risk education, and the evidence linking these elements to behavior change.

3.1 Information only

In one popular view, people use illegal drugs, get unintentionally pregnant, contract STDs and die in avalanches because they simply do not understand the hazard. In other words, once people understand the physical processes and consequences of a risk, they will choose to avoid it.

An example of this philosophy can be found in a prevalent approach to sexuality education in the nation's schools. These programs focus exclusively on the risks of sexual activity outside marriage and the benefits of abstinence (HRSA, 2004). Although there are some motivational elements embedded in these programs (fear arousal and moral appeal), the primary goal of these programs is to help students understand the hazards of sexual activity outside of marriage, in much the same way as an avalanche course might help students understand the hazards of avalanches in the backcountry.

Does this approach work? Certainly, the cognitive learning theory behind abstinence-only programs is sound. The programs organize and present information in such a way that comprehension and retention are maximized (Davis and Davis, 1998). So, in terms of information recall, such programs are probably quite successful.

In terms of behavior change, however, there is very little evidence that abstinence-only programs, and information-only sexuality programs in general, are effective in reducing pregnancy or STD transmission rates among teens (Kirby, 2001: AMA, 2000; Bearman, 2004). This result is not new; it echoes historical failures of information-only sexuality programs aimed at changing behavior in teens (Moran, 2002).

Beyond the realm of sexuality education, other programs aimed at changing behavior with information alone also have a poor track record. Information-only campaigns have failed to reduce illegal drug use (Glynn et al., 1983), automobile accidents (Lonero and Clinton, 1998), child firearm deaths (Hardy, 2002), HIV/AIDS transmission (Holtgrave et al. 1995), youth violence (Satcher, 2001), and smoking (Slovic, 2001).

In short, if the goal of avalanche education is to reduce avalanche deaths by changing how people behave in avalanche terrain, information-only approaches seem unlikely to be successful.

3.2 Information and skills

Closely related to the belief that information can change behavior is the assumption that people take drugs or die in avalanches because they lack a particular skill set. In other words, to decrease the avalanche accident rate, is it effective to simply focus on skills like route finding, stability evaluation and beacon recovery?

A similar question was asked by researchers in a study on driver training conducted in DeKalb County, Georgia. Roughly 16,000 driver-trainees were randomly assigned to three different training conditions. One group went through the Safe Performance Curriculum, a program developed by the National Highway Traffic Safety Administration and considered to be one of the most advanced and comprehensive driver training programs in the U.S. This program placed a heavy emphasis on skills development, and involved (along with classroom training) about 40 hours of skills instruction involving simulators, range driving, emergency maneuver practice and night driving. A second group went through a program that taught the minimum skills needed to pass the state driver's test. A third group received no formal driver training, and students were taught by parents or through private driving schools.

The four-year study showed that the group receiving state-of-the-art skills training had a significantly *higher* accident rate than the other two groups, whose accident rate was statically the same (Lund et al, 1986). Canadian researcher Gerald Wilde (2001) explains such results by suggesting that learners perceived their new skills as lowering their probability of crashing, and so took more risks in traffic (a principle known as risk homeostasis). Whatever the mechanism, skills instruction in this study did not decrease the accident rate, nor did it increase safe behavior among these drivers.

The DeKalb study was not alone in its conclusions. More recent investigations have shown that driving skills training does not, in fact, produce safer drivers (Vernick et al, 1999). And in a broad survey of the research on driver's education, Lonero and Clinton conclude: "As traditionally defined, motorcycle rider training and advanced driver training suffer from the fact that increased skill does not automatically lead to safer driving. Indeed, increasing skill may lead to more crashes." (1998:57).

Similar patterns appear in avalanche accidents among recreationists trained under the traditional information/skills paradigm. Although exact accident rates for these recreationists are unknown, we do know that between one-third and one-half of all avalanche victims had formal avalanche training prior to their accident (McCammon, 2000: 2004). This remarkably high proportion might be partially explained by the fact that trained recreationists spend more time in avalanche terrain than those without training. But it does not explain why trained recreationists typically die under conditions that any

novice would recognize as dangerous (McCammon, 2004). Nor does it explain why avalanche professionals, who spend vastly more time in avalanche terrain than recreationists, are buried much less frequently than trained recreationists (Atkins and McCammon, 2004).

Such evidence does not support the conclusion that avalanche skills training alone can reduce risk-taking behavior in avalanche terrain. Even when combined with a information-based (i.e. snow science) curriculum, the combination does not appear sufficient to reduce avalanche accidents. To understand why, we need to look deeper into the underlying assumptions about how people use information and skills when interacting with hazards.

3.3 Rational choice

One of the unspoken norms of our society is that people should act more or less rationally. It doesn't seem like a lot to ask. When faced with an opportunity to take illegal drugs for instance, or drive recklessly or cross an avalanche slope, it's nice to believe that people will balance the and risks of their actions against the benefits and do what is in their or society's best interests.

When rationality is defined in such concise economic terms, it's a tempting standard against which to measure all human decisions and behavior. This standard lies at the heart of many theories of risk communication, such as the highly influential Health Belief Model and the Theory of Reasoned Action (Witte et al, 2001). For many, the goal of health and safety education is to eliminate biases and emotions that impede rational, objective reasoning.[4]

But deliberative, rational risk management tends to be tedious and cognitively demanding. Besides, who has time to deliberate over the hundreds of small but complex risks they face each day? There's no doubt that we can deal with *some* risks rationally, but it's unrealistic to assume that we should deal with *all* risks in this way.[5] Researchers now believe that much of our risk management is accomplished by using heuristic reasoning and expertise, two largely unconscious processes that are fast, effortless and usually accurate (Klein, 1998; Gigerenzer et al., 1999; Montgomery et al. 2004).

Figure 1 shows why deliberative risk management is so difficult, if not impossible, to achieve in routine decisions. The vast majority of our

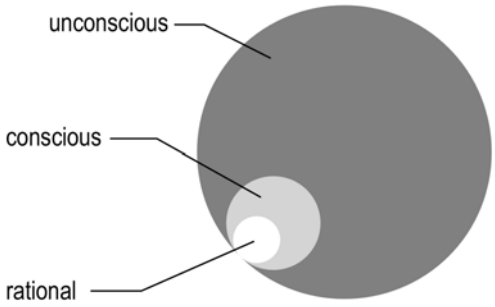

Figure 1. The vast majority of our cognition, learning and routine risk management takes place below the conscious level. When rational processes fail to provide quick and easy risk management, unconscious processes are ready to take over.

thoughts, learning and decision making takes place below the level of consciousness. Empirical studies estimate that as much as 95% of our mental processing is unconscious, as vast amounts of sensory and mental data are sorted, processed, saved or discarded (Zaltman, 2003; Baumeister and Sommer, 1997). Thankfully, we are conscious only of a small portion of all this.

Information-only, skills-based risk education generally targets the rational, conscious parts of our minds. Information-only risk education requires novices to consciously sift through and prioritize a good deal of data, a typically slow and laborious process. When time is short or there are distractions, rational deliberation about a risk is easily discarded in favor of unconscious processes which, while less accurate, are faster and easier. And, when the information-only approach yields ambiguous results (a common complaint among avalanche students), the transition to unconscious processes is even further facilitated. There is good evidence that this is precisely what happens in most recreational avalanche accidents (McCammon, 2004).

So if much of our learning and risk management takes place unconsciously, why not teach directly to the unconscious mind?

3.4 Advertising

Advertising targets those unconscious processes that take over when we are distracted, tired, hungry, or even eager to get fresh tracks. An entire school of thought about health and safety education, known as social marketing, is based on the perceived power of advertising (Whitte et al, 2001). And there is a long history of belief in the power of tinkering

with people's unconscious minds to produce desired actions (see, for example, Pratkanis and Aronson, 2000).

But is advertising really such a powerful agent for changing risky behavior? The National Youth Anti-Drug Media Campaign believed it was, yet the program failed. And, despite the contemporary rituals of focus groups and test marketing, eighty percent of new products and services fail in their first six months (Drucker, 2001).

Despite its prevalence in modern culture, the exact mechanics of how advertising influences behavior remain poorly understood. The basic principles are well-known and there is plenty of research in social and consumer psychology that explains laboratory results (see, for example, Cialdini, 2001). But implementing effective risk education campaigns in the dynamic context of modern culture remains as much an art as a science (Clay, 2002). For the avalanche educator, there are few ready-made tools available for designing effective classes based on advertising, save for those of fear arousal and moral appeal (Witte et al, 2001).

So, if information-only programs, skills-based training, and advertising are, by themselves, unlikely to address avalanche accidents rates, what is likely to work?

4. WHAT WORKS

Not all education programs aimed at high-affect, high-control risks like avalanches have failed. Successes are rare, but programs that succeed typically have similarities among them.

4.1 Goals

One of the common features of successful risk education programs is that they have precise, clearly-stated goals (Montoya et al. 2003, NIH, 2002; Kirby, 2001; Lonero and Clinton, 1998). While on the surface this would seem obvious, the act of specifying a goal for a program, whether it is drug campaign or an avalanche course, forces its designers to make deliberate choices about the methods to be used in the program and its intended outcomes.

Figure 2 shows one way to view the range of objectives for a safety campaign aimed at high-control, high-affect risks. If the goal of the campaign is to reduce the incident rate by defining how people should behave (i.e. avoid illegal drugs or potentially dangerous avalanche slopes), then it falls towards the left portion of Figure 2. Because much of our behavior arises from unconscious processes, this program will require methods that target unconscious learning and cognition. Such methods are available, but they are not well understood (as illustrated by failure of the the Youth Media Campaign), require significant resources, and pose a number of ethical challenges (Aronson, 1999).

Figure 2. Goal spectrum for risk education. Programs aimed at behavior change (a) must target unconscious cognition (difficult), whereas programs aimed at perception change (b) can target conscious cognition (easier).

In contrast, programs that aim to change perceptions (right side of Figure 2) can be more oriented towards conscious cognitive processes, and are generally easier to implement. In this case, perception not only relates to the students' perception of the hazard, but how students see themselves interacting with the hazard in a practical way. Two aspects of this interaction are risk assessment and risk reduction.

4.2 Risk assessment ladders

One of the cornerstones of modern risk communication is the risk ladder. These devices, often depicted as a three- or five-level graphic, communicate how likely it is that a hazard or event will occur. Examples include terrorism alerts, severe weather warnings and of course the avalanche danger scale. Risk ladders are typically welcomed by the public as they provide a simple guide to how much risk is posed by a particular set of circumstances (Tobin and Montz, 1997).[6] An important consequence of risk ladders is that people tend to pay much more attention to the relative *position* of a particular rating than to its corresponding numerical probability (Sandman et al. 1994).

Risk ladders appear frequently in successful health and safety campaigns, usually as a list of risk factors or unsafe behaviors (NIH, 2002: Advocates for Youth, 2003). These ladders allow people to assess the relative risk posed by a particular set of circumstances, and help them determine whether that level of exposure is appropriate to them.

An important feature of risk ladders is that they encode expert or statistical knowledge of the hazard into a simple tool for risk assessment in a particular situation. A person using a risk ladder is not burdened with the tedious task of estimating the level of risk from raw data, a process most commonly advocated by information-only education programs. Instead, a user simply relies on a number of simple cues that indicate their position on the risk ladder. The process is not immune from the unconscious biases described in Section 3.3, but it is much less vulnerable to them because it places fewer demands on conscious rational processes.

To be an effective risk assessment tool, the rungs of risk ladders must correlate closely with the actual degree of hazard. For broad assessments (like weather alerts or avalanche warnings) the rating derives primarily from expert opinions. But for situational assessments (that are specific to one person or group and may change by the hour or minute), ratings typically derive from statistical correlations between risk factors and negative outcomes.

Fortunately, such statistical information exists for avalanche accidents and has already been incorporated into various risk ladders for recreationists. Examples include the NivoTest, Reduction Method, SnowCard and Stop-or-Go Methods currently used in Europe. Other, more simple cue-based methods also show promise (see McCammon and Hägeli, 2004 for a review).

But simply being able to assess the risk isn't enough. A second key element for personal risk management is the ability to lessen, or mitigate, the hazard.

4.3 Simple mitigation measures

One of the primary features of sex education programs that prevent teen pregnancy and STD transmission is a discussion of contraception (AMA,1999; Kirby, 2001). Moral discussions aside, when students understand which precautionary measures will reduce the risks of sexual activity, they appear to make less risky choices. In contrast to attempting to change behavior, these programs attempt to change students' perception of what they can do to reduce the hazard besides avoid it.

Traditionally, avalanche education has done a pretty good job of teaching risk mitigation skills (as described in Section 3.2). Precautions like carrying rescue equipment, not traveling alone, and exposing one person at a time are standard recommendations. But to be fully useful as tools for risk management in avalanche terrain, recreationists must understand how much risk reduction these practices realistically represent.

Fortunately, recent investigations have begun to explore risk reduction values for traditional safety measures in avalanche terrain (Tschiriky et al. 2000; Brugger and Falk, 2004; McCammon and Hägeli, 2004). The more robust these risk reduction estimates become, the more accurate the risk management decisions of recreationists will be.

SUMMARY AND CONCLUSIONS

The risks we encounter in avalanche terrain have two characteristics that distinguish them from many of the other risks in our lives: 1) we have a great deal of control over our exposure to avalanches, and 2) if all goes well, our exposure is typically associated with highly positive emotional experiences.

Risks having similar qualities include illegal drug use, unsafe sex, and fast driving. Unfortunately, educational programs aimed at reducing the impact of these risks have had very limited success. As avalanche educators, what lessons can we take away from the many failures and few successes in these programs?

First, it seems unreasonable to assume that relatively short (2–3 day) traditional avalanche courses will change the behavior of winter recreationists enough to substantially reduce accident rates in the near term. We've seen that behavior change is unlikely to result from teaching information, skills, or rational decision strategies. Thus, avalanche courses that cover avalanche science along with travel and rescue skills may accomplish many things, but a reduction in the accident rate is unlikely to be one of them.

A far more realistic objective is to alter students' perception of the way they manage avalanche hazards. A practical way to do this is by giving them risk metrics and simple mitigation measures.

Risk metrics, in the form of quantitative risk ladders, already exist for recreationists in Europe, and there are current efforts to develop similar tools for North America. The power of these tools lies in their ability to make on-the-spot risk assessments. Such assessments will not be perfect, but they will be substantially better than the decisions that recreation-

ists, even those with training, seem to be currently making in avalanche terrain.

Avalanche education already does a good job of training students in mitigation measures. Such measures will become increasingly effective as risk management tools once their actual risk reduction factors are more precisely characterized.

In future avalanche courses, instructors may well have a choice between two paths:

In the first, novices will learn manual skills and snow science. Their decision making will consist of sorting through large amounts of information regarding the snowpack, terrain and weather. Lacking experience or rules of thumb, they will only vaguely know how to prioritize this information, and will frequently face ambiguity and confusion. Most of them will quickly tire of this approach and will instead make their choices based on unconscious biases or unfounded intuition. They will use their avalanche knowledge more often to justify their decisions than to arrive at them. They will travel for many seasons in avalanche terrain using this strategy, believing that their decision making is sound. When they are finally caught, and perhaps killed, it will be under avalanche conditions so obvious that a novice would have recognized them. Snow science will advance, changing the information taught in avalanche courses. But the circumstances of accidents will remain the same, repeating themselves year after year.

In the second path, students will be taught how to estimate their exposure to avalanche hazard using simple numerical tools. These tools will be easy to learn and easy to use. Such tools will not predict all avalanches, just the 98% or so that occur under obvious conditions. Students will also learn how much their risk is reduced by wearing a beacon, traveling one at a time, and not skiing alone. Using these tools, their decisions in avalanche terrain will be relatively quick, and their decision tools will show them when their decisions are influenced by unconscious biases. When accidents do occur, they will be under rare and unusual conditions, or when individuals knowingly choose to accept high levels of risk. Over time, these accidents will be reflected in the statistics, and new decision tools will emerge. Most importantly, accident victims will no longer die in vain; the lessons of their deaths will by passed on to the next generation of mountain travelers.

This paper has presented evidence that elements of the first path have been present in traditional avalanche education. Elements of the second path are emerging, driven by recreationists who want better decision tools and by designers who want to reduce avalanche deaths.

As in drug education, sexuality education and other programs, the intentions on both sides are good. But the question remains: how effective do we, as avalanche instructors, want our instruction to be?

ACKNOWLEDGEMENTS

The author would like to thank the students and staff of the National Outdoor Leadership School for valuable insights regarding avalanche education. Dale Atkins, Don Sharaf, and Knox Williams also provided many valuable insights and discussions.

DISCLAIMER

The views expressed are those of the author and do not necessarily reflect official positions of the National Outdoor Leadership School. Any errors or omissions are the sole responsibility of the author.

ENDNOTES

[1] Three other studies conducted over approximately the same period showed differing trends in teen marijuana use, but these were generally not statistically significant. Hornik et al. (2003) discuss the various findings.

[2] It is likely that the affect heuristic precedes the well-known availability heuristic (Tverysky and Kahneman, 1974). In other words, because people's attention is easily captured by stories with highly negative affective elements, the media report these stories more often, creating the impression that such events happen more frequently than they actually do.

[3] This conclusion is consistent with what avalanche educators and accident investigators have observed for years, that avalanche victims greatly underestimate hazards and overestimate their skills (see Tremper, 2001, or Fredston and Fesler, 1994). This conclusion is also consistent with the findings of Kobe and Jenkins (1990) in their study of backcountry skiers.

[4] In John Searle's excellent book *Rationality in Action* (2001, MIT Press), he deconstructs six assumptions of classical rationality and shows why true objectivity is actually impractical for most decision-making.

[5] In the past, risky decisions were viewed as rational or irrational – we now know that this is an oversimplification of how the mind works. See Damasio (1994) for an enlightening discussion.

[6] An important caveat to risk ladders is that they must be credible, that is they must correlate reliably with the actual level of risk.

REFERENCES

Advocates for Youth. 2003. Science and success: Sex education and other programs that work to prevent teen pregnancy, HIV and sexually transmitted infections, Adv. for Youth, Washington, DC.

American Medical Association. 1999. *Sexuality education, Abstinence, and Distribution of Condoms in Schools*, Report 7 of the Council on Scientific Affairs (I-99), Chicago, IL.

American Medical Association. 2000. *Evaluation of Federal Abstinence-Only Education Programs*, Report 5, Council on Scientific Affairs (A-00), Chicago, IL.

Aronson, E. 1999. *The Social Animal*, 9th ed., Worth Publishers, New York.

Atkins, D. and McCammon, I. 2004. Differences between avalanche experts and novices, *Proc. Int'l Snow Science Workshop*, Jackson, WY.

Baumeister, R. and Sommer, K. 1997. Consciousness, free choice, and automaticity, in R, Wyer et al. (eds.) *Advances in Social Cognition*, X:75–81.

Bearman, P. 2004. Rules, behaviors and networks that influence STD prevention among adolescence, *Proc. National STD Prevention Conference*, Philadelphia, PA, March 8–11, 2004.

Brehmer, B. and Sahlin, N. 1994. *Future Risks and Risk Management*, Kluwer, Boston.

Brugger, H. and Falk, M. 2004. Analysis of avalanche safety equipment for backcountry skiers, *Avalanche News* (66):34–38.

Canadian Standards Association. 1997. *Risk Management: Guidelines for Decision Makers*, Publication Q850-97, Etobicoke, Ontario.

Cialdini, R. 2001. *Influence: Science and Practice*, Allyn and Bacon, Boston, MA.

Clay, R. 2002. Advertising as science, *Monitor on Psychology*, 33(9).

Damasio, A. 1994. Descartes' Error: Emotion, Reason, and the Human Brain, Avon, New York.

Davis, J. and Davis, A. 1998. *Effective Training Strategies*, Berrett-Koehler, San Francisco, CA.

Drucker, P. 2001. The next society, *The Economist*, 3 November, 2001.

Fischhoff, B. et al. 1993. Risk perception and communication, *Judgment and Decision Making: An Interdisciplinary Reader*, T. Connolly and others, eds. Cambridge University Press, Cambridge, UK.

Fox, D. (ed.) 1967. *Risk Taking and Information Handling in Consumer Behavior*, Graduate School of Business, Harvard University, Boston, MA.

Fredston, J. and Fesler, D. 1994. *Snow Sense*, Alaska Mountain Safety Center, Anchorage, AK.

Gigerenzer, et al. 1999. *Simple Heuristics that Make Us Smart*, Oxford University Press, New York.

Glynn, T et al. (eds.)1983. *Preventing Adolescent Drug Abuse: Intervention Strategies*, NIDA Research Monograph 47, National Institute on Drug Abuse, Rockville, MD.

Griffin, D. and Tversky, A. 2002. The weighing of evidence and the determinants of confidence. *Heuristics and Biases: The Psychology of Intuitive Judgment*, T. Gilovoch and others, eds. Cambridge University Press, Cambridge, UK, 230–49.

Hardy, M. 2002. Teaching firearm safety to children: Failure of a program, *Journal of Developmental and Behavioral Pediatrics*, 23(2):71–6.

Health Resources and Services Administration. 2004. *Fact Sheet: SPRANS Community-Based Abstinence Education Project Grant Program*, U.S. Dept. of Health and Human Services, Rockville, MD, www.mchb.hrsa.gov

Holtgrave, D. et al. 1995. *An Overview of Effectiveness and Efficiency of HIV Prevention Programs*, Public Health Reports, v110(2), March-April.

Hornik, R. and others, 2002. Evaluation of the National Youth Anti-Drug Media Campaign: Fourth Semiannual Report of Findings, National Institute on Drug Abuse, www.nida.nih.gov.

Hornik, R. and others, 2003. *Evaluation of the National Youth Anti-Drug Media Campaign: 2003 Report of Findings*, National Institute on Drug Abuse, www.nida.nih.gov.

Kirby, D. 2001. *Emerging Answers: Research Findings on Programs to Reduce Teen Pregnancy,* National Campaign to Reduce Teen Pregnancy, Washington, DC.

Klein, G. 1998. *Source of Power: How People Make Decisions*, MIT Press, Cambridge, MA.

Kobe, K. and Jenkins, M. 1990. Hazard perception and preparation by cross-country skiers in Utah, *Proc. Int'l Snow Science Workshop*, Big Fork, MT, 130–140.

Logan, N. and Atkins, D. 1996. *The Snowy Torrents: Avalanche Accidents on the United States 1980–86*, Colorado Geological Survey, Special Publication 39, Denver, CO.

Lonero, L. and Clinton, K. 1998. *Changing Road User Behavior: What Works, What Doesn't*, PDE Publications, Toronto, Ontario.

Lund, A. et al. 1986. High school driver education: Further evaluation of the DeKalb County study, *Accident Analysis and Prevention*, 18:349–57.

Lupton, D. and Tullock, J. 2002. Life would be pretty dull without risk: Risk taking and its pleasures, *Health, Risk and Society*, 4(2):113–24.

McCammon, I. 2000. The role of training in avalanche accidents in the United States, *Proc. Int'l Snow Science Workshop*, Big Sky, MT, pp. 37–45.

McCammon, I. 2004. Heuristic traps in recreational avalanche accidents: Evidence and implications, *Avalanche News* (68):42–50.

McCammon, I. and Hägeli, P. 2004. Comparing avalanche decision frameworks using accident data from the United States, *Proc. Int'l Snow Science Workshop*, Jackson, WY.

Montgomery, H. et al (eds.). 2004. *How Professionals Make Decisions*, Lawrence Erlbaum, Mawah, NJ.

Montoya, I. et al. 2003. Best characteristics of adolescent gateway drug prevention programs, *J. of Addictions Nursing*, 14(2):75–83.

Moran, J. 2002. Teaching Sex: The Shaping of Adolescence in the 20th Century, Harvard University Press, Cambridge, MA.

Morgan, M. et al. 2002. *Risk Communication: A Mental Models Approach*, Cambridge University Press, Cambridge, UK.

National Institute of Health. 2002. *Making Health Communications Programs Work*, Dept. of Health and Human Services, Washington, DC.

National Research Council. 1996. *Understanding Risk: Informing Decisions in a Democratic Society*, National Academy Press, Washington, DC.

Office of Management and Budget, 2003. Youth Anti-Drug Media Campaign, Performance and Management Assessment, Budget of the United States Government, FY2004, available at www.whitehouse.gov/omb/budget/fy2004

Office of National Drug Control Policy, 2003. *Fact sheet: The National Youth Anti-drug Media Campaign*, available at www.meadiacampaign.org.

Pidgeon, N. et al. 2003. *The Social Amplification of Risk*, Cambridge Univ. Press, Cambridge, UK.

Plous, S. 1993. The Psychology of Judgment and Decision Making, McGraw-Hill, New York.

Pratkanis, A. and Aronson, E. 2003. The Age of Propaganda: The Everyday Use and Abuse of Persuasion, W. H. Freeman, New York.

Rogers, E. and Kincaid, D. 1981. Communications Networks: Toward a New Paradigm for Research, Free Press, New York.

Ronis, D. and Yates, J. 1987. Components of probability judgment accuracy: Individual consistency and effects of subject matter and assessment method. *Organizational Behavior and Human Decision Processes*, 40:193–218.

Ropeik, D. and Gray, G. 2002. Risk: A Practical Guide for Deciding What's Really Safe and What's Really Dangerous in the World Around You, Houghton Mifflin, New York.

Sandman, P. 1987. Risk communication: Facing public outrage, *EPA Journal*, November: 21–22.

Sandman, P. et al. 1994. High risk or low: How location on a "risk ladder" affects perceived risk, *Risk Analysis*, 14(10): 35-45.

Satcher, D. 2001. *Youth Violence: A Report of the Surgeon General*, U.S. Department of Health and Human Services, Washington, DC.

Slovic, P. 1987. Perception of risk, *Science*, 236:280–285.

Slovic, P. 2001. Cigarette smokers: Rational actors or rational fools, *Smoking: Risk, Perception and Policy,* P. Slovic (ed.). Sage Publications, Thousand Oaks, CA.

Slovic, P. et al. 2002. The affect heuristic, *Heuristics and Biases: The Psychology of Intuitive Judgment*, T. Gilovoch and others, eds. Cambridge University Press, Cambridge, UK, 397–420.

Starr, C. 1969. Social benefit versus technological risk, *Science*, 165: 1232–1238.

Tobin, G. and Montz, B. 1997. *Natural Hazards: Explanation and Integration*, Guilford Press, NY.

Tremper, 2001. *Staying Alive in Avalanche Terrain*, The Mountaineers, Seattle, WA.

Trimpop, R. *The Psychology of Risk-taking*, North-Holland, Amsterdam.

Tschiriky, F., Brabec, B. and Kern, M. 2000. Avalanche rescue systems in Switzerland: Experience and limitations, *Proc. Int'l Snow Science Workshop,* Big Sky, MT, USA, pp. 369–376.

Tullock, J. and Lupton, D. 2003. *Risk and Everyday Life*, Sage, London.

Tversky, A. and Fox, C. 1995. Weighing risk and uncertainty, *Psychological Review*, 102(2): 269–83.

Tversky, A. and Kahneman, D. 1974. Judgment under uncertainty: Heuristics and Biases, *Science*, 185: 1124–30.

Vernick, J. et al. 1999. Effects of high school driver education on motor vehicle crashes, violations and licensure, *Am. J. of Preventive Medicine*, 16(15): 40–6.

Wegner, D. 2002. *The Illusion of Conscious Will*, MIT Press, Cambridge, MA.

Witte, K. et al. 2001. *Effective Health Risk Messages: A Step-By-Step Guide*, Sage Publications, Thousand Oaks, CA.

Wilde, G. 2001. *Target Risk 2: A Psychology of Safety and Health*, PDE Publications, Toronto, Ontario.

Yates, F. (ed.). 1992. *Risk-Taking Behavior*, Wiley, New York.

Zaltman, G. 2001. How Customers Think: Essential Insights into the Mind of the Market, Harvard Business School Press, Boston, MA.