

## Overview

Understanding risk is an integral part of the risk management process. It is critical that risk information is communicated effectively to all concerned parties. This activity allows students to explore how timely and responsible communication among experts, the media, and lay people can lead to improved decisions about risk management.

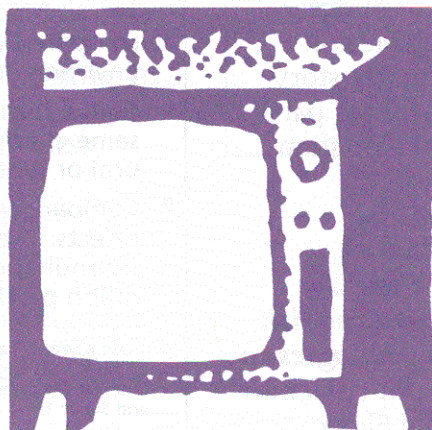
## Background

**Risk communication** refers to the *exchange* of information regarding risk. It is used to inform the public, including decision makers, citizens, organizations, corporations, industry, the media, and other special interest groups, about sources of risk and possible solutions for reducing risk. Some current goals of risk communication include (1) improving understanding of risk issues; (2) informing stakeholders, as well as possible, given the available information; (3) influencing attitudes toward risk; and (4) reconciling differences in values over the acceptability of risks through conflict or dispute resolution.

In the past, communicating risk to the public often took place after assessments and management decisions were already made. Such practices, however, have been changing. Risk experts now realize that most lay people are very capable of understanding risk when given sufficient information. Experts have also realized that involving the general public in risk decisions, through timely communication, is important to the successful management of risk. At the same time, it is important to recognize that good risk communication does not *guarantee* successful risk decisions because other factors, such as values, politics, and economics, also influence the decision-making process (National Research Council 1989, A).

### RISK PERCEPTION

An understanding of how people perceive risks is very important for effective risk communication. Accordingly, risk communication experts have done extensive studies on this topic and have found that a variety of factors affect the way in which people perceive risk. These factors help explain why people react to different risks differently. For example,



### Subjects

Chemistry, Communications, Earth Sciences, Environmental Science, Health, Language Arts, Math, Social Studies, Visual Arts

### Concepts

- ▶ Cultural and societal perspectives influence the attitudes, beliefs, and biases of people toward the use of resources and environmental protection. (6.3)
- ▶ In democratic societies, citizens have a voice in shaping resource and environmental management policies. They also share in the responsibility of conserving resources and behaving in an environmentally responsible manner. (9.2)
- ▶ Effective citizen involvement in the environmental decision-making process involves a careful study of all sides of the issues, along with the ability to differentiate between honest, factually accurate information and propaganda. (9.4)
- ▶ Increased public knowledge of the environment and the need for conservation of natural resources have resulted in lifestyle changes in many cultures. (15.5)

### Skills

Analyzing, Comparing and Contrasting, Discussing, Evaluating, Interpreting, Synthesizing and Creating

### Objectives

Students will (1) investigate the importance of communication in risk assessment and risk management, (2) identify guidelines for effective risk communication, (3) acquire a sense of scale using concentration analogies, and (4) communicate a local risk to their community.

### Materials

Copies of the Student Pages "Sybron Chemicals Inc.: Background Information," "Risk Communication Options," "Sybron Chemicals Inc.: Risk Communication Response," "Radon Risk Chart-A," "Radon Risk Chart-B," "Radon Brochure-A," "Radon Brochure-B," "Risk Communication Guidelines," and "Concentration Analogies" on pages 70–74 and 76–79; and an overhead transparency of the Student Page "Radon Alert" on page 75. For Part D—a strip of colored paper, a ruler, and a pair of scissors for each student or 29 copies of the Student Page "One Part per Million."

### Time Considerations

Preparation: 30 minutes  
 Activity:  
 Part A—one 50-minute period plus 30 minutes  
 Part B—one 50-minute period  
 Part C—one 50-minute period  
 Part D—30 minutes  
 Part E—one 50-minute period plus outside research



many people are more concerned about nuclear power than about radon gas in homes, even though radon is responsible for 7,000–30,000 cancer deaths per year (U.S. EPA 1998b, E). A list of factors that influence how people perceive risks may be found on the Student Page “Risk Perception Factors” in Activity 2, “Things Aren’t Always What They Seem.”

## THE COMPLEX NATURE OF RISK COMMUNICATION

Risk communication can be a complex and controversial undertaking for a number of reasons:

1. The hazards being described are often the center of controversy.
2. There is often enough uncertainty in the risk estimate that contradictory expert opinions are given to the public.
3. Communicating risk often involves the use of technical jargon that is unfamiliar to the general public.
4. It is unclear to what extent public officials should go beyond informing the public to advocating a certain position.
5. Risk messages are not always oriented to the target audience, making understanding the situation more difficult.
6. Risk communicators must be careful not to minimize the existence of uncertainty (National Research Council 1989, A).

In addition, one should be aware that risk messages may reflect the biases of the risk communicator. Looking for a complete story and checking sources can help interested parties develop a balanced view of the risk situation.

## RISK COMPARISONS AND CONCENTRATION ANALOGIES

In an effort to overcome some of these difficulties, risk communicators may use **risk comparisons** and **concentration analogies** to facilitate understanding and help put risks into perspective (Covello, Sandman, and Slovic

1991, A). Risk comparisons should be used to convey the nature and magnitude of a risk estimate. (See the box and the Student Page “Radon Risk Chart–A” for an example of a risk comparison table.)

An important part of communicating risk, particularly with respect to environmental and health pollutants, is the use of concentrations. However, understanding chemical concentrations (parts per million (ppm), **parts per billion (ppb)**, and so forth) can be difficult. So it is helpful to use analogies (1 ppm = 1 drop of gas in a car’s gas tank) that appeal to the imagination and that help people to understand the magnitude of a concentration. (See the Student Page “Concentration Analogies.”)

### Examples of Ways to Compare Risks

- ▶ Comparisons of chemically related agents: The risk of one organophosphate pesticide compared with the risk of another.
- ▶ Comparisons of risks and benefits: The risk to human health of using chlorine to disinfect drinking water vs. chlorine’s role in protecting human life from infectious diseases.
- ▶ Comparisons of alternatives: The risk of incinerating waste vs. landfilling it. (Which has less of an impact on the environment?)
- ▶ Comparisons of the same agent with different sources of exposure: The risk of carbon monoxide poisoning from automobile exhaust vs. from the burning of fuel in a wood-burning stove.
- ▶ Comparisons with a regulatory standard: The amount of arsenic in a city’s drinking water compared with the standard set by the Environmental Protection Agency.
- ▶ Comparisons of different agents with the same exposure route: Foods with either natural or synthetic carcinogenic components.
- ▶ Comparisons of different agents with similar effects: The risk of lung cancer from secondhand smoke vs. from exposure to radon particles.

Sources: Kamrin, Katz, and Walter, 1995, A; Presidential/Congressional Commission on Risk Assessment and Risk Management 1998b, E; Covello, Sandman, and Slovic 1991, A.

# Part A

## COMMUNICATING RISKS: THE CASE OF SYBRON CHEMICALS

However, there are significant limits to the value of risk comparisons and concentration analogies, which often makes their use more controversial than helpful:

- ▶ Certain risk comparisons may be inappropriate, such as comparing an involuntary risk with a voluntary risk (for example, exposure to low-level radiation versus alcohol consumption).
- ▶ Other factors besides the level of the risk (such as trust, ethics, fairness, and alternatives) also influence the public's understanding and acceptance of the risk.
- ▶ Because risk comparisons are based on probabilistic estimates of the risks, a certain degree of uncertainty exists. It is difficult to say for sure whether one risk is better than another because not all variables are known.
- ▶ Many times, the use of risk comparisons and concentration analogies can be viewed as trivializing the risk, which can misrepresent the potential for harm, thereby causing anger or mistrust.
- ▶ Risk comparisons and concentration analogies are limited by the reality that even when people understand a risk, it does not necessarily mean that they will be more accepting of it, nor does it mean that they will take action to reduce the risk.
- ▶ Concentration analogies, by themselves, can be misleading because chemicals vary in their potency. For example, one part per million of one substance may be lethal to a human, while one part per million of a different substance may be harmless.

Risk comparisons and concentration analogies may be useful as communication aids; however, it is important that the audience be critical consumers of the information provided. Likewise, it is important for the risk communicators to choose comparisons and analogies carefully.

This lesson provides students with an opportunity to explore how one company implemented a risk communication strategy. The case study demonstrates the benefits of risk communication even before a risk occurs.

It is important for students to understand that the process of risk communication is multidirectional (with all parties acting as both sender and receiver) and that the process is successful only when the risk message is understood. Figure 9 presents a simplified illustration of the communication process. You may want to put it on an overhead or on the chalkboard while you teach the activity.

### GETTING READY

Make a copy of the Student Pages "Sybron Chemicals Inc.: Background Information" and "Risk Communication Options" for each group. Make a copy of the Student Page "Sybron Chemicals Inc.: Risk Communication Response" for each member of the class.

