



Air Pollution and Health Risk

How Do We Learn About Risks?



The warnings about risks from hazardous substances are everywhere. Every day, the news media report information on hazardous substances. Many products now tout warning labels or claims about being "all natural" and "chemical free." How do we know when a risk is serious? How do researchers estimate risk, and how does the government use this information to develop regulations that limit our exposure to hazardous substances? This fact sheet is intended to help answer these questions.

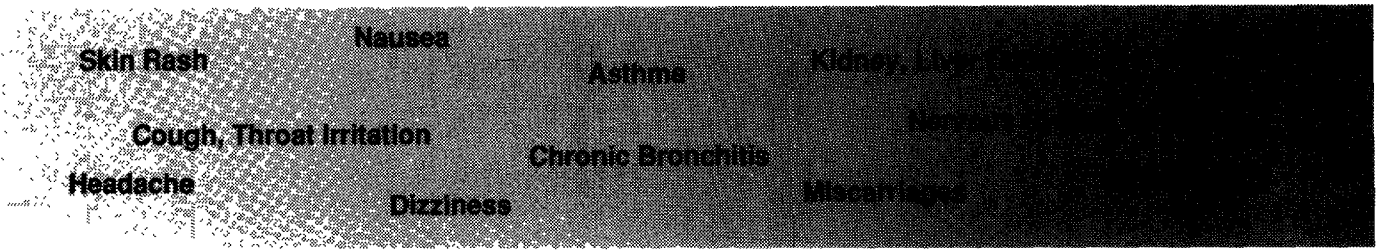


Which Risks Are of Greatest Concern?

Less Serious
 reversible
 not debilitating
 not life-threatening

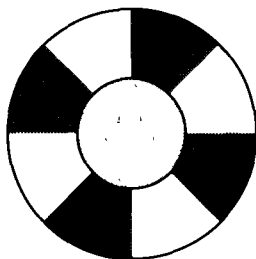


More Serious
 irreversible
 debilitating
 life-threatening



How Do Researchers Estimate Risk?

Health risk is the probability, or chance, that exposure to a hazardous substance will make you sick.



Animal experiments or human studies provide information about how hazardous a substance is. Scientists use the results of such studies to estimate the likelihood of illness at different levels of exposure.

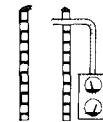


Animal Experiments



Human Studies

Information on exposure comes from two places: (1) monitors placed on factory smokestacks or at special places in your community, or (2) from mathematical models that estimate exposure based on amounts of chemicals released.



Monitors



Models

Health Risk

=

Hazard

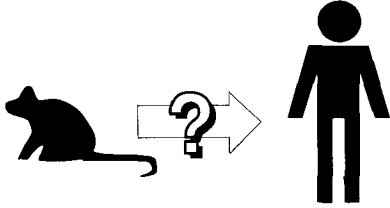
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Exposure

Why Is Information Used for Health Risk Decisionmaking Uncertain?

Uncertainty About Hazard

Many hazards are identified by testing animals. We do not know for certain whether the hazard estimated using animal studies is the same for humans.

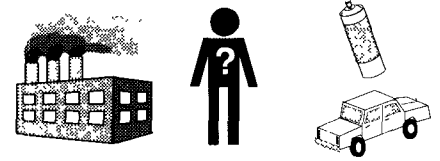


Information is uncertain because of:

- lack of complete scientific understanding of how a hazardous substance makes you sick and how it moves through the air, water, or ground;
- too few human or animal studies of the health effects of individual chemicals and mixtures of chemicals;
- the variable nature of weather patterns affecting exposure;
- the inability to know *everything*.

Uncertainty About Exposure

We do not know for certain that monitors or mathematical models always produce accurate estimates of exposure. It is nearly impossible to account for the different exposures a person may encounter daily.



What Are Important Factors in Risk Decisionmaking?

Balancing Scientific Results with Public and Economic Concerns

Ideally, regulators would like to eliminate all pollution and its risks, but this is usually not a realistic expectation. Regulators must address the most important risks and decrease them to the level at which they believe the risks are smaller than the benefits of the activity causing the pollution.

This is similar to what millions do each day when they balance the risks of an automobile accident with the convenience and necessity of driving. Just as a driver will buckle up and drive defensively to be safer, agencies take regulatory action to eliminate as much risk as is possible without losing the benefits of the activity.

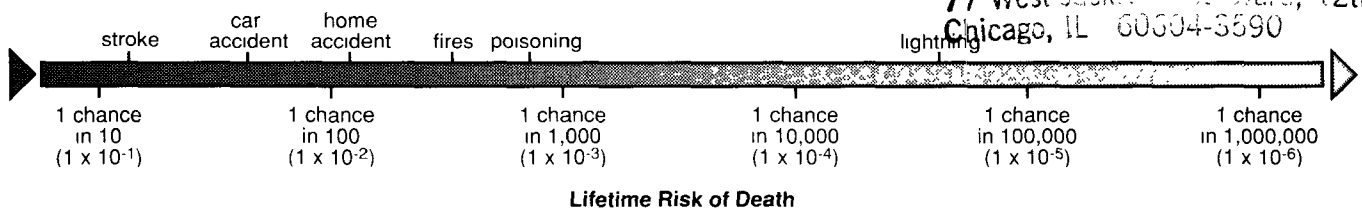
Public Risk Perceptions

Scientific results may show that certain hazardous substances pose a low health risk to people, but the public may still be concerned about these hazardous substances because of different attributes of the risk. Other attributes may affect people's perceptions of a risk:

- How serious and dreaded is the illness?
- How certain is scientific knowledge?
- What is the catastrophic potential?
- Who bears the risk?
- Is the risk voluntary?
- Who receives the benefits of the "risky" activity?

Putting Risks in Perspective

U.S. Environmental Protection Agency
Region 5, Lincoln Center
77 West Jackson Boulevard, 12th Floor
Chicago, IL 60604-3590



What Do the Numbers Mean?

To provide an idea of the size of risks from environmental hazards as risk analysts will describe them to you, the *continuum* above presents risk statistics for some familiar events. Risk analysts describe risks numerically in scientific notation, for example 1×10^{-5} , which means that there is one chance in 100,000 of an event occurring. It is important to note that these risk statistics are population averages, while risk analysts usually estimate risk to the maximum exposed individual.

Actions to Reduce Risk

By becoming better informed you can reduce the risks that you determine to be unacceptable. This may mean changing your lifestyle or providing input to government, industry, and consumer/environmental interest groups. If you would like more information the sources listed below are a good place to start. You may also want to contact your local health department or regional or state environmental agencies for other information sources.

For More Information ...

Risk Assessments for Toxic Air Pollutants: A Citizen's Guide. Write to: U.S. EPA, Air Risk Information Support Center, MD-13, Research Triangle Park, NC, 27711.

Evaluating Exposures to Toxic Air Pollutants: A Citizen's Guide. Write to: U.S. EPA, Air Risk Information Support Center, MD-13, Research Triangle Park, NC, 27711.