

Preface

The use of risk assessment to characterize human health and ecological risks has become a well-accepted and widely-used practice throughout the world. The same principles are also used to evaluate the benefits from medical screening tests and drugs. Health benefit and risk portrayal has become a part of our everyday language and is frequently reported in the press, on TV, and on the radio. Here are some typical examples:

- Individuals living in a Pennsylvania town have a 1 in 100,000 increased risk of getting cancer due to the presence of arsenic in the drinking water.
- Chromium contamination in sediments significantly increases the risk of toxicity to fish and other aquatic organisms. Chromium is a known carcinogen.
- Evidence confirms that PCBs in the Hudson River have tripled the likelihood that certain species of fish will not be able to reproduce in 8 years.
- People with elevated blood serum cholesterol levels have a 100% greater risk of getting atherosclerosis and heart disease compared to individuals with normal cholesterol.
- Individuals taking statins to lower their blood serum cholesterol levels benefit by having fewer heart attacks.
- Research proves that smokers are 90% more likely to get lung cancer than individuals who have never smoked.
- VioxxTM, a COX-2 anti-inflammatory drug, has recently been withdrawn from all world markets. Researchers had found an increased risk of heart attack or stroke for people taking a standard dose for 18 months or more.
- People exposed to elevated radon levels in indoor air have a dramatically increased risk of getting lung cancer.

- Screening tests for prostate cancer (PSA) can determine which men are at a higher risk for getting this deadly disease.

Are these statements accurate? If so, are they meaningful? The above assertions mention just a few examples of the issues that many of us face. Individuals who are at risk for chronic ailments like heart disease take medicines and make dramatic lifestyle changes, hoping they will benefit. Corporations confronted with risks associated with the presence of environmental contaminants incur significant costs. Indeed, risk is an everyday reality, and it affects decisions we make in our lives. But where can we go for advice and guidance on decoding risk pronouncements?

Risk assessment is a valid and important scientific discipline, but the uncertainty in this process tends to be forgotten. Unfortunately, ignoring uncertainty has serious results: errors of interpretation, communication of misleading information, even dissemination of deceptive statements. The chance of a health benefit or risk can be reported as a relative number or an absolute number. It can be presented as a rate, a probability, or the cause of a positive or adverse effect. Since the use of risk assessment has become common-place, proper interpretation of health benefit and risk values is essential.

The purpose of this book is to provide individuals with the tools to interpret health benefit and risk values objectively, and to give the reader an understanding and appreciation of the risk assessment process. Included will be an explanation of the uncertainty inherent in the assessment of health benefits and risks, as well as an explanation of how communication and characterization can dramatically alter how those benefits and risks are perceived. Generally speaking, benefit and risk statements tend to be presented as if they were authoritative, definitive, and based on clear and unequivocal evidence. This leads to an illusion of certainty. In this context, this book compares and contrasts the differences between risk assessment and causality.

Case studies will be used to illustrate the strengths and limitations of characterizing certain health benefits and risks. Using the accepted risk assessment paradigm proposed by the National Research Council, these case studies will illustrate which benefit and risk values have merit and why other assessments fail to meet basic criteria.

This book was written and designed primarily to assist the public in comprehending and interpreting health benefit and risk information. It uses unique, visual presentations to explain the risks and benefits of medical screening tests and drugs, as well as the risks associated with exposure to environmental contaminants. This book should also be of interest to professionals in medicine, nursing, and public health. Government advisory and regulatory agencies, politicians, lawyers, engineers, and academicians should also find this book to be of value. In addition, this book could be used as supplemental information for a variety of undergraduate and graduate courses.

NOTICE: This book is intended as a reference guide on risk assessment, not as a medical guide to self-treatment. The information of a medical nature in this book is meant to help you make informed decisions about your health by providing a more careful and complete understanding of benefits, risks, and uncertainty. If you suspect you need medical treatment, you should discuss it with your primary care physician. If you are being treated for a medical condition or are on medication, do not change your treatment program without discussing it with your doctor.

The Illusion of Certainty

Health Benefits and Risks

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2007, XX, 239 p. 28 illus., Hardcover

ISBN: 978-0-387-48570-6