RISK VS. RISK

Tradeoffs in Protecting Health and the Environment

Edited by

John D. Graham

and

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Foreword by Cass R. Sunstein

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Foreword

Cass R. Sunstein

Whatever we do, we are likely to encounter risks. A short drive to the grocery store brings dangers, however small. So too with a decision to ride a bicycle or to walk instead. So too with a decision to stay at home. If you play tennis to improve your health, you may endanger your health instead. Whenever you reduce or eliminate one risk, you may simultaneously increase or create another. If this is not so troubling, it is because most of the time the risks we face are, or seem, blessedly low. But sometimes each of us must make judgments about how to avoid significant risks, or how to minimize overall risk, when a genuine danger is unavoidable.

If this can be an issue for each of us, it is an even more serious issue for governments—especially, perhaps, for the national government. In the twentieth century, the reduction of risks to life and health has become one of government's most important tasks. Despite widespread questions about governmental effectiveness, the United States has already accomplished a great deal in lowering risk, especially in the area of environmental quality, and in the process it has saved many lives. But by now we know that when government tries to make things better, it may make things much worse instead. If, for example, government tries to protect human health by imposing fuel economy requirements on cars, it may lead companies to produce smaller and less safe cars, and thus en-

danger human health. If government imposes environmental regulations on companies, it may decrease some environmental risks. But these very regulations may increase other environmental risks or shift risks to other areas. Reductions in air pollution may cause greater production of solid wastes; protection of consumers may shift risks to workers; banning one substance may invite the use of more dangerous substances. Some cures are worse than the disease.

This pathbreaking book is the first sustained and systematic effort to explore this problem of "risk-risk tradeoffs." To say the very least, the book comes at the right time. At the national and international levels, it is widely understood that risks to life and health—from pollution, from unsafe consumer products, from dangerous workplaces—can exact a high toll on individual and social well-being. At the same time, there is enormous concern that government regulation may be costly, futile, or counterproductive. If nations are to provide good lives for their citizens, they need to know how to come up with regulations that will be effective in achieving their own goals.

Too frequently, risk regulation has been adversely affected by interest-group pressures, sensationalistic anecdotes, political opportunism, and sheer ignorance. Too often, important voices are left out of the regulatory process, and it is the people who are not heard who suffer the consequences of bad risk regulation. The contributors to this book show that risk-risk tradeoffs are an unavoidable aspect of life and an omnipresent issue for government. Consider the fact that when women reach menopause, they face increased risks of hip fractures and chronic discomforts in old age; hormonal replacement therapies can reduce these problems, but they can create cancer risks as well. Consider also the fact that efforts to reduce the risks associated with ozone depletion and global warming may result in other risks, some of them endangering the environment itself.

But the authors are not content just to demonstrate the pervasiveness of the problem. They also offer a diagnosis and a range of constructive suggestions for the future. They explore the phenomenon of "omitted voices"—the fact that some affected people do not play a role in the process of deciding about

risk. They show that ordinary people tend to rely on heuristic devices—simplified cognitive strategies for evaluating evidence—that lead to large private and public mistakes in risk assessment. The authors show too that risk-related decision-making is extremely fragmented in government, leading to a failure to treat risk in a coordinated way. They demonstrate that people's behavioral responses to regulation are often unanticipated by government, and that people sometimes react in a way that defeats inadequately considered regulation.

This book offers a number of promising remedies for the existing situation. The authors urge that the risk problem be treated holistically, with efforts to contain risks made not in isolation but in the context of the entire picture. To this end they emphasize the need to compile much more information about risk levels and to act on the basis of that information—rather than relying on guesswork, sensationalism, or interest-group pressures. As they note, the American government provides a great deal of information about social trends, but it does not monitor and measure levels and trends of risks to health, safety, and the environment; it offers no system for assessing "environmental indicators." This is a critical and easily remedied gap in modern policy.

The authors suggest too that Congress should avoid the "risk of the month" syndrome by adopting a more coordinated approach to regulation. They urge the courts to play a constructive role by striking down regulations that create risks larger than those that they control. They suggest that the executive branch should be more attentive to the danger that regulation of one risk will increase another.

The authors are aware that it is important to come to terms with two large questions with continuing significance for government: Why does the public view some risks as serious and others as trivial? Why do public assessments of risk differ so sharply from experts' assessments? It seems clear that people often misunderstand the sheer facts about risks, thinking, for example, that because a recent incident has occurred—involving a contaminated bottle or an airplane crash—the risk is much higher than it is in fact. As the authors show, people rely on heuristic devices that can lead to systematic errors, in

the form of both overvaluation and undervaluation of risks. It is important for people in the private and public sectors to try to counteract these errors, mostly through providing better information, but sometimes through regulation.

On the other hand, people's judgments about different risks are sometimes based not on factual errors, but on deep beliefs about fairness and equity. These beliefs deserve respect. Unlike many experts and economists, ordinary citizens do not seek simply to "decrease overall risk." They make qualitative as well as quantitative judgments. They care about a range of contextual factors—whether the risk is voluntarily or involuntarily incurred; whether it is catastrophic; whether it is equitably distributed or whether it is instead faced by discrete, vulnerable groups; whether the risk is faced by future generations. When dealing with risk, we ought to be especially concerned to ensure, to the extent possible, that ordinary citizens have a sense of control over their own environment and a sense of participation in determining risk levels. Thus the authors' valuable discussion of "risk tradeoff analysis" is designed to consider not merely the statistical magnitude of risk, but also a range of qualitative and contextual issues that the public deems important. Hence the important idea of "risk-superior moves" is an effort to ensure regulation that can make things better from all conceivable standpoints.

Much of the importance of this book lies in its exceptionally illuminating discussions of particular problems and in its wide range of provocative and constructive proposals. In my view, however, the book's importance lies above all in the fact that it promises to help stimulate a national and even international discussion that—astonishingly—has yet to occur. Of course that discussion should involve academics and other experts in the area of risk regulation, embodying the kinds of interdisciplinary work (including law, economics, science, public health, and psychology) so well exemplified by this book. But more than that, the discussion should occur among the officials who are entrusted with making and implementing regulatory policy, especially members of Congress and the executive branch. And most important of all, the discussion should involve citizens generally, who make countless decisions

about risk both in their daily activities and in their democratic judgments. In our private capacities, and in our role as citizens in a democracy, we could do much better; this book helps to point the way.

Preface

The idea for a systematic study of risk tradeoffs came from discussions at the 1990 annual meeting of the Advisory Committee of the Harvard Center for Risk Analysis. This group of thirty "risk professionals" from academia, government, nonprofit organizations, and business is asked each year to suggest directions for the research efforts of the Center. The Advisory Committee identified risk tradeoffs as a priority topic for Center inquiry, envisioning it as a modest exercise to bring scholarship to bear on some of the fundamental problems in modern risk management, including the "risk of the month" syndrome and the penchant for simple solutions to complex phenomena.

The research staff of the Center, its Director (Graham), and a member of the Advisory Committee (Wiener) then set out to document and analyze risk tradeoffs in diverse decision-making contexts. During the course of the project, the Advisory Committee periodically received briefings on its progress and provided constructive criticisms. Soon the project grew into a full book-length set of case studies, and we developed the first and last chapters to synthesize our findings and provide a unifying analytic approach to the problem. Extremely helpful comments on the manuscript were provided by Carol Barash, Elizabeth Drye, James Hammitt, David Hemenway, Lester Lave, Tim Profeta, Gerhard Raabe, Joanna Siegel, and Cass Sunstein. Our editors at Harvard University Press, Mi-

chael Fisher and Mary Ellen Geer, were extraordinarily challenging, constructive, and dedicated; we owe them thanks for many substantive and technical improvements to the text.

Funding for the project came in the form of unrestricted gifts to the Harvard Center for Risk Analysis. Special thanks are due to Patricia Worden (Harvard) and Judy Williamson, Joan Ashley, and Tim Profeta (Duke) for their work in preparing the manuscript for publication.

In addition, our families were inordinately understanding of our immersion in this project. Sue Graham and Ginger Young (and above all Jonathan and Ginger's first baby, Alex, who arrived a week before the due date for the manuscript) were endlessly cheerful and supportive as we struggled to complete the text.

Since this project began in 1990, there has been an explosion of interest in risk analysis. We hope this volume will contribute to the thorough reexamination now under way of how this country's decisions can reduce risk more intelligently and effectively.

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Contents

1

Confronting Risk Tradeoffs

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Good health and a clean environment are among the goals people seek most earnestly. Every day individuals, families, businesses, and governments are faced with important decisions on how best to achieve these goals. Consumers have increasingly sought "lite" and "organic" foods lacking ingredients they find worrisome, cars with airbags and other advanced safety measures, and "green" products that pollute less and can be recycled. Through politics these pro-safety preferences have been expressed in a growing body of laws to combat such hazards as cancer-causing chemicals, traffic accidents, and ecological degradation. In short, Americans are engaged in a national campaign to reduce risk.

Yet confounding this national campaign to reduce risk is the phenomenon of "risk tradeoffs." Paradoxically, some of the most well-intentioned efforts to reduce identified risks can turn out to increase other risks. Though the term "risk tradeoff" may not be familiar to many people, the phenomenon is commonplace in human decisionmaking, reflected in such familiar adages as "out of the frying pan and into the fire" and "the cure is worse than the disease." The general problem is that efforts to combat a "target risk" can unintentionally foster

increases in "countervailing risks." Many kinds of countervailing risks are commonly known by the terms "side effects" (medicine), "collateral damage" (military tactics), or "unintended consequences" (public policy). Other countervailing risks are less obvious, lurking in dynamic feedbacks and behavioral responses. Unless decisionmakers consider the full set of outcomes associated with each effort to reduce risk, they will systematically invite such risk tradeoffs. It is also conceivable that in addition to countervailing risks there are "coincident risks"—dangers which turn out to diminish in tandem with target risks even though that was not intended by the decisionmaker—and though such happy coincidences should also be considered in decisionmaking, they are not likely to be as plentiful as are countervailing risks. The net effect of actions taken to reduce risk is complex; the phenomenon of risk tradeoffs suggests that in the national campaign to reduce risk, not as much health, safety, and environmental protection is being achieved as was intended and expected.

We believe that risk tradeoffs are a pervasive feature of decisions people make to protect human health and the environment. As an example of an ordinary risk tradeoff in action, consider a routine decision we all face: what to do for a headache. Taking two aspirin will probably make your head feel better, because aspirin is acetylsalicylic acid, which blocks prostaglandins that would otherwise transmit pain signals to the brain. The analgesic properties of salicylic acid in willow leaves were noticed thousands of years ago, and aspirin was first synthesized in the 1800s; now it is the most widely used drug in the world (Wolfson 1985). But at the same time that the two aspirin make your headache feel better, they may well make your stomach feel worse, because a common side effect of acetylsalicylic acid is irritation of the lining of the gastrointestinal tract. Prolonged use of aspirin may lead to stomach ulcers, and in children with the flu it may even cause the potentially fatal Reye's syndrome (Edelson 1991).

This familiar example illustrates several of the key concepts in risk tradeoff analysis. In order to reduce a target risk (the headache), you decide on an intervention (aspirin), but thereby induce a set of potential countervailing risks (stomach

pain, ulcers, Reye's syndrome). The fact that Reye's syndrome and certain other countervailing risks are listed on the aspirin bottle emphasizes the importance to sound decisions of being informed in advance about risk tradeoffs. And the aspirin example suggests how a decisionmaker might resolve the risk tradeoff: in the short term, in which the only two options are to do nothing (endure the headache) and to take aspirin, the decisionmaker will need to weigh "risk versus risk": evaluate in light of his or her individual circumstances (and depending on how much aspirin is taken) the likelihood and severity of the countervailing risks as compared to the target risk and make a decision as to the preferred course. In the longer term, the decisionmaker can seek out additional options that both reduce the target risk and avoid countervailing risks. These options would be "risk-superior," reducing overall risk rather than trading one kind of risk for another.

A "risk-superior" alternative to taking aspirin might be to take acetaminophen, a non-aspirin pain reliever which treats the headache with little or no risk of stomach irritation or Reye's syndrome (Wolfson 1985). But acetaminophen does not match aspirin's ability to reduce inflammation, a target risk of concern to those suffering from injuries, arthritis, or premenstrual swelling. Or one might take ibuprofen, another non-aspirin analgesic, which relieves headache and inflammation with modest risk of stomach irritation (Edelson 1991). Indeed, acetaminophen (for example, Tylenol) and ibuprofen (for example, Nuprin) have been advertised as headache- and swelling-relieving treatments that avoid the countervailing risks posed by aspirin (Edelson 1991). And there may be non-drug alternatives, such as massage, to treat headaches. Ultimately, the choice of different headache remedies will depend on the individual's particular health circumstances and preferences—and on information about the target and countervailing risks of each option.

Our aim in this book is to explore risk tradeoffs faced by decisionmakers in all areas of life, from personal medical decisions to global environmental decisions. Our concern is that risk tradeoffs have received scant analytic attention (Keeney and von Winterfeldt 1986). We trust that development of a

more rigorous framework for analyzing risk tradeoffs will be valuable in recognizing, understanding, and resolving them. By suggesting such a framework, we seek to ensure that efforts to reduce health, safety, and environmental dangers are more fully thought through and more fully effective—not just well-intentioned, but pragmatically successful in terms of actual outcomes. Recognizing the prevalence of risk tradeoffs is thus an act not of reactionary intransigence but of constructive candor, since we will endeavor to show that much can be done to minimize countervailing risks once they are discerned. Our research indicates that risk tradeoffs are not an imagined inevitable perversity of life (Hirschman 1991) but rather a real consequence of incomplete decisionmaking, and that with attention and effort, individuals and society can wage the campaign to reduce risk with better tools that help to recognize and progressively reduce overall risk.

In this first chapter we propose a framework for "risk tradeoff analysis" (RTA) that decisionmakers at any level can apply to risk problems. RTA can help to illuminate the full range of risks involved in a decision, including potential countervailing risks that might arise through efforts to reduce the target risk of initial concern. RTA suggests ways to resolve risk tradeoffs when resources and technology are limited, through careful weighing of risk versus risk. This process of weighing risks requires ethical as well as scientific contributions. And RTA highlights the opportunities to resolve tradeoffs between target and countervailing risks by reducing overall risk through the development of risk-superior materials, technologies, and ways of organizing activities.

The heart of this book is a set of case studies drawn from the diverse fields of medicine, food, transportation, energy, and environmental protection. Although these case studies are not a random sample of all risk-reduction activity, we believe they are sufficiently rich and diverse to offer insights into the phenomenon of risk tradeoffs and promising directions for reform of decisionmaking. Each case study in the book treats a significant personal, social, or governmental problem from the perspective of an analyst employing RTA. The case studies are intended to be of current interest, but their main purpose

is to describe the tradeoffs that have confronted real-world decisionmakers. Thus new scientific discoveries that may have occurred since this volume was completed should not impair the durability of the case studies as insights into the challenge of decisionmaking.

The case studies begin with individual choices about personal health. Chapter 2 examines the choices a woman faces in dealing with menopause, when her changing hormonal balance can lead to osteoporosis and an increased risk of hip fractures and chronic discomforts in older age, but hormonal replacement therapies to ward off these ills can increase the risk of uterine (endometrial) and breast cancers. The case study in Chapter 3 illustrates a different medical tradeoff: the use of clozapine therapy to treat schizophrenia, which involves patients whose ability to decide for themselves is impaired.

Chapters 4 and 5 investigate tradeoffs in the effort to ensure highway safety. First we study the risks of highway fatalities associated with aging, and the tradeoffs that would be occasioned by rules proposed to restrict driving by senior citizens. Then we examine the tradeoff that has occurred as the government's automobile fuel economy (CAFE) rules have increased mileage per gallon but have also encouraged design changes such as downsizing that reduce the crashworthiness of cars.

The next five case studies involve the social regulation of widespread dietary and environmental risks. Chapter 6 examines the issues of whether to eat fish and whether to warn consumers about doing so, given that fish consumption reduces the risk of heart disease compared to other protein sources but that fish in some waterways may also carry carcinogenic contaminants. In Chapter 7 the question is whether to chlorinate drinking water, which helps suppress microbes that transmit acute infectious diseases, but which may add a cancer risk. Chapter 8 traces the risks posed by extracting more lead to make batteries and other products, versus the risks of recycling existing lead in secondary smelters. The system for registering pesticides is investigated in Chapter 9, with a focus on the extent to which regulatory authorities compare the risks of old pesticides with those of proposed newer