

# PREFACE

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## Introduction

Welcome to the world of decision analysis. This preface will introduce you to the purpose and organization of this book. This book describes how analytical tools can be used to help healthcare managers and policymakers make complex decisions. It provides numerous examples in healthcare settings, including benchmarking performance of clinicians, project implementation, scenario planning, resource allocation, analyzing the affect of HMO penetration, setting insurance rates, root-cause analysis, and negotiating employment agreements.

Nearly 20 years ago, Alemi (1986) [AU: Please provide source] wrote an article arguing for the training of healthcare administrators in decision analysis. Despite widespread acceptance of the idea at the time, as demonstrated by published commentaries, decision analysis has not caught on with healthcare administrators as much as it has in other industries. Overall, the application of decision analysis in other industries is growing (Keefer, Kirkwood, and Corner 2004). MBA students are more likely to receive instruction in decision analysis; and when they go to work, they are more likely to use these tools. Goodwin and Wright (2004) give several descriptive examples of the use of decision analysis by managers:

- DuPont uses it to improve strategic decision making;
- Nuclear planners used decision analysis to select counter measures to the Chernobyl disaster;
- ICI America uses it to select projects;
- Phillips Petroleum uses it to make oil exploration decisions;
- The U.S. military uses it to acquire new weapon systems;
- EXEL Logistics uses it to select a wide-area network; and
- ATM Ltd uses it for scenario planning.

The list goes on. In contrast, there are only few applications to healthcare management reported in the literature. This would not be so ironic if it were not for the fact that there are numerous applications of decision analy-

sis to clinical decision making and an increasing emphasis in healthcare to base clinical decisions on evidence and data (Detsky et al. 1998). This book hopes to change the situation in one of two ways. First, this book will highlight the applications of decision analysis to healthcare management. Healthcare managers can see for themselves how useful analysis can be in central problems they face. Second, this book covers decision analysis in enough depth so that readers can apply the tools to their own settings.

This book is ideally suited for students in healthcare administration programs. It may help these programs to develop courses in decision analysis. At the same time, the book will be useful for existing survey courses on quantitative analysis in terms of providing a more in-depth understanding of decision analysis so that students feel confident in their abilities to apply these skills in their careers.

The book is also intended for clinicians interested in the application of decision analysis to improving quality of care. Often, practicing physicians, medical directors, nurse managers, and clinical nurse leaders need to take a system perspective of patient care. This book provides them with analytical tools that can help them understand systems of care and evaluate the affect of these operations on patient outcomes. There are a number of books on clinical decision analysis. This book includes applications to quality improvement that are not typically discussed in other clinical decision analysis books, including conducting a root-cause analysis, assessing severity of patients' illness, and benchmarking performance of clinicians. These are tools that can serve clinicians well if they want to improve healthcare settings.

Finally, this book may be useful in training of healthcare policy analysts. Policy analysts have to provide accurate analysis under time pressures. Decision analysis is one tool that can help them provide relevant analysis in a timely fashion. The book contains a number of applications of decision analysis to policy decisions, including the design of health insurance programs and security analysis.

## Organization of the Book

This book is organized into two broad sections. In the first section, various analytical tools (multi-attribute value models, Bayesian probability models, and decision trees) are introduced. In particular, the following chapters are included in Part 1:

1. **An Introduction to Decision Analysis.**
2. **Modeling Preferences.** This chapter demonstrates how to model a decision maker's values and preferences. It shows how to construct

multi-attribute value and utility models—tools that are helpful in evaluation tasks. In particular, it shows how to use multi-attribute value models in constructing severity indices.

3. **Measuring Uncertainty.** This chapter introduces the concepts of probability and causal networks. It lays the ground work for measuring uncertainty by a subjective assessment of probability. It also shows how to assess the concept of probabilistic independence—a concept central to model building.
4. **Modeling Uncertainty.** This chapter demonstrates how to assess the probability of uncertain, rare events based on several clues. This chapter introduces Bayes's odds form and shows how it can be used in forecasting future events. In particular, the chapter applies the Bayes's odds form to a market assessment for a new type of HMO.
5. **Decision Trees.** This chapter discusses how to combine utility and uncertainty in analyzing options available to healthcare managers. It includes analyzing the sensitivity of conclusions to errors in model parameters, and it shows how a decision tree can be used to analyze the affect of a new PPO on an employer.
6. **Modeling Group's Decisions.** This chapter advises on how to obtain the preferences and uncertainties of a group of decision makers. This chapter describes the integrative group process.

In Part 2, the tools in Part I are applied to various management decisions, including the following:

7. **Root-Cause Analysis.** This chapter applies Bayesian networks to root-cause modeling. The use of causal networks to conduct root-cause analysis of sentinel events is addressed.
8. **Cost Effectiveness of Clinics.** This chapter demonstrates the use of decision trees for analyzing cost effectiveness of clinical practices and cost of programs.
9. **Security Risk Analysis.** This chapter applies Bayesian probability models to an assessment of privacy and security risks.
10. **Program Evaluation.** This chapter uses decision-analysis tools for program evaluation, using Bayesian probability models to analyze markets for new health services.
11. **Conflict Analysis.** This chapter shows the use of multi-attribute value modeling in analyzing conflict and conflict resolution. It also demonstrates how multi-attribute value models could be used to model conflict around a family-planning program. In addition, an example is given of a negotiation between an HMO manager and a physician.
12. **Rapid Analysis.** This chapter shows how subjective and objective data can be combined to conduct a rapid analysis of business and policy decisions.

13. **Benchmarking Clinicians.** This chapter addresses the use of decision analysis to construct measures of severity of illness of patients and to compare clinicians' performance across different patient populations.

## Suggested Chapter Sequences

Some of the chapters in this book are interrelated and should be read in order. Chapter 6: Modeling Group's Decisions should only be covered after the reader is familiar with modeling an individual's decision.

If you are modeling a decision maker's values, you may want to start with Chapter 2: Modeling Preferences and then read the Chapter 10: Program Evaluation and Chapter 11: Conflict Analysis, both of which show the application of this tool.

Readers interested in learning about the use of probability models may want to start with Chapter 3: Measuring Uncertainty and then read Chapter 4: Modeling Uncertainty before reading Chapter 7: Root Cause Analysis and Chapter 9: Security Risk Analysis.

Healthcare administrators trying to understand and analyze complex decisions might want to look at decision trees. To do so, they need to read all of the chapters through Chapter 5: Decision Trees. Once they have read the fifth chapter, they should read Chapter 8: Cost Effectiveness of Clinics and Chapter 13: Benchmarking Clinicians to see example applications.

Readers interested in conflict analysis may want to start with Chapter 2: Modeling Preferences and Chapter 6: Modeling Group's Decisions before reading Chapter 11: Conflict Analysis.

This book was written to serve the needs of healthcare administration students. But other students can also benefit from a selection of chapters in this book. If this book is used as part of a course on risk analysis, for example, then readers should start with the Chapter 3: Measuring Uncertainty, Chapter 4: Modeling Uncertainty, and Chapter 6: Modeling Group's Decisions before reading Chapter 9: Security Risk Analysis.

In a course on policy analysis, this book might be used differently. The sequence of chapters that might be read are all chapters through Chapter 5: Decision Analysis, and then Chapter 8: Cost Effectiveness of Clinics, Chapter 10: Program Evaluation, Chapter 11: Conflict Analysis, and Chapter 12: Rapid Analysis.

A course on quality improvement and patient safety may want to take an entirely different path through the book. These students would read all chapters through Chapter 5: Decision Trees, and then read Chapter 7: Root-Cause Analysis, Chapter 8: Cost Effectiveness of Clinics, and Chapter 13: Benchmarking Clinicians.

## Book Companion Web Site

This book has been based on an earlier book by Gustafson, Cats-Beril, and Alemi (1992). All of the chapters have gone through radical changes, and some are entirely new, but some, especially Chapter 6: Modeling Group's Decisions, Chapter 10: Program Evaluation, and Chapter 11: Conflict Analysis, continue to be heavily influenced by the original book.

Writing a book is very time consuming; the first book took a decade to write, and this one took nearly three years. With such schedules, book can become out-of-date almost as soon as they are written. To remedy this problem, this book features a companion web site that should make the book significantly more useful. At this site, readers of this book can

1. Listen to narrated lectures on the topic of each chapter;
2. See animated examples of how to use computer programs to conduct tasks needed for decision analysis;
3. Download free software and use online tools that can aid decision analysis;
4. Ask the author questions and read questions asked by others;
5. Comment on the value of different chapters and tools;
6. Link to web sites of interest; and
7. See annotated bibliographies of additional readings.

Perhaps the most useful aspect of the material included on the web site are examples of decision analysis done by other students. Most chapters end with Rapid-Analysis Exercises. These are designed to both test the knowledge of the student as well as to give them confidence that they can do decision analysis without relying on consultants. Many students have said that what helps them the most in learning decision analysis is doing the Rapid-Analysis Exercises, and what helps them in doing these assignments is seeing the work of other students. This book's companion web site will feature such examples of student's work.

The idea is relatively simple: learn one, do one, and teach one. If you would like to include examples of how you have used the decision analytic tools you have learned to complete the Rapid-Analysis Exercises, please e-mail author Farrokh Alemi at [falemi@gmu.edu](mailto:falemi@gmu.edu) so that your work can be posted on the companion web site.

When you learn decision analysis, you are admitted to a "club" of people who cherish the insights it provides. You will find that most decision analysts will be delighted to hear from you and will be intrigued with your approach to a problem. Most authors of books and articles on decision analysis would welcome your comments queries. Use the resources on the web to network with your colleagues. Welcome to our midst!

## Summary

We live in a fast-changing society where analysis is of paramount importance. Our hope is to help students solve pressing problems in our organizations and society. Good decisions based on a systematic consideration of all relevant factors and stakeholder opinions and values lead to good outcomes, both for those involved in the decision-making process and for the customers who are directly affected by the consequences and effects of such decisions.

## References

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