ANALYSIS, PLANNING, AND MANAGEMENT OF URBAN EMERGENCY SERVICES

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INTRODUCTION

This prospectus outlines a monograph, now under way, proposed for the Survey Project's State-of-the-Art Series. Tentatively titled "Analysis, Planning, and Management of Urban Emergency Services," the volume will present modern methods, concepts, and principles for emergency medical services, fire protection, and police emergency services, drawing on both advanced theoretical developments and international case examples. As it is now structured, the volume will attempt to

- Unify and synthesize an advanced but as yet unintegrated state-of-the-art in applying systems analytic techniques to significant, real problems.
- Help accelerate urban governments' understanding and use of selected innovative planning and managerial techniques.

IMPORTANCE

The urban emergency services form an important focus for such a monograph because:

1. Improving them can potentially save large amounts of scarce resources. Worldwide expenditures on emergency services, in addition to human and physical costs, amount (even excluding deaths) to about $100,000,000,000 per year. Using the material presented in this volume, improvements of more than 10 percent (much more, in some cases) may be possible; even 1 percent would amply repay the time and effort expended to achieve them.
2. Improvements in these services can immediately save lives. Perhaps more than most other things governments routinely do, the emergency services directly intervene in matters of life and death. Since the life-saving occurs day-by-day, sometimes even hour-by-hour, improvements that can be implemented quickly (as many of the prescriptions in the volume can) show immediate returns. Moreover, often merely the knowledge that services received are excellent can ease citizens' minds: Improving "physical insurance" enhances

security and imparts a sense of well-being, thus improving an important, though intangible quality of life.

3. The concepts, principles, and techniques presented promise to apply to services in many countries. The technological, planning, and managerial problems involved in providing emergency services appear remarkably universal--that is to say, quite similar even across major differences in cultures and economic systems. The basic approaches, techniques, and prescriptions for these problems should also apply widely. (We will attempt to note particular points where institutional differences may introduce asymmetries between problems and solutions.)
4. Relatively complete systems analytic research on emergency services has recently been conducted and is largely available. Some of it is supported by several years' experience with real applications. During the past eight years, extensive research has been done on emergency services, primarily in the United States (where the authors played key roles in much of the work) and in Great Britain. Of this research, a sizeable part has flowed from comprehensive systems analyses conducted jointly with responsible agencies. Backed by fundamental work carried out in parallel, these analyses have focused on achieving and implementing solutions to basic planning, managerial, and operational problems. Some of this recently completed work has led to results that pioneering service agencies have already successfully put into practice. A few results have been tested--and accepted--for over five years in daily operations and management.

In informally surveying the field, the authors found that most of the central problems in emergency services clearly amenable to quantitative analysis have now been treated, and many have essentially been solved. As yet, however, these advances are only partly documented, and what documentation exists is widely scattered in journals, working papers, and reports. The time is now right to pull together and document this material and produce it in an accessible and applicable form.

BACKGROUND

The volume will cover the research of many institutions, and will include case examples from several countries, although much of the work in the field--and hence the largest part of the results presented in the volume--is taken from research conducted and led by the authors at The New York City-Rand Institute and The Rand Corporation in Santa Monica, California. As it has developed, this work has kept abreast of related activities elsewhere (at least those conducted in English), and often has drawn directly upon the people involved (especially the public systems group at MIT) as well as their publications. Research and experiences originally developed in languages other than English are now being addressed through the auspices of the International Institute for Applied Systems Analysis in Laxenburg, Austria.

In the course of the authors' work, mainly supported by the City of New York and U.S. Department of Housing and Urban Development (which has catalyzed extension and application of the methods to several smaller cities), over 100 publications--reports, articles in professional journals, and formal working papers--have been written on the emergency services of concern. Selected items are listed in Appendix A. In addition, there is a substantial body of material that has never formally been written down. This includes not only unwritten material, but also memoranda and internal reports prepared by the service departments with whom the work has been done and, in addition, previously unavailable material describing details of policy and program development and implementation, which the authors are now free to use. Selected materials developed at other institutions are also noted in Appendix A.

*Appendix B provides biographical sketches of Dr. Edward H. Blum and the two probable co-authors, Dr. Jan M. Chaiken and Dr. Warren E. Walker, who have worked closely with Dr. Blum over the past seven and five years, respectively, much of the time intimately involved in the work on emergency services.

AUDIENCE AND PRESENTATION

As noted in the Introduction, the monograph will have a dual aim: to consolidate (and advance) the state-of-the-art, and to help transmit applicable features to potential users. To achieve this aim, we will write the main parts of the volume at an intermediate technical level, to meet the needs of what one might term "practicing analysts" and "analytical

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*Appendix B ommitted from this version.

practitioners." We will also include a variety of special features to meet the needs of both more general and more specialized readers.

Overall, our objective is to provide methods, analyses, ideas, and insights that can help managers (and those who assist and advise them) in the short- and near-term and to provide the analytical and intellectual framework (or Gestalt) that will serve as guidelines for the future. Although these short- and long-term considerations are often separated and handled by different groups of people who sometimes seem to speak different languages, we will try to avoid such a bifurcation.

To bridge the potential gap in interests, backgrounds, and styles between "managers" and their advisers on the one hand, and "planners" or "analysts" on the other, we will build strongly on case examples. Selected from actual experience in at least the United States and Great Britain (and several other countries, if we are able to locate and obtain sufficient details about relevant work in Europe, Japan, and the USSR), these examples will be used throughout the volume to illustrate concretely what analytical results mean, why they arise and how they are motivated, how methods can be--and indeed have been--applied in real situations, and how nonanalytic (e.g., organizational, psychological) considerations can be taken into account.

To meet the needs of more specialized readers, we are including details of some methodological advances that have been developed for several stages in the process of applied systems analysis, from problem formulation to implementation. We will also present insights into, and some heuristic methods for treating, unresolved methodological problems shared with many other areas of application (such as assessing public risk preferences, setting service standards, evaluating life-saving, etc.). We will provide the technical details largely by reference (except where original sources are inaccessible or incomplete), and we will give sufficient details of the unified methodology to permit analysts to verify and build upon it--either to advance the state-of-the-art or to apply it to new questions and problems.

For more general readers, from the work on emergency services and from related work on general service productivity, we will distill basic, applicable principles that show how to improve the planning and management of nearly all services. These will be presented as part of (and should contribute to) the broader literature on service management, in general--a literature that is surprisingly sparse, considering the major roles services play in all governments and developed economies.

We will also provide key sections to satisfy the interests of top management. Some will take the form of executive summaries, which will emphasize points most important for policy and link them to broader concerns. Some will focus, for example, on the purpose of the service and on the methods for developing criteria and incentives to help realize the purpose. Still other sections will introduce, motivate, and codify technical results, using a relatively nontechnical style and terminology. There will also be two chapters devoted to implementation.

With this organization and manner of presentation, the volume should also interest students and professionals in such fields as management, public administration, planning, urban studies, operations research, economics, and engineering.

ORGANIZATION AND CONTENTS

The volume will be organized into the following five major parts.

I. Introduction

The first part will consist of a single introductory chapter, which will show the importance of urban emergency services in a number of settings and illustrate the motivation for the book with several problems recently experienced by major service institutions.

II. Service Management Principles

The second part, consisting of three chapters, will provide a foundation for the remainder of the volume. It will provide the context for emergency service questions and methods for resolving them, and for showing how they can be understood, explained, and developed by applying basic service management principles. In so doing, this part will develop a conceptual structure that illuminates planning and management problems, issues, and principles common to all urban services and to many other services.

For example, we will briefly review some of the essential characteristics of services, especially public services, that distinguish their management tasks, style, and concepts from those of production management, which dominate the literature. We will examine in depth the features of urban services that determine how they can be supplied, and develop a systematic typology that reveals major points of leverage for making improvements.

Since much of the writing will stem from research done jointly with operating agencies, it will include material typically omitted from systems analysis. For example, when discussing criteria and measures, we will develop and show the use of such usually neglected but societally important measures as robustness (ability to perform well under widely varying conditions) and resilience (ability to recover quickly and effectively from stress). In another section, we will develop in some depth operational concepts of equity (tracing their bases in moral and political philosophy) and suggest ways to analyze and treat distributions of costs and benefits. We will also present methods that can help shape or revise service objectives and link them to societal goals and the service "products" that consumers demand or desire.

III. Emergency Services: Current Practices, Problems, and Milieu

In five chapters, this part will describe the "real world." Using examples and data from several countries, we will review concretely what the emergency services do, how they are organized and operate, what personnel and technologies they use, what planning and management problems may arise, and how the operating services are imbedded in larger systems (e.g., ambulances and emergency rooms in the health care system), and where points of leverage typically are. We will spotlight key points where change could be induced (or already seems likely to occur), especially in the larger milieu, where changes could significantly reshape the services' futures. We will also note, where appropriate, international variations and will highlight the essential similarities and differences between the several services.

IV. Emergency Services: Analysis and Prescriptions for Planning and Management

The fourth part will be the major focus of the volume. It will comprise nine chapters, which develop methods and results for key questions and problems, concentrating on those common to the several services. Topically, the chapters divide naturally into four groups:

Longer-range planning and management questions: supply. These chapters will develop the analytical tools needed to make essential, longer-range "strategic" decisions that determine the aims, levels, and qualities of service. Much of this part of the monograph will build on a large collection of mathematical models, which will be developed and described adequately to

permit careful analysts to use them in good conscience. Extremely technical details, however, will be left to technical references.

Topics in these chapters will include setting objectives and designing services, examining budgetary and organizational questions, establishing levels of service, setting numbers of personnel and facilities, choosing locations for personnel and facilities, selecting technologies and assessing their impacts, and dealing with the future.

Longer-range planning and management questions: demand. This section will include two chapters. One will cover longer-range demand projections and forecasting, and will emphasize the features, qualities, and details needed for longer-range planning and management decisions, as well as the methods needed to obtain them. The other will consider the nature of demands for emergency services and ways in which these can be reduced, modified, or at least well understood. Some of the more costly features of emergency services mainly provide physical insurance against dangerous risks; if the risk magnitude ("hazard") and/or the frequency of occurrence can be reduced, so can both the losses and the premium that the public pays.

Topics to be treated in this latter chapter are likely to include identifying points of leverage in causal loops, setting priorities for programs to influence demands, regulatory and economic approaches to "prevention," uses of marketing methods, consideration of secondary and tertiary impacts, and--since the field is not yet fully understood--pilot program design, testing, and evaluation.

Shorter-range planning and management questions. These chapters will develop the methods, ideas, and insights, and prescribe the tactical policies needed to make the frequent, rapid, short-range decisions that immediately influence the quality of the service provided. These chapters will make extensive use of complex, quantitative models, many of which have been designed to be used in "real time," some on computers and some in modern manual systems.

Topics treated here will include generating and selecting tactical response policies, setting policies and priorities for initial response, dynamic resource allocation, analyzing policies, allocating personnel, developing new alternatives, developing and implementing programs to effect tactical policies, and dealing with uncertainties and risks.

Basic methodological problems. This chapter will cover in moderate detail selected open problems encountered in analyzing all emergency services. These problems are also encountered in many other fields, such as ecological and energy policy, where work toward solving or understanding them is in progress. A number of topics will be treated briefly. Three main areas will be developed in greater depth:

- o Risk (hazard) analysis, by time, location, and contributing factors that can be influenced by policy.
- o Time preferences and the comparison of impacts occurring at different times (e.g., short-term versus long-term effects).
- o Risk preferences and their implications for standards, including questions of "the value of life," the marginal value of performance improvements (e.g., response time), and the identification of service impacts.

Where possible, we will present methods that appear to work well on typical real problems, given the current state-of-the-art. Thorough treatment would require extensive state-of-the-art reviews of these subjects; however, we will limit our coverage to especially pertinent issues. Some parts of these topics have been the subjects of entire books.

V. Implementation

The fifth part will contain two chapters, one that presents strategies to help ensure that results will be effectively put into practice, and one that focuses on proven practices for conducting real-world emergency service analyses.

The first chapter will emphasize the operational, strategic, and managerial considerations that underlie success in proceeding from analyses or plans to policies, to programs, and finally to working programs that have the desired effects. Most of our knowledge and experience in this area will derive from American sources, but we will try to develop points that appear to depend more on human nature and on organizational principles than on particular political or institutional settings. The second chapter will present a kind of manual (or guidebook) for planning or carrying out specific systems analyses on emergency services. It will highlight setting research priorities and describe in detail key methods that have been found to work well.

TENTATIVE CHAPTER OUTLINE:
Analysis, Planning, and Management of Urban Emergency Services

I. Chapter 1: Introduction

II. Service Management Principles
- Chapter 2: Service Management Features, Tasks, and Responsibilities
- Chapter 3: Service Objectives, Performance Criteria, and Measures
- Chapter 4: Improving Service Quality

III. Emergency Services: Current Practices, Problems, and Milieu
- Chapter 5: Fire Protection
- Chapter 6: Emergency Medical Services
- Chapter 7: Police Emergency Services
- Chapter 8: Other Emergency Services
- Chapter 9: Summary--Similarities and Differences

IV. Emergency Services: Analysis and Prescriptions

IV.A. Longer-Range Planning and Management: Supply of Services
- Chapter 10: Longer-Range Questions, Problems, and Issues
- Chapter 11: Strategic Policies
- Chapter 12: Allocation Policies
- Chapter 13: Dealing with the Future

IV.B. Longer-Range Planning and Management: Demands for Services
- Chapter 14: Demand Analysis and Protection
- Chapter 15: Approaches to Influencing Demands

IV.C. Shorter-Range Planning and Management
- Chapter 16: Response Capabilities and Policies
- Chapter 17: Dynamic Resource Allocation

IV.D. Chapter 18: Open Methodological Questions

V. Implementation

Chapter 19: Translating Analyses and Planning into Impact

Chapter 20: Conducting Studies for Emergency Service Planning and Management--Summary and Brief Guidebook.

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